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**GROUND ELEMENTS
COMMAND, CONTROL & COMMUNICATIONS
PROJECT**

**RECORDING & RETRIEVAL SERVER
SPECIFICATION**

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SPECIFICATION FOR THE LCS

RECORDING & RETRIEVAL SERVER

1. GENERAL

1.1 Recording & Retrieval Server Description

The Recording & Retrieval (R&R) SERVER is a recording, storage, retrieval, archive and management platform for data and files related to the Launch Control System (LCS) at John F. Kennedy Space Center (KSC), Florida. The LCS will be used to perform checkout, control, and monitoring of spacecraft, launch vehicles, and ground support equipment during pre-launch processing and launch countdown of Constellation Program spacecraft being launched from KSC.

1.2 Purpose of This Document

This specification establishes the general characteristics, performance and design requirements of the R&R SERVER. This specification also defines the deliverable documentation requirements and delivery preparation, packaging, and shipping requirements.

1.3 Requirements Weighting Definitions for This Document

Specific meanings have been assigned to the words “shall”, “should”, and “will” as follows:

- “Shall” indicates a requirement to provide a function. “Shall” indicates that the requirement is mandatory and will be the subject of specific compliance verification for acceptance.
- “Should” indicates a desired goal for which there is no objective test. “Should” indicates that the product will attempt to achieve the desired goal to the maximum extent feasible while still remaining cost effective. This should not be at the expense of mandatory requirements. Statements using “should” may be subject to specific acceptance testing, but only to qualitatively assess the level of achievement of the goal against a specific defined set of test criteria.
- “Will” indicates a statement of fact or provides information and is not subject to any acceptance testing. Statements using “will” must not, by definition, refer to a goal or a requirement.

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1.4 Quality Assurance

- a. The Vendor shall deliver all required SERVER documentation to KSC concurrent with the SERVER delivery, as described in Deliverable Documentation in section 1.5.
- b. The SERVER warranty requirements shall be as follows:
 - (1) The Vendor shall furnish factory warranties against defects in materials and/or workmanship on the SERVER supplied.
 - (2) The warranties shall be 5 years after final acceptance of the SERVER.
 - (3) Failures will be repaired or replaced by the vendor with an on-site service representative for warranty repair work.
 - (4) On site repairs will be completed within the Next Business Day from the time of the service call. Repairs will be done on 8x5 Monday through Friday with 24x7 telephone support.
 - (5) Disk drives that fail shall be retained by the customer.
- c. If available without additional cost, the vendor should provide certification documentation such as ISO9001SAE, AS9100B, ISO 9001 and/or SAE AS9003, Inspection and Test Quality System for Hardware.

1.5 Deliverable Documentation

1.5.1 Operations and Maintenance (O&M) Manuals

- a. The Vendor shall provide One (1) set of Operations & Maintenance (O&M) documentation.
- b. All documentation shall be in the English language.
- c. The Vendor shall provide O&M documentation, in the form of printed manuals and/or PDF files and customarily supplied data, consisting of the following as a minimum:
 - 1) SERVER general description, including basic features, characteristics, and specifications that describe the general physical and functional makeup and operation of the SERVER.
 - 2) Interfacing data, including connector information.

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- 3) A complete set of instructions for administrative functions, including block diagrams and pictorial diagrams.
 - 4) Operating instructions that contain a full and detailed step-by-step procedure to accomplish any setup or operation the unit is required to perform, without making any assumptions (for example, about pre-existing conditions), and diagnostic processes, preventive maintenance, and troubleshooting procedures.
- d. Any additional documentation that the vendor can make available to provide insight into the workings of the SERVER, either in hard copy or soft copy format, would be desired by the Government.
 - e. The Vendor shall provide a written right of transfer to NASA and the rights to reproduce by NASA (and its designated vendor representatives) for inclusion in on-site maintenance documentation.

1.5.2 Acceptance Testing Data Package

The Vendor shall provide a **Certificate of Compliance (COC)** for this specification package.

