



National Aeronautics and
Space Administration

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NASA-STD-2805-O
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MINIMUM HARDWARE CONFIGURATIONS

NASA TECHNICAL STANDARD

FOREWORD

This standard is approved for use by NASA Headquarters and all NASA Centers and is intended to provide a common framework for consistent practices across NASA programs.

The material covered in this standard is governed and approved by the NASA Information Technology Management Board. Its purpose is to define minimum hardware configurations necessary to support interoperability both between NASA end user computers and within the NASA operating environment. The standard establishes minimum “to keep” and minimum “to buy” hardware configurations. Adherence to this standard ensures compliance with federal requirements for desktop computers, laptops, and other end user devices.

Requests for information, corrections, or additions to this standard should be directed to the John H. Glenn Research Center at Lewis Field (GRC), Emerging Technology and Desktop Standards Group, MS 142-4, Cleveland, OH, 44135 or to *desktop-standards@lists.nasa.gov*. This standard may be viewed and downloaded, free of charge, from the NASA Emerging Technology and Desktop Standards web site: <http://etads.nasa.gov/current/2804.pdf>

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Chief Information Officer

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1 SCOPE

1.1 Purpose

This standard defines the current minimum desktop hardware configuration that will be used by NASA to support interoperability. These specifications apply to all NASA desktop and portable systems that are required to support interoperability.

1.2 Scope

Desktop hardware below this minimum configuration may be used in areas where interoperability is not required. However, Agency workstations used for interoperability must meet the criteria specified in section 3.3 of this document.

1.3 Waivers

This technical standard is governed by Enterprise Architecture Function as defined in Section 1.2.1.3 of [NPR 2800.1B Managing Information Technology](#). Adherence to this standard ensures compliance with the future state architecture as described in [NPR 2830.1 NASA Enterprise Architecture Procedures](#).

The Emerging Technology and Desktop Standards group, in cooperation with the End User Services Service Executive and the Chief Enterprise Architect, will evaluate and process waivers to this standard as appropriate. Waiver requests will include:

- 1) the reason the waiver is required,
- 2) justification for the waiver, and
- 3) a proposed date by which compliance with the standard will be met.

Waivers will be granted by the NASA CIO or at his/her discretion responsibility will be delegated to the Center or Mission Directorate CIO.

2 ACRONYMS AND DEFINITIONS

2.1 Acronyms

<u>CRT</u>	Cathode Ray Tube
<u>EPEAT</u>	Electronic Product Environmental Assessment Tool
<u>LCD</u>	Liquid Crystal Display
<u>LED</u>	Light Emitting Diode
<u>SSD</u>	Solid-state Drive

2.2 Definitions

2.2.1 Desktop Computer

The term desktop computer is used generically to refer to traditional desktop systems, as well as laptop computers, notebooks, tablets, engineering workstations, and similar platforms that are utilized to provide basic interoperability.

2.2.2 Netbook Computer

An inexpensive, highly mobile, itinerant use computer to enable minimal mobile access to enterprise data (web access, email and document viewing) on enterprise devices, as an alternative to more expensive (fully featured, desktop-replacement level) laptops, or the use of personally owned equipment to supplement travel use.

2.2.3 Minimum Workstation to Support Basic Interoperability

Workstations that support basic interoperability are defined by being networked, and by having users who exchange information electronically, including those users that perform any or all of the activities encompassed in the minimum office automation software suite defined below.

2.2.4 Minimum “To Keep” Workstation Hardware Configuration

The minimum interoperable workstation hardware configuration that may be retained by a NASA organization.

2.2.5 Minimum “To Buy” Workstation Hardware Configuration

The minimum interoperable workstation hardware configuration that may be procured by a NASA organization. (The CIO at each center is empowered and accountable for determining the performance/cost assessment for configurations that exceed the minimum hardware configuration and its associated cost. The center CIO will also ensure that obsolete workstations are excessed on a one-for-one basis as new workstations are introduced.)

2.2.6 Minimum Interoperability Software Suite

The Minimum Interoperability Software Suite, is defined in NASA-STD-2804-O, “*Minimum Interoperability Software Suite.*”

3 GENERAL REQUIREMENTS

3.1 Architectural Compliance Requirements

NASA maintains a baselined and approved Information Technology Architecture. The architecture is predicated on:

- The selection of standards for a broad and cost-effective infrastructure using commercial off-the-shelf and well-supported open source products to the greatest extent practical
- Interoperability both within and external to NASA
- Flexibility for future growth
- Consistency with generally accepted consensus standards as much as feasible
- Among these objectives, ensuring interoperability is one of NASA’s most critical issues related to information technology.

