वर्गीय आवश्यकताओं के लिए मानक
टीईसी ४८१४०:२०२५

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STANDARD FOR GENERIC REQUIREMENTS

TEC 48140:2025

(Supersedes No. TEC/GR/IT/SRV-001/02 Mar-2018)

सर्वर

Server

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र
खुर्शीदलालभवन, जनपथ, नई दिल्ली–११०००१, भारत

TELECOMMUNICATION ENGINEERING CENTRE

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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This GR pertains to the technical requirements of the Servers to be used in the Indian Telecom Network. A Server is a computer or device on a network that manages network resources. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server.

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HISTORY SHEET

Sl. No	*GR.No.*	*Title*	*Remarks*
1.	TEC/GR/IT/SRV-001/01 FEB-14	Generic Requirements for SERVERS	1st issue
2.	TEC/GR/IT/SRV-001/02 MAR-18	Generic Requirements for SERVERS	2nd issue
3.	TEC 48140:2025	Standard for Generic Requirements of Server	3rd issue

REFERENCES

Sl. No.	*Document No.*	*Title/Document Name*
1	GR/ISN/-01/04.MAR 2006	GR on Intelligent Network System and Service Description.
2	TEC/SD/DD/EMC-221/05.OCT 2016	EMI/EMC Standards
3	S/CCS-02	Standard on National CCS7 for MTP and ISUP
4	QM 118, QM205, QM 206, QM 210, QM 301, QM-324, QM 351	Quality Manual issued by the QA Circle
5	QM-333	Standards on Environmental Testing for Telecom Equipment
6	IEC/EN 61000-4-2	Testing and measurement techniques – Electrostatic discharge immunity test
7	IEC/EN 61000-4-3	Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
8	IEC/EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
9	IEC/EN 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
10	IEC/EN 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
11	EN 55011	Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement

12	EN 55022	Information Technology Equipment - Radio disturbance characteristics - Limits and methods of measurement
13	ITU-T H.323	Packet-based multimedia communications systems
14	ITU-T H.225	Call signalling protocols and media stream packetization for packet-based multimedia communication systems
15	ITU-T H.235	Security and encryption for H-Series (H.323 and other H.245-based) multimedia terminals
16	ITU-T H.245	Control protocol for multimedia communication
17	ITU-T H.248	Gateway control protocol
18	ITU-T H.261	Video codec for audio visual services at p x 64 kbit/s
19	ITU-T H.263	Video coding for low bit rate communication
20	T.38	Procedures for real-time Group 3 facsimile communication over IP networks
21	T.120	Data protocols for multimedia conferencing
22	G.107	The E-model: a computational model for use in transmission planning
23	G.108	Application of the E-model: A planning guide
24	G.703	Physical/electrical characteristics of hierarchical digital interfaces
25	G.707	Network node interface for the synchronous digital hierarchy (SDH)
26	G.958	Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables
27	V.35	Data transmission at 48 kbit/s using 60-108 kHz group band circuits
28	V.36	Modems for synchronous data transmission using 60-108 kHz group band circuits

29	G.711	Pulse code modulation (PCM) of voice frequencies
30	G.726	ADPCM speech codec standard covering the transmission of voice at rates of 16, 24, 32, and 40 kbit/s
31	G.729 A	Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)
32	Q.1902	Bearer Independent Call Control protocol (Capability Set 2)
33	Q.1912.5	Interworking between Session Initiation Protocol (SIP) and Bearer Independent Call Control protocol or ISDN User Part
34	SNMP Ver 3	Simple Network Management Protocol version-3
35	ISO 9002 or 9001:2000	Series of standards, developed and published by the International Organization for Standardization (ISO), that define, establish, and maintain an effective quality assurance system for manufacturing and service industries
36	IS 8473 (latest) (equipment & IEC publication 479-1)	Information technology -- Protocol for providing the connectionless-mode network service -- Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork
37	IS 13252 (equipment & IEC publication 95 & 215)	Information Technology Equipment -- Safety, Part 1: General Requirements
38	CISPR 11	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific & medical (ISM) radiofrequency equipment
39	CISPR 22	Limits and methods of measurement of radio disturbance characteristics of ITE

CHAPTER 1

1.0 Introduction

1.1 The history of servers moves parallel to the history of computer networks. The server is to serve - so technically it means that the specific computer is serving other computers. For example, the server is a computer that facilitates other computers (in network) by making queue of the printing command of several computers at a time or acts like a file server for those applications that are accessed by other computers.