1.6 Software Revisions

- a. The Vendor shall provide all server software on DVD/CD media in reproducible form with licensing information included.
- b. The Vendor shall provide firmware or driver upgrades or revisions within the warranty period at no additional cost.

1.7 Maintenance

The useful life of SERVER shall be at least 5 years with normal servicing and replacement of parts, during which time all requirements contained in the specification shall be met.

2. SERVER REQUIREMENTS

2.1 Environmental Requirements

2.1.1 Operating Environment

- a. The SERVER shall operate within a relative humidity range of 20% to 80%, non-condensing.

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- b. The SERVER shall be designed to operate in an air conditioned environment with the ambient room temperatures between 15.56° C (60° F) to 26.67° C (+80° F) with extremes of uncontrolled temperatures between 11.11° C (52° F) and 35° C (95° F) for one (1) hour.

2.1.2 Non -Operating Environment

- a. SERVER shall be designed to be stored within an ambient temperatures of -17° C (0° F) to 49° C (120° F).
- b. SERVER shall be designed to be stored within a relative humidity range of 10% to 80%, non-condensing.

2.2 Design and Construction Requirements

The design and construction requirements presented in this section address the general SERVER design requirements. These requirements are imposed on the design of the system to maximize safety, reliability, commonality, maintainability, and usability. The design requirements and criteria specified in this section are applicable for the SERVER.

2.2.1 Reliability, Maintainability, Availability (RMA) Requirements

The SERVER shall be designed and constructed to operate for 24 hours a day, 7 days a week, and 365 days a year.

2.2.2 Underwriters Laboratory Certifications & Approval

- a. The SERVER shall be compliant with either Underwriters Laboratory (UL) Specifications or the International Equipment Consortium (IEC) Specifications for product safety.
- b. The Vendor shall provide the results of UL or IEC compliance testing upon request.

2.2.3 Safety Requirements

- a. Any exposed electrical contacts shall be clearly marked and shielded to prevent accidental contact.
- b. Safety covers shall be non-conductive if there is insufficient metering or adjustment clearances.
- c. The SERVER shall be designed with receptacles “hot” and plugs “cold”.

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- d. The thermal design of the SERVER shall preclude surface temperatures exceeding 45° C (113° F).
- e. The SERVER shall meet limits specified in FCC Rules and Regulations for class A and B unless noted below.

2.2.4 Electromagnetic Interference

- a. The SERVER shall be compliant with FCC Class A or Class B specifications for electromagnetic emissions.
- b. The SERVER, if installed in an EMI-shielded equipment rack, shall meet all requirements during and after exposure to electromagnetic fields of 2 V/m in the frequency range from 2 MHz to 18 GHz.
- c. The SERVER, if installed in an unshielded equipment rack, shall meet all requirements during and after exposure to electromagnetic fields of 20 V/m in the frequency range from 2 MHz to 18 GHz.

2.2.5 Operating Supply Voltage

The SERVER shall operate normally within the ranges of 200 VAC to 240 VAC and 57HZ to 63Hz

2.3 Server Specifications

The R&R server should be a chassis-based, modular design with slots or bays for optional server/CPU, input/output (I/O), and storage modules.

2.3.1 CPU Requirements

- a. The SERVER shall provide multiple processor options with each processor optionally having four or more processor cores clocked at a minimum frequency of 2.93 GHz.
- b. The SERVER shall have a minimum 8 MB of L2 Cache per CPU
- c. The SERVER CPU cores shall be 64 bit and have the ability to run 64 bit operating systems.
- d. The SERVER shall provide server/host virtualization technology that can be enabled and disabled.