At times, it is in NASA’s best interest to specify commercial products as standards for an interoperable implementation of a particular set of related and integrated functions. The products themselves often include additional functionality or proprietary extensions not specified by this standard. While these products can be used to create higher-level interoperability solutions, these solutions may not be recognized within the context of the NASA interoperability environment and may be deprecated without warning by future revisions to this standard. Users of this standard are advised to apply appropriate caution when implementing proprietary or non-

standard extensions, features and functions that go beyond the explicitly stated standard functionality.

3.2 Computing Platforms

This standard recognizes that NASA is a diverse agency with independent computing requirements. NASA will continue to support three desktop computing platforms: Windows, Macintosh, and Linux/UNIX.

3.3 Performance-Based Interoperability

The following tables establish the minimum desktop system hardware configurations that will support the Agency-wide interoperability software suite as defined in NASA-STD-2804.

3.3.1 Minimum Hardware Requirements for PC and Macintosh Systems

Minimum Hardware Requirements to Keep			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Base Processor Frequency (x86)	1.0 GHz	Windows 7 Requirement
	Minimum Base Processor (Intel)		Mac OS X 10.6 Requirement
Memory (RAM)	512 MB		Windows XP Requirement
	1 GB		Windows 7 Requirement
Hard Drive Capacity		10 GB	Windows XP Requirement
		16 GB	Windows 7 Requirement
Graphics Technology	32 Bit Color Support		
Display Type	LCD		CRT displays shall be retired as of June 2013
Display Resolution	1024x768 Pixels		MS Office 2007 Requirement
Optical Drive	DVD+R 16X DVD+RW 8X DVD-R 16X DVD-RW 6X CD-R 48X CD-RW 32X		
Removable Storage	Encrypted		See 3.3.3 below
Sound	Analog Stereo Output		
Speaker(s)			Internal
Interfaces	USB		
Ports	USB (Version/Quantity)	Version 2.0 / Qty - 4	
	Display Port	QTY - 1	
	Serial	QTY - 1	
Slots	PCI	QTY - 2	
	PCI-E 1x	QTY - 1	
	PCI-E 16x	QTY - 1	
Network Interface	10 Base-T Ethernet		
Smart Card Reader	Required	NIST SP 800-96 Compliant	See 3.3.4 below
Energy Savings		EPEAT Registered	See 3.3.5 below

3.3.2 Minimum to Buy Configurations

The process for selecting hardware configurations is currently being re-evaluated. The next revision of this document will revise how hardware requirements are specified. Processor and clock speed alone are no longer the only criteria that are indicative of system performance.

3.3.2.1 Minimum Hardware Requirements for PC Desktop Systems

This system is configured for general office automation use.

Minimum Hardware Requirements for PC Desktop			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	6 MB	The Intel® Core™ i5-2400S Processor (6 MB Cache, 2.5 to 3.3 GHz) can satisfy this requirement
	Minimum Core Count	4	
	Available Thread Count	4	
	Integrated Graphics Max Dynamic Frequency	1100 MHz	
	Minimum Base Processor Frequency	2.50 GHz	
	Minimum Peak Processor Frequency	3.30 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Out of band KVM support	Required	
	Maximum Thermal Design Power	65 Watts	
Halogen Free	Required		
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	500 GB 7200 RPM	
Graphics Technology		128 bit, 256 MB On-board RAM Supports Dual Display Configuration	
Display Size	22" LED		
Display Resolution	1920x1200 Pixels		
Optical Drive	16X DVD+/-RW	Internal	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Optical USB w/ Scroll		
Keyboard	USB		
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Display Port	QTY - 1	
	Serial	QTY - 1	

Minimum Hardware Requirements for PC Desktop			
System Component	Component Characteristics	Component Specification(s)	Comments
Slots	PCI	QTY - 2	
	PCI-E 1x	QTY - 1	
	PCI-E 16x	QTY - 1	
Bluetooth	Revision 2.1 or Higher		
Network Interface	10/100/1000 Base-T Ethernet		
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Energy Savings		EPEAT Gold registered	

3.3.2.2 Minimum Hardware Requirements for Macintosh Desktop Systems

This system is configured for general office automation use.

