

SECTION C
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SECTION C

SPECIFICATIONS

C1 General.

The purpose of this acquisition is to provide general purpose super-minicomputer systems for the Navy, Army, Air Force, Defense Logistics Agency, Coast Guard, and other Government agencies for worldwide use. These systems shall support a wide range of users in areas of command and control, office automation, finance, inventory, engineering, and training. The Contractor shall furnish, install, maintain, and upgrade the hardware and software and shall integrate the system into the Government's existing data processing environments.

All additional components and features needed to satisfy specified performance and configuration requirements shall be provided in conjunction with hardware and software specified herein. All functions can be provided as hardware, firmware, or software unless otherwise noted. These specifications are mandatory except those features specifically identified as "Desired Capabilities."

1.1 Concept. This specification defines hardware and software characteristics which make up a super-minicomputer system to include network servers, networks, X-terminals, intelligent workstations, and other components. The largest system shall support 256 concurrent users in combinations varying from 200 relational database management system (RDBMS) users accessing a single database to 200 office automation users to 200 application development users all in conjunction with 56 other miscellaneous users. These systems shall be incrementally expandable within a family of systems from the smallest to largest configuration. These systems shall process classified information in system high mode (Trusted Computing Base (TCB) level C2) and in a multilevel security mode (TCB level B1). The Government will provide any physical controls deemed necessary to satisfy TEMPEST protection. The Contractor shall provide systems which can be accredited for multilevel processing. Functions to be run on these systems include user-supplied application programs, applications development, office automation, database management, system performance monitoring, and communications.

1.2 Architecture. The Contractor may provide a single processor, multiple processors, or any other architecture as long as minimum mandatory requirements are met.

1.3 Government-owned Equipment (GOE). The Government will utilize equipment and software acquired under other contracts (see Table C-1) to include terminals, workstations and personal computers, printers, optical disk storage, bar code equipment and software, local area network (LAN) hardware and software, graphics software, RDBMS, spreadsheets, project management packages, statistical analysis packages, electronic mail (E-mail) packages, and word processors. The Government will maintain all GOE hardware, software, and transmission circuits. The Contractor shall provide all necessary hardware and software for integration of GOE.

1.4 Software. Application software shall include a RDBMS, language processors, network management, office automation, intelligent workstation software, publishing software, and order generator.

1.5 Contractor Support. The Contractor shall provide maintenance support which shall include several options of principal period of maintenance and time to repair. Each component shall be maintained to assure a high component effectiveness level. A full complement of training courses shall be conducted at the Government and Contractor sites. A complete set of manuals for all hardware and software as well as other documentation shall be provided. Systems analyst and engineering support personnel shall be thoroughly knowledgeable in the super-minicomputer system including all hardware and software. The Contractor shall also provide system monitoring and tuning utilities and services.

1.6 Installation The Contractor shall install super-minicomputer systems in

a variety of office environments at sites located throughout the world. Network communications subsystems installation shall include all equipment, software, and cabling necessary to connect a complete subsystem. The Contractor shall also provide equipment relocation and re-installation services.

C2 Operational Concept.

2.1 Current Operational Environment. Any conceivable mix of computers and communication methods are in the current operational environment. The systems will replace and augment some existing systems, as well as, meet new requirements.

2.2 Hardware and Software. These systems must satisfy a variety of functions and provide both technical and non-technical professional personnel with the capability to utilize a wide range of commercially available software.

2.3 Communications. Multiple methods of communications shall be provided, ranging from direct-connect to client-server to open systems connections to heterogeneous computer systems located worldwide via packet switching. LANs shall provide maximum connectivity for fully configured systems with minimum direct-connect wiring. Each workstation shall be capable of connecting to other system workstations and to other workstations within the local dialing area. Users shall have Defense Data Network (DDN) connection capability for long-haul communications.

C3 Standards.

3.1 Compliance with Federal Information Processing Standards (FIPS). Equipment and software shall conform to the FIPS and Federal Standards listed in Attachment 3, as well as, the guidelines listed in Attachment 4.

3.2 Compliance with other Standards. Compliance is required with the specifications and standards listed in Attachment 5.

3.3 Request For Comments (RFCs). Order of precedence for RFCs (listed in Attachment 5) compliance shall be "MUST", "MUST NOT", "SHOULD", "SHOULD NOT", and then "MAY", except when otherwise specified by the Government.

C4 Environmental and Physical Constraints.

The super-minicomputer systems shall operate throughout the ranges of electrical power and environmental tolerances stated below.

4.1 Space.

4.1.1 Location. Systems such as the one described in paragraph C4.1.2 will be located in computer room facilities. Systems such as the one described in paragraph C4.2.2b will be located in office environments.

4.1.2 Physical Size. The following configuration shall require no more than 400 square feet including space for operations and maintenance access:

- a. A super-minicomputer configured to support 256 concurrent users;
- b. Sufficient rewritable direct access storage (DAS) to store all orderable super-minicomputer software plus 32 GB available for user storage;
- c. A system console;
- d. A 9-track tape subsystem with 2 drives;
- e. A DAS backup subsystem with 2 drives;
- f. Two (2) removable rewritable DAS devices;
- g. Two (2) WORM DAS devices;
- h. Two (2) CD-ROM DAS devices;

- i. A high-speed page printer with stand/cart;
- j. A line printer;
- k. 56 Kbps super-minicomputer X.25 Port.

4.1.3 Flooring. Equipment shall not require raised flooring. The flooring may be carpeted. There will be no special static control facilities. Cable raceways and troughs shall be installed by the Contractor as necessary to satisfy safety considerations.

4.1.4 Ceiling. The distance from floor surface to unobstructed ceiling will be at least 8 feet.

4.1.5 Access Route. Systems shall be installed in office buildings with access via a normal office doorway of 32 by 80 inches.

4.2 Air Conditioning.

4.2.1 Temperature will be maintained between 60 and 90 degrees F with a relative humidity of between 20 and 80% noncondensing (maximum wet bulb temperature of 70 degrees F). No special dust, static electricity control, or chilled water facilities will be available.

4.2.2 Environmental Control. The maximum heat dissipation shall not exceed:

- a. 80,000 BTUs per hour for configuration in paragraph C4.1.2;
- b. 20,000 BTUs per hour for the following configuration:
 - (1) A super-minicomputer system configured to support 75 concurrent users,
 - (2) Sufficient rewritable DAS to store all orderable super-minicomputer software plus 2 GB available for user storage,
 - (3) A system console,
 - (4) A magnetic tape subsystem with 2 drives,
 - (5) A DAS backup subsystem with 2 drives,
 - (6) Two (2) removable rewritable DAS devices,
 - (7) A high-speed page printer with stand/cart,
 - (8) 56 Kbps super-minicomputer X.25 Port.

4.3 Noise. Equipment noise levels shall not exceed recommended levels found in Military Standard (MIL-STD) 1472D, 14 Mar 89, as follows:

- a. Line printer shall comply with MIL-STD 1472D, paragraph 5.8.3.3.1, General Work Space, 75 dB(A) Speech Interference Level (SIL);
- b. The 128-user, 192-user, and 256-user super-minicomputers and the character printer shall comply with MIL-STD 1472D, paragraph 5.8.3.3.3, Large Workspaces 55 dB(A) SIL;
- c. All other equipment shall comply with MIL-STD 1472D, paragraph 5.8.3.3.4, Small Office Spaces/Special Areas, 45 dB(A) SIL.

4.4 Altitude. All equipment shall operate at altitudes from 0 to at least 8,000 feet above sea level.

4.5 Electrical Power. All equipment shall operate as specified when connected to a power source which conforms to Attachment 9, paragraph 3.

C5 Overall System Requirements.

5.1 Operating System. The operating systems and utilities shall support secure communications and networking capabilities.

5.2 Database Subsystem. The database subsystem shall have full application development utilities, data dictionary, and standard structured query language (SQL) interfaces.

5.3 Standards. This super-minicomputer system shall be capable of connecting system users to other National Institute of Standards and Technology (NIST) Applications Portability Profile (APP) compliant systems. (See paragraphs C33, C34, C35, and Attachments 3, 4, and 5)

5.4 Network Facilities. The network services subsystem shall meet the performance and throughput necessary to achieve system performance requirements.

5.5 User Interface. The graphical user interface shall be designed and integrated such that human interface with the system embodies characteristics making it easy to learn and use for both inexperienced and experienced users. Interface standards must be adhered to throughout. The ability for user-developed application program to utilize this human interface system must be provided.

5.6 Office Automation system shall have integrated functions and include electronic mail, spreadsheet, word processing, business graphics, project management, calendar, authentication, electronic filing, task and suspense management, spell checking, thesaurus, lexical analyzer, and document conversion.

5.7 Software Compatibility. Application software developed by the Government and developed under Government-sponsorship shall be source code compatible between the super-minicomputer, network server, and intelligent workstations. Data interchange shall be easy to perform and provide complete data transfer.

5.8 Desired Capabilities.

5.8.1 Contractor components provide a consistent user interface for an application across operating systems (e.g. the same word processor user interface for the super-minicomputer, network server, multi-user workstation, and single-user workstation).

5.8.2 Contractor components provide a consistent user interface within an operating system across applications (e.g. the same user interface on the super-minicomputer for the word processor, spreadsheet, electronic mail, relational database management system, etc.).

5.8.3 Contractor components provide functions and features making the systems and applications easier to manage, control, learn to use, develop applications, and diagnose faults.

C6 Super-minicomputer Equipment, CLINs 0001-0050.

All equipment shall meet or exceed Attachment 6 system performance (see also Section E). All CLINs shall include necessary inter-component cables, special hardware, and connectors. Include services necessary to install and test super-minicomputer components at the Government site.

6.1 Super-minicomputer Configurations, CLINs 0001-0004.

6.1.1 Common Requirements. All super-minicomputers shall:

- a. Have an expandable architecture accommodating added memory, peripherals, and communications equipment necessary to support at least 256 concurrent users;
- b. When installed with the UPS, be notified by the UPS of power

failure and brownout conditions to provide an automatic, orderly shut down prior to UPS shutdown;

- c. Notify the operating system of any I/O error conditions (e.g. failure to complete a data transfer to and from specified external devices within a prescribed time interval);
- d. IEEE 754 compliant floating point hardware with precision ranging from at least 10E+38 and 10E-38 (8 significant digits) to at least 10E+308 and 10E-308 (16 significant digits);
- e. Be object code compatible through the range of sizes;
- f. Support direct connection of at least 128 asynchronous devices as described in paragraph C36.1;
- g. Detect and correct all single-bit errors and detect all double bit errors;
- h. Reserved;
- i. On demand, the system shall produce a hard copy report detailing memory errors;
- j. Include a system console;
- k. Include sufficient rewritable direct access storage (DAS) to store all orderable super-minicomputer software plus user storage, where the D provides:
 - (1) Self-test error detection and error notification to the operating system, and automatic retry after error,
 - (2) Power failure and fluctuation protection;
- l. Include a super-minicomputer DAS Backup Subsystem which shall:
 - (1) Store at least 1 GB on a single media element,
 - (2) Backup at least 1 GB in 1.5 hours,
 - (3) Restore at least 1 GB in 2.25 hours,
 - (4) Format blank storage medium (if necessary),
 - (5) Ten (10) blank storage media;
- m. Include an IEEE 802.3 local area network (LAN) interface.

6.1.2 CLIN 0001, 75-user Super-minicomputer shall include sufficient processing power and memory to support 75 concurrent users and sufficient DAS to provide at least 2 GB of formatted user storage.

6.1.3 CLIN 0002, 128-user Super-minicomputer shall include sufficient processing power and memory to support 128 concurrent users and sufficient DAS to provide at least 3.5 GB of formatted user storage.

6.1.4 CLIN 0003, 256-user Super-minicomputer shall include sufficient processing power and memory to support 256 concurrent users and sufficient DAS to provide at least 7 GB of formatted user storage.

6.2 CLIN 0005, Super-minicomputer Expansion to 128 Users. Provide components necessary to upgrade the 75-user super-minicomputer to support 128 concurrent users and maintain Attachment 6 system performance specifications.

6.3 CLIN 0007, Super-minicomputer Expansion to 192 Users. Provide components necessary to upgrade the 128-user super-minicomputer to support 192 concurrent users and maintain Attachment 6 system performance specifications.

6.4 CLIN 0009, Super-minicomputer Expansion to 256 Users. Provide components necessary to upgrade the 192-user super-minicomputer to support 256 concurrent users and maintain Attachment 6 system performance specifications.

6.5 Super-minicomputer Rewritable DAS Subsystem Expansion, CLINs 0027-0032, shall:

- a. Provide incremental expansion of the super-minicomputer DAS subsystem so there is sufficient storage for all orderable super-minicomputer software plus 32 GB (formatted);
- b. Be available in at least 3 sizes of formatted storage (e.g. 500 MB, 1 GB, 2 GB);
- c. Provide self-test error detection and error notification to the operating system, and automatic retry after error;
- d. Provide power failure and fluctuation protection.

6.5.1 CLIN 0027, Super-minicomputer Small Rewritable DAS Device.

6.5.2 CLIN 0029, Super-minicomputer Medium Rewritable DAS Device.

6.5.3 CLIN 0031, Super-minicomputer Large Rewritable DAS Device.

6.6 CLIN 0033, Super-minicomputer Removable Rewritable DAS Device The requirements for this device may be satisfied by CLIN 0037 if that device supports rewritable storage media. The removable DAS device shall:

- a. Provide at least 250 MB formatted user storage on a single media element;
- b. Provide self-test error detection and error notification to the operating system, and automatic retry after error;
- c. Include at least 2 blank storage media with each device;
- d. Provide power failure and fluctuation protection.

6.7 CLIN 0035, Super-minicomputer Rewritable DAS Subsystem Redundancy. Provide the redundancy to configure the super-minicomputer DAS subsystem such that there is no single point of failure for accessing each DAS device.

6.8 Write Once Read Many (WORM) DAS, CLINs 0037-0040. A rewritable storage technology is acceptable for these devices, if they support WORM media.

6.8.1 Common Requirements shall include:

- a. At least 50MB of storage;
- b. Comply with International Standards Organization (ISO) 9171, Format A, Continuous Composite Servo or ANSI X3B11;
- c. Use 5.25 inch media;
- d. Include 10 blank media per drive.

6.8.2 CLIN 0037, Super-minicomputer Internal WORM shall be provided for the super-minicomputer and in the basic or expansion cabinet.

6.8.3 CLIN 0039, External WORM shall be provided for the super-minicomputer, network server, and the intelligent workstations.

6.9 Compact Disk - Read Only Memory (CD-ROM) DAS, CLINs 0041-0044.

6.9.1 Common Requirements shall include:

- a. Read 550 MB disks;

b. ISO 9660 compatibility.

6.9.2 CLIN 0041, Super-minicomputer Internal CD-ROM shall be provided for the super-minicomputer and mounted in the basic or expansion cabinet.

6.9.3 CLIN 0043, External CD-ROM shall be provided for the super-minicomputer, network server, and the intelligent workstations.

6.10 CLIN 0045, Super-minicomputer DAS Backup Subsystem Expansion. Provide additional drives for the super-minicomputer DAS backup subsystem.

6.11 CLIN 0047, Super-minicomputer 9-Track Tape Subsystem shall:

- a. Reserved;
- b. Provide 1600/6250 cpi 9-track Phase Encoding and Group Code Recording (PE/GCR) (ANSI X3.39-1986 and ANSI X3.54-1986);
- c. Have a tape speed of 125 inches per second (start/stop) or a tape speed of at least 100 ips (streaming);
- d. Provide automatic rewind, lock at end-of-reel, end-of-file, and end-of-job (may be accomplished by software);
- e. Provide read after write error detection;
- f. Provide read error detection with automatic retry and system notification of the error condition.

6.12 CLIN 0049, GOE Connection Hardware. Provide hardware to connect specified GOE (see Table C-1) to the super-minicomputer system. This includes but is not limited to all components needed to make 80386 GOE workstations functionally equivalent (provide access to use the specified software features and functions) to the super-minicomputer X-terminal workstation.

C7 Network Server and Peripherals, CLINs 0051-0090.

This subsystem shall support all network server applications to include file server, print server, and communications server support (see paragraph C16.4) and satisfy Attachment 6 system performance (see also Section E).

7.1 Network Server Configurations, CLIN 0051-0054.

7.1.1 Common Requirements. All network servers shall:

- a. Include a 3.5-inch, 1.44 MB diskette unit;
- b. Include IEEE 802.3 LAN interface hardware and provide support for additional IEEE 802.3 LAN connections as described in paragraph C35.2;
- c. Support a maximum DAS capacity sufficient to store all orderable network server software plus at least 3 GB of formatted user storage;
- d. Provide support for X.25 connectivity as outlined in paragraph C34;
- e. Provide support for ISDN connectivity as outlined in paragraph C34;
- f. Include at least 2 ports for connecting the printers described in paragraph C10;
- g. Include a DAS backup subsystem which:
 - (1) Stores at least 500 MB on a single media element,
 - (2) Backups at least 500 MB in 1 hour,

- (3) Restores at least 500 MB in 1 hour and 15 minutes,
 - (4) Formats blank storage medium, if necessary,
 - (5) Includes ten (10) blank storage media;
- h. Include an internal power supply sufficient for the following configuration:
- (1) Maximum memory,
 - (2) Fax card,
 - (3) Two (2) IEEE 802.3 LAN connections,
 - (4) X.25 or ISDN connectivity at the user's discretion,
 - (5) One (1) 3.5-inch floppy drive,
 - (6) Interface to two printers at the user's discretion,
 - (7) Eight (8) asynchronous connections,
 - (8) 3 GB of user DAS,
 - (9) Any 1 internal device to the system or expansion cabinet (e.g. 3.5-inch floppy drive, 5.25-inch floppy drive, removable rewritable DAS device) at the user's discretion,
 - (10) One (1) unused nonproprietary, open architecture expansion bus I/O slot,
 - (11) One (1) unused serial I/O port;
- i. Support at least eight (8) asynchronous devices as described in paragraph C36.2.

7.1.2 CLIN 0051, Small Network Server shall include:

- a. Sufficient processing power and memory to support at least 32 concurrent client sessions and maintain Attachment 6 system performance;
- b. Sufficient DAS capacity to store all orderable network server software plus at least 500 MB of formatted user storage.

7.1.3 CLIN 0053, Large Network File Server shall include:

- a. Sufficient processing power and memory to support at least 64 concurrent client sessions and maintain Attachment 6 system performance;
- b. Sufficient DAS capacity to store all orderable network server software plus at least 1.5 GB of formatted user storage.

7.2 CLIN 0055, Network Server Expansion. Provide incremental expansion of the small network file server processor/memory to support a total of at least 64 concurrent client sessions and maintain Attachment 6 system performance.

7.2.1 Desired Capability. Incremental expansion to support more than 64 concurrent client sessions and maintain the system performance stated in Attachment 6.

7.3 Network Server DAS Expansion, CLINs 0057-0060.

7.3.1 Common Requirements. All network server DAS shall include:

- a. Self-test error detection and notification;
- b. Power failure and fluctuation protection to prevent damage to drive and media.

7.3.2 CLIN 0057, Small Network Server Rewritable DAS Device. Provide expansion to the network server DAS by at least 500 MB formatted capacity.

7.3.3 CLIN 0059, Large Network Server Rewritable DAS Device. Provide expansion to the network server DAS by at least 1 GB formatted capacity.

7.4 CLIN 0067, Network Server 3.5-inch Diskette Unit. Provide at least 1.44 MB of formatted user storage.

7.5 CLIN 0069, Network Server 5.25-inch Floppy Disk Unit. Provide at least 1.2 MB of formatted user storage.

7.6 CLIN 0077, Network Server Removable DAS Device. The requirements for this device may be satisfied by CLIN 0079 if that device supports rewritable storage media. The removable DAS device shall include:

- a. At least 100 MB formatted user storage;
- b. Two (2) removable media or drives with each device.

7.7 CLIN 0079, Network Server Internal WORM. The device shall:

- a. Be internally mounted in the system or expansion cabinet;
- b. Comply with ISO 9171, Format A, Continuous Composite Servo or ANSI X3B11;
- c. Use 5.25-inch media;
- d. Include 2 blank dual-sided media per drive.

7.8 CLIN 0081, Network Server Internal CD-ROM shall be:

- a. Internally mounted in the system or expansion cabinet;
- b. ISO 9660 compatible.

C8 Workstations and Peripherals, CLINs 0091-0140.

Provide the following workstation configurations:

X-terminal Workstation
Basic Intelligent Workstation
High-resolution Basic Intelligent Workstation
Advanced Intelligent Workstation
High-resolution Advanced Intelligent Workstation

8.1 Basic Display. The display shall:

- a. Fully support the X-Windows graphical user interface standards (FIPS 158 and IEEE P1201.x);
- b. Interface with the X-terminal and intelligent workstations;
- c. Have a pixel resolution of at least 1024 by 768 with at least 256 concurrent colors from a palette of at least 4096 colors;
- d. Have a flicker free display (i.e. refresh rate of at least 60 Hz, non-interlaced);
- e. Have external operator controls for brightness, contrast, and power on/off;

- f. Have an active diagonal display area of at least 14 inches and no more than 20 inches;
- g. Provide a screen saver feature which blanks screen after a period of inactivity and instantly restores the full screen image when any key on the keyboard is hit (may be satisfied by software);
- h. Display text modes of 80 columns by 25 lines, 132 columns with 25 lines, and 132 columns with 43 lines;
- i. Generate the ASCII 128-character subset (decimal values 0 to 127) in accordance with FIPS 1-2, and the IBM Extended Character Set (decimal values 128 to 255);
- j. Generate a visible cursor indicating the next character position without obscuring any information displayed (excluding underline);
- k. Provide an addressable cursor;
- l. Generate true descenders for all appropriate characters.

8.1.1 Desired Capabilities are:

- a. Provide a video output interface compatible with 2 commercially available video projection devices and which automatically converts applications commands;
- b. Provide a mechanism for adjustment of maximum active display area (Sizing and position);
- c. Automatically emulate the industry standard EGA, VGA and super VGA video display modes.

8.2 High-resolution Display. The display shall:

- a. Fully support the X-Windows graphical user interface standards (FIPS 158 and IEEE P1201.x);
- b. Interface with the intelligent workstations;
- c. Have a pixel resolution of at least 1280 by 1024 with at least 256 concurrent colors from palette of at least 4096 colors;
- d. Provide support for "Computer Graphics Interface-like" primitive commands;
- e. Have a flicker free display (i.e. refresh rate of at least 60 Hz, non-interlaced);
- f. Have external operator controls for brightness, contrast, and power on/off;
- g. Have an active diagonal display area of at least 14 inches and no more than 20 inches;
- h. Include screen saver feature which blanks screen after period of inactivity and instantly restores full screen image when any key on keyboard is hit (may be satisfied by software);
- i. Display text modes of 80 columns by 25 lines, 132 columns with 25 lines, and 132 columns with 43 lines;
- j. Generate ASCII 128-character subset (decimal values 0 to 127) in accordance with FIPS 1-2, and IBM Extended Character Set (decimal values 128 to 255);
- k. Generate visible cursor indicating next character position

without obscuring any information displayed (excluding underline);

- l. Provide an addressable cursor;
- m. Generate true descenders for all appropriate characters.

8.2.1 Desired Capabilities are:

- a. Automatically emulate industry standard EGA, VGA, and super VGA video display modes;
- b. Available with the X-terminal workstation;
- c. Provide a video output interface compatible with 2 commercially available video projection devices and which automatically converts applications commands;
- d. Provide a mechanism for adjustment of maximum active display area (Sizing and position).

8.3 Keyboard shall:

- a. Be detachable;
- b. Provide 95-character ASCII subset (FIPS 1-2) in two keystrokes or less;
- c. Have visual indicators for caps-, and num-lock keys readable and distinguishable in normal office lighting;
- d. Have at least 12 user-programmable function keys accessing 48 user/application defined functions (these keys are separate from and in addition to character, numeric, cursor position and edit operation keys);
- e. Have an auto-repeat function for all printable ASCII characters and cursor, backspace, and space bar controls;
- f. Have 6 dedicated cursor positioning keys grouped together to perform the following:
 - (1) Cursor right,
 - (2) Cursor left,
 - (3) Cursor up,
 - (4) Cursor down,
 - (5) Home (moves cursor to upper-left screen corner),
 - (6) End (moves cursor to lower-left screen corner);
- g. Have separate numeric keypad apart from alphanumeric portion of keyboard including 4 arithmetic function keys (+, -, *, /), a ".", num-lock key, and an "ENTER" key;
- h. Have a "PRINT SCREEN" key or a 2-key combination to send screen image to a slave printer;
- i. Have the following enlarged keys:
 - (1) Tab,
 - (2) Enter/return,
 - (3) Shift;

- j. Have a "control" key;
- k. Have an "alternate" key;
- l. Have function keys, keypad, and cursor movement keys physically separated from QWERTY portion;
- m. Have a physical support feature to provide angle adjustment (tilt) of the keyboard;
- n. Operate at a speed of at least 6 keystrokes per second;
- o. Provide a separate key for each of the following functions:
 - (1) Insert,
 - (2) Delete,
 - (3) Repeatable line feed (move cursor down 1 line upon depression),
 - (4) Carriage return (cursor to extreme left of next line),
 - (5) Tab,
 - (6) Escape,
 - (7) Upper case lock (change to all capitals),
 - (8) Shift (single CAP entry),
 - (9) Break,
 - (10) Page up,
 - (11) Page down;
- p. Include all software and firmware drivers required to operate with the X-terminal and intelligent workstations.

8.4 Mouse shall:

- a. Include all software and firmware drivers required to operate with the X-terminal and intelligent workstations;
- b. Be compatible with all super-minicomputer, network server, and intelligent workstation software;
- c. Not require a separate power source.

8.5 CLIN 0099, X-terminal Workstation shall:

- a. Support all orderable super-minicomputer and network server software;
- b. Satisfy Attachment 6 system performance;
- c. Include a Basic Display (see paragraph 8.1), Keyboard (see paragraph C8.3), and Mouse (see paragraph C8.4);
- d. Provide connection to local area networks.

8.6 Intelligent Workstations, CLINs 0101-0110. The intelligent workstations include basic and advanced models.

8.6.1 Common Requirements. These workstations shall:

- a. Support all orderable intelligent workstation, network server, and super-minicomputer software;

- b. Satisfy Attachment 6 system performance;
 - c. Provide direct connection to super-minicomputer, network server, and LAN;
 - d. Have a 32-bit internal architecture with a 32-bit data and address external bus architecture between the microprocessor and memory;
 - e. Both intelligent workstations shall run a single-user workstation operating system and a multiuser workstation operating system and support a multitasking environment;
 - f. Include Keyboard (see paragraph C8.3) and Mouse (see paragraph C8.4);
 - g. Include IEEE 754 compliant floating point hardware with precision ranging from at least 10E+38 and 10E-38 (8 significant digits) to at least 10E+308 and 10E-308 (16 significant digits);
 - h. Include perpetual time-of-day clock and calendar with battery backup which provides at least 1 year of operation without replacement;
 - i. Reserved;
 - j. Provide connection to GOE printers listed in Table C-1;
 - k. Include one (1) 3.5-inch Floppy Disk Drive;
- 8.6.2 CLIN 0101, Basic Intelligent Workstation shall include:
- a. Sufficient memory to support the orderable single-user intelligent workstation software package using the most memory, while connected to the host using network drivers, plus at least 1 MB available;
 - b. A basic display (see paragraph C8.1);
 - c. Support memory expansion (see paragraph C8.6.6);
 - d. One (1) rewritable DAS device capable of storing all orderable single-user workstation software plus at least 40 MB of user storage available;
 - e. An internal power supply which provides 20% greater output than required by the following configuration:
 - (1) Display and video interface board (if necessary),
 - (2) Mouse and interface card (if necessary),
 - (3) Keyboard,
 - (4) Maximum memory,
 - (5) Internal modem or fax card at the user's discretion,
 - (6) Direct-connect to super-minicomputer or LAN at the user's discretion,
 - (7) One (1) 3.5-inch floppy drive,
 - (8) An interface to a page printer or a character printer at the user's discretion,
 - (9) Basic rewritable DAS device,

- (10) Large rewritable workstation DAS device,
- (11) One (1) internal device in the system or expansion chassis (e.g. 3.5-inch floppy drive, 5.25-inch floppy drive, DAS backup device, removable rewritable DAS device) at the user's discretion,
- (12) One (1) unused nonproprietary, open architecture I/O expansion slot,
- (13) One (1) unused serial I/O port.

8.6.3 CLIN 0102, High Res. Basic Intelligent Workstation Configuration.

Provide a basic intelligent workstation (CLIN 0101) and a high resolution display (see paragraph C8.2) vice the basic display.

8.6.4 CLIN 0103, Advanced Intelligent Workstation shall include:

- a. Sufficient memory to support the orderable multiuser intelligent workstation software package using the most memory, while connected to the host using network drivers, plus at least 1 MB available;
- b. Support memory expansion to 4 times minimum configuration;
- c. A basic display (see paragraph C8.1);
- d. One (1) rewritable DAS device capable of storing all orderable multiuser workstation software plus at least 80 MB of user storage available;
- e. Satisfy Attachment 6 system performance;
- f. Internal power supply which provides 20% greater output than required by the following configuration:
 - (1) Display and video interface board (if necessary),
 - (2) Mouse and interface card (if necessary),
 - (3) Keyboard,
 - (4) Maximum memory,
 - (5) Internal modem or fax card at the user's discretion,
 - (6) Direct-connect to super-minicomputer or LAN at the user's discretion,
 - (7) One (1) 3.5-inch floppy drive,
 - (8) Interface to page or character printer at the user's discretion,
 - (9) Basic rewritable DAS device,
 - (10) Large rewritable workstation DAS device,
 - (11) Any 3 internal devices in the system or expansion chassis (e.g. 3.5-inch floppy drive, 5.25-inch floppy drive, DAS backup device, removable rewritable DAS device) at the user's discretion,
 - (12) One (1) unused, nonproprietary expansion bus I/O slot,
 - (13) One (1) unused serial I/O port.

8.6.4.1 Desired Capability. Performance is 50% better than the basic intelligent workstation minimum mandatory requirements. (See Attachment 6)

8.6.5 CLIN 0104, High Resolution Advanced Intelligent Wkstation Configuration. Provide a basic intelligent workstation (CLIN 0103) and a high resolution display (see paragraph C8.2) vice a basic display.

8.6.6 CLIN 0105, Basic Intelligent Workstation Memory Expansion. Provide incremental expansion of basic intelligent workstation memory to at least twice the minimum or sufficient to support the multi-user operating system, whichever is larger.

8.6.7 CLIN 0107, Advanced Intelligent Workstation Memory Expansion. Provide incremental expansion of advanced intelligent workstation memory to at least 4 times the minimum.

8.7 Rewritable Workstation DAS Devices, CLINs 0111-0125.

8.7.1 Common Requirements. All rewritable DAS devices shall:

- a. If removable, provide a media write protect status indication to the operating system;
- b. If not removable, be capable of concurrently supporting all intelligent workstation operating system formats;
- c. Provide self-test error detection and notification;
- d. Provide power failure and fluctuation protection to insure no physical damage to the drive and the media.

8.7.2 CLIN 0111, Intelligent Workstation 5.25-inch Floppy Disk Unit. Device shall be internally mounted and shall read, write, and format diskettes in at least 360 KB and 1.2 MB 5.25-inch MS-DOS compatible formats.

8.7.3 CLIN 0113, Intelligent Workstation 3.5-inch Diskette Unit. Device shall be internally mounted and shall read, write, and format diskettes in at least 720 KB and 1.44 MB 3.5-inch MS-DOS compatible formats.

8.7.4 CLIN 0115, Intelligent Workstation Internal Removable DAS Device shall:

- a. Be internally mounted in the system or expansion chassis;
- b. Have at least 100 MB formatted user storage;
- c. Include 2 removable media or drives.

8.7.5 CLIN 0119, Basic Intelligent Workstation DAS Device shall be:

- a. Internally mounted in the system or expansion chassis;
- b. Capable of storing all orderable single-user workstation software with at least 40 MB of formatted user storage remaining.

8.7.6 CLIN 0121, Advanced Intelligent Workstation DAS Device shall be:

- a. Internally mounted in the system or expansion chassis;
- b. Capable of storing all orderable multiuser workstation software with at least 80 MB of formatted user storage remaining.

8.7.7 CLIN 0123, Large Workstation DAS Device shall:

- a. Be internally mounted in the system or expansion chassis;
- b. Have at least 300 MB formatted user storage.

8.7.8 CLIN 0125, Very Large Workstation DAS Device shall:

- a. Be internally mounted in the system or expansion chassis;
- b. Have at least 600 MB formatted user storage.

8.8 Intelligent Workstation DAS Backup Device, CLIN 0129-0131.

8.8.1 Common Requirements shall include:

- a. At least 150 MB on a single media element;
- b. Capability to format blank storage medium, if necessary;
- c. Ten (10) blank storage media with each unit.

8.8.2 CLIN 0129, Internal Intelligent Workstation DAS Backup Device shall be internally mounted in the system or expansion chassis.

8.8.3 CLIN 0131, External Intelligent Workstation DAS Backup Device shall interface with the basic and advanced intelligent workstations.

8.9 CLIN 0133, Digitizing Tablet shall:

- a. Include an electronic stylus, cross hair, and four push-button cursor with magnification;
- b. Have at least 100 points per inch resolution horizontally and vertically;
- c. Be compatible with graphics software and support both absolute coordinate addressing and relative coordinate addressing;
- d. Have at least a 12 by 12 inch digitizer surface;
- e. Interface to the intelligent workstations.

8.10 CLIN 0135, GOE Bar Code Equipment Interface(s). Provide an intelligent workstation interface compatible with the GOE bar code equipment and software listed in Table C-1.

8.11 CLIN 0137, GOE Optical Disk Interface. Provide an intelligent workstation interface for connection of ISO 9660 compatible GOE optical disk subsystems. (See Table C-1).

C9 CLIN 0141, Facsimile Card.

Provide fax cards for use with the network server and intelligent workstations. The cards will be provided for worldwide use. The card shall:

- a. Mount internally in the system or expansion chassis;
- b. Operate at a minimum of 9600 bps when transmitting and receiving text, bit-mapped data, and graphics with CCITT Group 3 and 4 FAX machines (FED-STD 1062, 1064, 1065) and fax cards, Group 4 support shall be provided within a mutually agreed time frame (REF: F4.9);
- c. Provide ASCII-to-FAX and FAX-to-ASCII data conversion;
- d. Provide a printed copy of data and text using character and page printers;
- e. Reserved;
- f. Include a modem that operates at a minimum of 2400 bps;
- g. If required by the nation for which the card is ordered, include certification of host-nation approval/connection authority. This

shall be provided within a mutually agreed time frame (REF: F4.8).

C10 Printers, CLINs 0191-0220.

This section includes printers and interface requirements. The Government is the sole judge of copy legibility and letter-quality print. The following devices shall be provided:

Page Printers - Low-speed
- Medium-speed
- High-speed
- Color Graphics

Line Printer

Character Printer

10.1 Page Printers, CLINs 0191-0210. Provide page printers capable of both letter-quality text and graphics output.

10.1.1 Common Requirements. All page printers shall:

- a. Support graphics printing tasks such as image rotation and shading (e.g. dithering or determining specially calculated dot patterns to achieve shading);
- b. Provide sufficient printing material, exclusive of paper, (e.g. toner cartridges, toner refills, etc.) for 6 months of usage at the stated duty cycle;
- c. Print the 95-character ASCII subset (FIPS 1-2);
- d. Print horizontal (landscape) and vertical (portrait) formats;
- e. Provide print resolution of at least 300 by 300 dots per inch (dpi) and plot density of 90,000 dots per square inch;
- f. (1) Provide a 10 cpi and a 12 cpi (both courier or both prestige) online for both portrait and landscape orientations,
(2) Provide a compressed font online for courier or prestige,
(3) Provide the following fonts and styles for both portrait and landscape orientations:

Orator-like/Narrator-like	10 cpi
Courier	10 cpi 12 cpi
Prestige Elite	10 cpi 12 cpi compressed
Letter Gothic	12 cpi compressed
OCR A, Size 1 (FIPS 32-1) (Portrait only)	10 cpi
Standard Roman Bold	8 Point 10 Point 12 Point
Helvetica Bold-like	10 Point 12 Point 14 Point

- g. Provide page description language compatible with publishing

software, word processing, and composition graphics packages;

- h. Provide software-selectable (without manual intervention at the printer) emulation for HP LaserJet. For the medium-speed and the high-speed page printers, also provide at least one of the following:
 - (1) Diablo 630,
 - (2) Epson FX/MX,
 - (3) IBM Proprinter;
- i. Process 8.5 by 11-inch and 8.5 by 14-inch cut sheet, 16- to 20-lb paper;
- j. Page printers except the color page printer process envelopes;
- k. Page printers except the color page printer process labels;
- l. Print 8.5 by 11-inch transparencies;
- m. Provide both automatic and manual paper feed except for the high-speed page printer which shall provide automatic paper feed;
- n. Automatically collate and stack output such that output is in ascending sequential order, and, in the case of multiple copies, each copy is self contained, not grouped;
- o. Provide controllers, connection devices, and cables necessary to interface with the super-minicomputer, network server, and intelligent workstations.