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- e. The SERVER shall be configurable for automatic failover of a server module to a backup server module

2.3.2 Memory/RAM Requirements

- a. The SERVER shall provide a minimum of 4GB of DDR2 ECC RAM for each core at a minimum memory speed of 1333 MHz.
- b. The SERVER shall provide a maximum memory capacity of 96 GB or more per server module

2.3.3 Disk Drive/Storage Requirements

- a. The SERVER shall provide a minimum of one slot per CPU for a local hard disk drive.
- b. The SERVER shall provide a local hard drive capacity of up to 600 GB or more.
- c. The SERVER shall provide local hard drive options that include hot-swap Serial Attached SCSI (SAS), Serial ATA (SATA), and Solid State drives.
- d. The SERVER shall provide local hard drives with a rotational speed of 7200 RPM or more.
- e. The SERVER shall provide external storage options that include Network Attached Storage (NAS), iSCSI Storage Attached Network (SAN), and Fibre Channel SAN.

2.3.3.1 Network Interface Requirements

- a. The SERVER shall provide a minimum of two 10/100/1000 Base-T Ethernet interface ports per CPU.
- b. Optional network interfaces shall include 10Gb Ethernet, 4Gb Fibre Channel, and 4X Infiniband

2.3.3.2 CD/DVD Requirements

The SERVER shall optionally provide an internal DVD+-RW/CD-RW drive.

2.3.3.3 Server Chassis Requirements

- a. The SERVER chassis shall be rack mountable in a 48.28 cm (19 inch) rack and shall be provided with a rack mounting kit.

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- b. The SERVER chassis shall be not larger than a 9U form factor.
- c. The SERVER chassis shall support up to 14 modules in hot-swap slots or bays.
- d. The SERVER chassis backplane or midplane shall provide 10GB or more bandwidth with redundant physical connections to each module.

2.3.3.4 Server Management Requirements

- a. The SERVER shall provide both local and remote system management.
- b. The SERVER shall provide health and status information via SNMPv3.

2.3.3.5 Power Supply Requirements

- a. The SERVER shall provide an N+1 power supply system using hot swappable power supplies.

2.3.3.6 Power-On Self-Test Requirements

The SERVER shall provide Power-On Self-Test.

3. PREPARATION FOR DELIVERY

The Vendor shall be responsible for preservation, packaging, and packing the SERVER and associated deliverable documentation, marking packages and containers, and shipping them to KSC.

3.1 Packing

- d. SERVER, software, and deliverable documentation shall be packed in shipping containers which ensure acceptance by common carrier and safe delivery at destination.
- e. Shipping containers shall comply with the Department of Transportation (DOT) common carrier rules and regulations as applicable to the mode of transportation.

3.2 Marking

Shipping containers shall be marked “Attention: NASA Launch Control System (LCS) R&R Server” in one-inch or larger lettering.

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4. ABBREVIATIONS AND ACRONYMS

ATA	Advanced Technology Attachment
°C	Degrees Celsius
CD	Compact Disk
CD-RW	Compact Disk Read/Write
cm	centimeter
CoC	Certificate of Compliance
CPU	Central Processing Unit
DDR2	Double Data Rate 2
DOT	Department of Transportation
DVD	Digital Video Disk
ECC	Error Correction Code
°F	Degrees Farenheit
FCC	Federal Communications Commission
Gb/S	Gigabits per second
GB	Giga Bytes
GHz	Gigahertz (billions of cycles per second)
HZ	Hertz (cycles/second)
IEC	International Equipment Consortium
I/O	Input/Output
iSCSI	Internet SCSI
ISO	International Standards Organization

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KSC	John F. Kennedy Space Center
LCS	Launch Control system
MB	Megabyte
MHz	Megahertz (millions of cycles per second)
NAS	Network Attached Storage
NASA	National Aeronautics and Space Administration
O&M	Operations and Maintenance
PDF	Portable Document Format
POST	Power-On Self Test
R&R	Recording & Retrieval
RAM	Random Access Memory
RMA	Reliability, Maintainability, Availability
RPM	Revolutions per Minute
RW	Read Write
SAN	Storage Area Network
SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment
SCSI	Small Computer Systems Interface
SNMP	Simple Network Management Protocol
UL	Underwriter's Laboratory
VAC	Volts Alternating Current