Minimum Hardware Requirements for Macintosh Desktop (21.5" i5 iMac)			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Cache Size	6 MB	The Intel® Core™ i5-2400S Processor (6 MB Cache, 2.5 to 3.3 GHz) can satisfy this requirement
	Minimum Core Count	4	
	Available Thread Count	4	
	Minimum Base Processor Frequency	2.50 GHz	
	Minimum Peak Processor Frequency	3.30 GHz	
	Processor Memory Controller	Integrated	
	Maximum Thermal Design Power	65 Watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz DDR3 SDRAM	
Hard Drive Capacity	SATA Interface	500 GB 7200 RPM	
Graphics Technology		64 bit, 256 MB On-Board RAM Supports Dual Display Configuration	Dual display requires optional Dual DVI adapter
Display Size	21.5" LCD	AMD Radeon HD 6750M graphics processor 512MB of GDDR5 memory	
Display Resolution	1920x1080 Pixels		
Optical Drive	8X DVD+/-RW	Internal	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Optical USB w/ Scroll	Apple Magic Mouse	
Keyboard	USB		
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 4	
	Thunderbolt	QTY - 1	
	Firewire 800	QTY - 1	
	Mini Display Port Output w/ DVI Support	QTY - 1	
	Dual-Link DVI	QTY - 1	
	VGA Video	QTY - 1	
Slots	SD Card Reader	QTY - 1	
Webcam (Built-in)		FaceTime HD camera 720p (1280 x 720 0.9 MP)	
Bluetooth	Revision 2.1 or Higher		
Network Interface	10/100/1000 Base-T Ethernet 802.11n		

Minimum Hardware Requirements for Macintosh Desktop (21.5" i5 iMac)			
System Component	Component Characteristics	Component Specification(s)	Comments
Smart Card Reader		NIST SP 800-96 Compliant External	
Energy Savings		EPEAT Gold registered	

3.3.2.3 Minimum Hardware Requirements for PC Laptop Systems

This system is configured for users who use a laptop for their primary system who desire mobility.

Minimum Hardware Requirements for PC Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	3 MB	The Intel® Core™ i5-2520M Processor (3 MB Cache, 2.5 to 3.20 GHz) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Integrated Graphics Max Dynamic Frequency	1300 MHz	
	Minimum Base Processor Frequency	2.50 GHz	
	Minimum Peak Processor Frequency	3.20 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	35 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	250 GB 7200 RPM Includes Free Fall Sensor or Equivalent	
Graphics Technology		128 bit, 256 MB On-Board RAM Supports Dual Display configuration with Docking Station	
Display Size	HD+	15.4" Widescreen LED	
Display Resolution	1600 x 900 Pixels		
Optical Drive	8X DVD+/-RW		
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			

Minimum Hardware Requirements for PC Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
Slots	Express Card	QTY - 1	
	SD/MMC Card Slot	QTY - 1	
	Locking Cable Slot	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Webcam	1.3 Megapixel (Built In)		
Microphone		Integrated	
Weight	5.8 lbs (Maximum)		
Energy Savings		EPEAT Gold registered	

3.3.2.4 Minimum Hardware Requirements for Macintosh Laptop Systems

This system is configured for users who use a laptop for their primary system who desire mobility.

Minimum Hardware Requirements for Macintosh Laptop (15" Core i7 MacBook Pro)			
System Component	Component Characteristics	Component Specifications	Comments
Processor	Minimum Cache Size	6 MB	The Intel® Core™ i7-2630QM Processor (6M Cache, 2.00 GHz) can satisfy this requirement
	Minimum Core Count	4	
	Available Thread Count	8	
	Minimum Base Processor Frequency	2.00 GHz	
	Processor Memory Controller	Integrated	
	Maximum Thermal Design Power	45 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	500 GB 7200 RPM	
Graphics Technology		64 bit, 256 MB On-Board RAM Supports Dual Display configuration	
Display Size		15.4" Widescreen LCD LED-backlit glossy widescreen	
Display Resolution	1440x900 Pixels		
Optical Drive	8X DVD+/-RW	Internal	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Thunderbolt	QTY - 1	
	MagSafe Power Port	QTY - 1	
	Audio Line In	QTY - 1	
	Audio Line Out	QTY - 1	
	FireWire 800	QTY - 1	
Slots	Locking Cable Slot	QTY - 1	
	SDXC Card Reader	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet / 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant External	
Webcam	1.3 Megapixel (Built In)	FaceTime HD Camera	
Microphone		Integrated	

Minimum Hardware Requirements for Macintosh Laptop (15" Core i7 MacBook Pro)			
System Component	Component Characteristics	Component Specifications	Comments
Weight	5.6 lbs (Maximum)		
Energy Savings		EPEAT Gold Registered	

3.3.2.5 Minimum Hardware Requirements for PC Lightweight Laptop Systems

This system is configured for the user who users who travel often and would like a lighter system.