10.1.2 CLIN 0191, Low-speed Page Printer shall:

- a. Use laser, ion deposition, or light emitting diode based technology;
- b. Provide a duty cycle of at least 2,500 pages per month;
- c. Provide a steady state print speed of a minimum of 240 lines of text per minute online or the equivalent of a minimum 4 page per minute (ppm) of 8.5 by 11-inch, 20-lb copier paper;
- d. Provide a combined text and graphics steady state print speed of a minimum of 1 ppm of 8.5 by 11-inch, 20-lb copier paper;
- e. Have an input hopper and output stacker, each with at least a 150-sheet, 20-lb copier paper capacity.

10.1.2.1 Desired Capabilities are:

- a. Print barcode labels;
- b. Provide duplex printing;

10.1.3 CLIN 0193, Low-speed Page Printer Memory Expansion. Provide expansion of the low-speed page printer memory so a fully configured system is capable of printing one page, processing a second, and receiving a third.

10.1.4 CLIN 0195, Medium-speed Page Printer shall:

- a. Use laser, ion deposition, or light emitting diode based technology;
- b. Provide a duty cycle of at least 5,000 pages per month;

- c. Provide a steady state print speed of a minimum of 480 lines of text per minute online or the equivalent of a minimum 8 ppm of 8.5 by 11-inch, 20-lb copier paper;
- d. Provide a combined text and graphics steady state print speed of at least 2 ppm of 8.5 by 11-inch, 20-lb copier paper;
- e. Have an input hopper and output stacker which each have at least a 200-sheet, 20-lb copier paper capacity;

10.1.4.1 Desired Capabilities are:

- a. Print barcode labels;
- b. Provide duplex printing;

10.1.5 CLIN 0197, Medium-speed Page Printer Memory Expansion.

Provide expansion of the medium-speed page printer memory so a fully configured system is capable of printing one page, processing a second, and receiving a third.

10.1.6 CLIN 0199, High-speed Page Printer shall:

- a. Use laser, ion deposition, or light emitting diode based technology;
- b. Provide a duty cycle of at least 40,000 pages per month;
- c. Provide a steady state print speed of a minimum of 1200 lines of text per minute online or the equivalent of at least 19 ppm of 8.5 by 11-inch, 20-lb copier paper;
- d. Provide a combined text and graphics steady state print speed of a minimum of 5 ppm of 8.5 by 11-inch, 20-lb copier paper;
- e. Have an offset paper stacker (may be satisfied by automatic insertion of colored paper between copies);
- f. Have an input hopper and output stacker which each have at least a 500-sheet, 20-lb copier paper capacity;

10.1.6.1 Desired Capabilities. The printer shall:

- a. Print barcode labels;
- b. Provide duplex printing;

10.1.7 CLIN 0201, High-speed Page Printer Memory Expansion. Provide expansion of the high-speed page printer memory so a fully configured system is capable of printing one page, processing a second, and receiving a third.

10.1.8 CLIN 0203, Color Page Printer which shall:

- a. Use either laser-based, wax transfer-based, or equivalent technology;
- b. Provide a minimum of 4096 colors;
- c. Have an input hopper with at least a 100-sheet capacity and output stacker with at least a 50-sheet, 20-lb copier paper capacity;

10.1.8.1 Desired Capability. Provide duplex printing;

10.1.9 CLIN 0205, Color Page Printer Memory Expansion. Provide expansion of the color page printer memory so a fully configured system is

capable of printing one page, processing a second, and receiving a third.

10.1.10 CLIN 0207, Page Printer Stand/Cart. Provide a standard stand or cart for use with the page printers which provides storage for paper, toner, etc.

10.2 CLIN 0211, Line Printer shall:

- a. Provide an initial supply of 6 ribbons;
- b. Operate with the 95-character ASCII subset (FIPS 1-2);
- c. Print at least 132 characters per line when printing 10 characters per inch (cpi);
- d. Process continuous feed fan-fold stock with lengths ranging from 3 to 14-inches and widths from 4 to 16 inches;
- e. Have vertical spacing of 6 and 8 lines per inch;
- f. Have horizontal spacing of 10 cpi;
- g. Require no special tools to replace the ribbon;
- h. Have start, stop, and form feed switches and controls which are easily accessible to the operator from both the front and rear of the printer;
- i. Provide an operator control panel with the following:
 - (1) Out of paper indicator with automatic print halt,
 - (2) On/off status indication for power,
 - (3) Printer ready/standby indicator,
 - (4) Reset switches for fault conditions,
 - (5) Paper feed controls,
 - (6) Error indicators,
 - (7) Online/off-line switch,
 - (8) Line advance switch,
 - (9) Top-of-form or page advance;
- j. Have operator adjustable character penetration and phasing;
- k. Print an original and at least 5 legible copies;
- l. Have operator controlled horizontal and vertical form alignment;
- m. Provide the following program selectable control features:
 - (1) Single and double space printing,
 - (2) Multiple line skip,
 - (3) Skip to a specific line,
 - (4) Page ejection or equivalent,
 - (5) Top-of-form and forms control;
- n. Provide off-line diagnostics which include print test and ribbon motion check;

- o. Provide controllers, connection devices, and cable necessary to interface with the super-minicomputer and network server;
- p. Print at least 1200 lines per minute (lpm) online using 64-character subset (FIPS 1-2);
- q. Have at least a 2000-page power-stacker output paper bin.

10.3 CLIN 0213, Character Printer shall:

- a. Print the 95-character ASCII subset (FIPS 1-2) and the IBM Extended Graphics Character Set;
- b. Provide manual vertical and horizontal paper adjustment;
- c. Provide cables, controllers, and connection devices necessary to interface with all workstations, network server, and super-minicomputer;
- d. Process standard cut sheet paper and continuous feed fanfold stock with widths of 3 to 15 inches;
- e. Provide hardware and software-selectable vertical spacing of 6 and 8 lines per inch (lpi);
- f. Provide a pressure feed mechanism and either sprocket-pin or tractor feed;
- g. Have all controls and switches easily accessible to the operator;
- h. Include an output paper tray for fanfold paper;
- i. Print draft quality of at least 200 cps online with 80 characters per line at 6 lpi using the 95-character subset;
- j. Print near-letter quality of at least 50 cps with 80 characters per line at 6 lpi using the 95-character subset;
- k. Provide a minimum selectable resolution of 90,000 dots per square inch;
- l. Print text and graphics;
- m. Print on acetate transparencies;
- n. Provide Couier and Prestige Elite print styles in 10-pitch, 12-pitch, and compressed;
- o. Provide OCR A (size 1, FIPS 32-1) print style;
- p. Provide bold, double-strike, italic, superscript, subscript, underline, and proportional spacing;
- q. Print an original and 5 legible copies using both fan fold paper and single feed paper sets. Fan fold paper is standard 6-part paper. Single feed paper set are made up of one 20-lb page (first page) and 5 carbon sets of onion skin thickness.
- r. Reserved;
- s. Provide single color (black) printing;
- t. Include 6 single-color (black) ribbons. If different ribbons are required for acetate, include an additional 6 single-color ribbons for the acetate;
- u. Require no special tools to replace ribbon;

v. Have a minimum buffer space of at least 8 KB.

10.4 CLIN 0215, Character Printer Buffer Expansion. Provide incremental expansion of printer buffer to at least 40 KB.

10.5 CLIN 0217, Character Printer Stand/Cart. Provide a standard desk-height stand or cart for input paper to be stored and fed from under the printer.

10.6 CLIN 0219, Character Printer Cut Sheet Feeder shall:

- a. Accept paper with widths from 7 to 13.5 inches and lengths of 8.5 to 14 inches;
- b. Have an input bin with a minimum capacity of 50 sheets;
- c. Have an automatic collating output bin with a minimum capacity of 50 sheets;
- d. Accept a minimum of 16- and 20-lb bond paper;
- e. Include an output paper tray for cut sheet paper, if different from the fanfold paper output tray.

C11 CLIN 0221, Plotter.

Provide plotter(s) compatible with the business graphics, composition graphics, free form graphics, and computer aided design packages. The plotter(s) shall:

- a. Have a programmable multipen changer with a minimum of 8 self-capping pens;
- b. Accept draft, ball-point, and fiber-tipped pens ranging in size from 0.2 mm to 1.0 mm;
- c. Draw at a rate of at least 10 inches per second;
- d. Accept standard bond paper, transparencies, mylar, and vellum (transparencies shall take no longer than 5 minutes to dry);
- e. Have a resolution of at least 0.07 mm;
- f. Have repeatability of at least 0.06 mm;
- g. Plot, as a minimum, the 95-character ASCII subset (FIPS 1-2);
- h. Include an initial supply of 2 sets each of 0.2 mm acetate pens and 0.2 mm paper pens;
- i. Accept ANSI Y14.1 standard A (8.5 by 11-inches), B (11 by 17 inches), standard C (17 by 22 inches), D (22 by 34 inches), and E (34 by 44 inches) paper sizes (up to two plotters can be provided to meet this requirement);
- j. The plotter shall be HP Graphics Language compatible;
- k. Include controllers, connection devices, and cable necessary to interface with the super-minicomputer, network server, and intelligent workstations.

C12 Scanner Hardware, CLINs 0223-0230.

12.1 CLIN 0223, Scanner shall:

- a. Use the scanner software for the super-minicomputer, network p server, and the intelligent workstations to provide both image scanning and optical character reader capability;

- b. Scan black ink and carbon based colors to include half-toning logic which supports 4 half-tone pattern selections and at least 32 gray levels for half-tone renderings;
- c. Handle documents ranging from 6 by 6 to 8.5 by 14-inches and paper from 16- to 30-lb weight;
- d. Able to adjust and control the top, bottom, and both side margins via operator direction;
- e. Scan and recognize as a minimum an 8.5 by 11-inch sheet of paper with minimum margins of 0.25 inch on all sides in less than 60 seconds;
- f. Retain 98% accuracy with a skew of up to 0.67 inches over 7 inches;
- g. Have a minimum resolution of 300 by 300 dpi;
- h. Comply with FIPS 32-1, FIPS 85, FIPS 89, and FIPS 90;
- i. Have ROM-based diagnostics which provide visual or audible indication when a fault is detected;
- j. Include necessary interface cables, controllers, and connectors

12.1.1 Desired Capabilities are:

- a. Have a 99.5% scan accuracy;
- b. Be able to scan bound material (i.e. books, magazines);
- c. Be able to read more than one font from the same page.

12.2 CLIN 0225, Scanner Automatic Sheet Feeder shall:

- a. Feed a minimum of twenty (20) 8.5 inch by 14-inch sheets of 20-lb bond paper at a rate such that the scanner does not wait for a paper feed;
- b. Accept a minimum of 16- to 24-lb paper.

C13 Power Conditioning and Distribution Unit, CLIN 0231-0240.

These units shall accept input power as specified in Attachment 9, paragraph 3 and shall provide output power for super-minicomputer equipment and data storage devices connected to the super-minicomputer which meets original equipment manufacturer's specification for operating power.

13.1 CLIN 0231, 75-user Power Conditioning and Distribution Unit.
Provide support for a 75-user Super-minicomputer.

13.2 CLIN 0233, 75- to 128-user Power Conditioning and Distribution Unit Upgrade.
Provide support for a 128-user Super-minicomputer.

13.3 CLIN 0235, 128- to 192-user Power Conditioning and Distribution Unit Upgrade.
Provide support for a 192-user Super-minicomputer.

13.4 CLIN 0237, 192- to 256-user Power Conditioning and Distribution Unit Upgrade.
Provide support for a 256-user Super-minicomputer.

C14 Uninterruptible Power Supplies (UPS), CLINs 0241-0280.

Uninterruptible power supplies shall be provided for super-minicomputers, network servers, and intelligent workstations. These devices may be either internal or external to the supported system. These devices will be used worldwide.

14.1 Common Requirements shall include:

- a. Require no change in operation and shall prevent loss of data for connected equipment during automatic transition from and return to commercial power;
- b. In the event of a total power blackout, the UPS shall maintain 100% power for a period of time necessary to perform an orderly shutdown of the connected equipment;
- c. All data shall be recovered uncorrupted and no damage to connected equipment shall occur during blackouts (incremental steps of degraded mode are acceptable);
- d. Recharge during normal conditions and shall not vent corrosive and explosive gases;
- e. Visual and audible alarm when loss of power and low power occur;
- f. Accept input power as specified in attachment 9, paragraph 3 and shall provide output power which meets original equipment manufacturer's specification for operating power.

14.2 Super-minicomputer UPS, CLIN 0241-0247. Provide software shutdown and support the specified super-minicomputer with the following peripherals for at least 10 minutes:

- a. A magnetic tape subsystem with 2 drives;
- b. A DAS backup subsystem with 2 drives;
- c. Two (2) removable rewritable DAS devices;
- d. A high-speed page printer;
- e. 56 Kbps super-minicomputer X.25 Port.

14.2.1 CLIN 0241, 75-user Super-minicomputer UPS.

14.2.2 CLIN 0243, 75- to 128-user Super-minicomputer UPS Upgrade.

14.2.3 CLIN 0245, 128- to 192-user Super-minicomputer UPS Upgrade.

14.2.4 CLIN 0247, 192- to 256-user Super-minicomputer UPS Upgrade.

14.3 CLIN 0249, 256-user Super-minicomputer UPS Upgrade. Provide software shutdown and provide expansion to 256-user super-minicomputer UPS (CLIN 0247) until it can support the following configuration for at least 15 minutes:

- a. A super-minicomputer configured to support 256 concurrent users;
- b. A high-speed page printer;
- c. A magnetic tape subsystem with 2 drives;
- d. A DAS backup subsystem with 2 drives;
- e. A total 32 GB of user storage;
- f. Two (2) removable rewritable DAS devices;
- g. Two (2) WORM DAS devices;
- h. Two (2) CD-ROM DAS devices;
- i. 56 Kbps super-minicomputer X.25 Port.

14.4 CLIN 0251, Network Server UPS shall support the following network server configuration for at least 10 minutes:

- a. A network server configured to support maximum concurrent users;
- b. Sufficient rewritable DAS to store all network server software plus 4 GB available for user storage;
- c. A DAS backup subsystem;
- d. A LAN interface;
- e. Maximum asynchronous connections;
- f. X.25 interface.

14.5 CLIN 0261, Basic Intelligent Workstation UPS shall support the following basic intelligent workstation configuration for at least 5 minutes:

- a. Display and video interface board (if necessary);
- b. Mouse and interface card (if necessary);
- c. Keyboard;
- d. Maximum memory;
- e. One (1) 3.5-inch floppy drive;
- f. Basic rewritable DAS device;
- g. Large rewritable workstation DAS device;
- h. Any 1 workstation internal device (e.g. 3.5-inch floppy drive, 5.25-inch floppy drive, DAS backup device, removable rewritable DAS device) at user's discretion.

14.6 CLIN 0263, Advanced Intelligent Workstation UPS shall support the following advanced intelligent workstation configuration for at least 5 minutes:

- a. Display and video interface board (if necessary);
- b. Mouse and interface card (if necessary);
- c. Keyboard;
- d. Maximum memory;
- e. One (1) 3.5-inch floppy drive;
- f. Basic rewritable DAS device;
- g. Large rewritable workstation DAS device;
- h. Any 3 workstation internal devices (e.g. 3.5-inch floppy drive, 5.25-inch floppy drive, DAS backup device, removable rewritable DAS device) at user's discretion.

C15 Overall Software Requirements.

Software includes the following functional areas: operating system and utilities, database software, communications software, programming languages, applications development utilities, office automation, specialized software, and publishing software. The software for each of these functional areas shall satisfy the general requirements specified below.

15.1 Compatibility. Hardware and software compatibility shall be maintained throughout the life of the contract. These features shall include:

- a. Software for one super-minicomputer shall be object code

mpatible with any other super-minicomputer;

- b. Intelligent workstation software shall be source code compatible between operating systems (e.g. single-user operating system, multiuser operating system);
- c. Applications software developed for the network server shall be source code compatible with both the super-minicomputer and the intelligent workstation;
- d. Associated software for the super-minicomputer, network server, and multiuser workstation (e.g. word processor to word processor) shall be data file compatible (use of filters is allowed if transparent to the user);
- e. All utilities and applications shall utilize a feature to establish user display environment, printer environment, and keycode mapping;
- f. A keycode mapping capability shall be provided for GOE listed in Table C-1;
- g. GOE terminals listed in Table C-1 shall be supported in a character mode by all super-minicomputer software except the integrated window environment (CLIN 1097), Computer Aided Software Engineering tools (CLIN 1161), business graphics (CLIN 1263), composition graphics (CLIN 1279), free-form graphics (CLIN 1287), and publishing software (CLINs 1305-1332).
- h. The super-minicomputer and intelligent workstation software shall provide similar capability with a consistent user interface and yield consistent results.

15.2 System Security. Systems software shall be at least in the vendor assistance phase of the National Computer Security Center (NCSC) evaluation process prior to the Live Test Demonstration (LTD). The Contractor shall meet requirements in Attachment 7. The systems software shall be evaluated within a mutually agreed time frame. (REF: F4.8)

15.2.1 Multiuser TCB. The super-minicomputer, network server, and workstation multiuser operating systems shall be certifiable as trusted computing base level B1 as defined in DOD 5200.28-STD, December 1985. The user shall be able to select between B1 and C2 security levels during system generation. Once a user at a site selects to run the system at a B1 TCB level, the user will not fall back to running a C2 TCB. All other multiuser software shall support processing in a multilevel security mode.

15.2.1.1 C2 Certifiable. All systems shall be C2 certifiable.

15.2.1.2 Interim B1. At contract award, the label integrity functions shall be implemented.

15.2.1.3 B1 Evaluation. Any changes required to achieve B1 evaluation as defined in attachment 7 subsequent to LTD testing shall not degrade performance of the super-minicomputer more than 10 percent. This shall be demonstrated at the post-award TCB test. (See also section E)

15.2.1.4 Multilevel Security Mode, under operating system control, shall provide the capability to permit various categories and types of classified and unclassified information to be concurrently stored and processed in a system. It shall permit concurrent selective access by uncleared users and users having different security clearances and need-to-know. Users without clearances will be limited to US military personnel, US civilian federal employees, and US Government contractors. The system shall maintain the identification, segregation, and control of users and classified material on the basis of security clearance, and need-to-know under operating system control and associated system software.

15.2.2 Workstation Single-user TCB. The workstation single-user

operating system shall be C2 certifiable.

15.2.3 Sign-on Tries. The user shall be denied system access after a security administrator-defined number of unsuccessful sign-on attempts.

15.2.4 Warning Screen. Before the system becomes operational a warning screen shall be displayed on the system console. The warning screen shall be displayed after acceptance of user's password.

15.2.5 Warning Screen Modification. The screen warning shall be modifiable only by the security administrator. The screen warning shall remain on the screen until the user initiates some action (e.g. strikes any key on the keyboard). The screen warning to be displayed is as follows:

** WARNING ** CAUTION ** WARNING ** CAUTION ** WARNING ** CAUTION **

UNAUTHORIZED ACCESS TO THIS UNITED STATES GOVERNMENT COMPUTER SYSTEM AND/OR SOFTWARE IS PROHIBITED BY PUBLIC LAW 98-473.

Public Law 98-473, Chapter XXI, Paragraph 1030 states, "Whoever knowingly accesses a computer without authorization, or having knowingly accessed a computer with authorization ... obtains, uses, modifies, destroys, or discloses ..., or prevents authorized use of data or a computer owned by or operated for the Government of the United States ... shall be punished by ... a fine ... or ... imprisonment." The punishments range up to \$100,000 and 10 years imprisonment, depending upon the nature and extent of the violation.

REPORT UNAUTHORIZED USE OR ACCESS TO THE SYSTEM SECURITY OFFICER.
TELEPHONE: (###) ###-#### or DSN ###-####

** WARNING ** CAUTION ** WARNING ** CAUTION ** WARNING ** CAUTION **

15.2.6 Password Aging. A password aging feature shall be provided which requires the user to select a new password upon being prompted for a periodic change of password.

15.3 Application Portability Profile. All software shall comply with the National Institute of Standards and Technology's (NIST) Application Portability Profile (APP) and with all the specifications developed by the POSIX Working Groups, approved, and subsequently published by NIST as FIPS.

15.3.1 POSIX Compliance. All operating systems shall conform to FIPS 151-1 to include the POSIX compliant UNIX-to-UNIX Copy Protocol (UUCP), chown, and job control. Strictly conforming POSIX software and application programs delivered under this contract shall be linked and executed under the revisions of the POSIX operating system without Government modification to the software and application programs. (See also paragraph H32)

15.3.2 Shell and Utilities Compliance. All software shall conform to the IEEE P1003.2 for Shell and Utilities to include the Software Development Utilities option, the C Language Development Utilities Option, the C Language Bindings Option, and the FORTRAN Development Utilities option within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.8)

15.3.3 Real-time Extensions Compliance. All software shall conform to the IEEE P1003.4 for Real-time Extensions within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.4 Ada Language Bindings Compliance. All software shall conform to the IEEE P1003.5 for Ada Language Bindings within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.5 Trusted System Extensions Compliance. All software shall conform to the IEEE P1003.6 for Trusted System Extensions within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.6 System Administration Compliance. All software shall conform to the IEEE P1003.7 for System Administration within a mutually agreeable time frame from acceptance and publication of the standard. At contract award the software shall include SVID functions or similar capability for acct, mount, nice, ulimit, umount, ustat, chroot, and profile. (REF: F4.9)

15.3.7 Transparent File Access. All software shall conform to the IEEE P1003.8x for Transparent File Access within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.8 FORTTRAN Language Bindings Compliance. All software shall conform to the IEEE P1003.9 for FORTRAN Language Bindings within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.9 User Interface. All software shall conform to FIPS 158 and to the IEEE P1201.x for User Interface (X-Windows) Standards within a mutually agreeable time frame from acceptance and publication of the standard. All software shall provide a graphical user interface (GUI) (e.g. Open Look or Motif), and tool box (e.g. Extensible Virtual Tool Kit). (REF: F4.8)

15.3.10 Integrated Software Engineering Environments (ISEE) and Tools. All Software shall conform to the Portable Common Interface Set (PCIS) or the Portable Computer Tools Environment (PCTE+) and Source Code Control System (SCCS) standards within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.11 Remote Database Access. All software shall conform to Generic Database Access and SQL Specialization standards within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.12 Remote Procedure Call (RPC). All applications shall be provided with software for transparent linkage across dissimilar hardware platforms and operating systems in accordance with ANSI X3 T5.5 RPC within a mutually agreeable time frame from acceptance and publication of the standard. (REF: F4.9)

15.3.13 Extended System Functionality. When additional FIPS PUBs are adopted, they shall take precedence. The Contractor shall provide extended system functionality for base commands, functions, commands and utilities, system interfaces and headers, and supplementary definitions that complies with one of the following:

- a. X/Open Common Applications Environment (CAE) as specified in X/Open Portability Guide Issue 3 (XPG3) - volumes 1, 2, and 3;
- b. AT&T System V as specified in System V Interface Definition (SVID) Third Edition - volumes 1, 2, and 3;
- c. Open Software Foundation (OSF) as specified in OSF/1.

15.4 Device Drivers. All super-minicomputer software shall include drivers for all super-minicomputer devices. All network server software shall include drivers for all network server devices. All workstation software shall include drivers for all workstation devices. Dynamic binding of device drivers at run time is acceptable. These drivers shall fully utilize the capabilities of each device.

15.5 Run Time Versions. Run time versions of all software shall also be provided, if available.

C16 Operating Systems, CLINs 1001-1010.

16.1 Common Requirements. All operating systems shall:

- a. Comply with TCB and APP standards;
- b. Provide online documentation for commands, systems calls, and

functions which shall:

- (1) Scroll forwards and backwards,
 - (2) Be printable on all printers using all printable attributes (e.g. underlines, boldface, highlighting, italics, tabs, carriage returns, paragraphing, etc.),
 - (3) Be printable on all GOE printers (Table C-1) using all printable attributes,
 - (4) Provide capability for authorized users to add manuals and documentation to the online library,
 - (5) Prevent unauthorized modification of manuals and documentation,
 - (6) At the option of the system administrator, not reformat the documentation text each time it is utilized;
- c. Provide spooling of output data to local and networked devices (e.g., printers, plotters, fax cards, etc.);
- d. Provide communication (e.g., pass data, pass parameters, pass addresses, create and destroy unique message interfaces, and send, receive, and acknowledge messages of at least 2048 bytes) between programs, modules, and routines written in Ada, COBOL, FORTRAN, Pascal, C, and the Fourth Generation Language (4GL);
- e. Provide the calendar date and time of day to the same resolution as the time of day clock and be accessible to all the programming languages via system call in the following formats:
- (1) Julian date of YYDDD with time as HH:MM:SS.SS,
 - (2) Date of DDMonthYYYY with time as HH:MM:SS,
 - (3) Date of DDMMYY with time as HH:MM:SS;
- f. Provide a windowing user interface into the operating system.

16.2 Workstation Operating Systems, CLINs 1001-1003.

16.2.1 Common Requirements. All workstation operating systems shall:

- a. Support a multitasking environment;
- b. Support at least 20 concurrent user-processes;
- c. Run the workstation software packages;
- d. Include Network File System (NFS) compatible protocol support for the LAN;
- e. Provide interchange of user data via network interconnect;
- f. Read and write MS-DOS compatible file formats and provide direct interchange of user data via floppy media;
- g. Have a shell that runs, unmodified, MS-DOS version 3.3 or higher applications to include those listed in Table C-1;

16.2.2 CLIN 1001, Single-user Workstation Operating System. Support a single user in a multitasking environment. Be at least C2 TCB certifiable.

16.2.3 CLIN 1002, Single-user Workstation Operating System Configuration. Provide the following software as a bundled configuration:

- a. Single-user workstation operating system (CLIN 1001);

- b. Single-user operating system utilities (CLIN 1015);
- c. Single-user workstation integrated window environment (CLIN 1091);
- d. Single-user workstation integrated menu system (CLIN 1099);
- e. Single-user workstation IEEE 802.3 interface software (CLIN 1539).

16.2.4 CLIN 1003, Multiuser Workstation Operating System. Support at least 4 concurrent users. Support at least 2000 unique user identifiers and be at least B1 TCB certifiable.

16.2.5 CLIN 1004, Multiuser Workstation Operating System Configuration. Provide the following software as a bundled configuration:

- a. Multiuser workstation operating system (CLIN 1003);
- b. Multiuser operating system utilities (CLIN 1011);
- c. Multiuser workstation integrated window environment (CLIN 1093);
- d. Multiuser workstation integrated menu system (CLIN 1101);
- e. Multiuser workstation IEEE 802.3 interface software (CLIN 1540).

16.3 CLIN 1005, Network Server Operating System shall:

- a. Support at least 64 concurrent client sessions;
- b. Provide direct interchange of user data via network interconnect;
- c. Include NETBIOS and NFS compatible protocol support for the LAN;
- d. Support at least 10,000 unique user identifiers and be B1 TCB certifiable;
- e. Provide users with remote access to mass storage for file server functions (includes capability for each user to assign logical drive designators to at least 20 directories);
- f. Provide print server functions for users to route output to any print-spooler and printer attached to the network;
- g. Provide communications server functions for users access to X.25, and asynchronous communications.

16.3.1 Desired Capability. Support more than 64 concurrent client sessions.

16.4 CLIN 1006, Network Server Operating System Configuration. Provide the following software as a bundled configuration:

- a. Network server operating system (CLIN 1005);
- b. Network server operating system utilities (CLIN 1012);
- c. Network server performance monitoring (CLIN 1021);
- d. Network server integrated window environment (CLIN 1095);
- e. Network server integrated menu system (CLIN 1103);

f. Network server IEEE 802.3 interface software (CLIN 1421).

16.5 CLIN 1007, Super-minicomputer Operating System.

16.5.1 Common Requirements.

16.5.1.1 Compatibility. The same operating system shall be provided for all super-minicomputer configurations.

16.5.1.2 Password User-ID Combinations. The systems shall support, at a minimum, 10,000 unique user ID and associated password combinations and be B1 TCB certifiable. Include CDRLs F001 through F011 with delivery of the super-minicomputer operating system. Also see attachment 7, paragraph 3.7.

16.5.1.3 Concurrent Processing. The operating system shall support concurrent interactive processing, program development, and background processing.

16.5.1.4 Power Failure. When installed with the UPS and in the event of a power failure, the system shall provide an orderly shut down of system operations (i.e., software shutdown) without loss of data and queued entries.

16.5.1.5 Defective DAS. The operating system shall detect and bypass defective DAS areas (i.e. assign alternate tracks when errors are detected).

16.5.1.6 Start Up. The operating system start-up procedures shall test to verify that all super-minicomputer components, excluding workstations and the system console, are functional and shall generate a message to the operator identifying detected problems.

16.5.1.7 Interactive Processing. The operating system shall support interactive processing to include:

- a. Application programs and file creation, editing, and modification from a workstation;
- b. Sending and receiving data files and word processing documents between the super-minicomputer, network servers, and the intelligent workstation;
- c. All users on all workstations shall be able to run background processes;
- d. The number of user processes shall be determined by the system administrator through tunable parameters;
- e. All related messages and output generate by a program shall be directed to the originating workstation; however, the operating system shall provide redirection of output;
- f. Automatically log-off any session which has been inactive for a period of time specified by the system administrator with a screen warning message and audible warning given at least one minute prior to automatic log-off.

16.5.1.8 System Resources. The operating system shall provide mechanisms for controlling allocation of system resources among active processes (interactive and background). This function shall be transparent to the users. The operating system shall be able to allocate at least 1 MB of addressable memory (real or virtual memory) for each user signed on the system and each background task. Memory management shall minimize fragmented memory allocation.

16.5.1.9 Remote Super-minicomputer System Administration. The remote system console shall be connected by dedicated and manually switched dial-up phone line. The Government will provide the phone line. The remote

super-minicomputer system access facility shall, within security constraints, include support for:

- a. Initial program loads;
- b. Start and stop processes;
- c. Changing date and time;
- d. Console messages;
- e. Changing between maintenance, single user mode, and multiuser mode;
- f. Other system operator functions;
- g. Power on and off or shutdown and restart;
- h. Diagnostics.

16.5.2 Desired Capabilities are:

- a. Provide parameter changes without requiring a remake of the kernel and reboot of the system;
- b. Provide a facility for local and networked disk mirroring or disk shadowing.

16.6 CLIN 1008, Super-minicomputer Operating System Configuration.

Provide the following software as a bundled configuration:

- a. Super-minicomputer operating system (CLIN 1007);
- b. Super-minicomputer operating system utilities (CLIN 1013);
- c. System usage accounting utility (CLIN 1017);
- d. Super-minicomputer performance monitoring (CLIN 1023);
- e. Super-minicomputer integrated window environment (CLIN 1097);
- f. Super-minicomputer integrated menu system (CLIN 1105);
- g. Super-minicomputer IEEE 802.3 interface software (CLIN 1419).

16.7 CLIN 1009, Super-minicomputer Operating System Source Code License.

The Contractor shall provide a source code and license for the super-minicomputer operating system to include all updates. If any prelicensing applies, the Government will show appropriate proof of prelicense prior to receiving source code and license.

C17 Multiuser Operating System Utilities, CLINs 1011-1014.

Provide an operating system level utilities package for each multiuser operating system. These utilities shall have a consistent user interface. These utilities shall support processing in multilevel security mode. Multilevel security shall be available within a mutually agreed time frame. (REF: C15 and F4.9)

17.1 Common Requirements.

17.1.1 Data File Management System (DFMS) shall:

- a. Control space allocated for directory files;
- b. Prevent deadlock conditions;
- c. Provide transparent use of files by all languages (e.g. COBOL programs can, without change, use files created and

maintained by C, FORTRAN, Ada, etc.);

- d. Provide routines for creation, maintenance, and processing of consecutive (e.g., sequential access), relative (e.g., random access), stream (e.g., regular), indexed, alternate indexed, and print files. Support record lengths of up to 2000 bytes;
- e. Indexed files shall support:
 - (1) An index key of any value up to 250 bytes located anywhere in the logical record,
 - (2) At least 10 alternate keys of any value located anywhere in the logical record,
 - (3) An alternate key length sum of up to 250 bytes,
 - (4) Duplicate values for the alternate keys.

17.1.2 Simultaneous File Access. The operating system access schemes shall allow a file to be shared concurrently among any number of authorized users, but shall protect against conflicts which may result from simultaneous writers of a file. The operating system shall:

- a. Prohibit 2 or more tasks from updating the same file at the same time;
- b. Provide multiple tasks "read only" access of the same file;
- c. Within security constraints, support the ANSI 3.27-1978 standard magnetic tape label system;
- d. Have a labeling system for all other secondary storage (i.e., WORM, DAS Backup, Removable DAS, and other writable removable media) including automatic checking of labels;
- e. Provide use of magnetic tapes with nonstandard labels and tapes without labels;
- f. Provide capability for the system administrator and file owner of a file and directory to define access rights to the file and directory for specific users and user groups to include read, write, and execute for the owner, the group, and all others.

17.1.3 System Management Functions. Within security constraints, the operating systems shall:

- a. Allow only the system administrator to perform the following functions:
 - (1) Complete access and permission to all files on the system as mediated by the TCB,
 - (2) Change user ID and password combination (e.g. assign a new password to a user ID and override the existing password),
 - (3) Place all addressable devices online and off-line by logical name and by physical address,
 - (4) Restrict any functions to groups of users as appropriate;
- b. Provide the system administrator control over menus (reference paragraph C25) by providing the ability to:
 - (1) Establish who may select any combination of

options for each menu,

- (2) Add and delete user-specific options to each menu,
- (3) Establish options for site specific default menus without having to recompile programs,
- (4) Provide ease-of-use menus to anything executable from the command interpreter.

17.1.3.1 Desired Capabilities. The system management functions:

- a. Display requests for operator attention on the operator's console and all designated consoles and be stored until acknowledged;
- b. Provide the following status information:
 - (1) Program accumulated clock time,
 - (2) Peripheral devices assigned,
 - (3) Number of input/outputs

17.1.4 System Logs. The operating systems shall provide log(s) to monitor system operation, system users, system errors, and maintain historical data. The log entry types shall be separately maintainable and displayable. Within security constraints, the system shall:

- a. Continuously record the log(s) on a DAS device as transactions occur;
- b. Display and print the log(s) upon demand;
- c. Record all communications between super-minicomputer and the system console as a system operation log entry type;
- d. Record the following as an operation log entry type:
 - (1) Start time,
 - (2) Finish time,
 - (3) Process ID's,
 - (4) Process status,
 - (5) Process execution time,
 - (6) Process accumulated clock time;
- e. Include a system error log entry type which keeps a historical record of information on abnormal system operation, to include:
 - (1) Soft intermittent faults (i.e. single bit memory errors) from which the system recovers,
 - (2) Faults which caused abnormal system termination with data on functions in process and the status of the device(s) involved;
- f. Include the following as a console log entry type:
 - (1) Capture panic and trap information for later analysis,
 - (2) Faults,

- (3) System hardware and software errors,
- (4) All attempts to become superuser,
- (5) All unsuccessful log-on attempts,
- (6) Other console messages;

g. Allow the operator to turn on and off log entry types.

17.1.4.1 Desired Capabilities are:

- a. The operation log entry type include:
 - (1) Number of input/outputs,
 - (2) Peripheral device assignments;
- b. The software:
 - (1) Provide sequential scan, forward and backward, through the log(s),
 - (2) Provide operator capability to switch printing of console log entry types to another printer, tape, and DAS device.

17.1.5 Command Interpreter shall include a POSIX-like command language consisting of words, mnemonics, and abbreviations which are descriptive of the function to be performed. The command interpreter shall:

- a. Be available to the user in both the interactive and background modes;
- b. Use a common set of commands to initiate and control interactive and background processes;
- c. Provide capability for user to create a series of commands, store a command string and repeatedly execute them (execution of commands from a stored procedure shall produce results equivalent to those obtained by inputting the commands and data, in sequence, from a workstation);
- d. Provide the user access to:
 - (1) Operating system user-facilities,
 - (2) All utilities required to build, debug, modify, maintain and control the execution of user programs,
 - (3) All utilities required to execute and control application programs;
 - (4) All of the utilities required to create, update, rename, save, copy, archive, and delete files;
- e. Provide the following features:
 - (1) Prompts to indicate system is waiting for input,
 - (2) HELP facilities providing detailed explanations for each command,
 - (3) Descriptive error messages which contain the reason for the error,
 - (4) Editing utilities which permit user to correct input errors,

(5) Provide capability for user to correct errors prior to processing an input line by the system,

(6) A function to repeat a previous command.