Minimum Hardware Requirements for PC Lightweight Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	3 MB	The Intel® Core™ i5-2520M Processor (3 MB Cache, 2.5 to 3.20 GHz) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Integrated Graphics Max Dynamic Frequency	1300 MHz	
	Minimum Base Processor Frequency	2.50 GHz	
	Minimum Peak Processor Frequency	3.20 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	35 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	250 GB 7200 RPM Includes Free Fall Sensor or Equivalent	
Graphics Technology		128 bit, 256 MB On-Board RAM Supports Dual Display configuration with Docking Station	
Display Size	HD+	14.0" Widescreen LED	
Display Resolution	1600x900 Pixels		
Optical Drive	8X DVD+/-RW		
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Integrated	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Locking Cable Slot	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	

Minimum Hardware Requirements for PC Lightweight Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Webcam	1.3 Megapixel (Built In)		
Microphone		Integrated	
Weight	4.3 lbs (Maximum)		
Energy Savings		EPEAT Gold registered	

3.3.2.6 Minimum Hardware Requirements for Macintosh Lightweight Laptop Systems

This system is configured for user who travel often and would like a lighter system.

Minimum Hardware Requirements for Macintosh Lightweight Laptop (13.3" MacBook Pro)			
System Component	Component Characteristics	Component Specifications	Comments
Processor	Minimum Cache Size	3 MB	The Intel® Core™ i7-2620M Processor (4M Cache, 2.70 GHz) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Minimum Base Processor Frequency	2.7 GHz	
	Processor Memory Controller	Integrated	
	Maximum Thermal Design Power	35 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	Solid State	256 GB SSD	
Graphics Technology		64 bit, 256 MB On-Board RAM	
Display Size		13.3" Widescreen LCD LED-backlit glossy widescreen	
Display Resolution	1280x800 Pixels		
Optical Drive	8X DVD+/-RW	Internal	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Thunderbolt	QTY - 1	
	MagSafe Power Port	QTY - 1	
	Audio Line In	QTY - 1	
	Audio Line Out	QTY - 1	
	FireWire 800 Port	QTY - 1	
Slots	Locking Cable Slot	QTY - 1	
	SD Card Slot	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant External	

Minimum Hardware Requirements for Macintosh Lightweight Laptop (13.3" MacBook Pro)			
System Component	Component Characteristics	Component Specifications	Comments
Webcam	1.3 Megapixel (Built In)	FaceTime HD Camera	
Microphone		Integrated	
Weight	4.5 lbs (Maximum)		
Energy Savings		EPEAT Gold Registered	

3.3.2.7 Minimum Hardware Requirements for PC Ultra Lightweight Laptop Systems

This system is configured for the user who travel extensively and are willing to give up functionality for a lighter system.

Minimum Hardware Requirements for PC Ultra Lightweight Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	3 MB	The Intel® Core™ i5-2520M Processor (3 MB Cache, 2.5 to 3.20 GHz) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Integrated Graphics Max Dynamic Frequency	1300 MHz	
	Minimum Base Processor Frequency	2.50 GHz	
	Minimum Peak Processor Frequency	3.20 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	35 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	250 GB 7200 RPM Includes Free Fall Sensor or Equivalent	
Graphics Technology		Integrated	
Display Size	WXGA+	13.3" LED	
Display Resolution	1366x768 Pixels		
Optical Drive	8X DVD+/-RW	External	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Firewire 1394	QTY - 1	

Minimum Hardware Requirements for PC Ultra Lightweight Laptop			
System Component	Component Characteristics	Component Specification(s)	Comments
Slots	Express Card	QTY - 1	
	SD/MMC Card Slot	QTY - 1	
	Locking Cable Slot	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Webcam	1.3 Megapixel (Built In)		
Microphone		Integrated	
Weight	3.7 lbs		
Energy Savings		EPEAT Gold registered	

3.3.2.8 Minimum Hardware Requirements for Macintosh Ultra Lightweight Laptop Systems

This system is configured for the user who travel extensively and are willing to give up functionality for a lighter system.

Minimum Hardware Requirements for Macintosh Ultra Lightweight Laptop (MacBook Air)			
System Component	Component Characteristics	Component Specifications	Comments
Processor	Minimum Cache Size	3 MB	The Intel® Core™ i5-2557M Processor (3M Cache, 1.70 GHz)) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Minimum Base Processor Frequency	1.7 GHz	
	Processor Memory Controller	Integrated	
	Maximum Thermal Design Power	17 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	Solid State	256 GB SSD	
Graphics Technology		Intel HD Graphics 3000 processor with 384MB of DDR3 SDRAM shared with main memory3	
Display Size		13.3" Widescreen LCD LED-backlit glossy widescreen	
Display Resolution	1440x900 Pixels		
Optical Drive	8x SuperDrive	External (DVD±R DL/DVD±RW/CD-RW)	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	ThunderBolt Port	QTY - 1	
	MagSafe Power Port	QTY - 1	
	SD Card	QTY - 1	
	Audio Line Out	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant External	
Webcam	1.3 Megapixel	Facetime	
Microphone		Integrated	
Weight	3.0 lbs		
Energy Savings		EPEAT Gold registered	

Minimum Hardware Requirements for PC Engineering Workstation Systems

Minimum Hardware Requirements for PC Engineering Workstation			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	24 MB (2 x 12 MB)	Two (x2) Intel® Xeon® Processor E5645 (12M Cache, 2.40 GHz, 5.86 GT/s Intel® QPI can satisfy this requirement
	Minimum Core Count	12 (2 x 6 Core)	
	Available Thread Count	24 (2 x 12 Threads)	
	Minimum Base Processor Frequency	2.40 GHz	
	Minimum Peak Processor Frequency	2.67 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	80 watts	
Halogen Free	Required		
Memory (RAM)	12.0 GB	1333 MHz	Minimum
Internal Hard Disks	SATA Interface	2x640 GB 10,000 RPM	
		1x128 Gb Solid State Drive	
Graphics Technology	Memory Size	2 GB	The Nvidia Quadro 4000 can satisfy this requirement
	Memory Type	GDDR5	
	Memory Interface	256-bit	
	Display Connectors	- (1) Dual Link DVI - (2) Display Port	
	Natively Support	- OpenGL Version 4.1 - ProE WildFire 5 - Creo 1 - Siemens UG NX 7.5 - Ansys Workbench 13.0 - MSC.Software Patran 2010.1.2	
Mouse	Optical USB w/ Scroll		
Keyboard	USB		
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
	Serial	QTY - 1	
Slots	PCI	QTY - 2	
	PCI-E 1x	QTY - 2	
	PCI-E 16x	QTY - 1	
Bluetooth	Revision 2.1 or Higher		

Network Interface	10/100/1000 Base-T Ethernet 802.11n		
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Minimum Hardware Requirements for PC Engineering Workstation			
System Component	Component Characteristics	Component Specification(s)	Comments
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Energy Savings		EPEAT Gold registered	

3.3.2.9 Minimum Hardware Requirements for Macintosh Engineering Workstation Systems

Minimum Hardware Requirements for Macintosh Engineering Workstation			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Cache Size	16 MB	Two Intel Xeon 5500 Series processors at 2.66 GHz can satisfy this requirement
	Minimum Core Count	8 (Two Quad Core)	
	Available Thread Count	16	
	Minimum Base Processor Frequency	2.66 GHz	
	Processor Memory Controller	Integrated	
	Maximum Thermal Design Power	95 Watts	
	Halogen Free	Required	
Memory (RAM)	16.0 GB	1066mhz	
Hard Drive Capacity	SATA Interface	2x640 GB 7200 RPM	
Graphics Technology		128bit, 768MB On-Board RAM Supports Dual Display Configuration	
Display Size	24" LCD		
Display Resolution	1920x1200 Pixels		
Optical Drive	18x	Integrated VD±R DL/DVD±RW/CD-RW	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Optical USB w/ Scroll	Apple Magic Mouse	
Keyboard	USB		
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 4	
	Firewire 800	QTY - 1	
	Mini Display Port Output w/ DVI Support	QTY - 1	
	Dual-Link DVI	QTY - 1	
	VGA Video	QTY - 1	
	PCI Express 2.0 4x	QTY - 2	
	PCI Express 2.0 16x	QTY - 1	
Bluetooth	Revision 2.1 or Higher		
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant External	
Energy Savings		EPEAT Gold Registered	

3.3.2.10 Minimum Hardware Requirements for Mobile Engineering Workstation

This system is configured for the Engineering users who travel or telecommute.

Minimum Hardware Requirement for Mobile Engineering Workstation			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	6 MB	The Intel® Core™ i7-2720QM Processor (6M Cache, 2.20 to 3.30 GHz) can satisfy this requirement
	Minimum Core Count	4	
	Available Thread Count	8	
	Integrated Graphics Max Dynamic Frequency	1300 MHz	
	Minimum Base Processor Frequency	2.20 GHz	
	Minimum Peak Processor Frequency	3.30 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	45 watts	
	Halogen Free	Required	
Memory (RAM)	8.0 GB	1600 MHz	
Hard Drive Capacity	Solid State	256 GB Capacity	
Graphics Technology	Memory Size	1 GB	The Nvidia Quadro FX 2800M can satisfy this requirement
	Memory Type	GDDR5	
	Memory Interface	256-bit	
	Display Connectors	(1) Dual Link DVI (2) Display Port	
	Native Support For:	OpenGL Version 3.3 ProE WildFire 5 Creo 1 Siemens UG NX 7.5 Ansys Workbench 13.0 MSC.Software Patran 2010.1.2	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Docking Station			
Mouse	Trackpoint Pad & Optical USB w/ Scroll		
2nd Mouse	External Optical USB w/ Scroll		
Keyboard		Internal	
2nd Keyboard	External USB Keyboard		
Sound	Analog Stereo Output	Version 2.0 / QTY - 2	
Speaker(s)		Internal	
Headphones			