17.1.6 Space Management software shall:

- a. Be provided to assist the system administrator in managing the system's storage space;
- b. Be executable as an interactive and a background task;
- c. Enable the system administrator to obtain, upon request, the following information:
 - (1) Free space by device,
 - (2) Total space used in the directory hierarchy,
 - (3) Space used by a specific group(s),
 - (4) Total space used summarized by group,
 - (5) Space used by files unused for a specified time,
 - (6) Space used by a specific user,
 - (7) Files and file sizes for individual user(s).

17.1.7 File Search Utility shall:

- a. Locate files in any known directory on any file system;
- b. Reference a compact database or index of files built for future reference;
- c. Provide capability for user to conduct a search based on:
 - (1) The file and directory name,
 - (2) A file and directory name with wild card mask characters.

17.1.8 File Comparison Utility shall compare and list differences of any two files and any two directories.

17.1.9 Data File Manipulation Utility shall create a file with padded fields and fields extracted from one or more existing files.

17.1.10 File Copy Utility shall be available to the user via the command interpreter and shall be accessible from all program languages. It shall copy files and directories of files from one device to another by:

- a. File and directory name;
- b. A file and directory name with wild card mask characters;

17.1.11 File Transfer Utility shall:

- a. Transfer a file using the full implementation Government Open Systems Interconnection Profile (GOSIP) File Transfer, Access and Management Protocol (FTAM) between any 2 GOSIP compliant computer systems and using thMIL-STD 1780 File Transfer Protocol (FTP);
- b. Provide capability for the user to transfer:
 - (1) Data files,

- (2) Print files,
 - (3) Executable program files,
 - (4) Word processing files,
 - (5) Graphics files,
 - (6) Spreadsheet Files,
 - (7) Language source files,
 - (8) RDBMS files;
- c. Retain the original file structure;
 - d. Provide both auto-dial and auto-answer modes in point-to-point operations;
 - e. Detect a duplicate file name condition and flag that condition to the recipient;
 - f. Automatically try to connect to the receiver a specified number of times then notify the user if the connection between sender and receiver is not established;
 - g. Provide capability for the user to select whether compression and decompression is used during the file transfer;
 - h. Provide a restart and recovery function to automatically restart file transfers;
 - i. Automatically restart file transfers after a specified timeout period;
 - j. Pickup restart from a checkpoint to continue from where the file transfer was interrupted (i.e. not from the beginning of the file);
 - k. Have an automatic, no operator intervention, pass-through capability to transfer a file from one system to another through an intermediate system without leaving any files on the intermediate system;
 - l. Provide transfer of single files, multiple selected files, all files in a directory, and all files on a storage device.

17.1.12 File Display Utility shall:

- a. Be able to search for a character string within a file;
- b. Display selected files on a workstation with the option to produce hard copy;
- c. Display ASCII and hexadecimal formats with an option to display a range of records in a file and the entire file;
- d. Provide capability for user to scroll entire width and length of the file.

17.1.13 File Control Utility shall:

- a. Provide management of the system's storage media library to:
 - (1) Provide capability for automatic assignment of storage media numbers,
 - (2) Maintain a current inventory of storage media numbers;

b. Upon inquiry, provide:

- (1) The number of files on each storage media,
- (2) Total current file size,
- (3) Historical and prior years' information by the same parameters.

17.1.14 Text Editor. An interactive text editor shall be provided which operates on sequential data files and all source programs. The editor shall:

- a. Have full screen editing to create, add, delete, insert, list, and replace a single character, strings of characters, lines, and files;
- b. Provide a warning when exiting the text editor without saving changes;
- c. Provide split screen processing;
- d. Provide renumbering of text lines;
- e. Provide capability for compile and assembly, link, and execution of a source file without exiting from the text editor;
- f. Provide capability for users to:
 - (1) Enter upper and lower case text,
 - (2) Set tabs,
 - (3) Modify, add, and delete text strings both file wide (global) and line by line,
 - (4) Add, delete, and rename files;
- g. Provide capability for the user to delete one or more lines using one command;
- h. Provide capability for the user to search for a user-defined character string and replace it with a user-defined character string;
- i. Provide capability for user to copy lines and records from another file and from the same file to any place within the current file;
- j. Provide capability for the user to move lines and records from one location in a file to any other place within that file;
- k. Provide capability for the user to print the currently edited source file.

17.1.15 Sort and Merge Utility. This utility accepts input and provides output from and to multiple DAS devices, and standard labeled and unlabeled tapes. The program shall:

- a. Sort only on alphanumeric data;
- b. Merge only on alphanumeric data;
- c. Sort and merge on alphanumeric data;
- d. Execute as a separate task under control of the operating system in both background and interactive modes;

- e. Process at least 3 noncontiguous fields with a field size of at least 18 characters each.

17.1.15.1 Desired Capabilities are:

- a. Provide a warm restart capability for a sort and merge which was interrupted by some event (e.g. power failure);
- b. Process fixed length records at least 2000 characters in length;
- c. Be callable from application programs;
- d. Process mixed ascending and descending collating sequences for any field, independent of sequences for other fields;
- e. Process at least 8 noncontiguous fields with a field size of at least 18 characters each.

17.1.16 Translation Utility shall translate the contents of files on DAS, WORM, and CD-ROM to a user-selected format. This shall output to a workstation display, designated printer, rewritable DAS and magnetic tape in printable format. The utility shall, within security constraints, convert:

- a. From hexadecimal to EBCDIC;
- b. From EBCDIC and ASCII to hexadecimal;
- c. From EBCDIC to ASCII;
- d. From ASCII to EBCDIC.

17.1.17 Backup and Restore Utility shall:

- a. Transfer file system information to and from backup media to protect against accidental destruction of data due to system malfunction, operational mishap, and user error;
- b. Save and restore files while users are connected to the system, and without interrupting the service of users (If a file is in use during a save, save the last available version. If a file is in use during a restore, then the restore should fail.);
- c. Backup shall be made to local, central, and shared magnetic tape, backup device, rewritable DAS, and WORM;
- d. Provide capability for users to list file(s) in alphabetical order;
- e. Provide multiple backup operations to the same device and a single operation continued on multiple device media;
- f. Backup and restore all files and a specified subset (e.g., incremental backup on files that have changed since a certain date) of the files;
- g. Aid the restoration of DAS and keep track of other media used for backup and shall:
 - (1) Maintain a listing of file systems with backup date and backup media identification,
 - (2) Provide capability for users, with proper access rights, to restore files.

17.1.18 Memory Dump Utility shall dump memory within security constraints, between user-specified limits and shall be dumped on rewritable DAS and magnetic tape. The dump shall be readable in a user-selected format

(hexadecimal, character) that shall be output to a workstation and designated printer.

17.1.19 Tape Dump Utility shall dump a user-specified number of files beginning at a specified location in a specified format (hexadecimal, ASCII, and EBCDIC). It shall output to a workstation display, designated printer, rewritable DAS, and all magnetic tape in printable format.

17.1.20 Disk Tuning Utility shall provide tuning mechanisms for disk subsystems for optimization of time spent allocating blocks and minimizing space fragmentation on the disk. Shall initialize and format rewritable DAS media.

17.1.21 Socket Library. Provide full socket library functions (e.g. socket, AF UNIX, AF INET, SOCK STREAM, SOCK DGRAM, SOCK RAW, SOCK RDM, SOCK SEQPACKET, bind, listen, accept, establish, get connection, connect, read, write, close, htons, ntohs, htonl, ntohl).

17.2 CLIN 1011, Multiuser Workstation Operating System Utilities.

17.3 CLIN 1012, Network Server Operating System Utilities.

17.4 CLIN 1013, Super-minicomputer Operating System Utilities.

C18 CLIN 1015, Single-user Operating System Utilities.

Provide an operating system level utilities package (i.e. reference paragraph C17) sufficient to support one workstation user for each single-user operating system to include at least:

- a. Data File Management System (DFMS);
- b. Command Interpreter;
- c. File Search Utility;
- d. File Comparison Utility;
- e. Data File Manipulation Utility;
- f. File Copy Utility;
- g. File Transfer Utility;
- h. File Display Utility;
- i. Text Editor;
- j. Sort and Merge Utility;
- k. Backup and Restore Utility;
- l. Disk Tuning Utility.

C19 CLIN 1017, System Usage Accounting Utility.

A usage accounting package shall provide billing cost reimbursement to users of super-minicomputer(s), network server(s), and LAN(s). It shall also account for payments received. Network resource usage data is collected by the network management system. This utility shall support processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

C20 Performance Monitoring Software, CLINs 1019-1024.

20.1 Common Requirements. Provide performance monitoring software for each system. The reports shall be exportable to a print file, electronic mail, and business graphics. This utility shall support processing in multilevel security mode in accordance with Air Force Regulation (AFR) 205-16

paragraph 6-2.d. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

20.2 Desired Capabilities are:

a. Historical evaluation for:

- (1) A user-defined time-period for evaluation of tnds in system load and plan for hardware upgrade(s) to handle predictable load increases,
- (2) Identifying and remedying performance problems in user-developed applications,
- (3) Identifying and adjusting data storage required versus economy of space (e.g. user determine level of data detail to maintain);

b. Hardware performance monitoring for:

- (1) Central processors,
- (2) Memory,
- (3) Direct access storage,
- (4) Data communications channels,
- (5) Workstation communications lines;

c. System performance monitoring to:

- (1) Identify choke points which impede workstation response and processing capacity,
- (2) Identify amount of real and virtual memory in use,
- (3) Show number of interactive terminals in use (active) during specified time intervals,
- (4) Provide measurement of communications usage,
- (5) Monitor and compute average terminal response time,
- (6) Provide real time notification on potential performance impacts;

d. Printed summary reports which on request, selectively:

- (1) Show data transfer rate by bits per second or records per unit of time,
- (2) Use other units of measure or comparable graphs as required to display performance related information,
- (3) Supply measurement source;

e. Provide a means to take performance measurements at a user-specified clock time and for a user-specified period of time with:

- (1) The ability to specify the number of sequential samples to be taken or a period of time during which the performance samples are to be taken,
- (2) The measurements shown on interactive terminal displays and printed listing at the end of each sample period;

f. Job and task monitoring which:

(1) Correlates job identity and status information with main processor functions and capacity;

(2) Provide capability for the user to study the system performance when executing specific jobs and tasks, logical classes of jobs and tasks, and selected types of jobs and tasks.

20.3 CLIN 1019, Multiuser Workstation Performance Monitoring.

20.4 CLIN 1021, Network Server Performance Monitoring.

20.5 CLIN 1023, Super-minicomputer Performance Monitoring.

C21 Purging Software, CLINs 1025-1050.

Utilities shall be provided which purge all memory, buffers, and rewritable storage media (except magnetic tape) upon completion of classified processing. Purging of devices shall be in accordance with AFSSI 5020, Remanence Security.

21.1 CLIN 1025, Single-user Workstation Memory Purging.

21.2 CLIN 1027, Multiuser Workstation Memory Purging.

21.3 CLIN 1029, Network Server Memory Purging.

21.4 CLIN 1031, Super-minicomputer Memory Purging.

21.5 CLIN 1033, Single-user Workstation DAS Purging.

21.6 CLIN 1035, Multiuser Workstation DAS Purging.

21.7 CLIN 1037, Network Server DAS Purging.

21.8 CLIN 1039, Super-minicomputer DAS Purging.

21.9 CLIN 1041, Single-user Workstation DAS Backup Media Purging.

21.10 CLIN 1043, Multiuser Workstation DAS Backup Media Purging.

21.11 CLIN 1045, Network Server DAS Backup Media Purging.

21.12 CLIN 1047, Super-minicomputer DAS Backup Media Purging.

C22 Programming Languages, CLINs 1051-1080.

22.1 Common Requirements.

22.1.1 Multilevel Security Support. The languages (except single-user versions) shall support development of application code that can be used for processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

22.1.2 Interactive Program Development shall be available from any workstation in the system.

22.1.3 Relocatable Object Code shall be produced such that it can be linked with object code generated by any other language processors and later executed. Other languages do not need to call Ada modules.

22.1.4 Embedded SQL shall be provided for Ada, COBOL, C, and Pascal and shall conform to FIPS 127-1. Ada and Pascal embedded SQL shall be available within a mutually agreeable time frame. (REF: F4.8)

22.1.5 Commands required to compile, link, and execute programs in interactive mode and in background mode shall be the same. Linked object programs shall run without modification in both interactive and background mode.

22.1.6 Compilation. Interactive and background users shall be able to submit Ada, COBOL, FORTRAN, C, and Pascal programs for compilation, link, and execution and for compilation only (with later link and execution). All error information and interactive debug information shall be included in the source program listing. Compilers shall provide error diagnostics which identify semantic and syntactic errors.

22.1.7 File and Listing Controls. All compilers shall provide:

- a. Sorted cross-reference file and listings of identifiers to source line numbers;
- b. Output source file and listing with diagnostics.

22.2 FORTRAN Compiler, CLINs 1051-1054. This compiler shall comply with ANSI FORTRAN, ANSI X3.9-1978 conforming to FIPS 69-1, latest edition, and shall interface via SQL with the relational database management system.

22.2.1 Desired Capabilities are:

- a. One or more file listing(s) of generated code relating data and procedure names to object module addresses, instructions, and run-time subroutines;
- b. Link and call Ada modules.

22.2.2 CLIN 1051, Multiuser Workstation FORTRAN Compiler.

22.2.3 CLIN 1052, Network Server FORTRAN Compiler.

22.2.4 CLIN 1053, Super-minicomputer FORTRAN Compiler.

22.3 COBOL Compiler, CLINs 1055-1060. This compiler shall:

- a. Conform to the high subset of FIPS 21-3 (or latest edition) and ANSI X3.23-1985 and interface with the RDBMS;
- b. Include the report writer, communication, debug, and segmentation modules;
- c. Provide blocked and unblocked, fixed and variable length records on all storage devices.

22.3.1 Desired Capabilities are:

- a. One or more file listing(s) of generated code relating data and procedure names to object module addresses, instructions, and run-time subroutines;
- b. Link and call Ada modules.

22.3.2 CLIN 1055, Single-user Workstation COBOL Compiler.

22.3.3 CLIN 1057, Multiuser Workstation COBOL Compiler.

22.3.4 CLIN 1058, Network Server COBOL Compiler.

22.3.5 CLIN 1059, Super-minicomputer COBOL Compiler.

22.4 C Compiler, CLINs 1061-1066. This compiler shall conform to FIPS 160 and ANSI X3.159-1989 and shall interface with the relational database management system.

22.4.1 Desired Capabilities are:

- a. One or more file listing(s) of generated code relating data and procedure names to object module addresses, instructions, and run-time subroutines;

b. Link and call Ada modules.

22.4.2 CLIN 1061, Single-user Workstation C Compiler.

22.4.3 CLIN 1063, Multiuser Workstation C Compiler.

22.4.4 CLIN 1064, Network Server C Compiler.

22.4.5 CLIN 1065, Super-minicomputer C Compiler.

22.5 Pascal Compiler, CLINs 1067-1070. This compiler shall conform to FIPS 109 and ANSI/IEEE770X3.97-1983 and shall interface with the relational database management system.

22.5.1 Desired Capabilities are:

a. One or more file listing(s) of generated code relating data and procedure names to object module addresses, instructions, and run-time subroutines;

b. Link and call Ada modules.

22.5.2 CLIN 1067, Multiuser Workstation Pascal Compiler.

22.5.3 CLIN 1068, Network Server Pascal Compiler.

22.5.4 CLIN 1069, Super-minicomputer Pascal Compiler.

22.6 Ada Compiler, CLINs 1071-1076. This compiler with utilities and library shall:

a. Conform to FIPS 119 and interface with the relational database management system;

b. Include the Ada Programming Support Environment (APSE);

c. Be registered with the Ada Joint Program Office (AJPO);

d. Include the following tools:

- (1) Debugger,
- (2) Source code editor and formatter,
- (3) Environment interface,
- (4) Linker, library manager,
- (5) Cross-reference tool,
- (6) Source dependent lister.

22.6.1 Desired Capability. One or more file listing(s) of generated code relating data and procedure names to object module addresses, instructions, and run-time subroutines;

22.6.2 CLIN 1071, Single-user Workstation Ada Compiler.

22.6.3 CLIN 1073, Multiuser Workstation Ada Compiler.

22.6.4 CLIN 1074, Network Server Ada Compiler.

22.6.5 CLIN 1075, Super-minicomputer Ada Compiler.

22.7 Remote Procedure Call (RPC) Compiler, CLINs 1077-1080. This compiler with library shall interface to the relational database management system. An RPC compiler compliant with standards shall be available within a mutually agreeable time frame. (REF: F4.9)

22.7.1 CLIN 1077, Multiuser Workstation RPC Compiler.

22.7.2 CLIN 1078, Network Server RPC Compiler.

22.7.3 CLIN 1079, Super-minicomputer RPC Compiler.

C23 Applications Development Utilities, CLINs 1081-1090.

The utilities (except single-user versions) shall support development of application code that can be used for processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

23.1 Callable Subroutines, CLINs 1081-1084. The software shall include subroutines and functions which are callable, within security constraints, by application programs. Must include a library of subroutines that conforms to FIPS 120-1 (Graphical Kernel System). All library routines shall be callable from all languages and perform the following:

- a. Provide capability for a user program to link to another program, or procedure and pass necessary arguments from the main program;
- b. Provide capability for a user program to return through at least three levels of subroutine calls;
- c. Submit a background task for execution;
- d. Perform communications (e.g., pass data, pass parameters, pass addresses, create and destroy unique message interfaces, and send, receive, and acknowledge messages of at least 2048 bytes) between program tasks;
- e. Sound the workstation alarm for a user-specified amount of time;
- f. Set and extract all of the allowable user-defaults that are available through the command language;
- g. Convert the current date and time to a formatted string and convert dates between Gregorian and Julian formats;
- h. Perform date calculations;
- i. Change the file security attributes of a file and directory;
- j. Obtain one or more file, directory, and volume names from complete and partial file, directory, and volume names supplied by a user-program and indicate whether a specified file resides in a specified directory and volume;
- k. Rename a file and directory, with the option of limiting access rights;
- l. Delete files and directories;

23.1.1 Desired Capabilities are:

- a. Terminate a user program and log the user off the system;
- b. Provide information about the system and the program user;
- c. A date function shall be provided to determine the day of the week corresponding to a given date.

23.1.2 CLIN 1084, Single-user Workstation Callable Subroutines.

23.1.3 CLIN 1081, Multiuser Workstation Callable Subroutines.

23.1.4 CLIN 1082, Network Server Callable Subroutines.

23.1.5 CLIN 1083, Super-minicomputer Callable Subroutines.

23.2 Debug Utility, CLINs 1085-1090. An interactive symbolic debug utility shall be provided for each of the following FORTRAN, COBOL, C, Pascal, and Ada with a user interface. Utility shall:

- a. Monitor and display specific and elementary data items without the requirement to add code to the source program;
- b. Provide snapshot dumps of a specified memory area and general registers;
- c. Dynamically examine and modify data in the program, referencing data by source names;
- d. Display and modify memory locations by symbolic and memory addresses;
- e. Include a trap mechanism capability for breakpoints to be set and taken at specified source code line numbers and when a specified variable's contents are modified;
- f. Provide the source code listing to be displayed and referenced during the debug session;
- g. Provide user with control of program execution to include:
 - (1) Trace the execution of programs using source level operation codes and verbs as appropriate,
 - (2) Monitor and display the execution of specific program lines,
 - (3) Process in single-step mode and in multistep mode;
- h. Provide user with ability to establish program breakpoints, accessible from command processor and user interrupt, where a specified action (i.e. variable modification, memory location modification, and statement execution) is to occur when executed;
- i. Actions which the user can initiate at a breakpoint include:
 - (1) Suspend program execution,
 - (2) Print specified variables,
 - (3) Resume program execution at the point where it was suspended.

23.2.1 Desired Capabilities are:

- a. One debug utility with a single user interface to all 3GLs;
- b. Debugger support calls to modules coded in other programming languages from the primary language the debugger supports;
- c. Establish links to user-written debugging routines at specified break points.

23.2.2 CLIN 1085, Single-user Workstation Debug Utility.
Only for COBOL, C, and Ada.

23.2.3 CLIN 1087, Multiuser Workstation Debug Utility.

23.2.4 CLIN 1088, Network Server Debug Utility.

23.2.5 CLIN 1089, Super-minicomputer Debug Utility.

C24 Integrated Window Environment, CLINs 1091-1098.

An integrated X-Window environment utilizing either a covered or tiled window approach shall run under all operating systems.

24.1 Common Requirements.

24.1.1 Multilevel Security. The integrated window environment shall support processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

24.1.2 Selections. All software and utilities shall be selectable and executable from the windowing environment.

24.1.3 Mouse. Operations shall utilize a mouse pointing device, with visual feedback to user for options, possible selections and indications. It shall provide the minimal ability to operate with the cursor control keys in lieu of the mouse.

24.1.4 Interface. The following shall be provided:

- a. Graphic representation of applications as icons;
- b. Proportional resizing of window dimensions and dynamic placement of the window within the screen boundary;
- c. Ability to cut and paste text and graphics between windows;
- d. Pull-down menus and dialogue boxes for a consistent user interface with dynamic highlighting of selections and indications;
- e. Consistent user interface for all text editing functions;
- f. All windowing features shall be accessible from all programming languages.

24.1.5 Note pad function for immediate entry and display of notes.

24.1.6 List manager for immediate access and search of user-defined free format lists.

24.1.7 File management functions to list, provide status of, copy, delete, and view files.

24.2 Desired Capability. A secure version of X windows.

24.3 CLIN 1091, Single-user Workstation Integrated Window Environment. Single user does not need to provide multilevel security.

24.4 CLIN 1093, Multiuser Workstation Integrated Window Environment.

24.5 CLIN 1095, Network Server Integrated Window Environment.

24.6 CLIN 1097, Super-minicomputer Integrated Window Environment.

C25 Integrated Menu System and Menu Creation Utility, CLINs 1099-1106.

This utility shall be provided for all operating systems and provide a comprehensive and transparent interface. The system must be tailored for use by non-computer oriented users to perform all recurring tasks and enable a user to become functional without extensive use of documentation. Help selection shall be available from the menu for options available. The user shall be able to run the menus under both a windowing and non-windowing environment. (Also reference paragraph C17.1.3b)

25.1 Common Requirements.

25.1.1 Multilevel Security. The menu utilities (except single-user versions) shall support processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

25.1.2 Menu Options. The user shall be able to select menu options by single alphanumeric keyboard input and to cycle through available menu choices using the space bar or cursor control keys. Highlighting of selected options shall occur prior to confirmation.

25.1.3 Macros. The user shall be able to define and store at least eight personal action macros to be recalled and executed from any point in the menu system by a single key input. The actions shall provide immediate execution of frequently used menu paths, bypassing intermediate menu tree sections.

25.1.4 Dynamic Selection. When a selection requires input of name (e.g. file name), the menu system shall provide a dynamic selection menu listing available choices. The desired choice shall be selected and highlighted by matching from first letter input and by cursor control key navigation. For those operations frequently performed on multiple files, the option to tag and untag shall be provided, enabling the user to enter all desired choices at the same time.

25.1.5 Uniform Commands. Traversal, highlighting, cancellation, and completion commands shall be uniform throughout the entire menu system.

25.1.6 Customizing. A menu-driven utility to customize and develop site specific additions and replacements shall be provided. Menu definition structures shall permit site specific development and evolution.

25.1.7 Features. The following shall be displayed on every menu screen: Current work area, Date, Menu screen name and abbreviation, and menu bypassing commands.

25.2 Desired Capability. Drag and drop technique (e.g. Printing via icon manipulation).

25.3 CLIN 1099, Single-user Workstation Integrated Menu System.

25.4 CLIN 1101, Multiuser Workstation Integrated Menu System.

25.5 CLIN 1103, Network Server Integrated Menu System.

25.6 CLIN 1105, Super-minicomputer Integrated Menu System.

C26 Relational Database Management System (RDBMS) and Utilities, CLINs 1107-1162.

26.1 Relational Database Management System, CLINs 1107-1114. Data shall be reported exactly as it appears in the database (i.e. upper and lower case, numbers and special characters). The RDBMS shall have full screen editing capabilities. The software shall display context-sensitive error messages, on-screen HELP and provide capability for a menu/prompting mode in which menu selections and responses to computer generated prompts take the place of typed commands. Be able to store graphs, documents, and other files in the database (i.e., store graphs from business graphics software, store word processing documents, and spreadsheet data). Use of string, longchar, or equivalent datatypes is acceptable. Upgrades shall be provided within a mutually agreeable time frame after acceptance and publication of changed standards. (REF: F4.9, and H33)

26.1.1 Common Requirements.

26.1.1.1 Multilevel Security. The RDBMS and tools (except single-user versions) shall support processing in multilevel security mode. Multilevel security shall be available within a mutually agreeable time

frame. (REF: C15 and F4.9)

26.1.1.2 Relational Orientation. The RDBMS shall be based on National Institute of Standards and Technology (formerly National Bureau of Standards) manual "A Functional Specification of the Relational Model," number NBS GCR 82372, dated February 1982. The RDBMS shall enable users to manage the database and the data dictionary entirely through relational interfaces. Non-relational interfaces may be provided, but they shall provide no functional capability that is not also available via some relational interface, and they shall not permit subversion of access control and data validation rules.

26.1.1.3 Operating System Interface. The RDBMS shall permit direct access to all the features of the operating system without exiting from the RDBMS.

26.1.1.4 Size. The number of rows and columns per database shall be limited only by available disk space with a minimum of 254 tables per database and 254 columns per table.

26.1.1.5 Data Compatibility. The RDBMS shall be 100% data compatible between the super-minicomputer, network server, and workstation versions. The capability to move, copy, and access data between databases on attached devices shall be provided.

26.1.1.6 Functional Compatibility. The addition of functions shall be transparent to any existing routines which were written in SQL (either embedded or interactive), 4GL, and any of the applications programs which use the RDBMS.

26.1.1.7 Structure and Access Method Independence. Application programs, stored commands, canned queries and reports, etc. shall be independent of changes in storage and access method.

26.1.1.8 Interface Compatibility. RDBMSs shall provide similar capability with a consistent user interface and yield consistent results.

26.1.1.9 Database Loading Utility. The RDBMS shall provide a utility for the initial loading of the database from sequential input files for both fixed and variable length records. The RDBMS shall import ASCII format files.

26.1.1.10 Import Data from Unify, Oracle, Progress, and Informix databases into the RDBMS. (REF: Table C-1) Import via ASCII files or flat files is acceptable.

26.1.1.11 Distributed Database/Distributed Processing. Distribution of database(s) and database processing across the network shall be supported. Also support distributed single database across multiple servers that appears to the user as a single logical database.

26.1.1.11.1 Database Server shall process requests for data and send only the results of the request to the client. Optimize query execution to minimize network traffic.

26.1.1.11.2 Data Distribution shall be transparent to the user.

26.1.1.11.3 Distributed Databases shall maintain consistency and integrity with one another automatically.

26.1.1.11.4 Commit Discrepancies. The RDBMS shall provide a means for resolving insert, delete, and update commit discrepancies. A unit of work shall be defined as being completed on an all or nothing basis. Provide two-phase commits across networks.

26.1.1.11.5 Autonomous. Each database configured into the distributed environment shall be autonomous and not dependent on any central services. Each RDBMS site shall continue communicating with all available sites even though one or more sites might have terminated communications due

to hardware failure, software failure or because communications at a site is disabled.

26.1.1.12 Order, Join, and Union. The RDBMS shall support order, join, and union capabilities.

26.1.1.13 Batch and Background Modes. The RDBMS shall enable interactive users to submit requests for noninteractive execution.

26.1.1.14 Online Help. Upon user request, the RDBMS shall provide on-screen help.

26.1.1.15 Concatenation. The RDBMS shall permit concatenation of two or more coln values and provide capability for insertion of one or more spaces and literal values. (e.g. \$, ., &, *, -, and blank). It is allowable to meet concatenation requirement with the 4GL.

26.1.1.16 Centralized Access Control. The logical and physical security of database components and interfaces shall be ensured by centralized access control rules for the database. Users shall be identified by user ID and password. (REF: NCSC-TG-021, Trusted Database Management System Interpretation) Data granularity access restrictions shall be at the level of column (view), tables, and entire database.

26.1.1.16.1 Access Control Rules shall be user-defined and modifiable by the Database Administrator. The user shall be able to prepare a declarative definition of the desired access controls and implement them without the necessity to write executable program logic for their enforcement.

26.1.1.16.2 Database Integrity. The RDBMS shall ensure the integrity of database updates and multiple record retrievals attempted simultaneously by multiple users. Deadlocks over database resources shall be detected and resolved.

26.1.1.16.3 Least Privilege Mechanism. The RDBMS shall provide, within a mutually agreeable time frame, a least privilege mechanism to assign privileges to perform database actions. (REF: F4.8)

26.1.1.16.4 Permissions. The RDBMS shall grant permissions to entire user groups as well as individuals. The permissions feature shall be provided within a mutually agreeable time frame. (REF: F4.8)

26.1.1.17 Database Administration. The RDBMS shall provide:

- a. User with online local and distributed database management and administration tools and functions using any attached workstation;
- b. A means to control physical data storage, monitor and control system performance, monitor usage, collect performance tuning data and protect the database against damage and loss;
- c. An audit trail which records selected accesses to the database for purpose of security;
- d. For the reorganization of the database following deletions and insertions to prevent fragmentation of storage;
- e. For reclaiming (e.g. compress or refile in contiguous portions) unused storage following deletion of a large number of rows;
- f. A utility for the dumping of selected database data to a sequential file;
- g. An import facility from every storage medium on which an export facility is supported;

- h. Import and export of selected data only;
- i. Import and export of data definitions with and without data (provide capability for the user to select whether imported data will merge with existing data or replace it);
- j. Import and export of tables with data, table definitions only, permissions, views, indexes, and clusters for:
 - (1) The entire database,
 - (2) One or more entire tables,
 - (3) All tables for one creator,
 - (4) Only tables which have changed since last import and export.

26.1.1.18 Database Backup and Recovery. The RDBMS shall provide backup and recovery which ensures database integrity. The RDBMS shall backup the database while the database is still in use. This facility shall:

- a. Provide facilities for backing up databases and transaction logs to DAS and DAS backup, and to the super-minicomputer 9-track tape;
- b. Provide recovery of the database by reloading from historical backup copy and applying all transactions successfully completed after the backup copy was run;
- c. Protect the database from damage by malfunction of hardware and software;
- d. Automatically back-out incomplete transactions upon abnormal program termination and upon system initialization following hardware failure.

26.1.1.19 Data Dictionary. The data dictionary shall provide control over the RDBMS. If the data dictionary is "freestanding, and hence not dependent on the presence of other software" or "designed to co-exist with particular database management systems," the data dictionary facility shall comply with FIPS 156 Information Resource Dictionary System by March 1991. Data dictionaries embedded within the RDBMS are not governed by FIPS 156. The data dictionary shall:

- a. Be structured as tables and views and it shall provide the following information about the database:
 - (1) Database users,
 - (2) Database security,
 - (3) Names of database objects (e.g. tables, views, columns, constraints, indexes, synonyms, users, and space definitions),
 - (4) Primary and foreign key information,
 - (5) Object ownership,
 - (6) Audit information;
- b. Be automatically updated when new data definitions are added (complete compilation) and when existing data definitions are revised and deleted (i.e. tables, views);
- c. Be modifiable by the database administrator;
- d. Contain metadata for the data elements (columns):

- (1) Element name (short title, long title),
- (2) Element definition (detailed description),
- (3) Element size,
- (4) Element type,
- (5) Element users (users allowed access to the data element).

26.1.1.20 SQL Interface. The SQL level 2 language as defined in FIPS 127-1, Database Language SQL, shall be provided for data definition (including access control), database control language, data manipulation language, and database definition language in both interactive and batch modes. The SQL shall:

- a. Have syntax and semantics which conform to FIPS 127-1;
- b. Include the "Integrity Enhancement" feature;
- c. Provide referential integrity at the server level;
- d. Provide embedded SQL for Ada, COBOL, C, and Pa Sscal (Ada and Pascal embedded SQL shall be available within a mutually agreeable time frame) and shall conform to FIPS 127-1; (REF: F4.8)
- e. Provide grouping by selected rows based on user-specified values;
- f. Permit user programs and interactive users to indicate certain database updates are interrelated (transactions);
- g. Ensure interrelated updates are applied to the database on an all-or-nothing basis;
- h. Enable user to indicate a column value is unknown (null) and distinguish unknown values from known values in storage, output displays, and reports;
- i. Reject rows containing null values from all selection criteria except the null criterion;
- j. Ignore null values in group calculations (i.e. sum and average of all values in a column);
- k. Produce a null result for individual calculations if any of the column values involved are null (i.e. a substring or the product or sum of two column values in a row);
- l. Sequence null values consistently higher than or lower than known values;
- m. Insert a single row by a command that provides a list of column values (each value in the list shall be either a literal or null);
- n. Insert one or more rows retrieved from one or more database tables (it shall be possible to insert into a table anything that can be retrieved from the database);
- o. Provide capability for users to update column values in existing rows and update multiple user-selected rows with a single command (each new column value shall be a literal, a retrieved or calculated value, or null);
- p. Access every database column value by specifying table

name, column name, and values of one or more columns whose values uniquely identify the corresponding table row (i.e. primary key value);

- q. Provide selection of rows based on following criteria and their negation:
 - (1) Value comparison,
 - (2) Range of values,
 - (3) List of values,
 - (4) Null,
 - (5) Set membership (result(s) of nested queries),
 - (6) Value similarity (wild card characters);
- r. Provide selection of rows based on the logical conjunction of four or more of the supported selection criteria (criteria joined by the conjunctions AND, OR);
- s. Permit the user-specified values in selection criteria to be:
 - (1) A literal value,
 - (2) the result of a calculation,
 - (3) A value retrieved from an existing row in the same table and in another table of the database (often called a "sub-query");
- t. Provide the following calculations on values in selection criteria, in the column values specified in update and insert requests, and in the list of values retrieved by a select request:
 - (1) Statistical functions (e.g., mean, standard deviation, etc),
 - (2) Financial functions (e.g., simple interest, compound interest, present value, annuities, etc),
 - (3) Mathematical functions,
 - (4) Date and time functions,
 - (5) Logical functions,
 - (6) Count of records,
 - (7) Count unique values,
 - (8) Extract a substring with a user-specified length at a user-specified offset from the beginning or end of a column value;
- u. Have a column definition comprised of column name, data types (character, date, number, long character), and an optional NOT NULL constraint;
- v. Permit the user to declare that no 2 rows of the table are allowed to contain the same value (column uniqueness) for a specified column and for concatenation of 2 or more specified columns;
- w. Permit the user to declare the column(s) to be used as an

index (the index can be used to quickly locate rows in a table).

26.1.1.21 Multiple Regions. The RDBMS shall support storage of a database across multiple physical storage devices.

26.1.1.22 Raw Devices. The RDBMS shall support input and output across raw devices for data storage under control of the TCB.

26.1.1.23 Views. The RDBMS SQL shall provide the definition of and access to "virtual tables" (views) that do not exist as such in physical storage. "Base tables" are physically stored within the database. Views shall be a logical representation of a "base table."

26.1.1.23.1 View Definition. A view shall be defined to be the result of a select operation from base table(s) and other view(s). It may, therefore, comprise a subset of columns and rows in a base table, and a join.

26.1.1.23.2 View Manipulation. All processing associated with a base table shall also apply to a view. The only restrictions that apply to manipulating a view shall be those imposed by the SQL standard (FIPS 127-1), and security constraints.

26.1.2 Desired Capabilities.

26.1.2.1 Distributed Database. Permit one transaction from one user to query and update while maintaining the integrity of all relevant databases within the network of databases.

26.1.2.2 Centralized Access Control. The number of users permitted simultaneous access to the database shall be limited by the operating system and not by the RDBMS. RDBMS users shall be identified by the user ID entered when logging onto the operating system.

26.1.2.3 Optimization. The operation of the RDBMS shall be dynamically optimized. The RDBMS includes tools for the assessment of database access performance and for the formulation of corrective adjustments to the storage structure and access method tuning parameters.

26.1.2.4 Backup and Recovery. Provide capability for backup and recovery of selected columns from selected rows of one or more tables.

26.1.2.5 Data Dictionary. The data dictionary facility appear to the user to be an integral part of the RDBMS product, not a free standing, optional add-on.