Minimum Hardware Requirement for Mobile Engineering Workstation			
System Component	Component Characteristics	Component Specification(s)	Comments
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 4	
	Firewire (1394)	QTY - 1	
Slots	Express Card	QTY - 1	
	SD/MMC Card Slot	QTY - 1	
	Locking Cable Slot	QTY - 1	
Bluetooth	Revision 2.1 or Higher	Integrated	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader	NIST SP 800-96 Compliant	Integrated	
Platform Integrity	Trusted Platform Module 1.2		
Webcam	1.3 Megapixel (Built In)		
Microphone		Integrated	
Weight	8.5 lbs		
Energy Savings		EPEAT Gold registered	

3.3.2.11 Minimum Hardware Requirements for PC Tablet systems

Minimum Hardware Requirements for PC Tablet			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	3 MB	The Intel® Core™ i5-2520M Processor (3 MB Cache, 2.5 to 3.20 GHz) can satisfy this requirement
	Minimum Core Count	4	
	Available Thread Count	4	
	Integrated Graphics Max Dynamic Frequency	1300 MHz	
	Minimum Base Processor Frequency	2.66 GHz	
	Minimum Peak Processor Frequency	3.2 GHz	
	Processor Memory Controller	Integrated	
	Native Hardware Assisted AES Encryption	Required	
	Native Support for Trusted Virtual Boot	Required	
	Native Anti-Theft Support	Required	
	Maximum Thermal Design Power	35 watts	
	Halogen Free	Required	
Memory (RAM)	4.0 GB	1333 MHz	
Hard Drive Capacity	SATA Interface	250 GB 5400 RPM	
Graphics Technology		Integrated	
Display Size	12.1 WXGA LED Widescreen	Touch Capacitive	
Display Resolution	1280x800 Pixels		
Optical Drive	4X DVD+/-RW	External	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Stylus, Trackpoint pad and Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	Firewire (1394)	QTY - 1	
	USB (Version/Quantity)	Version 2.0 / QTY - 2	
Slots	PCMCIA or Express Card 34/54	QTY - 1	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant Integrated	
Bluetooth	Revision 2.1 or Higher	Integrated	
WebCam	1.3 Megapixel (Integrated)		

Minimum Hardware Requirements for PC Tablet			
System Component	Component Characteristics	Component Specification(s)	Comments
Microphone		Integrated	
Weight	4.8 lbs		
Energy Savings		EPEAT Gold Registered	

3.3.2.12 Minimum Hardware Requirements for Netbook systems

This system is configured for the user who needs an itinerant use computer to enable minimal mobile access to corporate data (web access, email and document viewing).

Minimum Hardware Requirements for Netbook			
System Component	Component Characteristics	Component Specification(s)	Comments
Processor	Minimum Level 3 Cache Size	1 MB	The Intel® Atom™ Processor N550 (1M Cache, 1.50 GHz) can satisfy this requirement
	Minimum Core Count	2	
	Available Thread Count	4	
	Integrated Graphics Base Frequency	200 MHz	
	Minimum Peak Processor Frequency	1.5 GHz	
	Processor Memory Controller	800 MHz FSB	
	Maximum Thermal Design Power	8.5 watts	
	Halogen Free	Required	
Memory (RAM)	2.0 GB	667 MHz	
Hard Drive Capacity		250 GB 5400 RPM	
Graphics Technology		Integrated	
Display Size	10.1" WSVGA	LED Display	
Display Resolution	1024x600 Pixels		
Optical Drive	8X DVD+/-RW	External	
Removable Media	Encrypted USB 2.0 Memory Stick	2.0 GB, FIPS 140-2 Validated	
Mouse	Stylus, Trackpoint pad and Optical USB w/ Scroll		
Keyboard		Integrated	
Sound	Analog Stereo Output		
Speaker(s)		Internal	
Headphones			
Ports	USB (Version/Quantity)	Version 2.0 / QTY - 2	
Slots	Cable Locking Slot	QTY - 1	
	SD Card or Express Card 54	QTY - 1	
Network Interface	10/100/1000 Base-T Ethernet 802.11n		
Smart Card Reader		NIST SP 800-96 Compliant External	
Bluetooth	Revision 2.1 or Higher	Integrated	
WebCam	1..3 Megapixel (Built-in)		
Microphone		Integrated	
Weight	3.0 lbs		
Energy Savings		EPEAT Gold Registered	

3.3.2.13 Minimum Hardware Requirements for Smartphones

Function/Characteristic	Specification	Comments
Cellular Connectivity	Domestic	
Cellular Mode	700/850/900/1800/1900 MHz	CDMA, GSM, or 4G
Wireless Connectivity	802.11g Bluetooth 2.1	Support for HID, HFP, HSP Bluetooth profiles
Internal Memory	256 MB RAM / 256 MB ROM	
Screen Resolution	480 x 360/65k	
Data Storage	Internal memory or encrypted external 8 GB card (MicroSD or Mini SD)	
Battery	1100 mAh	
Service Notification	Ringtone/Vibrate/Silent	
Geographical/Location Services	Assisted GPS and/or cellular triangulation	
Device Navigation	Touch screen or built-in pointing device (trackball, scroll pad)	
Data Input	QWERTY keyboard (physical or screen based)	
Voice Input/output	Integrated earpiece/ microphone/speakerphone, 3.5mm stereo headset capable, Bluetooth headset capable	
Messaging and Calendaring Mail Attachment / Document support	Native support for NASA-STD-2804 defined messaging and calendaring standards	
Office Automation	Native support for NASA-STD-2804 defined Office Automation products.	
Mobile Device Management	Support for mobile device management suite defined in NASA-STD-2805	
Multimedia	H.264, mpg, mp4, AAC, AAC-LC, MP3, WAV, jpg, bmp, tiff, gif, png	Audio, Video, Images
Internet Browsing	HTML	
Local Device I/O	USB 2.0 and/or 30 Pin Dock Connector	Standard USB Mini USB Micro USB
Device Security	See Section 3.3.3	

3.3.2.14 Minimum Hardware Requirements for Cellular Phones

Function/Characteristic	Specification	Comments
Cellular Connectivity	Domestic	
Cellular Mode	700/850/900/1800/1900 MHz	CDMA, GSM, or 4G
Screen Resolution	176 x 220 65k	Or equivalent
Data Storage	2 GB card (MicroSD or Mini SD)	
Battery	1040 mAh	
Service Notification	Ringtone/Vibrate/Silent	
Device Navigation	Built-in pointing device (4-way, trackball, scroll pad)	
Data Input	Numeric keyboard with alpha input	
Voice Input/output	Integrated earpiece/ microphone/speakerphone, 3.5mm stereo headset capable, Bluetooth headset capable	
Productivity	Calendar, Tasks, Phone Book	
Multimedia	Audio, Video, Images	
Internet Browsing	HTML	
Connectivity	Bluetooth 2.0, USB (Standard, Micro, or Mini)	

3.3.2.15 Minimum Hardware Requirements for Pager Devices

Function/Characteristic	Specification	Comments
Cellular Connectivity	Domestic	
Cellular Mode	Single Band	900 MHz
Message Storage	10 messages minimum	
Display	Date and Time	
Backlight	Yes	
Indicator/Alerts	Alarm/Low battery/Messages	
Service Notification	Ringtone/Vibrate/Silent	
Messaging Display	Time Stamp/# of Messages/Indicator	
Device Navigation	Button(s)	

3.3.2.16 Minimum Hardware Requirements for Network Peripheral Seats

Function/Characteristic	Specification	Comments
Connectivity	10Base-T/100Base-TX, 1 Gig	
Printing Speed	35 pages per minute (ppm) B&W	
Minimum Print Resolution	600 dpi	
Duplex Printing	Automatic duplex printing	
Paper Handling	50-sheet Auto Document Feeder	
Paper Sizes	Letter and legal size	
Paper Capacity	Two (2) adjustable paper trays with a minimum of 250-sheet capacity each	Minimum of letter and legal size
Output Tray	Output tray selection	
Page Description Language	PCL6, PCL5e, Adobe Postscript 3	Support for other emerging standards
Security	Clearing/overwriting an image after completion of each job	Compliance with NIST SP 800-88 and NIST SP 800-36

3.3.2.17 Minimum Hardware Requirements for Multi-Functional Devices

Function/Characteristic	Specification	Comments
Paper Sizes	Letter, legal, and ledger size	
Paper Capacity	Two (2) adjustable paper trays with a minimum of 250-sheet capacity each	Minimum of letter, legal, and ledger size
Scan	Scan to desktop, Scan to e-mail, Scan to Network	
Scan File Formats	PDF, JPEG, TIFF, and Multi-page TIFF	
Copy	Copy Options: 1-1, 1-2, 2-2, and 2-1	
Fax	G3 33.6 Kbps Modem with auto fallback	
Input Resolution	Minimum 600 dpi	For Scan, Copy, and Fax services
Hard Drive	Minimum 40 GB	
Memory (RAM)	Minimum 1 GB	Capability to augment
Security	Enabled card reader for PIV-compliant Smartcards	Meets NIST SP 800-96

3.3.3 Minimum Mobile Device Requirements

Mobile devices entering NASA's IT environment are required to meet the minimum hardware requirements identified in section 3.3.2 as well as the following minimum mobile device requirements:

- Native support for Microsoft Exchange
- Centralized management via Microsoft Exchange ActiveSync Policies with specific support for remote wipe capability, password locking, and wipe after predetermined number of bad password attempts.
- Device encryption
- Corporate cellular phone licensing and billing agreements.