26.1.2.6 SQL Interface. The RDBMS support definition of columns with a default value. Provide the capability to support domains. Provide identification of primary and foreign keys in each table with NOT NULL required for each. Reorganization and modification of tables be provided by a fully functional SQL "ALTER TABLE" command or command/utility of equal capability. It must be possible to add, drop, and modify columns for any existing table.

26.1.2.7 Data Types. Permit user to define and store database types to include user-defined, "Money", and "binary large objects" (BLOB).

26.1.2.8 User-defined Functions. Permit user to define, store, call, and use user-defined functions, rules, and procedures.

26.1.2.9 Database Shadowing. The RDBMS provide a facility for local and networked database replication. This facility includes:

- a. Utilities for creating, maintaining, monitoring, verifying, and administrating database replication at the database and table level;
- b. A mechanism that provide capability for a database

administrator to set an interval rate at which a replica is updated by the master and where the interval rate is set independently at the database and table level and has a default setting of immediate;

- c. A mechanism that provide capability for a user to request an immediate refresh of a replica with the most current master data;
- d. Fault-tolerant recovery.

26.1.2.10 Size. The number of rows and columns per database shall be limited only by available disk space with a minimum of 500 tables per database and 3000 columns per table.

26.1.3 CLIN 1107, Single-user Workstation RDBMS.

26.1.4 CLIN 1109, Multiuser Workstation RDBMS.

26.1.5 CLIN 1111, Network Server RDBMS.

26.1.6 CLIN 1113, Super-minicomputer RDBMS.

26.2 Screen Formatter, CLINs 1115-1122. A screen formatter shall be provided for generation of formatted interactive screens for data entry, update, and query without requiring the user to learn and use a programming language. The screen formatter shall provide capability for the user to:

- a. Prepare a declarative definition of the format, content, and sequence of the screen layout;
- b. Specify an individual display field from any character position on the displayable window;
- c. Provide scrollable columns from multiple tables;
- d. Specify a literal value in separate fields of the display (i.e. labels to identify other display fields), interspersed with data output;
- e. Specify that certain fields are: "non-display," "required entry," and "protected";
- f. Specify a display field whose format and length differ from those of the database column whose value is displayed in that field;
- g. Concatenate column values so that no space, or a single space, appears between the data fields (i.e. dates where month, day, and year are separate columns). It is allowable to meet concatenation requirement with the 4GL;
- h. Specify style (underlining, high intensity, reverse video, blinking, color, etc.) for each display field independently;
- i. Display the current date and time.

26.2.1 Desired Capabilities are:

- a. Concatenate variable length fields, and text fields which start or end with spaces, so that no space, or a single space, appears between the data fields (i.e. first and last name);
- b. In a multiframe display, display a computer generated count of the number of frames in the display and the frame number of the currently displayed frame;
- c. Specify a literal value between concatenated values (i.e. comma, period, hyphen, and slashes between values).

- 26.2.2 CLIN 1115, Single-user Workstation RDBMS Screen Formatter.
- 26.2.3 CLIN 1117, Multiuser Workstation RDBMS Screen Formatter.
- 26.2.4 CLIN 1119, Network Server RDBMS Screen Formatter.
- 26.2.5 CLIN 1121, Super-minicomputer RDBMS Screen Formatter.

26.3 Report Generator, CLINs 1123-1130. A report generator shall be provided to generate formatted reports and screen displays in batch and interactive mode without requiring user to learn and use a programming language. The report generator in conjunction with the operating system and utilities shall provide capability for the user to:

- a. Prepare a declarative definition of the format, content, and sequence of the report;
- b. Specify an individual report field at any character position of any report line and specify a report column at any character position;
- c. Specify a literal value that contains any ASCII character:
 - (1) Between concatenated values (e.g. comma between the last and first names),
 - (2) In separate fields of the report (i.e. labels to identify other report fields),
 - (3) Interspersed with data output;
- d. Specify the content and format of headings and footings to be printed on every page of the report;
- e. Specify which lines are automatically right justified, left justified, and centered;
- f. Automatically generated column headings, page numbers, date, and time, in user-specified locations;
- g. Define a break point at each point in a report where the value of one or more fields changes;
- h. Produce column subtotals, page breaks, heading line(s), and footing line(s) at user-designated control breaks;
- i. Specify print size, font, and style (underlining, boldface, italics, etc.) for each display field independently;
- j. Direct output to a printer, workstation display, a sequential DAS file, and file on tape which is suitable for use with word processor, spreadsheet, and electronic mail;
- k. Specify number of copies to be generated;
- l. Specify field format and length differently than the database column definition from which the value is obtained;
- m. Specify concatenation of column values such that no space, or a single space, appears between the values (i.e. dates in a record where month, day, and year are separate columns);
- n. Specify a total of all the values in a report column is to be calculated;
- o. Store report format for later modification and execution and provide selection of query parameters at run time;

- p. Display and print:
 - (1) Predefined files,
 - (2) Ad hoc entries,
 - (3) Header specifications,
 - (4) Page definitions,
 - (5) Format definitions,
 - (6) Multiple tables,
 - (7) Data fields.

26.3.1 Desired Capabilities are:

- a. User-written HELP which shall display application specific help information;
- b. Terminal preview as a means of reviewing the appearance and format of a report at the terminal before the report is generated;
- c. Ability to specify concatenation of variable length fields, and text fields which begin or end with spaces, such that no space, or a single space, appears between the fields (i.e. first and last name).

26.3.2 CLIN 1123, Single-user Workstation RDBMS Report Generator.

26.3.3 CLIN 1125, Multiuser Workstation RDBMS Report Generator.

26.3.4 CLIN 1127, Network Server RDBMS Report Generator.

26.3.5 CLIN 1129, Super-minicomputer RDBMS Report Generator.

26.4 Query and Update, CLINs 1131-1138. The software shall provide a method to query and update the database without writing an executable program. The query update facility shall:

- a. Provide a default display layout which is easily modified by the user;
- b. Permit users to direct query output to a workstation display, system printers, workstation printers, and to a file which is suitable for use with the word processor, electronic mail, spreadsheet, and graphics package.

26.4.1 Desired Capabilities are:

- a. On-screen HELP which shall provide command syntax semantics and user guidance for effective use;
- b. User-written HELP which shall display application specific help information;
- c. Provide terminal preview as a means of reviewing the appearance and format of a database query before the query is initiated;

26.4.2 CLIN 1131, Single-user Workstation RDBMS Query and Update.

26.4.3 CLIN 1133, Multiuser Workstation RDBMS Query and Update.

26.4.4 CLIN 1135, Network Server RDBMS Query and Update.

26.4.5 CLIN 1137, Super-minicomputer RDBMS Query and Update.

26.5 Easy Query Language and Report Writer, CLINs 1139-1146. A query language and report writer utility program shall be provided for the non-programmer and non-technical user to query a data file in batch and online mode. The program shall:

- a. Provide commands with an English-like syntax and from menus;
- b. Provide user with ability to select data through the use of logical and relational operators to include: greater than, less than, equal to, AND, OR, and NOT;
- c. Provide user with ability to direct output and template-based reports to the following:
 - (1) Workstation display,
 - (2) Disk file,
 - (3) Tape file,
 - (4) Temporary file,
 - (5) Word processor file,
 - (6) Electronic mail,
 - (7) Graphics package,
 - (8) Spreadsheet,
 - (9) Workstation printer,
 - (10) System printer;
- d. Provide user ability to resequence data retrieved from existing files by using contents of data fields as a search and sort key;
- e. Have feature which displays a count of records with specific values, a count of records with values within a range of values, subtotals, and grand totals;
- f. Display fields from data files, in user-defined format, based upon specific search keys and range selections, for at least 3 file data items.

26.5.1 CLIN 1139, Single-user Workstation RDBMS Easy Query Language and Report Writer.

26.5.2 CLIN 1141, Multiuser Workstation RDBMS Easy Query Language and Report Writer.

26.5.3 CLIN 1143, Network Server RDBMS Easy Query Language and Report Writer.

26.5.4 CLIN 1145, Super-minicomputer RDBMS Easy Query Language and Report Writer.

26.6 Fourth Generation Language (4GL), CLINs 1147-1154. Provide an easy to learn and use, enhanced application development environment which uses e RDBMS as its foundation and integrates menus and windows as its primary user interface. The 4GL shall:

- a. Access and execute relocatable object code modules generated by any of the 3GL programming languages;
- b. Interface with the Query and Update software;
- c. Provide FIPS 127-1 Database Language SQL;
- d. Interface with the screen formatter;

- e. Interface with the report writer;
- f. Utilize the data dictionary for data definitions, synonyms, database structure, and other pertinent media data;
- g. Provide menu and screen generation;
- h. Include context sensitive help facilities;
- i. Provide distributed processing across the network (e.g. screen formatter, query and update, and report generator).

26.6.1 Desired Capabilities are:

- a. An optimizer for the 4GL;
- b. The ability for user-generated help information attached to a screen, application, and online report such that when user accesses that screen, application, and report, a single command displays the text which was previously attached;
- c. A utility for the developed 4GL code to be converted to, modified by, compiled using the programming languages (the result is a 3GL executable file and an object code file).

26.6.2 CLIN 1147, Single-user Workstation 4GL.

26.6.3 CLIN 1149, Multiuser Workstation 4GL.

26.6.4 CLIN 1151, Network Server 4GL.

26.6.5 CLIN 1153, Super-minicomputer 4GL.

26.7 Computer Aided Software Engineering (CASE) Tools, CLINs 1155-1162.

The CASE tools shall:

- a. Integrate with the RDBMS or use the RDBMS as their foundation;
- b. Run under the windows environment;
- c. Provide generation, modification, and printing of syntactically correct entity relationship and data flow diagrams based on the information engineering methodology;
- d. Provide automatic entry of data from diagrams to the data dictionary;
- e. Provide automatic generation of design documentation;
- f. Provide consistency and completeness checks on system generation.

26.7.1 Desired Capabilities are:

- a. A formal information system planning and development methodology defined as Information Engineering which covers both functional and operational requirements of a project's Life Cycle Management;
- b. Assist in mission analysis and project initiation, concept development, definition and design, system development, deployment and operation, and maintenance phases;
- c. Provide a business viewpoint analysis to include current and future mission, purpose, goals, objectives, and strategies of the organization;
- d. Provide an organization wide data model which graphically

- presents the information needed to achieve the mission, purpose, goals, and objectives of the organization;
- e. Provide the logical database design at the subject area level;
 - f. Produce appropriate models to include a system data, data entities, normalized records, and processing procedures models that identify potential inconsistencies and incompatibilities;
 - g. Identify individual transactions, database schema, record formats, data relationships, primary/secondary keys, and record groupings for performance considerations;
 - h. Identify backup, recovery, security, audit, data archiving, and future expansion requirements;
 - i. Generate ANSI COBOL source code, screen code, report writer code, and data dictionary entries;
 - j. Produce documentation (text and graphics) to include functional description, data requirements, system specifications, program specifications, database specifications, user manual, operations manual, maintenance manual, and test plan;
 - k. Produce graphic diagrams to include organization chart, business procedures decomposition, entity relationship, logical procedures, conditional logic, logical database design, action diagrams, data flow diagrams, data model diagrams, and data structure diagrams;
 - l. Provide modifications to mission, purpose, goals, objectives, policies, procedures, data models, procedure models, and design;
 - m. Automatically generate modified database design, source code, screen code, report writer code, data dictionary entries, database queries, and documentation;
 - n. Serve as a change control vehicle;
 - o. Provide an active environment that will suggest changes to the development team;
 - p. Provide at least 50 different data models, a 1000 uniquely identifiable entities with a 100 attributes per entity, and a 1000 associations between entities per data model;
 - q. Provide validation and consistency checking to include syntax, duplicate entries, attributes associated with an entity, impact of potential updates, referential integrity, cardinality, and level balancing between higher and lower level processes of the data flow diagram;
 - r. Provide import and export of data files and partial data files in ASCII format from DOS and POSIX files;
 - s. Provide capability for separation of test and production environments;
 - t. Generate matrices to document relationships between processes to entities, processes to organization, processes to system activities, organization to system activities, organization to entities, and organization to organization;
 - u. Active updating between open windows of all related graphical diagrams;
 - v. An integrated reverse engineering product to enable conversion

of 3GL implementations of existing applications;

w. An "UNDO" function.

26.7.2 CLIN 1155, Single-user Workstation CASE Tools.

26.7.3 CLIN 1157, Multiuser Workstation CASE Tools.

26.7.4 CLIN 1159, Network Server CASE Tools.

26.7.5 CLIN 1161, Super-minicomputer CASE Tools.

C27 Office Automation Software, CLINs 1163-1264.

An integrated office automation software package shall be provided which includes (as identified by the CLINs): user directory, calendar, electronic authentication, electronic filing, project management, task and suspense management, electronic mail, spreadsheet, word processing, forms generation, business graphics, and spell checking. If a bundled integrated package is provided, it shall be configurable by the user so that only the portions to be used are stored on the system. All office automation software (except single-user versions) shall support processing in multilevel security mode in accordance with AFR 205-16 paragraph 6-2d (see C15.2.1.4). Multilevel security shall be available within a mutually agreeable time frame. Individual files shall be capable of being password protected. (REF: C15 and F4.9)

27.1 Common Requirements. The software shall:

- a. Support all features and functions of the printers;
- b. Provide data file format for all modules (i.e. Word processing, project management, spreadsheet, business graphics, and E-mail) to enable transfer and integration of data and graphics between modules;
- c. Provide the various office automation tools with a level of integration for user to easily move data and graphics from one tool to another without retreating to a higher command level (e.g. between E-mail and word processing, between project management and E-mail, etc.);
- d. Provide online help facilities;
- e. Reserved;
- f. If menu controlled, provide the ability to bypass the menus;
- g. Provide capability for user to interrupt a current application, go to another application, and return to the same point in the original application;
- h. Provide the ability to mark files for deletion at a later time;
- i. Provide capability for the document size and number of documents per user or provide capability for the total document storage space per user to be limited by the system administrator, not by the office automation package;
- j. Provide a personal database with an easy-to-use menu-driven interface. Provide capability for generation of simple applications and reports. Provide import of ASCII files.

27.1.1 Reserved.

27.1.2 Reserved.

27.1.3 Reserved.

27.1.4 Desired Capability. Provide integration of keystrokes such that, throughout the various office automation tools, similar functions (save,

print, insert, etc.) will be accomplished through the use of the same keystrokes (e.g. the F2 key is the "save" key in word processing, spreadsheet, graphics, etc.).

27.2 Directory Software, CLINs 1169-1174. A directory listing all system users and including their name, office symbol, and user ID shall be provided. Shall support CCITT X.500 within a mutually agreeable time frame. (REF: F4.9)

27.2.1 Reserved.

27.2.2 CLIN 1171, Network Server Directory Software.

27.2.3 CLIN 1173, Super-minicomputer Directory Software.

27.3 Calendar Software, CLINs 1175-1180. The software shall include planning calendars which:

- a. Display, edit, save, and produce hard copy of a planning calendar by hour, day, week, and month for both public and private calendars;
- b. Provide capability for user to enter information on their own personal calendar and on other calendars to which they have access;
- c. Inform user when their personal calendar has been modified by someone else to include the date the modification was made;
- d. Provide a signed-on user an alarm for scheduled events and appointments.

27.3.1 CLIN 1175, Multiuser Workstation Calendar Software.

27.3.2 CLIN 1177, Network Server Calendar Software.

27.3.3 CLIN 1179, Super-minicomputer Calendar Software.

27.4 Authentication Software, CLINs 1181-1186. The user, as established by the system administrator, shall be able to electronically authenticate any document produced by office automation software that they are authorized access to by insertion of the correct password. The system shall verify the password entry then automatically display the individual's name and title in a manner which will distinguish it from the rest of the text (e.g. reverse video). This signature password shall be different from the password used to log onto the system and shall be changeable by user.

27.4.1 CLIN 1181, Multiuser Workstation Authentication Software.

27.4.2 CLIN 1183, Network Server Authentication Software.

27.4.3 CLIN 1185, Super-minicomputer Authentication Software.

27.5 Electronic Filing, CLINs 1187-1190. Provide software to establish and maintain a filing system for significant and insignificant documents. Significant documents (records) are those determined to have legal, financial, operational, historical, and administrative value to the organization. These documents need to be identified, controlled, and preserved in order to conduct and document official Government business. Insignificant documents (nonrecords) are all other documents. These documents are generated in the conduct of official business, but they are those files determined by user as not needed as matters of record to document the transactions of the Government. The system shall:

- a. Store all significant documents in the central file;
- b. Treat any document submitted to the central file as a significant document, by virtue of being in the central file;
- c. Provide capability for a significant document to be copied from the central file, but shall not allow alteration of the

central file document;

- d. Provide capability for only one logical central file and it will be the "corporate memory";
- e. Provide a basic menu for filing and displaying the available files including the central file;
- f. Provide user, upon request, the percentage of file space available;
- g. Have the ability to produce a generic tape and disk file (one which is free of all coding instructions and has only raw information either formatted or unformatted) of any central file significant documents;
- h. Provide an audit trail for all versions of each significant document and any significant documents linked to each significant document by reference;
- i. Automatically store authenticated significant documents into the correct file within the correct central file cabinet;
- j. Automatically assign the disposition code assigned to the file, when an authenticated significant document is directed to records storage;
- k. Individually identify each significant document in the central file and automatically create an index entry which contains:
 - (1) Individual document identifier,
 - (2) Name or office of the creator,
 - (3) Addressee(s),
 - (4) Date of the document,
 - (5) Subject of the document,
 - (6) A set of keywords on the text of the document,
 - (7) Retention period for the document,
 - (8) Location and records archive status of the document;
- l. Provide capability for user to enter documents into the system received via electronic transfer, input by scanning, and derived from other information within the system (e.g. a report generated from several data files and a word processing document);
- m. Retrieve significant documents by inclusive dates of document creation and retention periods (scheduled disposition dates);
- n. Provide capability for user to search the index and identify documents by any field(s) in the index;
- o. Provide capability for user to search a limited set of significant documents for a specified character string;
- p. Provide capability for user to restrict searches to a limited set of significant documents already identified through an index search;
- q. Upon inquiry, provide the number of significant documents on each file system, total current file size, disposition code by record, and historical and prior years' information by the same parameters;

- r. Batch and mass expunge significant documents as they become eligible for destruction;
- s. Block document authors from having the means to destroy significant documents;
- t. Only allow the system administrator to implement actual significant document destruction;
- u. Copy selected significant documents to another storage medium and computer system;
- v. Provide retrieval of archived significant documents with minimal human intervention;
- w. Hold online archived central file significant documents for a length of time determined by the system administrator, then automatically removed to more economical storage media;
- x. Provide capability for user selection of compression and decompression;
- y. Assign each significant document an appropriate disposition date which can be abbreviated with a single character;
- z. Provide capability for the system administrator to enter a disposition code on each file;
- aa. Automatically assign to individual significant documents the disposition code assigned to the file in which the significant document is stored;
- ab. Provide the following disposition codes:
 - (1) T (Temporary) = Destroy two years from 1 January following the year the document is dated. ,
 - (2) M (Middle) = Destroy eight years from 1 January following the year the document is dated,
 - (3) L (Long) = Destroy 20 years from 1 January following the year the document is dated,
 - (4) F (Fifty-six) = Destroy 60 years from 1 January following the year the document is dated,
 - (5) P (Permanent) = Retire to the National Archives (the volume of permanent significant documents will determine how often retirement takes place) while retaining a copy for reference,
 - (6) I (Indefinite) = Retain until an event or action (such as supersede, obsolescence, or completion of an action) renders the significant document useless, then destroy.

27.5.1 CLIN 1187, Network Server Electronic Filing.

27.5.2 CLIN 1189, Super-minicomputer Electronic Filing.

27.6 Project Management, CLINs 1191-1196. A project management software package shall be provided for the scheduling of project tasks and milestones and the monitoring of resource allocations. The software shall:

- a. Provide capability for user to build project profile(s) which include:
 - (1) At least 100 projects, 300 tasks per project, and 500

dependencies per task,

- (2) Critical path management,
- (3) Calculate starting and ending dates for tasks,
- (4) Indicate which tasks must start on time and which can wait,
- (5) Indicate when individual, machine, and other resources are overloaded;

b. Provide user editing capabilities as follows:

- (1) Instantly recalculate dates and critical path in response to "what if" changes,
- (2) Automatically combine two existing projects into one, to include tasks, resources, and milestones,
- (3) Provide capability for user to add, modify, and delete tasks, milestones, and dependencies, and dates on which they occur,
- (4) Provide capability for sorting of tasks and resources by the order in which they appear in the project and by their slack time,
- (5) Indicate the critical path;

c. Display graphics and text on a workstation and print and plot in portrait and landscape mode on a printer and plotter each of the following:

- (1) Gantt chart,
- (2) PERT chart,
- (3) Charts showing project tasks, milestones, dependencies, and the dates on which they occur,
- (4) Resource charts showing resource utilization over time and resource allocation for various tasks for the duration of the project,
- (5) A task chart showing each task and who is responsible for completion of the task;

d. Provide capability for user to work in the network view and perform the same functions as in the Gantt view;

e. Provide ability to outline tasks and project and subproject lists;

f. Reserved.

27.6.1 Desired Capabilities are:

- a. Provide an "UNDO" function;
- b. Provide more than 300 tasks per project;
- c. Enable user to link and combine projects, master milestone lists, and resource lists to make and update super projects;
- d. Provide capability for user to customize presentation layouts, use note pads, maintain a text journal, and to specify report formats by filtering and selection criteria;

27.6.2 CLIN 1191, Multiuser Workstation Project Management Software.

27.6.3 CLIN 1193, Network Server Project Management Software.

27.6.4 CLIN 1195, Super-minicomputer Project Management Software.

27.7 Task and Suspense Management, CLINs 1197-1202. Software shall be provided for user to assign, track, and manage actions required for current projects and the day-to-day workload. The software shall:

- a. Provide capability for user to enter the following information within each field of the action item:
 - (1) All recipients in at least an 80-character field,
 - (2) Action Addressee in at least a 30-character field,
 - (3) Action item and subject being created in at least a 80-character field,
 - (4) Date action is to be completed in at least a 20-character field,
 - (5) Comments field for entering status and actions taken (the originator and the person(s) performing the action shall have access to enter data into this variable length field with a minimum size of 1200 characters);
- b. At originator's option, affix a due date to any item assigned to a user;
- c. Automatically log due date into both the originator's and recipient's "tickler" file;
- d. Sort "tickler" file by due date;
- e. Provide capability for originator to remove all occurrences of an action item from the tickler file(s) with a single command;
- f. Include the following items in the "tickler" file:
 - (1) Originator,
 - (2) Action Addressee,
 - (3) Subject,
 - (4) Original Due Date,
 - (5) Revised Due Date,
 - (6) Actual Completion Date;
- g. Provide capability for user to transfer action items to other designated user and to a predesignated group of user;
- h. Provide capability for originator and user to query the system and receive status of their action item(s);
- i. Automatically notify originator and recipient of any action items due and not yet completed plus any overdue items;
- j. Provide capability for originator option to mark the action item as complete, cleared with comment, revised due date, and overdue with the user prompted each day for overdue items.

27.7.1 CLIN 1197, Multiuser Workstation Task and Suspense Management Software.

27.7.2 CLIN 1199, Network Server Task and Suspense Management Software.

27.7.3 CLIN 1201, Super-minicomputer Task and Suspense Management Software.

27.8 Electronic Mail Utility, CLINs 1203-1206. A utility shall be provided which gives user the ability to send messages and mail to any other user(s) on any DDN (SMTP) and GOSIP (CCITT X.400) compliant networked system within security constraints (see also Table C-1). The utility shall:

- a. Display available program function key actions at user's option while continuing to use other electronic mail capabilities;
- b. Provide capability for user to send messages to user(s) ensuring that the receiver is the only one with the ability to view, print, forward, and copy the message;
- c. Provide capability for user to send mail which shall include any file(s) and a routine slip for comments to user(s);
- d. Provide capability for user to transfer entire documents and copies of documents to other user as a single mail package;
- e. Provide capability for user to generate format items (e.g. TO, From, Copy to, Subject);
- f. Provide capability for user to create and send messages to all users, to a single user, and to user-designated in distribution lists;
- g. Provide capability for user to create, edit, spell check, and save messages prior to transmission;
- h. Provide capability for user to send a message of at least 20 lines without creating a word processing document;
- i. Provide capability for user to read, file, delete, list, answer, forward, and route messages;
- j. Automatically identify the message originator, date, time, and subject for user review of items and to facilitate printing of desired items;
- k. Store unsent outgoing (e.g. Due to communications failure, communications overload) messages for a period of 3 days, if the message is not sent in this period of time, notify the originator via his mailbox to make disposition;
- l. Provide capability for user to mark outgoing mail by at least two categories:
 - (1) "Registered" shall notify the originator that the mail has been delivered to the destination system,
 - (2) "Certified" shall include "registered" capability and send a notification back to the originator when the mail item has been read;
- m. Automatically notify user when mail and message waiting each time they sign on to the system and at the time that the mail arrives if user is currently signed on;
- n. Provide capability for user to interrupt any office automation feature to send a message to another user and to view user "in" box;
- o. Provide capability for user to automatically return to the interrupted feature at the point of interruption;
- p. Provide a global directory which includes all users from all

networked systems (this X.500 directory shall be accessible while addressing electronic mail items);

- q. Provide capability for user to select addresses from the X.500 directory;
- r. Automatically synchronize the global directory (any change made in the directory of one system is synchronized to the directory of the other systems) to include names added, names deleted, and names changed in the X.500 directory;
- s. Provide capability for user to create personal aliases (nicknames) for any user and use public system aliases;
- t. Provide the ability to create, store, modify, and delete distribution lists;
- u. Provide automatic housekeeping on a timed basis (e.g. once every 24 hours) as an administrative function as a background process;
- v. Automatically purge only 'READ'd mail items that have exceeded a retention period specified per user in the global directory;
- w. Automatically route all applicable outbound mail to the Simple Mail Transfer Protocol (SMTP) and the X.400 software and deliver any inbound mail received from the SMTP and the X.400 software to the electronic mail utility;
- x. Provide a wastebasket for mail which provide capability for retrieval of discarded messages.

27.8.1 Desired Capabilities are:

- a. Notify originator if registered mail has not been read within a user-specified time frame;
- b. Provide capability for user to queue messages for future delivery;
- c. Capability to download mail to an intelligent/GOE workstation, process the mail on the workstation while disconnected from super-minicomputer, and then upload mail from the workstation.

27.8.2 CLIN 1203, Network Server Electronic Mail Software.

27.8.3 CLIN 1205, Super-minicomputer Electronic Mail Software.

27.9 Spreadsheet, CLINs 1207-1212. The spreadsheet software shall:

- a. Be 100% data and formula compatible between the super-minicomputer, network server, and the workstation versions;
- b. Provide at least 1000 rows and at least 256 columns, and display the current row and column position;
- c. Provide capability for user to use symbolic and absolute references to other cells;
- d. Provide capability for user to name a specified range of cells and to view and erase a range of cells by referring to the range name;
- e. Provide capability for user to protect specific cells and groups of cells from global commands;
- f. Provide capability for user to protect data by cell, row, column, range of cells, and whole spreadsheet;

- g. Provide capability for user to set the column width to more or less than the global and the default value;
- h. Provide capability for continuous entry of text from one cell to the next when the text length exceeds the number of spaces in the cell in which the text entry begins;
- i. Provide the ability to store variable length text strings in individual cells;
- j. Provide capability for user to select the current date;
- k. Provide multiple windows to display multiple cell ranges from different portions of a single and multiple spreadsheet files and perform the full range of spreadsheet functions in each window;
- l. Provide capability for user to store a series of commands in a separate file and execute the commands at a later time;
- m. Execute a command file via a single command or function;
- n. Provide capability for a user introduced pause to be placed in a command file for special information entry and provide capability for use of conditionals to alter the order of command execution;
- o. Provide capability for user to erase all and part of a spreadsheet;
- p. Provide capability for user to retrieve all or part of a spreadsheet file and combine it with the one in current use;
- q. Provide capability for user to extract and save part of a spreadsheet in a separate file without altering the original file;
- r. Provide capability for user to specify a different directory for spreadsheet file storage, user shall be able to display a list of all files;
- s. Provide capability for user to display a graph on the workstation display, print it on the page and character printers, and plot it on the system plotter;
- t. Provide capability for printing of the spreadsheet sideways on the page and character printers;
- u. Provide compressed print;
- v. Permit at least 240 characters of the to be output as a page header and footer;
- w. Provide capability for user to accept and change the default margin settings;
- x. Provide capability for user to change the following default output report for mat items: Range of the spreadsheet model to be output, Line spacing, Page spacing, and Control breaks (e.g. after sorting);
- y. Provide capability for user to select from the following output formats for numeric values: dollar signs, commas, decimal points, negative (minus) signs, and negative values inside parenthesis;
- z. Provide capability for user to select the number of decimal digits displayed after the decimal point;

- aa. Provide capability for user to scroll horizontally and vertically by page, screen, and by line;
- ab. Provide capability for user to lock and unlock row and column headings while scrolling data;
- ac. Provide capability for user to save, execute, display, print, modify, copy, and delete spreadsheet models, their structure, and report formats;
- ad. Provide capability for user to enter values, labels, and formulas directly into the cells on the worksheet;
- ae. Provide capability for user to display user prompts and menus, and the general worksheet settings;
- af. Perform mathematical operations on integer and real numbers to include the following:
 - (1) Addition,
 - (2) Subtraction,
 - (3) Multiplication,
 - (4) Division,
 - (5) Integer function (convert real number to an integer),
 - (6) Absolute value calculations,
 - (7) Rounding,
 - (8) Combinations of the above;
- ag. Perform compare operations to include greater than, less than, and equal;
- ah. Perform logical operations to include AND, OR, and NOT;
- ai. Perform combinations of arithmetic, comparative and logical operations;
- aj. Perform statistical operations to include average, sum, minimum, maximum, standard deviation, and count;
- ak. Provide macros or functions for financial operations to assist with the following:
 - (1) Compute present and future values,
 - (2) Calculate amortization tables,
 - (3) Calculate rate of return,
 - (4) Calculate annuities,
 - (5) Compute depreciation;
- al. Provide capability for user to specify how to recalculate
- at entire spreadsheet:
 - (1) Column by column,
 - (2) Row by row,
 - (3) Manually,

(4) Automatically;

- am. Provide capability for user to automatically adjust formulas (default), no formula adjustment, and manual formula editing (program asks for adjustment) to provide absolute and relative addressing when user copies, moves, and erases data;
 - an. Provide capability for user to copy, move, and erase a row, a column, and a range of cells (copy command leaves the original data unchanged);
 - ao. Provide capability for user to format the style and degree of precision used to display numbers, including settings for currency, scientific notation, percent, dates, and formulas;
 - ap. Provide capability for user to define how the values and text are to appear in the cells (i.e. left justified, right justified, and centered);
 - aq. Provide capability for format and data alignment to be defined for a cell, row, column, range of cells, and the whole spreadsheet;
 - ar. Provide capability for user to insert one or more rows and columns by use of a simple command or function, automatically adjusting all formulas to account for inserted rows and columns with all other information on the worksheet remaining unchanged and with new rows and columns assigned the global format, alignment and column width;
 - as. Provide capability for user to delete one or more rows and columns by use of a single command sequence or function and to readjust the location of the unaffected data to fill the spaces created by the delete and to adjust formulas as required;
 - at. Provide capability for user to sort columns and multiple columns containing numbers and text in ascending and descending order using a primary key and a secondary key;
 - au. Provide capability for user to create line, vertical bar, horizontal bar, and pie charts;
 - av. Link or import and integrate spreadsheet, word processing, and business graphics. Import and integrate ASCII text file(s) (e.g. source program files, data files, database files, and print files), DIF files, and from different GOE spreadsheet programs (i.e. Enable, Excel, Lotus 1-2-3, Multiplan, Unisys OFIS, 20/20, see also Table C-1);
 - aw. Translate and export the file into ASCII text, SYLK files, DIF formats, and a standard format compatible with GOE spreadsheet programs, see Table C-1;
 - ax. Provide capability for user to incorporate the spreadsheet charts into a composite document composed of spreadsheets, word processing documents, ASCII format documents (e.g. source program files, data files, database files, and print files), and business graphics;
 - ay. Provide an "UNDO" function.
- 27.9.1 Desired Capabilities are:
- a. Provide capability for user option of enabling and disabling page numbers;
 - b. Provide capability for user to create more than one report

format for a spreadsheet;

- c. Changes in one document will be automatically reflected in other documents that contain the same data;
- d. Handle files 1 MB or greater in size;
- e. Provide capability for user to scroll the data in the windows simultaneously and individually in each window;
- f. Provide capability for user to calculate the number of occurrences of a user-defined value (numbers and text) within a user-defined range;
- g. Perform mathematical operations to include the following:
 - (1) Logarithmic function,
 - (2) Exponentiation,
 - (3) Trigonometric functions,
 - (4) Modulus,
 - (5) Square root calculations,
 - (6) Pi calculations,
 - (7) Random number selection;
- h. Perform statistical operations to include:
 - (1) Linear regression,
 - (2) Variance;

27.9.2 CLIN 1207, Single-user Workstation Spreadsheet Software.

27.9.3 CLIN 1209, Multiuser Workstation Spreadsheet Software.

27.9.4 CLIN 1210, Network Server Spreadsheet Software.

27.9.5 CLIN 1211, Super-minicomputer Spreadsheet Software.

27.10 Word Processing Software, CLINs 1213-1220. The word processor shall:

- a. Import and export ASCII files and files from GOE word processing software, see Table C-1;
- b. Be 100% character and format compatible between super-minicomputer, network server, and workstation versions;
- c. Provide at least 158 columns per line, 250 lines per page, and 500 pages per document;
- d. Provide printing all of all 250 lines but not on a single sheet of paper;
- e. Provide multiple concurrent users using multiple documents;
- f. Be capable of creating compound documents which include word processing text, spreadsheets, business graphs, and data processing files (e.g. source program files, data files, database files, and print files);
- g. Provide capability for user to define, save, and reuse on subsequent editing sessions multiple page formats (margins, tabs, ruler, etc.) within one document;

- h. Provide a status line, online help, and menus;
- i. Provide a user-level menu for changing word processor default options;
- j. Automatically save the text to the storage media;
- k. Provide basic horizontal and vertical line drawing on the screen and printout;
- l. Provide capability for user to "undo" the last action using a command or function;
- m. Provide capability for user to return to the original document without saving changes, if desired;
- n. Provide automatic numbering of chapters, sections, subsections, and paragraphs using a user-selected numbering system;
- o. On user request, provide automatic creation of a table of contents and an index;
- p. Have a normal screen display which is in the same format and font in which it is to be printed;
- q. Provide on-screen text formatting with automatic alignment;
- r. Display to user the following:
 - (1) Line centering,
 - (2) Indention,
 - (3) Underlines,
 - (4) Subscripts and superscripts,
 - (5) Text justification (left and right),
 - (6) Text flush right,
 - (7) Ragged right edge,
 - (8) Boldface,
 - (9) Line spacing (single, double, etc.),
 - (10) Page breaks,
 - (11) Horizontal and vertical lines,
 - (12) Boldface and underline,
 - (13) Ruler (margins, tabs, and columns);
- s. Provide capability for user to change the following formatting features:
 - (1) Tabs,
 - (2) Ragged left,
 - (3) Ragged right,
 - (4) Justification (left and right),
 - (5) Centering,

- (6) Page width,
 - (7) Page length,
 - (8) Columns,
 - (9) Left, right, top, and bottom margins;
- t. Provide capability for user to indent blocks of text from both the left and right margins without changing the document margins;
 - u. Automatically return to the document margins upon termination of the indention function;
 - v. Provide automatic carriage return and automatic cursor wraparound in column and full width modes;
 - w. Provide repeated entry of key phrases by use of function keys, mouse click, or other keystroke combinations;
 - x. Provide automatic emphasis options which shall be displayed and printed in a highlighted manner when selected (change and removal of any emphasis option shall not require user to re-enter any text);
 - y. Support the emphasis options with all printing devices and all fonts required under this contract;
 - z. Provide capability for user to select any of the emphasis options before entering text and by marking a previously entered block of text;
 - aa. Provide capability for user to concurrently within one document select the following options:
 - (1) Boldface,
 - (2) Underline words only,
 - (3) Underline words and spaces in unbroken line,
 - (4) Subscripts,
 - (5) Superscripts,
 - (6) Italics,
 - (7) Capitalization;
 - ab. Provide capability for user to view and edit at least 2 documents concurrently on the same screen;
 - ac. Provide capability for user to change between 2 documents using up to a full screen display for each document;
 - ad. Provide capability for user to move the cursor back and forth between windows;
 - ae. Use similar commands for copying and moving documents and parts of documents (including calculations, line drawings and highlighted functions) between windows to those used for editing a single document;
 - af. Provide capability for user to move the cursor:
 - (1) Left, right, up, and down using keyboard arrow keys,

- (2) To the last character in a line,
 - (3) To the first character in a line,
 - (4) To the next screen of text which shall include the last two to four lines of text from the previous screen,
 - (5) To previous screen of text which shall include first two to four lines of text from the following screen,
 - (6) To next page of text,
 - (7) To previous page of text,
 - (8) To a user-selected page number,
 - (9) To first character of the document (top of document),
 - (10) To end of the document,
 - (11) To end of the screen,
 - (12) To beginning of the screen;
- ag. Provide capability for user to scroll the text vertically one line at a time, up and down, and horizontally, left and right, a width of at least 158 characters;
- ah. Provide a pagination function which divides a text stream into pages of specified length and generate page numbers;
- ai. Provide capability for user to override page break placement;
- aj. Provide user-selectable automatic page numbering with the option for:
- (1) All pages to be numbered,
 - (2) A range of pages within a document to be numbered,
 - (3) Numbering to begin on a specified document page number with a user-specified page number;
- ak. Automatically change page endings, if text is inserted and deleted, to maintain specified page length with no loss of text;
- al. Provide capability for user to override break placement and to protect a block of text against pagination;
- am. Ensure automatic pagination and repagination prevent the first line of a paragraph, title, and heading from being the last line of a page and prevent the last line from being first line on a new page (orphan line protection);
- an. Provide capability for user to copy text within a page, document, and between documents by line and by block, without deleting the original text;
- ao. Provide making repeat copies of marked text without remarking;
- ap. Provide capability for user to move defined block of text to a new location within a document and between documents and delete the text from the original location;
- aq. Provide capability for user to delete text with automatic display adjustment in the following increments:
- (1) Characters,

- (2) Words,
 - (3) Lines,
 - (4) Remainder of line to the right of the cursor,
 - (5) User-defined block;
- ar. Provide capability for user to insert text, a document and a data file into the document being edited at the location of the cursor;
 - as. Provide inserting text into a column and not change the parameters of the column;
 - at. Provide capability for user to automatically center a word, line of text and a user-defined block of text between the right and left margins and between revised margins, by using a command or keystroke without retyping the text;
 - au. Perform search and search-and-replace within specified pages and globally throughout the document;
 - av. Search the text for an occurrence of a user-specified character string (all ASCII characters including a carriage return and other keyboard-generated characters);
 - aw. Search text for an occurrence of a user-specified character string and replace it with a user-specified character string;
 - ax. Provide automatic numbering and placement of footnotes throughout the document and to place them all at the end of document;
 - ay. Associate footnotes with the appropriate text so reformatting, adding, and deleting text does not cause the footnote to have to be manually relocated;
 - az. Provide capability for user to automatically place header and footer text at the top and bottom of each page of a document and from a designated page of a document to the end of the document;
 - ba. Once the text of a header and footer is entered, automatically print on all pages and alternating pages of a document until another header or footer is entered by user;
 - bb. Not allow changes to the text of a document to affect the headers and footers;
 - bc. Provide capability for user to include the automatic page numbering function in headers and footers;
 - bd. Provide automatic insertion and removal of hyphenation and user intervention for manual setting;
 - be. Automatically align vertical columns of text and shall have the capability to format text with right and left justification and centered within the column;
 - bf. Align columns of decimal figures on the decimal point;
 - bg. Provide the following print options:
 - (1) Number of copies,
 - (2) Alternate headers and footers on even and odd pages,

- (3) Print selected pages of a document,
- (4) Pitch (10, 12, and compressed),
- (5) Left, right, bottom, and top margins,
- (6) Page length and width,
- (7) Line spacing - single, double spacing,
- (8) Paper feed (manual and continuous),
- (9) Draft and letter quality selection,
- (10) Select all logical and physical print devices (except the slave printer) with print queuing,
- (11) Proportional spacing,
- (12) Select the slave printer;

- bh. Provide capability for user to merge text from various files and documents at print time with page numbering, headers and footers, footnote numbering and placement, and pagination continue as if they were one document;
- bi. Provide capability for user to create, rename and delete user-specified documents and document directories from a menu.

27.10.1 Desired Capabilities are:

- a. Math functions available within a document and as a calculator;
- b. Changes in one document automatically reflected in other documents that contain the same data (e.g. spreadsheet chart within a word processor document);
- c. Provide capability for a user-selectable number of keystrokes and period of time between each save function;
- d. Provide capability for user to define a hyphenation zone where the software will automatically split a word at the end of a line with the option to override the hyphenation of a word and to place a hard hyphen in a word;
- e. Provide capability for user to copy text within a column;
- f. Ability to display and print mathematical symbols, and Greek alphabet.

27.10.2 CLIN 1213, Single-user Workstation Word Processing Software.

27.10.3 CLIN 1215, Multiuser Workstation Word Processing Software.

27.10.4 CLIN 1217, Network Server Word Processing Software.

27.10.5 CLIN 1219, Super-minicomputer Word Processing Software.

27.11 Forms Generation and Management Software Package, CLINs 1221-1226.

A forms package shall be provided that is usable in a stand alone mode and from the word processor. The software shall:

- a. Provide capability for the operator to create forms and mask preprinted blank forms;
- b. Provide capability for user to generate, modify, and store for repeated use, a template screen image of a form;

- c. Provide, at user level, a menu with ability to enter default values for specified fields and to overwrite a default value;
- d. Provide capability for user to enter data into blank fields and to move the cursor forward and backward field by field with one keystroke and to type over previously entered data;
- e. Provide automatic reformatting of text within the parameters of the field during insert, modification, and replacement;
- f. Provide capability for user to print just the variable data from the displayed form onto preprinted forms, and print both the variable data and the displayed form;
- g. Provide capability for user to store just the variable data from the displayed form into a file, and store both the variable data and the displayed form;
- h. Provide adding columns of numbers.

27.11.1 CLIN 1221, Multiuser Workstation Forms Generation and Management Software.

27.11.2 CLIN 1223, Network Server Forms Generation and Management Software.

27.11.3 CLIN 1225, Super-minicomputer Forms Generation and Management Software.

27.12 Spell Checking, CLINs 1227-1234. An interactive spell checking program shall be provided which uses a primary dictionary and a supplementary dictionary to check for misspelled words. The software shall:

- a. Be accessed directly from word processor and E-mail;
- b. Utilize a dictionary of at least 80,000 words;
- c. Provide user-expandable supplemental dictionaries;
- d. Provide a menu for user to add, change, and delete words in expanded dictionary;
- e. When an incorrect word is found, provide a list of words from which user may select a replacement of the incorrect word;
- f. Provide capability for user to correct misspelled word by selecting from a list of words offered by the dictionary and by manually editing word (manually correcting a word shall not interrupt spell checking process);
- g. Provide capability for automatic search and replacement of an incorrect word with a word selected by user (replacement word may be from the list of words offered from the spell checking dictionary and by a word which has been manually entered as the replacement word by user);
- h. Provide capability for global and selective correction;
- i. Provide capability for user to interrupt the spell checking.

27.12.1 CLIN 1227, Single-user Workstation Spell Checking Software.

27.12.2 CLIN 1229, Multiuser Workstation Spell Checking Software.

27.12.3 CLIN 1231, Network Server Spell Checking Software.

27.12.4 CLIN 1233, Super-minicomputer Spell Checking Software.

27.13 Thesaurus, CLINs 1235-1242. The thesaurus shall be accessed directly from the word processor, and the electronic mail utility. The software shall provide capability for user to manually and automatically enter a word offered by the thesaurus.

- 27.13.1 CLIN 1235, Single-user Workstation Thesaurus Software.
- 27.13.2 CLIN 1237, Multiuser Workstation Thesaurus Software.
- 27.13.3 CLIN 1239, Network Server Thesaurus Software.
- 27.13.4 CLIN 1241, Super-minicomputer Thesaurus Software.

27.14 Lexical Analyzer Software, CLINs 1243-1250. An interactive lexical analyzer shall be provided for correction of grammatical errors.

- 27.14.1 CLIN 1243, Single-user Workstation Lexical Analyzer Software.
- 27.14.2 CLIN 1245, Multiuser Workstation Lexical Analyzer Software.
- 27.14.3 CLIN 1247, Network Server Lexical Analyzer Software.
- 27.14.4 CLIN 1249, Super-minicomputer Lexical Analyzer Software.

27.15 Document Conversion Utilities, CLINs 1251-1256. The conversion shall maintain a similar format (e.g., maintain underline, bold, page breaks, rulers, justification, and other style features) to the original document and note inconsistencies for user intervention. A conversion utility package shall be provided to convert between any word processing document developed with the word processor and the following:

- a. ASCII;
- b. Navy DIF (MIL-STD 2002);
- c. DISPLAYWRITE;
- d. ENABLE version 1.15 or later;
- e. Reserved;
- f. LYRIX version 5.0 or later;
- g. Microsoft Word version 5.0 or later;
- h. Microsoft Word for Windows version 1.0 or later;
- i. MULTIMATE version 3.3 or later;
- j. Quadratron Q-One version 1.96 or later;
- k. SAMNA Word III version 3.0 or later;
- l. WANG (to include VS, OIS, WP Plus, and WANG PC WP);
- m. WORDPERFECT version 4.0 or later;
- n. WORDSTAR version 3.3 or later and WORDSTAR Professional;
- o. Convergent/Unisys Doc Designer version 2.2;

- 27.15.1 CLIN 1251, Single-user Workstation Conversion Utility.
- 27.15.2 CLIN 1253, Multiuser Workstation Conversion Utility.
- 27.15.3 CLIN 1255, Network Server Conversion Utility.

27.16 Business Graphics Software, CLINs 1257-1264. A business graphics software package with an interactive interface for all applications software shall be provided. The software shall:

- a. Provide flow charts, maps, and shapes library;
- b. Provide capability for color changes online, flipping of the X

and Y axis, and user positioning of multiple graphs on one screen;

- c. Generate the following:
 - (1) Pie charts,
 - (2) Horizontal bar chart,
 - (3) Vertical bar chart,
 - (4) Line chart,
 - (5) Scatter plot diagrams,
 - (6) Text only graphics,
 - (7) Exploded pie charts;
- d. Provide at least eight distinct colors;
- e. Provide at least eight distinct line patterns;
- f. Provide at least eight distinct shading patterns;
- g. Provide definable color vectors;
- h. Provide color labeling entries;
- i. Provide independent scaling and windowing;
- j. Provide capability for the use of a mouse;
- k. Provide capability for user to generate a frame for the graph and display a graph grid;
- l. Provide capability for user to label the x-axis and y-axis with user-provided labels, horizontally and vertically (portrait and landscape modes);
- m. Provide capability for user to place the x-axis label at the top and bottom of the graph, the y-axis label at the right and leftside of the graph, and to place labels at top of each bar in a bar chart;
- n. Provide capability for user to enter at least 3 title lines of 40-characters and 3 footnotes of 40-characters each;
- o. Provide capability for user to select for each title line and footnote the character size, color, font, and justification;
- p. Provide capability for user to select size and type of scale (linear and logarithmic);
- q. Provide capability for user to zoom (shrink and enlarge) portions of the graph and the entire graph;
- r. Provide at least 8 character fonts and 8 character sizes, all of which can be used in the same graph;
- s. Provide capability for user to use a mouse, menu selections, cursor keys, function keys, control keys, and/or a combination to provide the following graph creation capabilities:
 - (1) Selection of specific chart format and plot desired data,
 - (2) Processing of input from calculations based upon analysis of database content and online workstation entry,

- (3) Creating charts for display from user-supplied data;
 - t. Provide capability for user to store, delete, and retrieve graphics images and their parameters and settings into and from the filing system;
 - u. Provide capability for user to interactively edit and annotate maps and other stored graphics which have been entered via keyboard and mouse;
 - v. Provide the following editing capabilities:
 - (1) Add text to graphics,
 - (2) Edit graphs for size, type style, color, pattern, shade, angle (e.g. rotation), and location (e.g. midpoint),
 - (3) Superimpose one graph on another and remove superimposed graph(s),
 - (4) Paint over a graph (e.g. place a narrow white bar over a wide blue bar and insert a box of text inside a filled in curve);
 - w. Provide the following output capabilities:
 - (1) Print completed graph and text on the page printers,
 - (2) Plot completed graph and text on the system plotter,
 - (3) Display graph on the workstation display,
 - (4) Print graph on the workstation printers,
 - (5) Print and plot in portrait and landscape modes;
 - x. Provide capability for user to include graphics images in electronic mail packages and word processing documents.
- 27.16.1 Desired Capabilities:
- a. Provide three dimensional type codisplay;
 - b. Test chart formats representing the same data without any rekeying of the data;
 - c. Selectively delete portions of a display without having to recreate the entire display.
- 27.16.2 CLIN 1257, Single-user Workstation Business Graphics Software.
- 27.16.3 CLIN 1259, Multiuser Workstation Business Graphics Software.
- 27.16.4 CLIN 1261, Network Server Business Graphics Software.
- 27.15 CLIN 1263, Super-minicomputer Business Graphics Software.

C28 Specialized and Interface Software, CLINs 1265-1304.

All software (except single-user versions) shall support processing in multilevel security mode in accordance with AFR 205-16 paragraph 6-2.d. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

28.1 Statistical Analysis Package, CLINs 1265-1272. Provide a statistical analysis package with an interactive interface for all applications software. The package shall provide the following capabilities:

- a. Descriptive statistics;
 - b. Analysis of variance, to include one- and two-way analysis of variance tables;
 - c. Correlation analysis;
 - d. Regression analysis, to include linear regression and multiple regression;
 - e. Time series analysis (i.e. a method of predicting the future based on historical data);
 - f. Non-parametric tests;
 - g. Distribution functions, to include calculating mean, median, mode, percentile, ranked percentiles, variances, standard deviations (weighted and unweighted), and frequency distributions for multiple sets of individual values;
 - h. Trend analysis;
 - i. Print and plot results;
 - j. A utility to import and export statistical data created using the GOE packages (see Table C-1);
 - k. Perform Chi-square tests, t-tests for dependent and independent variables, other significant tests which generate confidence intervals for means and medians, and generate skewness and kurtosis;
 - l. Generate random numbers within user-specified ranges and on probability distributions, including normalized and Poisson numbers;
 - m. Perform cross tabulation, where this type of table breaks two variables into discrete intervals and matches one against the other.
- 28.1.1 CLIN 1265, Single-user Workstation Statistical Analysis Package.
- 28.1.2 CLIN 1267, Multiuser Workstation Statistical Analysis Package.
- 28.1.3 CLIN 1269, Network Server Statistical Analysis Package.
- 28.1.4 CLIN 1271, Super-minicomputer Statistical Analysis Package.

28.2 Composition Graphics Package, CLINs 1273-1280. A composition graphic package and library must fully support the graphics hardware. The software shall:

- a. Provide capability for user to create illustrations interactively using a digitizer tablet in combination with an intelligent workstation, keyboard and menu of commands;
- b. Display the image on the monitor as it is being created;
- c. Provide flow charts, maps, and shapes library;
- d. Provide capability for user to create symbols from an available set of primitive shapes, line styles, and graphics commands;
- e. Provide capability for user to select, place, scale, rotate and move picture elements, and store these in a library;
- f. Provide capability for user to combine symbols to form comprehensive images and pictures and settings w which must be

stored in a library on a diskette or removable media hard disk;

- g. Provide capability for user to create and place text within a picture;
- h. Provide capability for user to scale and rotate text;
- i. Provide capability for graphics composed on the display to be transferred to graphics output devices (i.e. page printers, character printer, and plotter) in two modes, screen dump and post processing;
- j. Draw post processing mode images and pictures to the full resolution capability of each output device;
- k. Interactively edit and annotate maps and other stored graphics which have been entered on the digitizer.

28.2.1 CLIN 1273, Single-user Workstation Graphics Composition Package.

28.2.2 CLIN 1275, Multiuser Workstation Graphics Composition Package.

28.2.3 CLIN 1277, Network Server Graphics Composition Package.

28.2.4 CLIN 1279, Super-minicomputer Graphics Composition Package.

28.3 Free Form Graphics Software CLINs 1281-1288. The graphics software shall provide an interactive interface. The software shall be bit oriented (paint) with support for curves (bezier or B-spline) and shall support keyboard, mouse, tablet, and scanner input. A clip art library shall be included. The software shall meet the requirements of the super-minicomputer business graphics software and the following:

- a. Draw straight, rubber band straight, continuous straight, and free form lines with at least 2 line types and 4 line widths;
- b. Provide a snap-to ruler and grid;
- c. Draw open and filled rectangles, round cornered rectangles, freehand shapes, polygons, squares, circles, ellipses, and arcs;
- d. Provide capability for drawn image and graphics and portions of the image to be duplicated many times on screen with each duplicate enlarged, reduced, stretched, and compressed with user-selectable size scaling where stretching maintains the essential shape of the initial image;
- e. Paint options include: pencil, brush (at least 10 shapes and/or sizes), spray, pour and fill, automatically fill shapes, select colors (at least 15 colors), select patterns (at least 30 patterns), and erase;
- f. Provide capability for user to create a drawing larger than the drawing window by moving and scrolling a drawing within the drawing window;
- g. Recall exact drawing parameters to create symmetrical items;
- h. Create objects which have a 3-dimensional appearance;
- i. Use keyboard entered text and graphics in the graphic mode;
- j. Text options shall include bold, italics, underline, shadow text, outline, proportional spacing and shall be savable as graphics;
- k. Provide capability for user to select a path along which to position text, such as flowing text around a circle;

- l. Editing options shall include: clear page, undo change, transparent and opaque cut and paste, cut and paste between files, cut and paste within the same file, select region, copy, erase, flip an area and object from left to right, flip an area and object from top to bottom, and rotate an object by a specified number of degrees;
- m. Provide selection of a rectangular drawing area for editing;
- n. Provide clipping several objects to paste into a specified area;
- o. Viewing options shall include: show page, zoom and scroll in zoom mode, bidirectional vertical and horizontal scrolling;
- p. Provide saving screen contents to disk;
- q. Provide output to page and character printers and plotter;
- r. Printing options shall include selection of print resolution and print of selected areas;
- s. Provide capability for user to perform standard file functions to include store, delete, and retrieve graphic image files;
- t. Provide capability for user to import and export graphic images and their parameters and settings from its own native format, CGM (Computer Graphics Metafile) FIPS 128, and at least three of the following industry standard formats:
 - (1) ASCII Text,
 - (2) Reserved,
 - (3) Direct RGB CGM,
 - (4) Indexed CGM,
 - (5) DIA (Diagraph/2000),
 - (6) EPS (Encapsulated Postscript),
 - (7) PIC (Lotus),
 - (8) TIFF (Tagged Image File Format),
 - (9) Windows Metafiles,
 - (10) CALS data;
- u. Convert an imported graphics image file to a series of objects and curves (Bezier or B-spline);
- v. Provide capability for multiple arrangement, such as layering, grouping and ungrouping objects;
- w. Provide at least 8 character fonts and at least 8 character sizes, all of which can be used in the same graphics image;
- x. Provide capability for user to turn black areas and objects to white and white areas and objects to black;
- y. Provide general, free form map creation, editing, retrieval, deletion and printing including:
 - (1) Create a new map from predefined maps and altering it by designated regions,

(2) Provide creation of a new designated region, editing an existing designated region and deletion of an existing designated region,

(3) Edit map parameters to include:

- (a) Layout (e.g., design, scale, rotation, etc.),
- (b) Labels,
- (c) Symbols,
- (d) Data (e.g., numerical information),
- (e) Titles,
- (f) Legend,

(4) Reserved;

z. Provide capability for user to import and export graphic images and their parameters and settings from the following GOE software:

- (1) Reserved,
- (2) Harvard Business Graphics version 2.0 or greater.

28.3.1 CLIN 1281, Single-user Workstation Free Form Graphics Software.

28.3.2 CLIN 1283, Multiuser Workstation Free Form Graphics Software.

28.3.3 CLIN 1285, Network Server Free Form Graphics Software.

28.3.4 CLIN 1287, Super-minicomputer Free Form Graphics Software.

28.4 Scanner Interface Software, CLINs 1289-1296. Provide interface software which shall produce output files compatible with the word processor, the document tagging software, the composition graphics, free form graphics, and publishing and page layout packages. The software shall:

- a. Automatically recognize at least courier 10, courier 12, prestige elite, elite, OCR A, and proportional spacing at 6 lines per inch spacing;
- b. Automatically recognize single and double line spacing;
- c. Flag questionable characters and errors to the output;
- d. Save graphics images in the Tag Image FilFormat.
- e. Scan graphical data such as line drawings, charts, logos, maps, photographs, floor plans, and graphs;
- f. Provide capability for line art image data to be compressed by at least 90%;
- g. Provide scaling from 25% to 100% in 5% increments on x and y axis (keeping the same proportion or ratio between x and y axis);

28.4.1 CLIN 1289, Single-user Workstation Scanner Interface Software.

28.4.2 CLIN 1291, Multiuser Workstation Scanner Interface Software.

28.4.3 CLIN 1293, Network Server Scanner Interface Software.

28.4.4 CLIN 1295, Super-minicomputer Scanner Interface Software.

28.5 Fax Interface Software, CLINs 1297-1302. Provide interface software which shall receive data from the FAX card and generate files importable into the word processor, publishing and page layout package, composition graphics, and free form graphics. Provide interface software which shall produce output files from the word processor, publishing and page layout package, composition graphics, and free form graphics for transmission to FAX cards and CCITT Group 2, 3, and 4 FAX machines (FIPS 147).

28.5.1 CLIN 1297, Single-user Workstation Fax Interface Software.

28.5.2 CLIN 1299, Multiuser Workstation Fax Interface Software.

28.5.3 CLIN 1301, Network Server Fax Interface Software.

28.6 CLIN 1303, Super-minicomputer GOE Barcode Interface Software. Provide interface software for the GOE barcode equipment to interface to the super-minicomputer.

28.7 CLIN 1304, GOE Connection Software. The Contractor shall provide software to connect specified GOE (Table C-1) to the super-minicomputer system. This software shall include, but is not limited to, X-terminal emulation for the GOE workstations (excluding BTOS workstations and IBM PC XT compatibles). These workstations must maintain the capability to selectively operate as stand-alone units and as workstations attached to a super-minicomputer system. While online to a super-minicomputer, GOE workstations shall be capable of communicating with intelligent workstations and other GOE workstations attached to the super-minicomputer, accomplish office automation, as well as, interface with the RDBMS and other applications software packages.

C29 Publishing Software, CLINs 1305-1339.

These packages shall run under the operating systems as noted by CLIN structure. The publishing software (except single-user versions) shall support processing in multilevel security mode in accordance with AFR 205-16 paragraph 6-2.d. Multilevel security shall be available within a mutually agreeable time frame. (REF: C15 and F4.9)

29.1 Publishing and Page Layout Software, CLINs 1305-1310. This software electronically composes pages by merging graphics and text.

29.1.1 Common Requirements.

29.1.1.1 Import and Export text in the word processor (CLINs 1213-1220), ASCII, Document Content Architecture, Enable, WORDPERFECT, WORDSTAR, Word, and the document tagging software (CLINs 1311-1316) formats. (REF: Table C-1) Import software shall:

- a. Provide automatic page text flow for all imported files and text;
- b. Import graphics from business graphics software, free form graphics software, and Tagged Image File Format (TIFF).

29.1.1.2 File Operations shall include:

- a. Mixing files from different input formats in the same document;
- b. Copying between files;
- c. Saving a file without exiting;
- d. Reverting to the last version.

29.1.1.3 Document Size. Provide at least 120 pages per document. Provide at least eight text columns per page.

29.1.1.4 Provide mouse, tablet, scanner, and full WYSIWYG user interface. Provide moving of text and graphics via the mouse.

29.1.1.5 Views. Provide document and page views to include 50, 100, and 200 percent. Provide an option to view facing pages and 2 page views.

29.1.1.6 Menus. Provide drop down screen menus. Control key sequence to provide shortcuts (e.g. bypass menus).

29.1.1.7 Rulers. Display rulers and column guides on screen.

29.1.1.8 Templates. Provide at least 20 user-predesigned templates.

29.1.1.9 Format. Style sheets shall control document format and layout to include:

- a. Typeface and font;
- b. Variable margins and columns;
- c. Elimination of widows and orphans;
- d. Provide embedded tags;
- e. Automatic text flow and wraparound.

29.1.1.10 Typographic Controls shall be provided for kerning (manual and automatic), letter and word spacing, leading and automatic hyphenation.

29.1.1.11 Page Control shall include:

- a. Automatic headers and footers with separate headers and footers for left and right pages;
- b. Automatic page numbering and paragraph headings in header and footer;
- c. Automatic section numbering with a minimum of eight levels;
- d. Automatic table of contents generated from paragraph tags;
- e. Automatic index generated from index entries;
- f. Page counter from 1 to at least 9999.

29.1.1.12 Text and Graphics. Interactive text insertion and deletion at any point to include:

- a. Text and graphics shall be cut, copied, and pasted;
- b. Blocks of text shall be deleted, moved, and copied;
- c. Text wrapped around irregular graphics;
- d. Graphics scaled to fit graphic frames;
- e. Graphics shall be cropped, enlarged, and reduced.

29.1.1.13 Font Sizes. Provide font sizes of 4 to 127 points.

29.1.1.14 Printing. Support a page description language(s) available on the page printers. Print options shall include:

- a. Print single page, multiple copies, page to start, and page to stop;
- b. Interrupt and continue printing;
- c. Automatic page numbering and user-specified page to begin numbering;

d. Collate multiple copies.

29.1.2 CLIN 1305, Single-user Workstation Publishing and Page Layout Software.

29.1.3 CLIN 1307, Multiuser Workstation Publishing and Page Layout Software.

29.1.4 CLIN 1308, Network Server Publishing and Page Layout Software.

29.1.5 CLIN 1309, Super-minicomputer Publishing and Page Layout Software.

29.2 Document Tagging Software CLINs, 1311-1316. Software shall:

- a. Conform to FIPS 152 and ISO 8879, Standard Generalized Markup Language;
- b. Be menu driven;
- c. Generate and insert standard tags for each typographical entity (e.g. titles, chapter headings, subheadings, tables, etc.) in a document by recognizing key entry conventions (i.e. tabs, indents, rd lines, page breaks, ASCII text strings) for word processor software;
- d. Tag files such that they require only cosmetic and minor formatting of text to achieve desired layout of style sheets of the publishing software;
- e. Produce a separate text file with the embedded tags without altering the original word processing file;
- f. Convert a tagged file for typesetting back to a tag free text file without loss of the original file and text;
- g. Provide capability for user to add tagging templates to the software to accommodate the format;
- h. Provide import of GML, Scribe, TEX, and TROFF files;
- i. Provide import and export of CALS data with the ability to edit and manipulate it.

29.2.1 CLIN 1311, Single-user Workstation Document Tagging Software.

29.2.2 CLIN 1313, Multiuser Workstation Document Tagging Software.

29.2.3 CLIN 1314, Network Server Document Tagging Software.

29.2.4 CLIN 1315, Super-minicomputer Document Tagging Software.

29.3 Computer Aided Design (CAD) Software CLINs 1317-1320. The software shall provide capability for user to interactively create drawings and illustrations from keyboard input, menu of commands, user-developed macros and scripts, mouse, tablet, and input from the scanner. The image shall be immediately visible on the workstation screen as it is being created. The software shall:

- a. Have drawing features which include:
 - (1) Cartesian addressable coordinates, cursor coordinates displayed on command and continuously and a snap-to capability,
 - (2) User shall be able to select single and multiple entities, within a window, snap-to grid points, horizontal and vertical line, center, endpoint, intersection, and center of circle,
 - (3) Draw points, continuous lines, lines by 2 points, length, angle, and delta coordinate,

(4) Draw circles by center and radius, define arcs by 3 points, center, and endpoints, and by 2 angles,

(5) Draw rectangles by 2 points;

- b. Include a symbols library (user shall be able to select, place, rotate, scale, move display and image entities and store them in a library);
- c. Provide a minimum of 16 colors;
- d. Provide a minimum of 250 layers and the ability to edit entities in several layers simultaneously;
- e. Provide capability for user to erase selected entities, unerase last erase, move and copy, multicopy, proportionally scale, rotate, mirror, delete portions, split single entity, group and ungroup, and save group as separate file;
- f. Include a zoom viewing option with a user-specified scale factor, to fit screen, on user-specified window, and around a specified point;
- g. Have text options of unlimited type sizes, right justified, centering, and user-specified placement angle;
- h. Have dimensioning in metric and English units, horizontal and vertical distance dimensions, distance between 2 user-specified points and the area within a user-specified shape;
- i. Provide import and export of initial graphics exchange specification files and CALS data;
- j. Provide page and character printers and plotters with print and plot of selected areas, selection of scale factor (actual and other)selectable orientation, and batch print and plot.

29.3.1 CLIN 1317, Multiuser Advanced Workstation Computer Aided Design Software.

29.3.2 CLIN 1319, Super-minicomputer Computer Aided Design Software.

29.4 Generic Electronic Printed Output and Exchange CLINs 1321-1326. The software shall support technical publication documents represented in accordance with MIL-M-28001 (Manuals, Technical: Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange) and support import and export of technical publication data and documents. The software shall:

- a. Include filters to import and integrate for use by the publishing and page layout software from ASCII text, computer graphics metafiles, product data, raster data, free form graphics, CAD data, CALS data, and data from scanning equipment;
- b. Include filters to export to ASCII text, raster data, computer graphics metafiles, and product data;
- c. Include overlay raster images with CAD data, free form graphics, word processing, and publishing data;
- d. Import and export computer graphics metafiles and graphics illustration data for use by the graphics software;
- e. Import and export product data for use by the computer aided design software.

29.4.1 CLIN 1321, Single-user Workstation Generic Electronic Printed Output and

Exchange.

29.4.2 CLIN 1323, Multiuser Workstation Generic Electronic Printed Output and Exchange.

29.4.3 CLIN 1324, Network Server Generic Electronic Printed Output and Exchange.

29.4.4 CLIN 1325, Super-minicomputer Generic Electronic Printed Output and Exchange.

29.5 Computer Aided Acquisition and Logistics Support (CALs), CLINs 1327-1332. The software shall support reliable and economical transfer of digital technical publication data. It shall provide automated interchange of technical information in compliance with MIL-STD 1840A, Automation Interchange of Technical Information. It shall provide import and export of digital raster data files in accordance with MIL-R-28002 with the ability to edit and manipulate the graphics illustration data in accordance with MIL-D-28003, and produce data files in accordance with MIL-D-28000, Digital Representation for Communication for Products Data: IGES Application Subsets.

29.5.1 CLIN 1327, Single-user Workstation CALS.

29.5.2 CLIN 1329, Multiuser Workstation CALS.

29.5.3 CLIN 1330, Network Server CALS.

29.5.4 CLIN 1331, Super-minicomputer CALS.

C30 CLIN 1341, Order Generator Software.

The Contractor shall provide software for Government personnel to generate a list of hardware and software for all CLINs and SLINs. This software shall be distributed on 5.25-inch DS/DD diskettes and run on workstations and GOE personal computers already configured with at least a 20MB hard disk running under MS-DOS version 3.0 or later. The GOE PC will also have at least 1MB RAM, be an AT compatible or better, and support EGA or better graphics display (e.g., Zenith Z-248, Unisys PW-800, Everex 3000D, etc.) The Government shall have the right to make and distribute unlimited copies of the order generator software. The source code shall be provided to the Government. Procedures to keep the software current shall be provided. The software shall:

- a. Provide the capability to configure a system using a series of prompts and menus that include hardware, cabling, communication ports, network components, software, and related data and documents;
- b. Take into consideration minimum disk capacity, DDN connectivity, network connectivity, TCB requirements, and number of system user;
- c. Include the capability to add, delete, modify, combine, and store configurations;
- d. Store the configuration in an ASCII file;
- e. Print the configuration on a standard 'OF 336' or 'SF 36' form, which will be used to order the system;
- f. Have an online introduction to the system;
- g. Store multiple configurations with comments;
- h. Provide preconfigured systems and provide capability for user editing;
- i. Ask the user critical questions such as: number of users, number of connections, concurrent users, applications needed, peripherals, etc.;
- j. Have an online description of each SLIN, usage, and prerequisites;
- k. Graphically display configured slots on the system using the current configuration;

- l. Automatically include cables, connectors, and other required items;
- m. Provide a summary of the current order and it's cost;
- n. Provide a summary of power requirements, cooling requirements, installation space, floor layout, and three dimensional layout of the system;
- o. Export information to the office automation, and graphics software for archiving, and further editing;
- p. Produce orders for equipment and software to expand any system already installed.

C31 General Communications Requirements.

The communications subsystem components shall be FIPS compliant. Systems communications connectivity shall comply with the standards set forth in the Applications Portability Profile (APP), specifically Data Communications (GOSIP, FIPS 146-1) and Transparent File Access (IEEE P1003.8x). The network shall have the performance and throughput necessary to achieve overall system performance requirements specified in Attachment 6. The components shall be modular in design to permit expansion and reduction of network size without interference to operation of the system. (See also paragraph H34). It shall include:

- a. Network management system (NMS);
- b. Directory Services;
- c. Wide area network (WAN) interfaces for:
 - (1) Defense Data Network (DDN),
 - (2) Government Open Systems Interconnection Profile (GOSIP),
 - (3) Integrated Services Digital Network (ISDN);
- d. Local area network (LAN) facilities for:
 - (1) IEEE 802.3 10BASE5,
 - (2) IEEE 802.3 10BASE2,
 - (3) IEEE 802.3 10BASET,
 - (4) IEEE 802.3 10BASEF,
 - (5) FDDI,
 - (6) Bridges,
 - (7) Gateways;
- e. Direct connection support for workstations and other peripherals;
- f. GOE network interfaces for:
 - (1) IBM communications architectures,
 - (2) OpenNet;
- g. Data Communication Equipment (DCE):
 - (1) Modems,
 - (2) DSU/CSUs,
 - (3) Data PBXs,

(4) Multiplexers;

h. Cables.

31.1 Installation. Super-minicomputer network equipment installation shall be provided. Contractor responsibility for installation of other LAN components will be determined at the pre-installation site survey. If the communications installation (CLIN 7101) is not ordered, the Government is responsible for installation of other LAN components.

31.2 GOE Circuits and Modems. When twisted-pair cable is used, all connecting equipment shall be compliant with local telephone company regulations. At the Government's option and where locally permissible, GOE voice grade twisted pair cable shall be used.

31.3 Foreign Nation Circuits. Circuits terminated at foreign-nation locations will be voice-grade telephone circuits usually provided at those locations. All communications equipment, attached to these circuits, shall have host-nation approval for connection to that nation's telephone network. The Contractor is solely responsible for obtaining host-nation approval, connection authority and providing approved equipment.

31.4 Security.

31.4.1 Trusted Network Interpretation (TNI) Certifiable. Provide a certifiable C2 level network according to the Trusted Network Interpretation NCSC-TG 005 Version 1 dated 31 Jul 87.

31.4.2 B1 Evaluation. The communications subsystem shall be submitted to the National Computer Security Center for B1 evaluation within a mutually agreeable time frame from acceptance and publication of the Revised Trusted Network Interpretation. (REF: F4.9)

31.4.3 Non-TNI Operation. Also provide the capability for networks to operate in a non-TNI mode.

C32 Network Management System (NMS), CLINs 0401 and 1401.

32.1 Common Requirements. The network management system (NMS) shall provide a manager process which has global responsibility and authority to monitor and configure all networks and sub-networks assigned to the domain. The NMS shall provide an agent process which shall have the ability to monitor and modify only sub-portions or sub-networks in the domain. The agent process shall be controlled by the manager process. Information related to network management shall be transmitted from agent processes to the management process via the network domain. Only specific ID and password protected user-profiles shall be allowed to access network management systems. The NMS shall conform to the integrated window environment provided by this contract.

32.1.1 Standards. The Network Management System (NMS) shall conform to the Common Management Information Service (CMIS) and the Common Management Information Protocol (CMIP). CMIS and CMIP shall be provided within a mutually agreeable time frame after the effective date of the applicable FIPS. Until FIPS-compliant CMIS and CMIP are provided, the NMS shall comply with either CMIS (ISO 9595) and CMIP (ISO 9596) or Simple Network Management Protocol (SNMP) RFC 1157 and Structure of Management Information (SMI) RFC 1155 and Management Information Base (MIB) RFC 1156. NMS functions common within a layer regardless of the protocol stack (TCP/IP and GOSIP) shall appear the same to the network manager. (REF: F4.9)

32.1.2 Functionality. The NMS shall support all components provided and integrated under this contract and shall provide the following functions:

- a. Configuration Management;
- b. Fault Management;
- c. Performance Management;

- d. Security Management;
- e. Accounting Management.