All new devices and any existing devices that undergo a significant platform revision (i.e. noteworthy operating system upgrade, hardware redesign, etc.) as part of their normal technology evolution are subject to an enterprise interoperability assessment performed by ETADS as well as an Agency-sanctioned Risk Assessment prior to being approved for use.

3.3.4 Removable Storage

Desktop computer systems procured after this standard's effective date must include a small USB-based removable encryption storage device of not less than 2 GB capacity. This storage device must be FIPS 140-2 validated.

3.3.5 Smart Card Reader

All desktop computer systems must include, a smart card reader that meets the requirements of NIST SP 800-96, and appears on the GSA's FIPS 201 Approved Product List, found at: <http://fips201ep.cio.gov/apl.php>. Additionally, the NASA Desktop Smartcard Integration project validates smartcard readers of various interface types for use on NASA desktops. Additional information on supported smartcard reader devices on specific platforms is provided on the ETADS Desktop ICAM Integration site as it become available. See <http://etads.nasa.gov/DI/CR> for current detailed information.

3.3.6 Energy Saving

Newly procured systems must be EPEAT Gold. See <http://www.epeat.net> for the list of registered systems.

EPEAT evaluates electronic products in relation to 51 total environmental criteria, identified in the [Criteria Table](#) below and contained in IEEE 1680 — 23 required criteria and 28 optional criteria. To qualify for registration as an EPEAT product, the product must conform to all the required criteria.

Products are also ranked in EPEAT according to three tiers of environmental performance: Bronze, Silver, and Gold. All registered products must meet the required criteria, and achieve Bronze status. Manufacturers may then achieve a higher level EPEAT “rating” for products by meeting additional optional criteria as follows:

EPEAT Criteria Table

Bronze



Meets all 23 required criteria

Silver



Meets all 23 required criteria plus at least 50% of the optional criteria

Gold



Meets all 23 required criteria plus at least 75% of the optional criteria

The IEEE 1680 Standard, which forms the basis of EPEAT, requires that every EPEAT registered product meet the current version of the applicable ENERGY STAR standard.

Please refer to NASA-STD-2804 for requirements on how energy-saving features should be configured.

3.3.7 Printers

All printers shall be configured for duplex printing by default. Only printers capable of supporting duplex printing shall be procured.

3.4 Section 508 Compliance Requirements

Hardware products procured after June 21, 2001 must be in conformance with Section 508 of the Rehabilitation Act. Complete information and guidance on addressing Section 508 requirements is available at:

<http://www.section508.nasa.gov>

4 REVIEW AND REPORTING REQUIREMENTS

4.1 Interoperability Reporting

Each center CIO will establish the necessary processes and tools, both manual and automated, to report on an annual basis to the NASA CIO the hardware and software configuration of all workstations at their respective centers. These data will contain sufficient information to ascertain if the workstation supports NASA employees or is Government-furnished equipment to a contractor, whether the equipment is required to be interoperable, and a description of the hardware architecture/environment. The report will specify the number of NASA employees that do not have access to interoperable workstations.

4.2 Basic Interoperability Standards Maintenance

This standard, and it's companion, NASA-STD-2804 Minimum Interoperability Software Suite, are maintained on behalf of the NASA CIO by the Emerging Technology and Desktop Standards group. Together, these standards define the software, hardware, and configurations necessary to ensure basic interoperability within the NASA information technology computing infrastructure.

This standard will be reviewed and updated on an as-required basis, not to exceed 12-month intervals. Participation in the revision process is open to all NASA employees. Details on how to be alerted of changes to the standards and/or comment on proposed updates can be found at:

<http://etads.nasa.gov/DCS>

This site also maintains interim guidance, position papers, software and hardware reviews, recommendations and other documentation intended to promote standardized basic interoperability.

5 DURATION

5.1 Duration

This standard will remain in effect until canceled or modified by the NASA CIO.

6 SUPPORTING DOCUMENTS

6.1 Supporting Documents

Supporting documents and additional information related to this standard may be found at:

<http://etads.nasa.gov/DCS>
<http://etads.nasa.gov/DSI/>