32.1.2.1 Configuration Management. This function shall provide a single (or series of) geographic display(s) showing the specific LAN sites and devices connected to the LAN as well as the inter-network links and their relationship to one another. The display(s) shall be configurable to represent specific er requirements. The display(s) shall show physical and logical links and distinguish between the two. Execution of all configuration management commands shall update the geographic display(s).

32.1.2.1.1 Configuration Initialization. This function shall provide capability for network tables to be initialized to default hardware and software versions and parameter values appropriate for operation of the network environment. The installation and configuration function shall provide initialization of the following:

- a. Device parameters to match the characteristics of the connected device;
- b. Protocol operational parameters to their default value;
- c. Security parameters for network gateways, and data PBXs (e.g. user access privileges);
- d. The centralized file of registered component names and associated internet protocol and media access control duplicate names;
- e. Bridge addresses for Network Management Software access and any other parameters necessary for network operation.

32.1.2.1.2 Configuration Determination. The network administrator shall, as a minimum, be able to do the following:

- a. Access network component default configuration parameters remotely from the components and from the database within the NMS;
- b. List media access control addresses on each individual sub-network of active attachments, bridges and gateways (i.e. those which transmitted a frame within the last five minutes);
- c. Display on the network administrator's console the current status of all communication devices upon request from the network administrator;
- d. Display status of sessions on selected resources including source and destination address identification and total packet volumes;
- e. Each device on the communication subsystems shall be accessible by a unique address;
- f. Each device shall be addressable by a symbolic name (i.e. Bill, Jim, printer, laser, etc.).

32.1.2.1.3 Configuration Modification. The network administrator, via the network management system, shall be able to perform the following online:

- a. Shut down a bridge;
- b. Reset a bridge to the default configuration parameters;

- c. Reserved;
- d. Set address filters for a bridge;
- e. Modify bridge forwarding table entries including media access control address;
- f. Shut down a gateway;
- g. Reset a gateway to the default configuration parameters;
- h. Disable frame forwarding for a gateway;
- i. Set address filters for a gateway;
- j. Modify gateway forwarding table entries including media access control address;
- k. Provide capability for the system administrator to logically connect and disconnect designated devices within the system;
- l. Permit selective enabling and disabling of network devices and workstations only by authorized users on any workstation;
- m. Make appropriate updates to gateway routing tables indicating availability and non-availability of other gateways in the configuration.

32.1.2.2 Fault Management. The network management system shall have diagnostic functions to detect and isolate network malfunctions. Any errors encountered during initialization, configuration, and operation shall be reported to the network manager via the NMS. All outages shall be identified on the geographic display.

32.1.2.2.1 Self-test Diagnostics. The network shall provide execution of internal self-test diagnostics to determine the basic operational status of all network components. Self-test diagnostics shall be provided for super-minicomputer and network server communication ports as well as bridges, gateways, concentrators, and data PBX.

32.1.2.2.2 Node Status. The network management system shall be able to determine whether the network nodes (servers, super-minicomputers, gateways, bridges, concentrators, and data PBX) are fully operational or in some state of diminished functionality.

32.1.2.2.3 Fault Detection and Isolation. The network administrator shall be able to display and print the data obtained from fault monitoring of network components. An alarm feature shall identify the network components which triggered an alarm event. The network administrator shall be able to define the alarm thresholds.

32.1.2.2.3.1 LAN Fault Detection and Isolation. This function shall include, but not be limited to the following:

- a. Frame check failures;
- b. Alignment and length errors;
- c. Number of collisions;
- d. Carrier and collision detect failures;
- e. Failure of remote bridge links.

32.1.2.2.3.2 WAN Fault Detection and Isolation. This function shall support both X.25 and ISDN and shall include, but not be

limited to, the following:

- a. Physical layer error diagnostics provided by network components (e.g. modems, multiplexers, DSU/CSUs);
- b. Link layer error diagnostics (e.g. frame checksums, timeouts, retransmissions);
- c. Transport layer error diagnostics (e.g. retransmissions, flow control, reset problems);
- d. Network layer diagnostics (e.g. retransmissions).

32.1.2.3 Performance Management. The performance management function shall monitor network performance, collect and analyze system statistics, and provide useful reports to enable the network administrator to tune and control network performance. Based on these collected statistics, the NMS shall be able to analyze and display the circuit utilization of all networks and sub-networks.

32.1.2.3.1 LAN Statistics. As a minimum, the following statistics shall be collected on all components of the network:

- a. Fault Detection Statistics shall be collected on all errors identified by the fault management function;
- b. Traffic Statistics shall be collected for at least the following:
 - (1) Frame count (count of frames using all filters on the network, source address filters, destination address filters, and type field filters),
 - (2) Frames per second,
 - (3) Byte count,
 - (4) Bytes per second,
 - (5) Mean size (last second and cumulative),
 - (6) Number of frames by size (e.g. 64 bytes, 65 to 100 bytes, 101 to 500 bytes, 501 to 1517 bytes, 1518 bytes and larger),
 - (7) Number of frames observed on each adjacent network and forwarded in each direction,
 - (8) Peak frames per second,
 - (9) Peak bytes per second,
 - (10) Longest quiet time begin,
 - (11) Longest quiet time end,
 - (12) Instantaneous load,
 - (13) Peak load.

32.1.2.3.2 LAN Load Generation. The NMS shall be able to generate the following loads on the LAN:

- a. Load between one (1) percent and ten (10) percent;
- b. Reserved;

- c. Load between ten (10) percent and fifty (50) percent;
- d. Rapid burst rate of 100 for both minimum and maximum size frames per second.

32.1.2.3.3 WAN Statistics. As a minimum, the following statistics shall be collected on WAN components of the network:

- a. Number and size of packets transmitted on each X.25 port, identified by user and destination upon network manager command or parameter;
- b. Indications of failures at physical layer of X.25 from diagnostics provided by modems, multiplexers, DSU/CSUs, and other physical layer equipment;
- c. Number of checksum errors, time-out errors, and retransmissions occurring at the X.25 data link layer;
- d. Indications of flow control problems and reset counts occurring at the TCP and GOSIP TP layer;
- e. Number of errors by type occurring in the DDN IP layer and the GOSIP Network Service layer;
- f. Errors related to ISDN protocols not otherwise covered by a through e above.

32.1.2.4 Security Management. The security management function shall provide access control and security logs.

32.1.2.4.1 Network Access Controls. The network access controls shall prevent unauthorized access to network resources. These access control mechanisms in the system security subsystem shall ensure users have been properly authenticated before accessing network resources and prevent unapproved access attempts. Access control shall be invoked at the super-minicomputer, network server, intelligent workstations, gateways, and data PBX. In addition to authentication, access shall be refused and terminated according to limits set by the Government designated personnel:

- a. During specific time periods;
- b. According to access time limits placed on specific resources.

32.1.2.4.2 Network Log. As a minimum, all successful and unsuccessful access attempts shall be logged.

32.1.2.4.2.1 Audits. Auditing shall include, but not be limited to:

- a. Identification of the network resource being accessed;
- b. Identification of the user and device attempting the access;
- c. The starting and ending times of each session with a super-minicomputer or network server;
- d. Identification of the user's resource gaining access.

32.1.2.4.2.2 Audit Record Retention. Audit records shall be stored for a system security manager selectable period of time. Mechanisms shall be provided for review of stored audit records by authorized Government personnel. These individuals shall be able to view audit records from an online terminal and from hard copy output.

32.1.2.4.2.3 Audit Record Access. The audit records shall be protected from unauthorized read, modification, and deletion.

32.1.2.4.3 Security Log. The network security software shall enable authorized/designated personnel to selectively initiate and terminate a network log of all relevant network traffic for any specific user-initiated session to include recording of all network resources accessed.

32.1.2.5 Accounting Management. The accounting function shall permit automatic analysis of network resource utilization and associated costs incurred. This data shall be forwarded to the super-minicomputer System Usage Accounting Utility.

32.2 Desired Capabilities.

- a. Configuration management graphic display automatically updated/changed to reflect updates/changes to the configuration;
- b. Configuration management provides ability to zoom and explode operator selected portions of the graphics display to see varying levels of detail related to the network;
- c. Configuration management provides ease of installation and configuration of network nodes and components:
 - (1) Super-minicomputer,
 - (2) Network server,
 - (3) Workstation,
 - (4) Bridge,
 - (5) Gateway,
 - (6) Concentrator,
 - (7) Data communication equipment (DCE);
- d. Fault diagnostic identifies the replaceable malfunctioned component;
- e. Fault isolation function integrated with the graphics display;
- f. Performance management integrated 50% or more of LAN statistics with the tuning facilities;
- g. Performance management integrated 50% or more of WAN statistics with the tuning facilities;
- h. Performance management enables operator to easily redirect or load level traffic across segments of the network;
- i. Network security function refuses/terminates access upon the occurrence of a specific character string(s) in a data packet;
- j. Accounting function provides user flexibility in defining cost components or resources to be tracked;
- k. Accounting function integrated with the NMS database tables used for configuration and security.

32.3 CLIN 0401, Network Management Hardware.

32.4 CLIN 1401, Network Management Software.

C33 CLIN 1403, Directory Services.

The system shall use integrated directory services which shall function

transparently, appearing as a single directory service, to the user and to all applications. Additionally, this directory shall incorporate the CCITT X.500 standard within a mutually agreeable time frame of the adoption of CCITT X.500 as a FIPS. In the interim, this directory shall be initially based on the current ISO DIS 9594-X for X.500. The interim directory shall include directory system agent and directory user services. This directory shall be capable of operating as both a client and a server over both TCP/IP and GOSIP protocols for the WAN and LAN and interface with the NMS manager and agent functions. These services shall provide a routine to synchronize directories using upper level protocols for GOSIP (FTAM & X.400) and TCP/IP (FTP & SMTP). (REF: F4.9)

C34 Wide Area Network Interfaces, CLINs 0403-0418 and 1405-1418.

All Wide Area Network (WAN) interfaces shall:

- a. Integrate with NMS to control configuration, analyze faults, monitor performance, and implement security and accounting processes;
- b. Integrate with the directory services;
- c. Support the LANs using bridges and gateways;
- d. Simultaneously support TCP/IP and GOSIP protocol stacks.

34.1 Transmission Control Protocol/Internet Protocol (TCP/IP) Interface for DDN, CLINs 1405-1408.

34.1.1 Common Requirements.

34.1.1.1 DDN X.25 Interface shall enable the system to communicate with heterogeneous hosts via a DDN access circuit connection. The DDN port shall be provided as specified in DCA document "Defense Data Network X.25 Host Interface Specification (December 1983) and FIPS 100-1. The interface shall be certified by the Defense Communication Agency (DCA) and listed in DCA's qualified products list. The interface shall include cabling with connectors to the DTE/DCE demarcation point.

34.1.1.2 Internet Host Support and Domain Name Services. The interface shall implement the requirements for the communication protocol as defined in RFC 1122 and shall also implement the requirements for application and support protocols as defined in RFC 1123. All options labeled "MUST" and "SHOULD" in both RFC 1122 and RFC 1123 shall be implemented. The TCP/IP interface shall be certified under the National Volunteer Laboratory Accreditation Program (NVLAP). The following protocols shall be included:

- a. Internet Protocol (IP);
- b. Transmission Control Protocol (TCP);
- c. TELNET;
- d. File Transfer Protocol (FTP);
- e. Simple Mail Transfer Protocol (SMTP);
- f. Domain Name Server and Resolver.

34.1.2 CLIN 1405, Super-minicomputer DDN Interface Software.

34.1.3 CLIN 1407, Network Server DDN Interface Software.

34.2 GOSIP Interface, CLINs 1409-1418. Provide current FIPS 146-1 Government Open Systems Interconnection (OSI) Profile (GOSIP) compliant network protocol items including electronic mail and file-transfer, which shall enable the system to achieve interconnection and interoperability with computers and systems from various manufacturers in an open systems environment. The Contractor-provided communications software shall comply

with the Government Open System Interconnection Profile (GOSIP), FIPS 146-1, and shall be listed in the NIST Register of Conformance Tested GOSIP Products. Network equipment and software shall be updated with GOSIP-2 compliant components and applications within a mutually agreeable timeframe after the effective date listed in the FIPS 146-1 GOSIP standard or future FIPS 146-1 revisions adopting changes have been published. (REF: F4.8 and F4.9)

34.2.1 Common Requirements.

34.2.1.1 Integrated Services Digital Network (ISDN) Interface shall be compatible with the Federal Telephone System (FTS) 2000 network. The interfaces shall extend to the circuit demarcation and shall automatically manage establishment and maintenance of connections.

34.2.1.2 GOSIP Compliant Computer Network Data Communications Protocols shall include:

- a. Directory Service agent and user agent (CCITT X.500) (provided by Directory Services CLINs);
- b. Message Handling Systems (MHS) (CCITT X.400) (provided by Electronic Mail Software CLINs);
- c. File Transfer, Access and Management (FTAM), Phase 2 (FIPS 146-1);
- d. Virtual Terminal (VT) (TELNET and Forms profiles) (Draft International Standard (DIS) 9041);
- e. Association Control Service Element (ISO 8650);
- f. Connection-oriented Presentation Protocol (ISO 8823);
- g. Connection-oriented Session Protocol (ISO 8327);
- h. Connection-oriented Transport Protocol Class 4 (ISO 8073);
- i. Connectionless network protocol (ISO 8473);
- j. Integrated Services Digital Network (ISDN) (provided by ISDN interface);
- k. X.25 Packet Layer Protocol (ISO 8208);
- l. Logical Link Control (ISO 8802-2);
- m. End System - Intermediate System (ESIS) Protocol (ISO 9542);
- n. Reserved;
- o. Reserved;
- p. Office Document Architecture (ODA);
- q. Remote Operations Service Element (ROSE) (ISO 9072);
- r. Common Management Information Service (CMIS) (ISO 9595);
- s. Common Management Information Protocol (CMIP) (ISO 9596).

34.2.1.3 Desired Capabilities are:

- a. Interim solutions to include CMIS/CMIP ISO (DIS) compliant NMS and early availability of GOSIP compliant products;
- b. Migration plan from GOSIP version 1 to version 2 and ISDN;

- c. Demonstrated knowledge of GOSIP version 1 and version 2 differences;
- d. Demonstrated relationship of provided products to GOSIP compliant products.

- 34.2.2 CLIN 1409, Super-minicomputer X.25 GOSIP Interface Software.
- 34.2.3 CLIN 1411, Network Server X.25 GOSIP Interface Software.
- 34.2.4 CLIN 1413, Super-minicomputer ISDN Basic Rate Interface Software.
- 34.2.5 CLIN 1415, Network Server ISDN Basic Rate Interface Software.
- 34.2.6 CLIN 1417, Super-minicomputer ISDN Primary Rate Interface Software.

34.3 X.25 Ports, CLINs 0403-0410. The super-minicomputer shall be capable of supporting five (5) X.25 interfaces (two (2) 9.6 to 19.2 Kbps, two (2) 56 to 64 Kbps, and one (1) 1.544 Mbps). The network server shall be capable of supporting two (2) X.25 9.6 to 19.2 Kbps interfaces.

34.3.1 CLIN 0403, 9.6 to 19.2 Kbps Super-minicomputer X.25 Port. Provide a port with an Electronic Industries Association (EIA)-232-C or an EIA-232-D connector.

34.3.2 CLIN 0405, 9.6 to 19.2 Kbps Network Server X.25 Port. Provide an X.25 port with an EIA-232-C or an EIA-232-D connection.

34.3.3 CLIN 0407, 56 to 64 Kbps Super-minicomputer X.25 Port. Provide an X.25 port with either an EIA RS-449 with MIL-STD 188-114A (balanced), EIA-530 (High Speed 25-Position Interface for DTE and DCE), or CCITT V.35 connection.

34.3.4 CLIN 0409, 1.544 Mbps Super-minicomputer X.25 Port.

34.4 ISDN Ports, CLINs 0413-0418. The super-minicomputer shall be capable of supporting two (2) basic rate interfaces and one (1) primary rate interface. The network server shall be capable of supporting two (2) basic rate interfaces.

34.4.1 CLIN 0413, Super-minicomputer ISDN Basic Rate Interface Hardware.

34.4.2 CLIN 0415, Network Server ISDN Basic Rate Interface Hardware.

34.4.3 CLIN 0417, Super-minicomputer ISDN Primary Rate Interface Hardware.

C35 Local Area Network (LAN), CLINs 0419-0616 and 1419-1655.

Provide hardware and software to implement LANs which conform to IEEE 802.3 and LANs which conform to Fiber Distributed Data Interface (FDDI) specifications. The 802.3 LANs shall interoperate with the super-minicomputer, all workstations and terminals provided under this contract, the network server, GOE workstations, concentrators, FDDI LAN, bridges and gateways. All options labeled "MUST" and "SHOULD" in both RFC 1122 and 1123 shall be implemented. All LANs shall:

- a. Integrate with the NMS to control configuration, analyze faults, monitor performance, and implement security and accounting processes;
- b. Integrate with the directory services;
- c. Provide both TCP/IP and GOSIP upper level protocol stacks;
- d. Provide server software that includes: socket head interface, file transfer, TELNET, remote file access, and remote printer access;
- e. Provide software to include User Datagram Protocol (UDP), RFC 768,

and Transmission of IP Datagrams Over IEEE 802.3 Networks, RFC 948, that integrates with Sun Microsystems Network File System (NFS) products.

35.1 Super-minicomputer IEEE 802.3 Interface, CLINs 0419 and 1419. The super-minicomputer shall be capable of directly supporting at least four separate IEEE 802.3 LANs. Each interface shall include:

- a. All additional protocols necessary to satisfy the software product functionality provided;
- b. Hardware necessary to support one IEEE 802.3 LAN (10BASE5 and 10BASE2).

35.1.1 CLIN 0419, Super-minicomputer IEEE 802.3 Interface Hardware.

35.1.2 CLIN 1419, Super-minicomputer IEEE 802.3 Interface Software.

35.2 Network Server IEEE 802.3 Interface, CLIN 0421 and 1421. The network server shall be capable of supporting at least two separate IEEE 802.3 LANs. Each interface shall include:

- a. All additional protocols necessary to satisfy the software product functionality provided;
- b. Hardware necessary to support one IEEE 802.3 LAN (10BASE5 and 10BASE2).

35.2.1 CLIN 0421, Network Server IEEE 802.3 Interface Hardware.

35.2.2 CLIN 1421, Network Server IEEE 802.3 Interface Software.

35.3 Thick-cable IEEE 802.3 LAN, CLINs 0423-0450. All LAN components shall adhere to the IEEE 802.3, 10BASE5 standard. All cables shall be provided in plenum grade (such as Teflon), and non-plenum grade (such as polyvinylchloride (PVC)).

35.3.1 CLIN 0425, 15-foot Transceiver Cable. Provide a 15-foot, transceiver cable with 15-pin, D-type connectors.

35.3.2 CLIN 0427, 50-foot Transceiver Cable. Provide a 50-foot, transceiver cable with 15-pin, D-type connectors.

35.3.3 CLIN 0429, 100-foot Transceiver Cable. Provide a 100-foot, transceiver cable with 15-pin, D-type connectors.

35.3.4 CLIN 0431, 150-foot Transceiver Cable. Provide a 150-foot, transceiver cable with 15-pin, D-type connectors.

35.3.5 CLIN 0433, Thick IEEE 802.3 Coaxial Cable. Provide an 50-ohm 10BASE5 coaxial cable orderable by the foot.

35.3.6 CLIN 0435, Thick-cable IEEE 802.3 LAN Terminators.

35.3.7 CLIN 0437, Thick-cable IEEE 802.3 LAN Transceiver with Vampi Tap.

35.3.8 CLIN 0441, Thick-cable IEEE 802.3 LAN Repeater.

35.3.9 CLIN 0443, Thick-cable IEEE 802.3 LAN 8-port Fan-out Unit.

35.3.10 CLIN 0445, Thick-cable IEEE 802.3 LAN 16-port Fan-out Unit.

35.3.11 CLIN 0447, Thick-cable IEEE 802.3 LAN Grounding Kit with ground lug.

35.3.12 CLIN 0449, Thick-cable IEEE 802.3 LAN Fiber Optic Half Repeater.

35.4 Thin-cable IEEE 802.3 LAN, CLINs 0451-0464. All LAN components shall adhere to the IEEE 802.3, 10BASE2 standard. All cables shall be

provided in plenum grade (such as Teflon), non-plenum grade (such as polyvinylchloride (PVC)) and riser grades.

35.4.1 CLIN 0451, Thin-cable IEEE 802.3 LAN Cable. Provide a 50-ohm 10BASE2 coaxial cable orderable by the foot.

35.4.2 CLIN 0453, Thin-cable IEEE 802.3 LAN Terminator used with tap assembly.

35.4.3 CLIN 0454, BNC Connector Tools. Provide tools required to connect BNC plugs to coaxial cable.

35.4.4 CLIN 0455, IEEE 802.3 LAN BNC Tap. Provide BNC jacks (BNC "T" connections) or BNC RF coaxial "T" jack-jack-jack connectors also provide Tap Plug and BNC Plug sets or drop-cable BNC RF coaxial plugs.

35.4.5 CLIN 0456, BNC Connectors. Provide BNC RF coaxial "T" jack-plug-jack connectors with BNC plugs.

35.4.6 CLIN 0457, Thin-cable IEEE 802.3 LAN Transceiver shall connect the workstation's GOE network interface card 15-pin, D-type IEEE 802.3 plug to the BNC coaxial cable network interface, Signal Quality Error (SQE) switch selectable.

35.4.7 CLIN 0459, Thin-cable IEEE 802.3 LAN 8-port Fan-out Unit.

35.4.8 CLIN 0461, Thin-cable IEEE 802.3 LAN 16-port Fan-out Unit.

35.4.9 CLIN 0463, Thin-cable IEEE 802.3 LAN Repeater. Provide repeaters which are SQE switch selectable.

35.5 Twisted-pair LAN, CLINs 0465-0498. All applicable LAN components shall adhere to the IEEE 802.3 10BASET standard. Premise distribution components shall interface to new (provided under this contract), as well as existing AT&T, GTE, and NTI Premise Distribution Systems (PDS).

35.5.1 Twisted-pair LAN Terminators, CLINs 0465-0472.

35.5.1.1 CLIN 0465, Twisted-pair Wall Outlet. Provide duplex wall outlet with cover plate equipped with two standard RJ-45 modular jacks. Each jack shall terminate an 8-conductor 26 to 22 AWG cable.

35.5.1.2 CLIN 0467, Twisted-pair Crimp Style Connector Block. Provide a connector block equipped with solderless 66-type crimp connectors, arranged in at least four columns with 50 clips each. Each column shall also terminate a 26 to 22 AWG 25-pair cable. Block shall also be equipped with a 50-pin Amphenol-type plug.

35.5.1.3 CLIN 0469, Twisted-pair Punch-down Style Connector Block. Provide a connector block equipped with modular connector strips and shall also terminate a 26 to 22 AWG 25-pair cable. Terminals shall also accommodate multi-pair "punch-down" type connections. Block shall also be equipped with a 50-pin Amphenol-type plug.

35.5.1.4 CLIN 0471, Twisted-pair Modular Plug. Provide standard 8-conductor RJ-45 modular plug compatible with the wall outlet (CLIN 0465).

35.5.2 Unshielded Twisted-pair LAN Concentrators, CLINs 0473-0488.

35.5.2.1 Common Requirements. Concentrators shall:

- a. Provide the LAN with unshielded twisted pair concentration points;
- b. Be 19-inch rack mountable and wall mountable;
- c. Connect to the LAN using new and existing unshielded twisted-pair;
- d. Interface with the NMS for diagnostics and configuration

support;

- e. Have the capability to selectively lock out a port and ports via the NMS;
- f. Have the following features:
 - (1) Work with standard 115 volt AC outlets,
 - (2) Operate in a typical telephone wiring closet,
 - (3) Provide LAN connectivity of workstations for a distance of up to 100 meters,
 - (4) Provide a "star network" coverage pattern of over 600 feet in diameter of floor space,
 - (5) Provide all timing functions required for compliance with IEEE 802.3 10BASET standards,
 - (6) Provide a minimum of eight ports and be expandable up to 64 ports,
 - (7) Provide non-disruptive replacement and addition of component boards except for the power supply,
 - (8) Provide the following status:
 - (a) Power status indicators
 - (b) Data activity indicators
 - (c) Collision detect indicators
 - (d) Workstation status link indicator for each port
 - (e) Partition status link indicator for each port,
 - (9) Provide interface with each workstation via RJ-45 connections,
 - (10) Provide internal interface to the following:
 - (a) Other concentrators via 10BASET, 10BASE5, 10BASE2, and 10BASEF connections
 - (b) Local and remote bridges and repeaters via 10BASE5, SQE must be user selectable, and via 10BASE2.

35.5.2.2 Desired Capabilities are:

- a. Expandable above 64 ports;
- b. Provide internal FDDI interface;
- c. Provide IEEE 802.5 interface;
- d. Provide local bridge functions.

35.5.2.3 CLIN 0473, Rack Mounted Twisted-pair LAN Concentrator.

Provide an 8-port concentrator (expandable to 64 ports) for a 10BASET twisted-pair LAN. The concentrator shall provide the IEEE connections as specified below. All twisted pair connections shall be made using standard RJ-45 modular connectors.

35.5.2.4 CLIN 0475, Expansion for Rack Mounted Twisted-pair LAN Concentrator.

Provide incremental expansion for the rack mounted twisted-pair LAN concentrator from the

original 8 ports up to 64 ports.

35.5.2.5 CLIN 0477, Wall Mounted Twisted-pair LAN Concentrator.
Provide an 8-port concentrator (expandable to 64 ports) for a 10BASET twisted-pair LAN. The concentrator shall provide the IEEE connections as specified below. All twisted pair connections shall be made using standard RJ-45 modular connectors.

35.5.2.6 CLIN 0479, Expansion for Wall Mounted Twisted-pair LAN Concentrator.
Provide incremental expansion for the wall mounted twisted-pair LAN concentrator from the original 8 ports up to 64 ports.

35.5.2.7 CLIN 0481, 10BASE5 Interface to Twisted-pair LAN Concentrator.
Provide interface to connect one 10BASE5 segment to one port on the concentrator.

35.5.2.8 CLIN 0483, 10BASE2 Interface to Twisted-pair LAN Concentrator.
Provide interface to connect eight 10BASE2 segments to eight ports on the concentrator.

35.5.2.9 CLIN 0485, 10BASEF Interface to Twisted-pair LAN Concentrator.
Provide interface to connect six 10BASEF duplex fiber optic segments to six ports on the concentrator.

35.5.2.10 CLIN 0487, RJ-45 Interface to Twisted-pair LAN Concentrator. Provide interface to connect one 10BASET segment to one port on the concentrator. The segment shall connect to the interface with a standard RJ-45 modular connector.

35.5.3 CLIN 0489, Twisted-pair LAN Patch Panel. Provide patch panel equipped with standard RJ-45 modular receptacles to allow the Government user to easily connect workstations to the concentrator.

35.5.4 CLIN 0491, Twisted-pair LAN Patch Transceiver. The transceiver shall connect the workstation's GOE network interface card, IEEE 802.3 10BASE5 plug to the IEEE 802.3 10BASET network interface, SQE switch selectable. Status link LED and SQE LED shall be provided.

35.5.5 CLIN 0493, 8-foot Twisted-pair LAN Drop Cable. Provide connection from the transceiver to the workstation via an 8-foot cable.

35.5.6 CLIN 0495, 15-foot Twisted-pair LAN Drop Cable. Provide connection from the transceiver to the workstation via a 15-foot cable.

35.5.7 CLIN 0496, Twisted-pair LAN Cable. Provide cable for a twisted-pair LAN orderable by the foot.

35.5.8 CLIN 0497, 15-foot, 25-pair Cable with 50 pin Amphenol-type Plugs.

35.5.9 CLIN 0498, 25-pair Cable with 50 pin Amphenol-type Plugs.
Provide cable for a LAN orderable by the foot.

35.6 Fiber Optic LAN, CLINs 0499-0538.

35.6.1 Common Requirements include:

- a. All LAN components shall implement the IEEE 802.3 standard;
- b. Cable shall be multimode 62.5/125 micron fiber and shall exhibit an optical loss of no greater than 3 dB per kilometer at 1300 nanometers;
- c. Snap-twist (ST) connections shall be used for connectors.

35.6.2 Fiber Optic LAN Concentrator, CLINs 0499-0514.

35.6.2.1 Common Requirements. The fiber optic LAN concentrator shall:

- a. Provide facilities for connecting fiber optic LANs as well as connecting twisted-pair LANs;

- b. Be 19-inch rack mountable (not applicable for CLIN 0503);
- c. Interface with the NMS for diagnostics and configuration support;
- d. Have the capability to selectively lock out a port and ports via the NMS;
- e. Provide the following features:
 - (1) Work with standard 115 volt AC outlet,
 - (2) Operate in a typical telephone wiring closet,
 - (3) Provide LAN connectivity of workstations for distances of 50 through 1950 feet,
 - (4) Provide a coverage pattern of over 3900 feet in diameter of floor space,
 - (5) Provide all timing functions required for compliance with IEEE 802.3 standards,
 - (6) Provide a minimum of six ports and be expandable to 60 ports,
 - (7) Provide the following status:
 - (a) Power status indicators
 - (b) Data activity indicators
 - (c) Status link indicator for each port
 - (d) Collision detect indicator
 - (e) Workstation status link indicator
 - (f) Partition status link indicator,
 - (8) Provide interface with each workstation via fiber ST connections,
 - (9) Provide interface to the following:
 - (a) Other concentrators via 10BASET, 10BASE5, 10BASE2, and 10BASEF connections
 - (b) Local and remote bridges and repeaters via 10BASE5, SQE must be user selectable, and via 10BASE2;
 - (10) Provide FOIRL signaling.

35.6.2.2 Desired Capabilities are:

- a. Expandable above 60 ports;
- b. Provide internal FDDI interface;
- c. Provide IEEE 802.5 interface;
- d. Provide local bridge functions.

35.6.2.3 CLIN 0499, Rack Mounted Fiber Optic LAN Concentrator.

Provide a rack mounted 6-port concentrator (expandable to 48 ports) for a 10BASEF fiber optic LAN. The concentrator shall provide the IEEE connections as specified below. All fiber optic cable connections shall be made using snap-twist (ST) connectors.

35.6.2.4 CLIN 0503, Floor/Wall Mounted Fiber Optic LAN Concentrator. Provide a floor or wall mounted 6-port concentrator (expandable to 48 ports) for a 10BASEF fiber optic LAN. The concentrator shall provide the IEEE connections as specified below. All fiber optic cable connections shall be made using snap-twist (ST) connectors.

35.6.2.5 CLIN 0505, Expansion for Fiber Optic LAN Concentrator. Provide incremental expansion for both fiber optic LAN concentrators from the original 6 ports up to 48 ports.

35.6.2.6 CLIN 0507, 10BASE5 Interface to Fiber Optic LAN Concentrator. Provide interface to connect one 10BASE5 segment to one port on the concentrator.

35.6.2.7 CLIN 0509, 10BASE2 Interface to Fiber Optic LAN Concentrator. Provide interface to connect one 10BASE2 segment to one port on the concentrator.

35.6.2.8 CLIN 0511, 10BASET Interface to Fiber Optic LAN Concentrator. Provide interface to connect one 10BASET segment to one port on the concentrator. The segment shall connect to the interface with a standard RJ-45 modular connector.

35.6.2.9 CLIN 0513, 10BASEF Interface to Fiber Optic LAN Concentrator. Provide interface to connect one 10BASEF duplex fiber optic segment to one port on the concentrator. The segment shall connect to the interface with snap-twist (ST) connectors.

35.6.3 CLIN 0515, Fiber Optic LAN Patch Panel. The patch panel shall support snap twist terminations and be rack mountable in ANSI/EIA-310-C compliant 19-inch racks.

35.6.4 CLIN 0517, Fiber Optic LAN Transceiver. The transceiver shall connect the workstation's GOE network interface card 15-pin, D-type IEEE 802.3 plug to the fiber snap twist network interface connection.

35.6.5 CLIN 0519, 3-foot Fiber Optic LAN Drop Cable. Provide connection from the transceiver to the workstation via a 3-foot cable.

35.6.6 CLIN 0521, 8-foot Fiber Optic LAN Drop Cable. Provide connection from the transceiver to the workstation via an 8-foot cable.

35.6.7 CLIN 0523, 3-foot Fiber Optic LAN Patch Cable. Provide a 3-foot ST patch cable for use with concentrators and patch panels.

35.6.8 CLIN 0525, 8-foot Fiber Optic LAN Patch Cable. Provide an 8-foot ST patch cable for use with concentrators and patch panels.

35.6.9 CLIN 0527, 10-foot Fiber Optic LAN Patch Cable. Provide a 10-foot ST patch cable for use with concentrators and patch panels.

35.6.10 CLIN 0529, 4-strand Fiber Optic LAN Cable. Provide 4-strand 10BASEF cable for a fiber optic LAN orderable by the foot.

35.6.11 CLIN 0531, 6-strand Fiber Optic LAN Cable. Provide 6-strand 10BASEF cable for a fiber optic LAN orderable by the foot.

35.6.12 CLIN 0533, 12-strand Fiber Optic LAN Cable. Provide 12-strand 10BASEF cable for a fiber optic LAN orderable by the foot.

35.6.13 CLIN 0535, 24-strand Fiber Optic LAN Cable. Provide 24-strand 10BASEF cable for a fiber optic LAN orderable by the foot.

35.6.14 CLIN 0537, Fiber Optic LAN Connectors. Provide 10BASEF connectors for a fiber optic cable.

35.7 Network Interface Cards, CLINs 0539-0552 and 1539-1552. All NICs shall include:

- a. A primary port for standard IEEE 802.3 10BASE5 15-pin D-type connection (DB-15);
- b. Sufficient on-board memory to support the software interface

and performance requirements of the system;

- c. Primary or secondary port selection shall be user selectable during installation.

35.7.1 Intelligent Workstation IEEE 802.3 Interface, CLINs 1539-1540. In addition to NICs listed below, provide all protocols, including X-Windows, necessary to support client-server access to all network resources.

35.7.1.1 CLIN 1539, Single-user Workstation IEEE 802.3 Interface Software.

35.7.1.2 CLIN 1540, Multiuser Workstation IEEE 802.3 Interface Software.

35.7.2 CLIN 1541, Networked GOE Workstations IEEE 802.3 Interface. In addition to NICs listed below, provide the software required to network GOE workstations (Table C-1). GOE workstations shall be connected to the super-minicomputer via the network and have use of all super-minicomputer and network server software. The GOE workstations shall support Network File System software that integrates with the Sun Microsystems NFS public domain product, to include User Datagram Protocol (UDP) RFC 948 and Internet Protocol (IP) RFC 768.

35.7.3 Network Interface Card - Type I (NIC I), CLINs 0539-0554. The NIC I shall have a secondary port for interface to IEEE 802.3 10BASE2 (BNC female and t-connector).

35.7.3.1 CLIN 0539, Basic Intelligent Workstation NIC I.

35.7.3.2 CLIN 0541, Advanced Intelligent Workstation NIC I.

35.7.3.3 CLIN 0545, XT Compatible NIC I. 8-bit IBM XT bus compatible NIC.

35.7.3.4 CLIN 0547, AT Compatible NIC I. 16-bit IBM AT bus compatible NIC.

35.7.3.5 CLIN 0551, Macintosh II Compatible NIC I. Provide Apple Macintosh II architecture compatible NIC.

35.7.3.6 CLIN 0553, Macintosh SE Compatible NIC I. Provide Apple Macintosh SE architecture compatible NIC.

35.7.4 Network Interface Card - Type II (NIC II), CLINs 0555-0570. The NIC II shall have a secondary port for interface to IEEE 802.3 10BASET (RJ-45).

35.7.4.1 CLIN 0555, Basic Intelligent Workstation NIC II.

35.7.4.2 CLIN 0557, Advanced Intelligent Workstation NIC II.

35.7.4.3 CLIN 0561, XT Compatible NIC II.

35.7.4.4 CLIN 0563, AT Compatible NIC II.

35.7.4.5 CLIN 0565, MCA Compatible NIC II.

35.7.4.6 CLIN 0567, Macintosh II Compatible NIC II.

35.7.4.7 CLIN 0569, Macintosh SE Compatible NIC II.

35.8 Fiber Distributed Data Interface (FDDI) LAN, CLINs 0571-0583 and 1571. Within a mutually agreeable time frame after the effective date of the GOSIP (FIPS 146-1) version which specifies FDDI protocols, provide hardware and software components necessary to install and make operational an FDDI LAN. Until then, the FDDI LAN provided shall comply with the current ISO FDDI standards. The FDDI LAN shall provide a ESIS protocol translation. Components shall include but not be limited to all fiber optic cabling, cable concentrators, splice kits, terminators, class A and class B attachment stations, concentrator hubs, repeaters, routers, and bridges. (REF: F4.9)

- 35.8.1 CLIN 0571, FDDI LAN Hardware.
- 35.8.2 CLIN 0573, IEEE 802.3 Fiber Optic Interface.
- 35.8.3 CLIN 0575, IEEE 802.3 Thin Cable Interface.
- 35.8.4 CLIN 0577, IEEE 802.3 Thick Cable Interface.
- 35.8.5 CLIN 0579, IEEE 802.3 Twisted Pair Interface.
- 35.8.6 CLIN 1571, FDDI LAN Software.

35.9 Super-minicomputer to Super-minicomputer Interconnect, CLINs 0585 and 1585.

Within a mutually agreeable time frame after the effective date of the GOSIP (FIPS 146-1) version which specifies FDDI protocols, provide hardware and software to interconnect co-located super-minicomputers. Until then, the interconnect shall comply with the current OSI FDDI standards. Link communications shall operate in accordance with the FIPS 146-1 FDDI specification at a speed of 100 Mbps. This connection shall provide high speed transfer of data files as well as support for interactive processing sessions between super-minicomputers. (REF: F4.9)

- 35.9.1 CLIN 0585, Super-minicomputer to Super-minicomputer Interconnect Hardware.
- 35.9.2 CLIN 1585, Super-minicomputer to Super-minicomputer Interconnect Software.

35.10 Bridges, CLINs 0587-0600. Provide bridges to link local area networks to each other. All bridges shall:

- a. Notify the NMS and discard all frames that contain bit errors;
- b. Automatically recognize the addition of a new attachment to its connected sub-networks;
- c. Provide filtering interfaces to eliminate unnecessary traffic between any two sub-networks;
- d. Be shut down remotely from the NMS via software commands;
- e. Operate in a standby mode (i.e. not forwarding frames) such that redundant bridges can span the same two sub-networks;
- f. Detect and prevent frames from looping through a multiple bridged network by implementing the IEEE 802.1 Spanning Tree Algorithm standard;
- g. Transmit the contents of forwarding table entries to, and accept updates from, the NMS upon demand (this feature shall be protocol independent above the ISO Layer 2);
- h. Be able to implement an algorithm which shall provide capability for two bridges to share traffic workload;
- i. Utilize the IEEE 802.3 10BASE5 15-pin D-type connection as its network connection;
- j. Include NMS support for configuration, error notification, statistics and self-test functions.

35.10.1 Local Bridge, CLINs 0587-0592. A local bridge shall connect four collocated sub-networks. The local bridge shall filter data at a minimum rate of 75K packets per second at 128 bytes per packet. The local bridge shall forward data at a minimum of 30K packets per second at 128 bytes per packet.

35.10.1.1 CLIN 0587, Local Bridge.

35.10.1.2 CLIN 0588, 10 Mbps 10BASE2 Coaxial Cable Local Bridge Interface. Provide an IEEE 802.3 10BASE2 coaxial cable with a BNC network connection at 10 Mbps.

35.10.1.3 CLIN 0589, 10 Mbps 10BASE5 Coaxial Cable Local Bridge Interface. Provide an IEEE 802.3 10BASE5 coaxial cable with 15-pin D-type network connection at 10 Mbps.

35.10.1.4 CLIN 0590, 10 Mbps Fiber Network Local Bridge Interface. Provide an IEEE 802.3 10BASEF fiber network connection at 10 Mbps.

35.10.1.5 CLIN 0591, 100 Mbps FDDI Local Bridge Interface. Provide a FDDI fiber network connection at 100 Mbps.

35.10.2 Remote Bridge, CLINs 0593-0600. A remote bridge shall connect sub-networks which have no geographic boundaries and are linked via common carrier and similar Government-owned systems. The remote bridge shall operate in conjunction with the standards and communications equipment provided. The remote bridge shall support a minimum of two IEEE 802.3 LANs and two remote connections. The remote bridge shall be capable of load-leveling traffic between two or more circuits.

35.10.2.1 CLIN 0593, Remote Bridge.

35.10.2.1.1 Desired Capabilities are:

- a. Provide more than 2 remote connections;
- b. Provide more than 2 LAN connections.

35.10.2.2 CLIN 0594, 9.6 Kbps Telephone Link Remote Bridge Interface.

35.10.2.3 CLIN 0595, 19.2 Kbps Telephone Link Remote Bridge Interface.

35.10.2.4 CLIN 0597, 56 Kbps Telephone Link Remote Bridge Interface.

35.10.2.5 CLIN 0599, 1.544 Mbps Telephone Link Remote Bridge Interface.

35.11 Gateways, CLINs 0601-0616. The network gateways shall provide communications and protocol conversion between wide area networks (WANs) and LANs. The gateways shall operate in conjunction with the standards and communications equipment provided. The gateways shall implement dual protocol stacks for forwarding of GOSIP and TCP/IP packets. The network layer protocol conversions shall be provided for common upper and transport layer protocols.

35.11.1 Common Requirements.

- a. Implement all options labeled "MUST" and "SHOULD" in RFC 1009;
- b. Conform to IEEE 802.3 attachment unit interface LAN interface;
- c. Provide a packet throughput rate of at least 80 packets per second for 576 octet IP packets and 600 packets per second for minimum length packets;
- d. Include the capability to process routing tables which identify routes via intermediate systems and end systems and provide:
 - (1) Address Resolution Protocol RFC 826,
 - (2) Reverse Address Resolution Protocol RFC 903,
 - (3) Exterior Gateway Protocol RFC 904;
 - (4) OSI IS-IS Routing exchange protocols (ISO 8473 and 9542);
- e. Include the capability to filter packets based on packet type and source/destination address;
- f. Provide simultaneous communication with at least 64 users;
- g. Include NMS support for configuration, error notification, statistics and self-test functions.

35.11.2 CLIN 0601, LAN Gateway shall have LAN interface cards as well as the power supply and internal supports for the various WAN interface cards.

35.11.2.1 Desired Capability. Provide more than one LAN interface.

35.11.3 CLIN 0602, X.25 Gateway Interface. Provide a X.25 interface which supports speeds from 9600 bps to 1.544 Mbps and 64 virtual circuits.

35.11.4 CLIN 0609, ISDN Gateway Interface. Provide an ISDN primary interface.

35.11.5 CLIN 0613, Public Data Network (PDN) Gateway Interface shall provide access to Telenet and Tymnet.

35.12 CLIN 1650, Application Gateway. Provide software to convert between applications running over GOSIP and TCP/IP. Application protocol conversion shall include FTP-to-FTAM and SMTP-to-X.400 (RFC 1148). The application gateway shall be available for the super-minicomputer and at least one other platform (either the network server or the LAN gateway) provided by the Contractor. Implement all options labeled "MUST" and "SHOULD" in both RFC 1122 and 1123. If the Contractor provides a hybrid protocol stack, with GOSIP applications over TCP/IP, then the application gateway shall perform the transport conversion.

35.12.1 Desired Capabilities are:

- a. Application protocol conversion for TELNET-to-VT;
- b. Operate on the Network Server and on the LAN Gateway platform.

C36 Asynchronous Interfaces, CLINs 0651-0660 AND 1651-1660.

Provide hardware and software to connect asynchronous devices to the super-minicomputer and the network server. These interfaces shall support both local and wide area connections. All I/O connections (except for GOE workstations, GOE terminals and GOE printers) shall satisfy Attachment 6 system performance specifications. The GOE workstations and intelligent workstations shall be capable of file transfer, terminal emulation, and electronic mail access. The GOE terminals shall be capable of terminal emulation and electronic mail access. The GOE printers shall be capable of printing files transmitted from the super-minicomputer.

36.1 Super-minicomputer Asynchronous Interface, CLIN 0651-0653 and 1651. Provide hardware and software for the super-minicomputer for connection of asynchronous devices.

36.1.1 CLIN 0651, Basic Super-minicomputer Asynchronous Connections. Provide the initial 8 asynchronous connections for modems, multiplexers, GOE workstations, GOE terminals, GOE printers, and intelligent workstations.

36.1.2 CLIN 0653, Super-minicomputer Asynchronous Connection Expansion. The number of asynchronous connections shall be expandable to at least 128 connections in increments of at least 8 connections.

36.1.3 CLIN 1651, Super-minicomputer Asynchronous Software. Provide software to support connection of asynchronous devices.

36.2 Network Server Asynchronous Interface, CLIN 0655-0657 and 1655. Provide hardware and software for the network server for connection of asynchronous devices.

36.2.1 CLIN 0655, Basic Network Server Asynchronous Connections. Provide at least 2 connections to connect asynchronous devices.

36.2.2 CLIN 0657, Network Server Asynchronous Connection Expansion. Provide incremental expansion to at least 8 asynchronous connections.

36.2.3 CLIN 1655, Network Server Asynchronous Software. Provide software to support connection of asynchronous devices.

C37 Super-minicomputer-to-GOE Systems Interfaces, CLINs 0661-0682 and 1661-1682.

The super-minicomputer-to-GOE subsystem includes the hardware and software to communicate with GOE systems. It shall support multiple terminals and communications applications operating simultaneously.

37.1 IBM 3274 Systems Network Architecture (SNA) Interface, CLINs 0661 and 1661. The super-minicomputer shall have the ability to communicate with existing IBM and IBM compatible host systems in an SNA Synchronous Data Link Communication (SDLC) environment. The interface shall:

- a. Make the super-minicomputer appear as an IBM 3274 cluster controller and provide capability for attached terminals and virtual terminals across the network to emulate 3278 and 3279 devices;
- b. Provide multisesion capability and support up to 16 Logical units simultaneously;
- c. Provide full bi-directional ASCII and binary file transfer;
- d. Operate at transmission speeds of up to 9600 bps;
- e. Functionally conform to IBM SNA Reference Manual #SC30-3112.

37.1.1 CLIN 0661, IBM 3274 Systems Network Architecture (SNA) Interface Hardware.

37.1.2 CLIN 1661, IBM 3274 Systems Network Architecture (SNA) Interface Software.

37.2 BM 3770 SNA Remote Job Entry (RJE) Interface, CLINs 0663 and 1663. The super-minicomputer shall support full IBM 3770 RJE. The interface shall:

- a. Be capable of submitting batch jobs to a host and receiving the results to a disk file and printer;
- b. Provide full bi-directional file transfer;
- c. Support reception of compressed data from a host;
- d. Operate at speeds of up to 9600 bps;
- e. Functionally conform to IBM System Network Architecture (SNA) Reference Manual #SC30-3112.

37.2.1 CLIN 0663, SNA RJE Interface Hardware.

37.2.2 CLIN 1663, SNA RJE Interface Software.

37.3 IBM 2780 and 3780 Binary Synchronous Communications Interface, CLINs 0667 and 1667. The super-minicomputer shall communicate with existing IBM and IBM-communications compatible computers in binary synchronous environments. The interface shall:

- a. Make the super-minicomputer appear as an IBM 3780 or 2780 RJE workstation;
- b. Operate at speeds up to 9600 bps;
- c. Provide full bi-directional ASCII and binary file transfer;
- d. Provide the submission of batch jobs and the reception of the job output to a disk file and printer.

37.3.1 CLIN 0667, IBM 2780 and 3780 Binary Synchronous Communications Interface Hardware.

37.3.2 CLIN 1667, IBM 2780 and 3780 Binary Synchronous Communications Interface Software.

37.4 CLIN 0669, IBM 3270 Binary Synchronous Communications. The super-minicomputer shall have the capability to communicate with existing IBM and IBM-communications compatible computers in 3270 binary synchronous and SNA environments. The interface shall:

- a. Make the super-minicomputer appear as an IBM 3271 controller;
- b. Operate at speeds up to 9600 bps;
- c. Provide interactive sessions of up to sixteen IBM 3277 terminal emulations and provide capability for the reception of the printer output to a disk file or to a 3287 printer emulator.

37.4.1 CLIN 0669, IBM 3270 Binary Synchronous Communications Interface Hardware.

37.4.2 CLIN 1669, IBM 3270 Binary Synchronous Communications Interface Software.

37.5 CLIN 1671, IBM Document Interchange Architecture and Document Content Architecture Interface. Provide a utility which is functionally equivalent to the IBM 5798-DQH CICS/VS File Transfer Program: IND\$FILE. The utility shall support use of IBM's Document Interchange Architecture and Document Content Architecture for document exchange and file transfer. Refer to IBM Reference Manual #GC23-0765.

37.6 OpenNet Gateway, CLINs 0681 and 1681. Provide hardware and software for interoperability between the super-minicomputer and existing OpenNet local area networks. The OpenNet Gate Pway will be a single level, unclassified connection. Services to be provided are OpenNet Remote Network File Access, Virtual Terminal Connections, and Network Electronic Mail.

37.6.1 Common Requirements.

37.6.1.1 Gateway, Remote Network File Access. Provide remote file server access capability between the super-minicomputer and existing OpenNet resources (Intel 310, Intel 320, Unisys 5000/80, Unisys 5000/95, and Army Small Multiuser Computer Prime EXL320) in accordance with:

- a. XENIX Networking Software Release 2.0 - External Architecture Specification;
- b. Microsoft Networks/OpenNet - File Sharing Protocol;
- c. OpenNet/Microsoft Networks - File Sharing Protocol Extensions.

37.6.1.2 Gateway, Virtual Terminal Emulation. Provide the capability for the super-minicomputer to establish and disconnect virtual terminal connections with existing OpenNet LAN workstations through network commands as implemented in Microsoft Networks/OpenNet Virtual Terminal Protocol.

37.6.1.3 Gateway, Network Electronic Mail. Provide the capability to exchange electronic mail with users on existing resources (Intel 310, Intel 320, Unisys 5000/80, Unisys 5000/95, and Army Small Multiuser Computer Prime EXL320) within the OpenNet network as implemented in:

- a. XENIX Networking Software Release 2.0 - External Architecture Specification;
- b. Microsoft Networks/OpenNet - File Sharing Protocol;
- c. OpenNet/Microsoft Networks - File Sharing Protocol Extensions;
- d. OpenNet Mail Architecture;

e. OpenNet Summary.

37.6.2 Desired Capabilities. An OpenNet network interface card and software for the super-minicomputer be provided for interoperability between the super-minicomputer and existing OpenNet local area networks. Services to be provided are OpenNet Remote Network File Access, Virtual Terminal Connections, and Network Electronic Mail (as specified above).

37.6.3 CLIN 0681, OpenNet Interface Hardware.

37.6.4 CLIN 1681, OpenNet Interface Software.

C38 Data Communications Equipment, CLINs 0701-0968.

38.1 Modems, CLINs 0701-0901. FIPS compliant modems shall be provided for operation with super-minicomputer and network server communication interfaces and shall be usable by all workstations.

38.1.1 Common Requirements.

38.1.1.1 USA and Overseas Versions. Each modem shall be provided in both USA and overseas versions.

38.1.1.2 Multiple Countries. Overseas modem requirements may be met by modems approved for multiple countries or by a modem approved for each country. Modems shall be International Network approved for use on circuits between countries. Modems shall be host nation approved and connection authorized for use on the public switched telephone network. These devices shall be available within a mutually agreeable time frame. (REF: F4.8)

38.1.1.3 Host Nation Compliance. With Government approval, the features and functions as specified by the host nation authority for overseas modems shall take precedence over this specification wherever such features and functions shall be determined by the duly authorized regulatory body of the host nation to be contrary to their statutes and regulations.

38.1.1.4 Modem Cables. Three-meter long data communications cables, with the appropriate connectors for the country in which the modem is used, shall be provided with all modems.

38.1.1.5 NMS Interface. All modems shall be configurable (except CLIN 0855) by the NMS and shall be provided with diagnostics which integrate with the NMS. These modems shall also satisfy the NMS requirements for physical level (OSI Level 1) fault isolation and performance monitoring.

38.1.1.6 Modem Packaging. All modems shall be provided in both nest mount and standalone versions. Provide card nests for nest mountable versions of all modems. Card nests shall include sufficient power supplies and be mountable in ANSI/EIA-310-C compliant 19-inch racks.

38.1.2 Desired Capability. Early availability of host nation approved overseas modems (see list of locations in paragraph F6).

38.1.3 Limited Distance Mom (LDM) - 19.2 Kbps, CLINs 0703-0750. This modem shall:

- a. Operate from 9600 bps to at least 19.2 Kbps, with a minimum distance of 4 miles at 19.2 Kbps;
- b. Be suitable for point-to-point and multipoint applications and operate in both synchronous and asynchronous modes, full- and half-duplex over both 2-wire and 4-wire circuits;
- c. Have an EIA-232-D or EIA RS-232-C compliant interface.

38.1.3.1 CLIN 0703, LDM - 19.2 Kbps, Nest-mount.

38.1.3.2 CLIN 0705, LDM - 19.2 Kbps, Standalone.

38.1.4 LDM - High Speed, CLINs 0751-0800. This modem shall:

- a. Operate at data rate of at least 56 Kbps over a distance of at least 5 miles on 24 AWG wire;
- b. Be capable of point-to-point synchronous operation, full- and half-duplex;

38.1.4.1 CLIN 0751, LDM - High-speed EIA Nest-mount shall have either an EIA RS-449 with MIL-STD 188-114 (balanced) or EIA-530 connection.

38.1.4.2 CLIN 0753, LDM - High-speed EIA Standalone shall have either an EIA RS-449 with MIL-STD 188-114 (balanced) or EIA-530 connection.

38.1.4.3 CLIN 0759, Card Nest, LDM.

38.1.5 19.2 Kbps Leased Line Modem, CLINs 0801-0850. This modem shall:

- a. Be capable of 19.2 Kbps synchronous full-duplex operation over 4-wire Bell 3002-D1 and CCITT M.1020 conditioned leased lines;
- b. Have selectable data rates of at least 19.2 Kbps and 14.4 Kbps with fallback rates of at least 14.4 Kbps and 9600 bps.

38.1.5.1 CLIN 0801, 19.2 Kbps Leased Line Modem, Nest-mount.

38.1.5.2 CLIN 0803, 19.2 Kbps Leased Line Modem, Standalone.

38.1.5.3 CLIN 0805, 19.2 Kbps Leased Line Modem, 4-channel Multiplexing. Provide 4-channel multiplexing for 19.2 Kbps leased line modems.

38.1.5.4 CLIN 0813, Card Nest, 19.2 Kbps Leased Line Modem.

38.1.6 CCITT V.32 Modem, CLINs 0851-0900. This modem shall:

- a. Provide 300 to 9600 bps full duplex operation over 2-wire switched lines and 2- or 4-wire leased lines;
- b. Be CCITT V.32 (9600/4800 bps), CCITT V.22 bis (2400 bps), CCITT V.22 (1200 bps), and Bell 103J/113 (300 bps) compliant;
- c. Provide synchronous and asynchronous operation;
- d. Provide "AT" command set compatibility;
- e. Provide auto answer/dial functionality and user adjustable volume control;
- f. Provide CCITT V.42/V.42 bis error correction/data compression;
- g. Provide EIA-232-D (or 232-C), and V.24/V.28 interfaces;

38.1.6.1 CLIN 0851, CCITT V.32 Modem, Nest-mount. User adjustable volume control not required.

38.1.6.2 CLIN 0853, CCITT V.32 Modem, Standalone.

38.1.6.3 CLIN 0855, CCITT V.32 Modem, Workstation shall be internally mounted in the system or expansion chassis. Synchronous operation, user adjustable volume control, and V.24/V.28 interfaces are not required.

38.1.6.4 CLIN 0857, CCITT V.32 Modem, Dial-line Backup and Look-back. Provide dial-line backup and look-back capabilities for USA V.32 modems.

38.1.6.5 CLIN 0867, Card Nest, CCITT V.32 Modem.

38.1.7 CLIN 0901, Modem Cabinet shall include an ANSI/EIA-310-C compliant 19-inch rack and shall have National Electrical Manufacturers Association compliant or equivalent internal power receptacles. The cabinet shall be at least 1.5 meters high with a hinged, see-through front door. Modem nests shall be mountable in this cabinet.

38.2 56 Kbps D/CSU, CLINs 0905-0908. This DSU/CSU shall connect the DDN Interface with a USA DDN packet switching node (PSN) access circuit. The DSU/CSU shall operate at 56,000 bps on this dedicated, four-wire line. All DSU/CSUs shall be NMS manageable.

38.2.1 CLIN 0905, High-speed EIA DSU/CSU. Provide a DSU/CSU with either an EIA RS-449 with MIL-STD 188-114 (balanced) or EIA-530 connection.

38.3 CLIN 0909, Data PBX. The data PBX shall be incrementally expandable to support up to a minimum of 500 lines. The lines shall support the modems (ref: C38.1) and the direct connect asynchronous ports (ref: C36). The data PBX shall support simultaneous calls for at least half the configured lines/ports (i.e., 250 simultaneous calls for a 500 line configuration). The modem pool shall include all hardware (except modems and circuits) and software for an auto-answer and auto-dial interface to:

- a. Connect the super-minicomputer to remote modems through the switched telephone network;
- b. Establish connections on the basis of user entered address and symbolic name;
- c. Provide switching among multiple connections;
- d. Terminate a connection automatically when no activity occurs over that connection during a Government selectable time interval;
- e. Terminate a connection if DTR is de-asserted from the attached device;
- f. Terminate a connection if circuit CD is discontinued from the attached device.

38.4 Statistical Time Division Multiplexer (STDM), CLINs 0951-0968. The STDMs shall be under network management. All STDMs shall be configurable by the NMS and shall be provided with diagnostics which integrate with the NMS. These STDMs shall also satisfy the NMS requirements for physical level (OSI Level 1) fault isolation and performance monitoring.

38.4.1 STDM Chassis, CLINs 0951-0956. The STDM chassis shall be provided in models supporting 8 and 16 input ports. The STDM chassis shall:

- a. Provide at least one composite output link at speeds from 9600 bps to at least 19.2 Kbps;
- b. Provide internal and external clocking;
- c. Include the following features:
 - (1) Flow control,
 - (2) Remote device configuration via supervisory control port,
 - (3) Buffer support,
 - (4) Password protection,
 - (5) Echoplex, autobaud,
 - (6) Autoparity,

- (7) Switching with contention;
- d. Include the following diagnostics:
 - (1) Self-test,
 - (2) Composite link test,
 - (3) Local and remote loopback,
 - (4) Test character generator,
 - (5) LEDs/LCDs,
 - (6) Buffer overflow.
- 38.4.1.1 CLIN 0953, 8-Port STDM Chassis.
- 38.4.1.2 CLIN 0955, 16-Port STDM Chassis.
- 38.4.2 CLIN 0957, EIA-232-D (or 232-C) and V.24/V.28 STDM Channel Card shall:
 - a. Support synchronous line speed of 9.6 Kbps;
 - b. Provide EIA-232-D (or 232-C) and V.24/V.28 interfaces.
- 38.4.3 CLIN 0959, High-speed EIA STDM Channel Card shall:
 - a. Support asynchronous input at line speeds up to 9.6 Kbps;
 - b. Have either an EIA RS-449 with MIL-STD 188-114 (balanced) or EIA-530 connection.

C39 Communications Cabling, CLINs 0969-0989.

Cabling systems shall adhere to all applicable building and fire codes.

39.1 CLIN 0969, 9-Conductor Bulk Exterior Cable. Data cables with exterior grade PVC coating, orderable in 1000-foot reels without connectors.

39.2 CLIN 0970, 25-Conductor Bulk Exterior Cable. Data cables with exterior grade PVC coating, orderable in 1000-foot reels without connectors.

39.3 CLIN 0971, 37-Conductor Bulk Exterior Cable. Data cables with exterior grade PVC coating, orderable in 1000-foot reels without connectors.

39.4 CLIN 0973, 9-Conductor Bulk Plenum Cable. Data cable with smoke retardant coating, orderable in 1000-foot reels without connectors.

39.5 CLIN 0974, 25-Conductor Bulk Plenum Cable. Data cable with smoke retardant coating, orderable in 1000-foot reels without connectors.

39.6 CLIN 0975, 37-Conductor Bulk Plenum Cable. Data cable with smoke retardant coating, orderable in 1000-foot reels without connectors.

39.7 CLIN 0977, DB-25 Connector Kit. Connector kit having two connectors and all associated parts to include hoods, cable inserts, etc.

39.8 CLIN 0979, DB-9 Connector Kit. Connector kit having two connectors and all associated parts to include hoods, cable inserts, etc.

39.9 CLIN 0981, DB-37 Connector Kit. Connector kit having two connectors and all associated parts to include hoods, cable inserts, etc.

39.10 CLIN 0985, Bulk Plenum Twisted-pair Cable. Unshielded, 4-pair 24 AWG solid conductor twisted pair cable with smoke retardant coating, orderable in 1000-foot reels.

C40 Maintenance, CLINs 2001-4999 and 8001-8989.

40.1 General Requirements. The Contractor shall provide maintenance service as described herein and the maintenance plan in Attachment 11.

40.1.1 Effectiveness Level. Maintain a minimum component effectiveness level of 98%.

40.1.2 Maintenance Calls. Provide a point of contact 24 hours per day, seven days per week, to receive notification of the need for remedial maintenance by telephone for all sites. Provide at least one toll free telephone number in the continental United States (CONUS) for all CONUS sites and at least one outside of CONUS (OCONUS) telephone number for all OCONUS sites. A maintenance technician shall respond to all maintenance service calls (a recorded answering service is unacceptable).

40.1.3 Remote Assistance. Provide, within security constraints, a remote technical assistance capability for the super-minicomputer. When requested by the Government, maintenance personnel shall diagnose and resolve problems from a remote location using a teleprocessing link. The Contractor shall provide all hardware and software for remote assistance. The Government will provide the dial-in phone line.

40.1.4 Time-to-repair. Complete the repair of the malfunctioned components within the time frames listed below. The time-to-repair hours apply only during periods of ordered OCPPM, PCPPM, and OPPM. The time frame is measured from the time a bona fide attempt is made by the Government to notify the Contractor of required maintenance.

Malfunctioned Component	Time-to-Repair (Hours)	
	CONUS Hawaii and Alaska	OCONUS except Hawaii and Alaska
Core Components (Ref. Table C-2, Components List)	4	24
All Other Components	8	48

40.1.5 Incidental Charges. All maintenance includes parts, travel, and all other incidental charges related to the maintenance action. (See paragraph H11.5 for further details.)

40.1.6 Preventive Maintenance. Provide preventive maintenance services as part of all maintenance options (excluding mail-back/carry-in) to include all material and labor necessary to perform preventive maintenance. For each delivery, the Contractor shall specify, in writing prior to the start of acceptance testing, the frequency and duration for preventive maintenance required for each component listed on the delivery order. The designated Government representative at the site will then establish a schedule for preventive maintenance.

40.1.7 Diagnostics. Provide a full range of system diagnostics that shall, as a minimum, identify the faulty component and subcomponent. The diagnostics shall test all applicable equipment provided under this contract, be available on the computer system, and be password protected. There shall be adequate online diagnostics for the computer operator to isolate hardware failures.

40.1.8 Worldwide Technical Assistance. Provide information, advice and technical assistance supplementary to that provided in manuals and publications for all hardware and software included in this contract by telephone to designated Government personnel. At least one toll free telephone number shall be provided. Telephone access shall be made available between the hours of 0800 to 1700 local time for each Government site, Monday through Friday excluding Government holidays. This assistance shall include the identification, tracking, and resolving of hardware and software problems and questions raised by the Government.

40.1.9 Cannibalization. Cannibalization of components shall not be utilized to ensure the availability of other system components unless approved by the Government.

40.1.10 Clearances. When requested by the Government, the Contractor shall provide maintenance personnel who possess security clearances at the highest level of classification required at the site. See Atch. 1 (DD254).

40.1.11 Purging of Defective Components. Components and parts of components, which may contain non-volatile memory will not be removed from Government control until an approved declassification procedure has been completed by Government personnel or until it is determined that the part contains no classified material.

40.1.12 Site Maintenance Journal. The Contractor shall maintain a Site Maintenance Journal which includes an equipment list and a chronology of all system maintenance activity. The chronological list of Contractor maintenance activity shall include, but is not limited to, diagnostic tests, preventive maintenance, system upgrades and remedial maintenance. Each journal entry shall include the name(s) of Contractor personnel working on the system and shall be signed by the senior Contractor representative in attendance and the senior Government representative. The journal shall remain the property of the Government. MBCI malfunction reports, when submitted by the Contractor, will be posted to the site maintenance journal by the Government.

40.2 CLINs 2001-2989, On-call Principal Period of Maintenance (OCPPM). Provide an unlimited number of calls for remedial and preventive maintenance for all components during the principal period of maintenance (PPM) from 0800 to 1700 local time Monday through Friday except Government holidays. Provide optional extended coverage as listed below:

- a. Nine Hour PPM from 0800 to 1700 local time Monday through Saturday except Government holidays;
- b. Nine Hour PPM from 0800 to 1700 local time seven days per week except Government holidays;
- c. Thirteen Hour PPM from 0600 to 1900 local time Monday through Friday except Government holidays;
- d. Thirteen Hour PPM from 0600 to 1900 local time Monday through Saturday except Government holidays;
- e. Thirteen Hour PPM from 0600 to 1900 local time seven days per week except Government holidays;
- f. Eighteen hour PPM from 0600 to 2400 local time Monday through Friday except Government holidays;
- g. Eighteen hour PPM from 0600 to 2400 local time Monday through Saturday except Government holidays;
- h. Eighteen hour PPM from 0600 to 2400 local time seven days per week except Government holidays;
- i. Twenty-four hour PPM Monday through Friday except Government holidays;
- j. Twenty-four hour PPM Monday through Saturday except Government holidays;
- k. Twenty-four hour PPM seven days per week including Government holidays.

40.3 CLIN 2991, Per-call Principal Period of Maintenance (PCPPM). Provide a per-call remedial and preventive maintenance coverage for all components other than the core components during the principal period of maintenance from 0800 to 1700 local time Monday through Friday except

Government holidays and complete the repair within the time frames stated in paragraph C40.1.4.

40.4 CLIN 2995, Per-call Outside the Principal Period of Maintenance (OPPM). Provide remedial and preventive maintenance coverage at all times outside of the ordered OCPPM and PCPPM and complete the repair within the time frames stated in paragraph C40.1.4.

40.5 Software Support, CLINs 3001-4999, shall be provided in accordance with paragraph H5. The structure shall provide a primary and a secondary level of support.

40.5.1 CLINs 3001-3999, Primary Site software support shall be provided for all central design agencies as designated on the delivery order (primary site). The primary site support shall include at least telephone access, software distribution, and documentation distribution. Primary support sites shall receive a copy of the software updates and documentation for themselves and all associated secondary support sites after acceptance of the software.

40.5.2 CLINs 4001-4999, Secondary Site software support shall not include direct telephone access, direct software distribution, or direct documentation distribution. Primary sites will be responsible for telephone access, software distribution, and documentation distribution to associated secondary sites. Software updates and documentation shall be delivered to the associated primary site (as identified on the secondary site delivery order) for all secondary sites. All secondary sites must be associated with a primary site. There shall be no limit on the number of secondary sites that can be associated with a primary site.

40.6 CLINs 8001-8989, Mail-back/Carry-in (MBCI) Maintenance shall be provided at the Contractor's repair facilities, for any malfunctioning unit returned to a repair facility by mail or carried in by Government personnel. This option shall be provided for those items listed in Table C-3.

40.6.1 General Requirements.

40.6.1.1 The Contractor shall have 5 working-days from the time of receipt to repair or replace the malfunctioning hardware and turn it over to a shipper for return to the user (mail-back) or make available for pick up by the user (carry-in).

40.6.1.2 The Government will mail-back/carry-in whole units or less than a whole unit (e.g. connector cable, board replacement, or a complete sub-unit replacement such as a detachable keyboard). The Contractor shall identify any item within a CLIN that the Government may return as less than a whole unit. On items for which return at less than a whole unit is allowed, return of less than a whole unit will be at the discretion of the Government.

40.6.1.3 Government personnel will either ship or carry in the malfunctioning whole unit, sub-unit, connector cable, or replaceable board as agreed upon when the malfunction was originally reported to the Contractor's designated service center. The Government will be responsible for all costs associated with the delivery of all defective hardware items to the Contractor's facility.

40.6.1.4 For each mail-back/carry-in maintenance order, the Contractor shall mail/hand the Government a written notification of receipt of the malfunctioning equipment. This notification shall, as a minimum, contain a unique maintenance tracking number, date and local time the equipment was received by the Contractor for repair and the name of the Contractor representative who accepted the defective equipment. Upon completion of the repair, the Contractor will submit, with the returned item, a malfunction and diagnostic maintenance record. This record shall contain, as a minimum, the maintenance identification number, date and local time the equipment was received by the Contractor for repair, type, model, and serial number of the equipment (include old and new serial numbers if the equipment has been exchanged), description of the malfunction, and description of the repair including parts replaced, name of the Contractor technician, and date and

local time the repair was completed.

40.6.1.5 Upon receipt of a defective part that is still covered by the original warranty, the Contractor shall replace the defective part, at no cost to the Government. All Government-installed components shall have the identical warranty as those installed by the Contractor.

40.6.1.6 The Contractor shall return the repaired or replacement whole unit, sub-unit or board via means considered acceptable to both the Contractor and the user (fourth class mail will not be acceptable). The Contractor shall be responsible for all costs associated with the return of all repaired/replaced hardware item(s) to the user.

40.6.1.7 The Contractor shall, as a minimum, provide at least three (3) mail-back/carry-in facilities, one each in the:

- a. Continental United States (CONUS);
- b. European theater;
- c. Pacific theater.

C41 Training, CLINs 5001-5999.

41.1 General Training Requirements. The Contractor shall provide technical services and materials to train Government personnel. Training shall be accomplished using MIL-STD 1379D (Military Structured Contract Training Programs) as a guide.

41.1.1 Number of Attendees per class shall not exceed 20 students. When a course requires laboratory instruction, the student-to-instructor ratio shall be a maximum of ten students to one instructor.

41.1.2 Combining of Courses. Courses may be combined with standard commercial training courses, where applicable, provided all training requirements are met. However, required training courses listed in paragraph C41.3 shall be separately orderable.

41.1.3 Instructors shall be fully qualified personnel who are knowledgeable of the provided hardware and software. All instructors shall have previously taught the course they are instructing.

41.1.4 Hands-on Training is required utilizing production and support equipment. Where interactive terminals are used by students in support of training, the ratio of terminals to students shall be a maximum of two students to one terminal.

41.1.5 A Training Plan shall be provided for each course in accordance with Exhibit B, CDRL B001.

41.1.6 Course completion reports shall be provided in accordance with Exhibit B, CDRL B002.

41.2 Types of Training.

41.2.1 On-site Training. Training shall be provided in Government furnished classroom facilities, on-site, at both CONUS and OCONUS sites as specified by the Government.

41.2.2 Contractor-facilities Training. Training conducted at the Contractor's facility shall be provided on both a course by course and a per student basis.

41.2.3 Desired Capabilities (Types of Training). If Video-Audio Instruction (VAI) or Computer Assisted Instruction (CAI) courses are proposed, they shall meet the minimum requirements as stated below.

41.2.3.1 SLINs 5001AD-5999AD, CAI Courses shall be provided which can be used on-site to train personnel on the use, operation, and maintenance of the system. CAI courses, as a minimum, shall operate under single-user workstation operating system or MS-DOS. CAI courses shall be updated as necessary when changes are made to the components for which they provide training. CAI courses shall incorporate the following criteria:

- a. An easy to use menu driven format;
- b. Instructions on using the course and how to progress through the individual lessons;
- c. Termination and resumption of the course at the student's option.

41.2.3.2 SLINs 5001AE-5999AE, VAI Courses for on-site use shall be provided on VHS media. VAI courses shall become the property of the Government. The Government shall be authorized to reproduce any of the VAI student materials where such reproduced material is used only with the super-minicomputer systems(s) for which it is intended to be used. VAI courses shall be updated as necessary when changes are made to the components for which they provide training.

41.3 Training Courses Required. A complete cadre of training for the systems provided under this contract shall be provided. At a minimum the following courses shall be provided.

41.3.1 CLIN 5001, Executive Overview. This course is intended for managers involved in the management, operation and use of the equipment and software. The course shall provide an overview of the function and features of the hardware, software, and Contractor's support plans. The course shall be directed to upper and middle managers. The estimated length of this course is one day.

41.3.2 CLIN 5005, System Administrator Training. This course shall include the necessary information and hands-on experience to enable personnel to perform the duties of the systems administrator. This course shall be directed to students that have a minimum of six months programming experience. The estimated length of this course is five days. The course shall include training in the operation and administration of the system (through both menus and shell access) to include the following areas:

- a. Physical and operational characteristics of hardware devices and all unique software features;
- b. Operational overview of each software package;
- c. Console operation;
- d. System configuration and reconfiguration;
- e. Use of diagnostics routines;
- f. System operation;
- g. Error messages;
- h. Task control and utility routines;
- i. System software operations (library management, file sharing features, security software, peripheral software);
- j. File naming conventions;
- k. Use of the security system;
- l. Monitoring operational system efficiency;
- m. Catastrophic error recovery;
- n. System usage accounting routines;
- o. Dump and restore;
- p. Communications facilities;
- q. Installing a system from the ground up;

- r. Booting from tape;
- s. Problem and error reporting and correction procedures and other administration tasks;
- t. Menu manipulation;
- u. Add and remove users from the system;
- v. Other system software unique features.

41.3.3 CLIN 5007, System Programmer Training. This course shall include the necessary information and hands-on experience to enable personnel to perform the duties of the system programmer. This course shall be directed to students that have a minimum of six months programming experience. The estimated length of this course is three days. The course shall include training in the operation and administration of the system (through both menus and shell access) to include the following areas:

- a. Physical and operational characteristics of hardware devices and all unique software features;
- b. System performance tuning;
- c. System debugging;
- d. System internals;
- e. Use of diagnostics routines;
- f. Error messages;
- g. Task control and utility routines;
- h. Use of the security system;
- i. Catastrophic error recovery;
- j. System usage accounting routines;
- k. Installing a system from the ground up.

41.3.4 CLIN 5011, Operator Training. This course shall provide the necessary information and hands-on experience to enable personnel to perform the duties of the systems operator. The course shall be directed to entry level computer operators. The estimated length of this course is three days. The course shall include classroom and hands-on training in the following areas:

- a. Start-up procedures;
- b. Shut-down procedures;
- c. Emergency procedures;
- d. Normal operating procedures;
- e. Problem definition and solution (abnormal operating conditions);
- f. File and disk backup and recovery procedures;
- g. Degraded modes of operation;
- h. Equipment interface requirements;
- i. Routine housekeeping chores such as changing printer ribbons, cleaning display screens and other operator maintenance.

41.3.5 CLINs 5101-5199, Basic Operating System Training. These courses shall be

directed at personnel with no prior experience. The estimated length of these courses is three days. These courses shall include classroom and hands-on experience in the following areas:

- a. Directory structure;
- b. Use of online manuals;
- c. Shell commands;
- d. Print commands (Direct connect and slave);
- e. Text editor;
- f. Basic stem commands.

41.3.6 CLINs 5201-5299, Advanced Operating System Training. These courses shall include classroom and hands-on experience. These course shall be directed to more advanced users such as the system administrators and programmers. The estimated length of these courses is three days. They shall include:

- a. Advanced text editor;
- b. Shell programming techniques;
- c. Special files (character device files, block device files);
- d. Environment modification;
- e. Pipes and filters;
- f. File manipulation utilities;
- g. Text manipulation utilities;
- h. Process control utilities.

41.3.7 CLINs 5301-5399, Applications Programming Training. These courses provide training on special features of all the language processors. These courses shall be directed to journeyman computer programmers in the language being taught. The estimated length of these courses is three days.

41.3.7.1 Courses to be provided include:

- a. COBOL;
- b. FORTRAN;
- c. Pascal;
- d. 'C' Programming Language;
- e. Ada.

41.3.7.2 Course Content shall include:

- a. Special features and extension of the compiler;
- b. Debug facilities;
- c. Input and output routines;
- d. Diagnostic interpretation;
- e. Memory utilization;
- f. Array usage;

- g. System interface calls;
- h. Subroutine interface;
- i. Data statements;
- j. File structures;
- k. Make files;
- l. Program linkage;
- m. Text editor;
- n. Any other processor unique features;
- o. Shell programming;
- p. Source code control system.

41.3.8 CLIN 5401, Intelligent Workstation Training. This course shall be directed to students with basic knowledge of personal computers. The estimated length of this course is two days. The intelligent workstation course shall include:

- a. The basic operating instructions and control language required to use the intelligent workstation;
- b. Administration and management of the intelligent workstation and its resources;
- c. Use and functions of basic utilities and communications features to perform file transfers;
- d. How to use the intelligent workstation as an interactive terminal to the super-minicomputer processor.

41.3.9 CLINs 5501-5549, RDBMS Training. RDBMS training shall be at beginner, intermediate, and advanced levels and include training in every aspect of the RDBMS. These courses shall be directed to personnel with little or no RDBMS experience (beginner), at least six months experience with an RDBMS (intermediate), and extensive experience with an RDBMS (advanced). The estimated length of these courses is three days.

41.3.10 CLINs 5551-5599, 4GL Training. The 4GL training shall be provided at beginner, intermediate, and advanced levels. These courses shall include training in every aspect of the 4GL. These courses shall be directed to personnel with little or no experience in 4GLs or RDBMSs (beginner), at least six months experience with 4GLs or RDBMSs (intermediate), and extensive experience with 4GLs or RDBMSs (advanced). The estimated length of these courses is three days.

41.3.11 CLIN 5601, Communications Overview. This class shall be directed to personnel with no prior computer experience through journeyman computer programmers. The estimated length of this course is two days. The communications overview course shall include

- a. An overview of the different communications concepts, techniques and capabilities associated with the equipment and software available under this contract;
- b. Basic techniques used for communication between the super-minicomputer and workstations, remote printers, programmable workstations, personal computers, and other super-minicomputers;
- c. Techniques needed to use direct short and long distance communications, dial-up connections, communications through LAN, and any other significant method used to transfer data.

41.3.12 CLIN 5651, Network Administration Training. This course shall teach administration of the network hardware and software. The course shall be directed to personnel with a general background in microcomputers and networking. The estimated length of this course is two days. The course shall provide in-depth administrative instruction to include:

- a. Installation and management of all LAN hardware and software;
- b. Implementation of security;
- c. LAN configuration and reconfiguration.

41.3.13 CLIN 5701, Network Management System Operator Course. This course shall include classroom and hands-on experience for students who have completed, as a minimum, a formal entry level course in NMS operations. The instruction shall cover overall supervisory functions performed by system operators, and the operation of all system components provided under this contract. The estimated length of this course is three days. At the conclusion of the training the students shall be able to:

- a. Start up, configure and operate the system using various applicable system configurations;
- b. Respond to system control messages and reconfigure the system as required;
- c. Determine system status;
- d. Control, assign and reconfigure managed devices;
- e. Select NMS input/output files, load NMS programs, files, and databases;
- f. Isolate and diagnose causes of network malfunctions due to failures and perform necessary system recoveries;
- g. Perform all system shutdown procedures;
- h. Perform all equipment power-on and off procedures;
- i. Perform all operating tasks under minimum supervision while meeting system demands for speed and accuracy;
- j. Explain when and why tasks shall be done;
- k. Use the operations manual provided for the system.

41.3.14 CLIN 5751, LAN Users Training. This course shall teach network users how to effectively use their LAN workstation. The course shall provide instruction in the use of the LAN system to include user interface with the operating ersystem. This course shall be directed to entry level office workers up to experienced computer personnel. The estimated length of this course is two days.

41.3.15 CLINs 5801-5899, Application User Training. These courses shall teach how to effectively use the application programs. The courses shall provide instruction in the use of the various applications programs, to include the user interface with the operating system. These courses shall be directed to entry level office workers up to experienced computer personnel. The estimated length of these courses is one to two days. Courses shall be provided for all of the following office automation software:

- a. User directory;
- b. Calendar;
- c. Electronic authentication;
- d. Electronic filing;

- e. Project management;
- f. Task and Suspense management;
- g. Electronic mail;
- h. Spreadsheet;
- i. Word processing to include: spell checking, thesaurus, lexical analyzer, and document conversion;
- j. Forms generation and management;
- k. Business graphics;
- l. Statistical analysis package;
- m. Composition graphics.

41.3.16 CLIN 5901, Hands-on CASE Tools Training. This course is intended for system analysts, designers, programmers, engineers, and managers. The estimated length of this course is three days. This course shall cover as a minimum training in the following areas:

- a. Introduction to CASE including the software development process and productivity improvements;
- b. Hands-on experience with analysis and design tools to include using the in class workstation to understand user interface and developing an initial system design with data flow and entity relationship diagrams, and data dictionary;
- c. Using rapid prototyping tools for screen generation and report generators;
- d. Using support tools for consistency and completeness checks on the system design;
- e. Using tools for system documentation;
- f. Implementing a pilot project.

41.3.17 CLIN 5951, C2 Security Training. This course shall include the necessary information and hands-on training for security personnel. This course shall be directed at system administrators, and security personnel with one year of experience. The estimated length of this course is two days. This course shall include the following areas through the use of menus:

- a. Overview of operating system security;
- b. Root log-on;
- c. Advanced files and permissions;
- d. Password security;
- e. Monitoring system usage;
- f. Terminal security;
- g. Addition and removal of user accounts;
- h. Text editor;
- i. Shell commands.

41.3.18 CLIN 5952, B1 Security Training. This course shall include the necessary information and hands-on training for security personnel. This course shall be directed at

system administrators, system evaluators, and security personnel with one year of experience. The estimated length of this course is two days. This course shall include the following areas through the use of menus.

- a. Overview of operating system security;
- b. Root log-on;
- c. Advanced files and permissions;
- d. Password security;
- e. Monitoring system usage;
- f. Terminal security;
- g. Addition and removal of user accounts;
- h. Text editor;
- i. Shell commands.

41.4 CLIN 5961, Acceptance Test Familiarization Training. Provide familiarization training to the Government acceptance test team (consisting of approximately twenty (20) personnel) on the capabilities and operational features of the hardware and software under test sufficient to enable Government personnel to operate the system. Training shall start after delivery of the acceptance test system and be completed prior to the start of the acceptance test. The training shall be conducted at the Government's acceptance test sites and shall be for a minimum of forty (40) hours.

C42 CLINs 6001-6999.

42.1 General Requirements. Manuals and complete documentation shall be provided for all systems, software, hardware, communications, and services ordered. All software shall include a quick reference card or keyboard template. All manuals and documentation shall comply with the Contract Data Requirements List (CDRL) and associated Data Item Descriptions (DIDs) set forth in Exhibits A through E.

42.1.1 Index. All manuals provided under this contract shall contain an index to the manual.

42.1.2 Binding. All manuals delivered shall be either bound manuals or contained in hardback binders.

42.2 Commercial Manuals.

42.2.1 CLIN 6001, Hardware Manuals. Provide all OEM manuals for each hardware item. (CDRL A001)

42.2.2 CLIN 6201, Software Manuals. Provide all original software manufacture manuals for each software item. (CDRL A002)

42.2.3 CLIN 6301, System Administration Manuals. The Contractor shall provide a system administration manual (to include system tuning) to aid the system administrator in performing his duties. The system administration manual shall contain the specific information most commonly used by the system administrator, system tuning guidance, and a reference/cross reference to other system information located in other documents. (CDRL A003)

42.2.4 CLIN 6311, Network Administration Manual. The Contractor shall provide a network administration manual to aid the network administrator in performing his duties. The network administration manual shall contain the specific information most commonly used by the network administrator and a reference/cross reference to other system information located in other documents. (CDRL A004)

42.2.5 CLIN 6321, System Operations Manual. The Contractor shall

provide a system operations manual to aid the system operator in performing his duties. The system operations manual shall contain the specific information most commonly used by the system operator and a reference/cross reference to other system information located in other documents. (CDRL A005)

42.3 Training Materials.

42.3.1 Training Plan. Provide a training plan for each course ordered. (CDRL B001)

42.3.2 Trainee and Training Course Completion Reports. Provide course completion reports for each student attending ordered training. (CDRL B002)

42.4 Site Preparation Requirements and Installation Plan. A Site Preparation Requirements and Installation plan shall be submitted to the Government. (CDRL C001)

42.5 Security Data and Documents, CLINs 6701-6799. Available commercial equivalent documents or copies of documents used for the NCSC evaluation can be provided in lieu of documents complying with the DID format(s). The security documents shall be included with the super-minicomputer operating system (CDRLs F001-F011) and shall also be separately orderable (CDRLs D001-D011). See also Attachment 7. Updated, separately orderable CDRLs (SLIN 67xxAB) can only be ordered if that site has previously separately ordered that CDRL (SLIN 67xxAA).

42.5.1 CLIN 6701, Risk Assessment (Internal). (CDRL D001)

42.5.2 CLIN 6702, System Security Plan. (CDRL D002)

42.5.3 CLIN 6703, System Security Concept of Operations. (CDRL D003)

42.5.4 CLIN 6704, Operations Security (OPSEC) Plan. (CDRL D004)

42.5.1 CLIN 6705, Informal Computer Security Policy Model. (CDRL D005)

42.5.6 CLIN 6706, Security Test and Evaluation Master Plans (TEMP) Annex. (CDRL D006)

42.5.7 CLIN 6707, Certification Plan. (CDRL D007)

42.5.8 CLIN 6708, Security Test and Evaluation (ST&E) Test Report. (CDRL D008)

42.5.9 CLIN 6709, Certification Support. (CDRL D009)

42.5.10 CLIN 6710, Security Features User's Guide. (CDRL D010)

42.5.11 CLIN 6711, Trued Facility Manual. (CDRL D011)

42.6 List of Items Delivered During the Term of a Contract. (CDRL E001)

C43 Contractor Technical Services, CLINs 7001-7999.

Prices for Contractor technical services shall include travel, lodging, meals, and any other applicable incidental costs.

43.1 Pre-installation Site Survey, CLINs 7001-7049.

43.1.1 Common Requirements.

43.1.1.1 Scope of Survey. The pre-installation site survey shall include:

- a. A determination that the physical space allocated for the equipment is adequate and accessible within the requirements of Section C of this document;

- b. A determination that the flooring is adequate to support the configuration of the equipment to be installed;
- c. A determination that adequate electrical power is available into the building and within the building to accommodate the equipment and that proper grounding is available;
- d. A determination that adequate air circulation and air-conditioning are available;
- e. A determination that the cable paths are accessible and usable (still room to install new cables);
- f. A determination that telephone line connections are available and accessible;
- g. Evaluation of existing cables which may be used;
- h. Preparation of a complete list of all materials required for proper system installation (i.e. connectors, cables, power plugs and connectors, etc.);
- i. Compiling any other information the Contractor deems pertinent to the installation of the system;
- j. An estimate of installation man-hours and charges.

43.1.1.2 Site Preparation Requirements and Installation Analysis. Using the data obtained during the site survey, the Contractor shall prepare a detailed site preparation, requirements analysis, and installation plan, including hardware and software, in accordance with CDRL C001. In addition to the required information listed in the referenced Data Item Description, the installation plan shall include:

- a. A diagram of the physical layout of the equipment including cable routes, power locations, signal paths, environmental controls for super-minicomputer and remote equipment;
- b. Hardware testing to be accomplished;
- c. How the software installation will be completed;
- d. How the entire system will be tested after the installation is completed;
- e. Recommended user training.

43.1.2 CLIN 7001, 30-user LAN Site Survey. Conduct a pre-installation site survey for a 30-user intra-building LAN.

43.1.3 CLIN 7011, 75-user LAN Site Survey. Conduct a pre-installation site survey for a 75-user intra-building LAN.

43.1.4 CLIN 7021, 128-user LAN Site Survey. Conduct a pre-installation site survey for a 128-user intra-building LAN.

43.1.5 CLIN 7031, Greater than 128-user LAN Site Survey. Conduct a pre-installation site survey for an intra-building LAN to support more than 128 users. This CLIN will only be ordered in conjunction with CLIN 7021, and shall be for increments not to exceed 32 users.

43.1.6 CLIN 7041, Backbone LAN Site Survey. Conduct a pre-installation site survey for an inter-building backbone LAN.

43.2 CLIN 7101, Communications Installation. Provide services necessary to install Contractor LAN components (CLINs 0419-0616 and 1419-1655) and GOE communications equipment in accordance with the Government approved

installation plan to include:

- a. Install network communication equipment (e.g. network interface cards, repeaters, bridges, gateways, etc.);
- b. Install and route all direct connect and network cabling to include cable raceways and troughs as necessary to satisfy safety considerations;
- c. Verification and test of all communication network equipment and cabling.

43.3 CLIN 7103, Network Server On-site Upgrade. Provide services necessary to configure internal components at the Government site to include:

- a. Install and test internal network server equipment (CLINs 0053-0083, and 0141) and cabling;
- b. Load and test all network server software.

43.4 CLIN 7105, Network Server Factory Configuration. Provide services necessary to configure internal components, as specified on the delivery order, at the factory prior to shipment to include:

- a. Install and test internal network server equipment (CLINs 0053-0083, and 0141) and cabling;
- b. Load and test all network server software.

43.5 CLIN 7107, Intelligent Workstation On-site Upgrade. Provide services necessary to configure internal components at the Government site to include:

- a. Install and test internal intelligent workstation equipment (CLINs 0105, 0107, 0111, 0113, 0115, 0119, 0121, 0123, 0125, 0129, 0141, and 0855) and cabling;
- b. Load and test all intelligent workstation software.

43.6 CLIN 7109, Intelligent Workstation Factory Configuration. Provide services necessary to configure internal components, as specified on the delivery order, at the factory prior to shipment to include:

- a. Install and test internal intelligent workstation equipment (CLINs 0105, 0107, 0111, 0113, 0115, 0119, 0121, 0123, 0125, 0129, 0141, and 0855) and cabling;
- b. Load and test all intelligent workstation software.

43.7 Relocation, CLINs 7201-7202.

43.7.1 CLIN 7201, Relocation - Technical Assistance. Provide technical assistance as described in this section when super-minicomputer equipment is to be relocated, to include:

- a. Survey of the new site to determine if adequate facilities (space, environmental controls, power, etc.) exist at the new site;
- b. Provide a not-to-exceed estimate of the number of hours of Contractor time required to perform relocation services;
- c. De-installation of all components which are to be relocated;
- d. Guidance in the packing and crating of the components which are to be relocated;
- e. Guidance in the unpacking and uncrating of the components at the new site;

- f. Reinstallation of the components at the new site;
- g. Test and check out of the components at the new site including regeneration of software required to bring the system up to its fully operational state.

43.7.2 CLIN 7202, Relocation - Packing/Unpacking and Moving. Provide the following services:

- a. Packing and crating of the components which are to be relocated;
- b. Transporting the equipment to the new location;
- c. Unpackg and uncrating of the components at the new site;
- d. The Contractor shall provide all materials required for relocation of previously installed equipment.

43.8 CLIN 7301, Performance Monitoring and Tuning Services. Provide monitoring and tuning services capable of evaluating system performance and determining hardware, software, and communications limitations and performance characteristics. The Contractor's technical personnel shall perform the types of services described below.

43.8.1 System Response Analysis to include:

- a. Hardware configuration variations;
- b. Operating system configuration variations;
- c. Application programs variations.

43.8.2 System Monitoring to include an evaluation of the following:

- a. Impact of system performance by new software packages, including new releases of existing software;
- b. Trends in system load;
- c. A specific job(s), class of jobs, and type of job;
- d. Program performance during software development stage;
- e. Program performance during production phase while still in the development stage.

43.8.3 System Tuning to identify the following:

- a. The need for hardware expansion to maintain system throughput as the processing load increases;
- b. Choke points which impede terminal response (either hardware or software);
- c. Choke points which limit batch processing capacity (either hardware or software).

43.9 CLINs 7401-7409, On-site Systems Analyst and Engineering Support. Systems analyst and engineering personnel shall be thoroughly knowledgeable in the provided systems to include all hardware and software. Support personnel shall be available for eight consecutive hours per day, plus an official meal period (not to exceed one hour per day), during the period 0700 to 1800 hours Monday through Friday, excluding federal holidays. The following technical support shall be provided:

- a. Survey, analyze, evaluate and provide technical advice pertaining to the performance and functionality of the system;

- b. Analyze and evaluate the application software design and its integration into the Contractor provided hardware and software;
- c. Provide assistance and guidance on installing software;
- d. Provide consultation and guidance to Government system analyst and programmers pertaining to the application systems design;
- e. Provide assistance and guidance to the system operators pertaining to system generation, troubleshooting and general system operation;
- f. Assist in the detection and resolution of system and application program errors.

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - HARDWARE

TERMINALS	Paragraph References
	C6.12, C15.1.g, C28.7, C36
AT&T 605G (VT-100 or VT-220 emulation)	C1.3
AT&T 700 (AT&T 605G emulation)	C1.3
DEC VT-100, VT-220	C3
Unisys 1220/1224 (VT-100 or VT-220 emulation)	C1.3
Wang PC 'Classic' (VT-100 level emulation)	C1.3
Wyse 60, 75, 370	C1.3
 WORKSTATIONS AND PERSONAL COMPUTERS	 C1.3, C6.12,
	C15.1.f,
	C28.7, C35, C35.4.6, C35.5.4, C35.6.4, C35.7.2, C36, C36.1.1
AT&T 386/20, (4MB RAM, UNIX SVID version 3.2, VGA, 1 I/O open slot, DOS 4.01, 85-600 MB Hd, mouse)	C35.7.3.4, C35.7.4.4
Apple Macintosh II (Apple DOS, 1 MB RAM, 1 I/O open slot)	C35.7.3.5, C35.7.4.6
Apple Macintosh SE (Apple DOS, UNIX, 1 MB RAM, 1 I/O open slot)	C35.7.3.6, C35.7.4.7
Everex 3000D (MS-DOS, UNIX, 1 MB RAM, 80386-20 CPU, 80387 math co-processor, 1 open 16-bit AT slot, two serial ports, VGA, mouse)	C35.7.3.4, C35.7.4.4
IBM PC XT compatibles (640KB RAM, 1 open slot, 20MB HD, MS-DOS 3.0 or later)	C35.7.3.3, C35.7.4.3
IBM PC AT compatibles (1MB RAM, 2 open expansion slots, 5.25-inch DS-DD disk drive, 20 MB HD, DOS version 3.0 or later, SCO UNIX)	C35.7.3.4, C35.7.4.4
PC 80386/80486 or 100% compatible (4MB RAM, 2 open expansion slots, 40 MB HD with an MFM or IDE disk interface, DOS 4.1 or later, POSIX, VGA, mouse)	C35.7.3.4, C35.7.4.4
IBM MCA compatibles (1MB RAM, O/S 2, 1 open slot)	C35.7.4.5
Unisys B28, (4MB RAM, Ethernet Bus, 40-300 MB HD, BTOS II version 3.0 or later, 1 open slot)	C35.7.3.4, C35.7.4.4
Unisys B38, (8MB RAM, Ethernet Bus, 140-300 MB HD, BTOS II version 3.0 or later, 1 open slot)	C35.7.3.4, C35.7.4.4
Unisys B39, (24MB RAM, Ethernet Bus, 140-300 MB HD, BTOS II version 3.0 or later, 1 open slot)	C35.7.3.4, C35.7.4.4
Unisys PW-800/16, PW-800/20 (1MB RAM, DOS 4.0 or later, POSIX, 1 open slot, 80386, VGA, mouse)	C35.7.3.4, C35.7.4.4
Zenith Z-248, (1MB RAM, AT-bus, 2 open slots, 5.25-inch DS-DD disk drive, 20 MB HD, DOS version 3.0 or later, SCO UNIX)	C35.7.3.4, C37.7.4.4
 COMPUTERS	 C1.3, C6.12, C35, C35.4.6, C35.5.4, C35.6.4, C36
Intel 310, 320	C37.6.1.1, C37.6.1.3
Prime EXL320	C37.6.1.1, C37.6.1.3
Unisys 5000/80 (4MB RAM, 3 open slots, 170MB HD, UNIX)	C37.6.1.1, C37.6.1.3
Unisys 5000/95 (4MB RAM, 3 open slots, 170MB HD, UNIX)	C37.6.1.1, C37.6.1.3

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - HARDWARE (continued)

PRINTERS	Paragraph References
	C1.3, C6.12, 8.6.1j, C16.1b(3), C28.7, C36, C36.1.1
Alps ALQ224EGX (RS-232C serial and Centronics parallel interfaces)	
Alps ALQ324EGX (RS-232C LEserial and Centronics parallel interfaces)	
Alps P2000 (RS-232C serial and Centronics parallel interfaces)	
Canon LP8-3 (RS-232C serial and Centronics parallel interfaces)	
Canon LP8-2 (RS-232C serial and Centronics parallel interfaces)	
Citoh 467, 414 (RS-232C serial interface)	
Dataproducts 9044 (draft/near letter quality, RS-232C serial and Centronics parallel interfaces)	
Dataproducts 9044C (color graphics printer, RS-232C serial and Centronics parallel interfaces)	
Dataproducts 9034 (24 wire printhead dot-matrix, RS-232C serial and Centronics parallel interfaces)	
Fujitsui M3176 (RS-232C serial and Centronics parallel interfaces)	
Juki 6300 (RS-232C serial interface)	
Kyocera F-1000A (desktop laser printer, 10 ppm, RS-232C serial and Centronics parallel interfaces)	
Kyocera Q-8010 (graphics laser printer, 10 ppm, RS-232C serial and Centronics parallel interfaces)	
Kyocera F-3010 (high-speed laser printer, 18 ppm, RS-232C serial and Centronics parallel interfaces)	
Mannesmann Tally MT645 (heavy duty dot matrix, 450 lpm, RS-232C serial and Centronics parallel interfaces)	
Office Automation System Laserpro Express series II (RS-232C serial and Centronics parallel interfaces)	
Okidata Laserline 24 (RS-232C serial and Centronics parallel interfaces)	
Okidata Microline 321 (RS-232C serial and Centronics parallel interfaces)	
Output Technology Corp. 2180 (RS-232C serial and Centronics parallel interfaces)	
Qume Sprint 1155 (letter quality, RS-232C serial and Centronics parallel interfaces)	
 OPTICAL DISK STORAGE SUBSYSTEM	 C8.11
Pioneer DD-S5001 (SCSI interface)	
 BAR CODE EQUIPMENT	 C8.10, C28.6
AF Contract F19630-88-D-0005 (Welch Allen BCCD Model HBD-Micro 2)	
LOGMARS DAHC 94-88-D-0007 (Fixed Bar Code Reader (FBCR) Intermec models 9510 and 9570, Point of Sale Scanner (POS) Metrologic model MS260 and modem OmniTel Encore model 1200SD)	

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - HARDWARE (continued)

LOCAL AREA NETWORKS (LANs)	C6.12, C28.7, C35
AT&T Star-LAN 10 Network	C35
B-NET I, from USCG contracts	C35
B-NET II, from USCG contracts	C35
Ethernet LAN	C35
LAN from Army SMC contract	C35
LAN from ULANA contracts	C35
Navy PC LAN contract	C35
OpenNet	C31f(2), C37.6, C37.6.1, C37.6.2

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - SOFTWARE

BAR CODE SOFTWARE	Paragraph References
AF Contract F19630-88-D-0005 (Bar Code Utilities FSD-BCU release 1.0.0 or later)	C8.10, C28.6
LOGMARS DAHC 94-88-D-0007	C8.10, C28.6

GRAPHICS

Art Designer version 2.0 or later	C16.2.1.g
Harvard Business Graphics version 2 or later	C16.2.1.g, C28.3.z
Summa Graphics	C16.2.1.g

RELATIONAL DATABASE MANAGEMENT SYSTEMS

Informix 2.0 or later	C16.2.1.g
Oracle V6 or later	C26.1.1.10
Progress V5 or later	C26.1.10
Unify 2000 V1.3 or later	C26.1.1.10

SPREADSHEETS

20/20	C27.9av, C27.9aw
Enable version 1.15 or later	C16.2.1g, C27.9av
EXCEL version 2.1 or later	C16.2.1g, C27.9av
Extended Multiplan version 2 or later	C16.2.1g, C27.9av
Lotus 1-2-3 version 2 or later	C16.2.1g, C27.9av
Prelude	C16.2.1g, C27.9av
Uniplex version 6.10	C27.9av
Unisys/OFIS spreadsheet version 1.1 or later	C27.9av

PROJECT MANAGEMENT

Pinnell	C16.2.1g
Prelude Task Manager	C16.2.1g
Timeline 3.0 or later	C16.2.1g

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - SOFTWARE (continued)

STATISTICAL ANALYSIS

Paragraph References
C28.1j

Prelude version 3.A0.1 Statistical Analysis

E MAIL	C27.8
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Ascent E-mail
B-MAIL, USCG contracts
MMDF2
Prelude E-MAIL
PROFS
Star Mail (SMTP), USCG contracts
Uniplex version 6.10

LAN SOFTWARE

CBIS-ST DOS LAN-SW version 1.0	C35
CENTURY-OpenNet version 1.0	C37.6
Intel-SMC Lan-SW, OpenNet version 1.0	C37.6
Interactive-ST UNIX LAN-SW, OpenNet version 1.0	C37.6
Retix-SMC LAN-SW, GOSIP version 1.0	C35c
Retix-ST DOS LAN-SW, GOSIP version 1.0	C35c
Retix-ST UNIX LAN-SW, GOSIP version 1.0	C35c
Sun Microsystems NFS	C35e
WIN/3B (TCP/IP)	C35e

TABLE C-1
GOVERNMENT-OWNED EQUIPMENT (GOE) - SOFTWARE (continued)

WORD PROCESSORS

Convergent/Unisys Doc Designer version 2.2	C27.15
DISPLAYWRITE	C27.15
Enable version 1.15 or later	C16.2.1g, C27.10a, C27.15, C29.1.1.1
LYRIX version 5.0 or later	C27.10a, C27.15
Microsoft Word 5.0 or later	C16.2.1g, C27.10a, C27.15, C29.1.1.1
Microsoft Word for Windows version 1.0 or later	C27.10a, C27.15
MULTIMATE version 3.3 or later	C16.2.1g, C27.10a, C27.15
Quadratron Q-One version 1.96 or later	C27.si10a, C27.15
SAMNA Word III version 3.0 or later	C27.10a, C27.15
Uniplex version 6.10	C27.10a
WANG (to include VS, OIS, WP Plus, and WANG PC WP)	C27.10a, C27.15
WORDPERFECT version 4.0 or later	C16.2.1g, C27.10a, C27.15, C29.1.1.1
WORDSTAR version 3.3 or later	C16.2.1g, C27.10a, C27.15, C29.1.1.1
WORDSTAR Professional	C27.10a, C27.15

TABLE C-2
CORE COMPONENTS

1. Super-minicomputer and rewritable DAS devices (CLINs 0001-0032)
2. Designated 9-track drive (CLIN 0047)
3. Designated network server(s) and rewritable DAS devices (CLINs 0051-0059)
4. Designated system printer (CLINs 0191-0215)
5. Designated super-minicomputer power conditioner (CLINs 0231-0237)
6. Designated super-minicomputer UPS (CLINs 0241-0249)
7. Designated network server UPS (CLIN 0251)
8. Designated LAN and bridge components:
 - a. Super-minicomputer WAN interface (CLINs 0403, 0407, 0409)
 - b. Network Server WAN interface (CLIN 0405)
 - c. Super-minicomputer LAN interface (CLIN 0419)
 - d. Network Server LAN interface (CLIN 0421)
 - e. Backbone (10BASE5) (CLINs 0433-0450)
 - f. Backbone (10BASE2) (CLINs 0451-0464)
 - g. Backbone (10BASET) (CLINs 0465-0498)
 - h. Backbone (10BASEF) (CLINs 0499-0538)
 - i. Backbone (FDDI) (CLINs 0571-0583)
 - j. Super-minicomputer to super-minicomputer interconnect (CLIN 0585)
 - k. Bridges (CLINs 0587-0600)
 - l. Gateways (CLINs 0601-0616)
 - m. Data PBXs (CLIN 0909)

NOTE: Core components will be designated (identified) on the delivery order.

TABLE C-3
CLINs COVERED BY MAIL-BACK/CARRY-IN MAINTENANCE

CLIN	DESCRIPTION
0039	External WORM
0043	External CD-ROM
0099	X-terminal Workstation
0101	Basic Intelligent Workstation
0102	High-resolution Basic Intelligent Workstation
0103	Advanced Intelligent Workstation
0104	High-resolution Advanced Intelligent Workstation
0105	Basic Intelligent Workstation Memory Expansion 1<?8 è0107 Advanced Intelligent Workstation Memory Expansion
0111	Intelligent Workstation 5.25-inch Floppy Disk Unit
0113	Intelligent Workstation 3.5-inch Diskette Unit
0115	Intelligent Workstation Internal Removable DAS Device
0119	Basic Intelligent Workstation DAS Device
0121	Advanced Intelligent Workstation DAS Device
0123	Large Workstation DAS Device
0125	Very Large Workstation DAS Device
0129	Internal Intelligent Workstation DAS Backup Device

0131 External Intelligent Workstation DAS Backup Device
0133 Digitizing Tablet
0135 GOE Bar Code Equipment Interface(s)
0137 GOE Optical Disk Interface
0141 Facsimile Card
0191 Low-speed Page Printer
0193 Low-speed Page Printer Memory Expansion
0195 Medium-speed Page Printer
0197 Medium-speed Page Printer Memory Expansion
0199 High-speed Page Printer
0201 High-speed Page Printer Memory Expansion
0203 Color Page Printer
0205 Color Page Printer Memory Expansion
0213 Character Printer
0215 Character Printer Buffer Expansion
0219 Character Printer Cut Sheet Feeder
0221 Plotter
0223 Scanner
0225 Scanner Automatic Sheet Feeder
0261 Basic Intelligent Workstation UPS
0263 Advanced Intelligent Workstation UPS
0457 Thin-cable IEEE 802.3 LAN Transceiver
0459 Thin-cable IEEE 802.3 LAN 8-port Fan-out Unit
0461 Thin-cable IEEE 802.3 LAN 16-port Fan-out Unit
0463 Thin-cable IEEE 802.3 LAN Repeater
0473 Rack Mounted twisted-pair LAN Concentrator
0477 Wall Mounted Twisted-pair LAN Concentrator
0481 10BASE5 Interface to Twisted-pair LAN Concentrator
0483 10BASE2 Interface to Twisted-pair LAN Concentrator
0485 10BASEF Interface to Twisted-pair LAN Concentrator
0487 RJ-45 Interface to Twisted-pair LAN Concentrator
0491 Twisted-pair LAN Patch Transceiver

Table C-3 continued

CLIN DESCRIPTION

0507 10BASE5 Interface to Fiber Optic LAN Concentrator
0509 10BASE2 Interface to Fiber Optic LAN Concentrator
0511 RJ-45 Interface to Fiber Optic LAN Concentrator
0513 Snap-twist Interface to Fiber Optic LAN Concentrator
0517 Fiber Optic LAN Transceiver
0539 Basic Intelligent Workstation NIC I
0541 Advanced Intelligent Workstation NIC I
0545 XT Compatible NIC I
0547 AT Compatible NIC I

0551 Macintosh II Compatible NIC I
0553 Macintosh SE Compatible NIC I
0555 Basic Intelligent Workstation NIC II
0557 Advanced Intelligent Workstation NIC II
0561 XT Compatible NIC II
0563 AT Compatible NIC II 1<?8 è0565 MCA Compatible NIC II
0567 Macintosh II Compatible NIC II
0569 Macintosh SE Compatible NIC II
0573 IEEE 802.3 Fiber Optic Interface
0575 IEEE 802.3 Thin Cable Interface
0577 IEEE 802.3 Thick Cable Interface
0579 IEEE 802.3 Twisted Pair Interface
0587 Local Bridge
0588 10 Mbps 10BASE2 Coaxial Cable Local Bridge Interface
0589 10 Mbps 10BASE5 Coaxial Cable Local Bridge Interface
0590 10 Mbps Fiber Network Local Bridge Interface
0591 100 Mbps FDDI Local Bridge Interface
0593 Remote Bridge
0594 9.6 Kbps Telephone Link Remote Bridge Interface
0595 19.2 Kbps Telephone Link Remote Bridge Interface
0597 56 Kbps Telephone Link Remote Bridge Interface
0599 1.544 Mbps Telephone Link Remote Bridge Interface
0601 LAN Gateway
0602 X.25 Gateway Interface

0609 ISDN Gateway
0613 Public Data Network (N) Gateway Interface
0703 LDM - 19.2 Kbps, Nest-mount
0705 LDM - 19.2 Kbps, Standalone
0751 LDM - High-speed, Nest-mount
0753 LDM - High-speed, Standalone
0801 19.2 Kbps Leased Line Modem, Nest-mount
0803 19.2 Kbps Leased Line Modem, Standalone
0805 19.2 Kbps Leased Line Modem, 4-channel Multiplexing
0851 CCITT V.32 Modem, Nest-mount
0853 CCITT V.32 Modem, Standalone
0855 CCITT V.32 Modem, Workstation
0857 CCITT V.32 Modem, Dial-line Backup and Look-back
0905 High-Speed EIA DSU/CSU
0957 EIA-232-D (or 232-C) and V.24/V.28 STDM Channel Card
0959 High-speed EIA STDM Channel Card