1.2 A Server is a computer or a device on a network that manages network resources. For example, a file server is a computer and storage device dedicated to storing files. Any user on the network can store files on the server. In a general network environment, the following types of servers may be found:

a. Application server- a server dedicated to running certain software applications
b. Catalog server- a central search point for information across a distributed network
c. Communications server- carrier-grade computing platform for communications networks
d. Compute server- a server intended for intensive (esp. scientific) computations
e. Database server- provides database services to other computer programs or computers
f. File server- provides remote access to files
g. Game server- a server that video game clients connect to in order to play online together
h. Mobile Server or Server on the Go is a server class laptop form factor computer.
i. Name server or DNS
j. Print server, provides printer services

k. Proxy server, acts as an intermediary for requests from clients seeking resources from other servers

l. Sound server, provides multimedia broadcasting, streaming.

m. Stand-alone server, a server on a Windows network that neither belongs to nor governs a Windows domain

n. Web server, a server that HTTP clients connect to in order to send commands and receive responses along with data contents.

1.3 For all ITU–T recommendations and TEC standards referred in this document, the latest release/issue with all associated amendments, addendum and corrigendum shall be applicable.

1.4 The RFC documents of the IETF are subject to periodic revision. Hence where ever RFC's are mentioned in this document, the offered product shall meet either the referred RFC or its updated version with all amendments/addendum. Wherever a feature of the RFC is mentioned, product shall comply with the part of the RFC specifying the feature.

1.5 The interpretation of the clauses of the RFC's shall be as per RFC 2119.

2.0 Description of Servers

2.1 Servers are classified as CISC, RISC and EPIC based servers on the basis of CPU used in the Servers.

2.1.1 CISC based CPU's

CISC based CPU stands for the CPU's made with Complex Instruction Set Computing Architecture. A **complex instruction set computer** (**CISC**) is a computer where single instructions can execute several low-level operations (such as a load from memory, an arithmetic operation, and a memory store) and/or are capable of multi-step operations or addressing modes within single instructions. To design instruction sets that directly supported high-level programming constructs such as procedure calls, loop control, and complex addressing modes, allowing data structure and array accesses to be combined into single instructions. Instructions are also typically highly encoded in order to further enhance

the code density. The compact nature of such instruction sets results in smaller program sizes and fewer main memory accesses, which resulted in savings on the cost of computer memory and disc storage, as well as faster execution. It also means good programming productivity even in assembly language similar to high level languages.

However low-end versions of complex architectures could lead to situations where it was possible to improve performance by *not* using a complex instruction (such as a procedure call or enter instruction), but instead using a sequence of simpler instructions.

One reason for this was that programmers sometimes "over-designed" assembly language instructions, i.e. including features which were not possible to implement efficiently on the basic hardware available. This had "side effects", such as the setting of a register or memory location that was perhaps seldom used; which would demand extra process cycles every time, and thus be quite inefficient.

Even in balanced high performance designs, highly encoded and high-level instructions could be complicated to decode and execute efficiently within a limited transistor budget. Such architectures therefore required a great deal of work on the part of the processor designer in cases where simpler, but slower, solutions based on decode tables and/or microcode sequencing is not appropriate.

2.1.2 RISC or EPIC based CPU's

Reduced instruction set computing, or **RISC** is a CPU design based on the insight that simplified (as opposed to complex) instructions can provide higher performance if this simplicity enables much faster execution of each instruction. A computer based on this strategy is a *reduced instruction set computer*, also called *RISC*.

The term "reduced" in that phrase was intended to describe the fact that the amount of work any single instruction accomplishes is reduced—at most a single data memory cycle—compared to the "complex instructions"

of CISC CPUs that may require dozens of data memory cycles in order to execute a single instruction. In particular, RISC processors typically have separate instructions for I/O and data processing

A RISC chip will typically have far fewer transistors dedicated to the core logic which originally allowed designers to increase the size of the register set and increase internal parallelism.

Other features that are typically found in RISC architectures are:

- Uniform instruction format, using a single word with the opcode in the same bit positions in every instruction, demanding less decoding;
- Identical general purpose registers, allowing any register to be used in any context, simplifying compiler design (although normally there are separate floating point registers);
- Simple addressing modes, with complex addressing performed via sequences of arithmetic and/or load-store operations;
- Few data types in hardware, some CISCs have byte string instructions, or support complex numbers; this is so far unlikely to be found on a RISC.

Explicitly parallel instruction computing (**EPIC**) permits microprocessors to execute software instructions in parallel by using the compiler, rather than complex on-die circuitry, to control parallel instruction execution. This was intended to allow simple performance scaling without resorting to higher clock frequencies.

2.2 Broadly Servers are classified into the following four types based on their size / modularity.

a. Tower Server

b. Rack Server

c. Blade Server

d. High End Servers

2.2.1 Tower servers:

Tower servers look more like desktops than servers. In general, if requirement is for a lot of servers, tower servers shall not be a choice, because they can take up a lot of space and are difficult to manage physically as they cannot be easily stack one on another.

Tower servers require individual monitor, keyboard and mouse or a keyboard, video, mouse (KVM) switch that allows them to be managed with a single set of equipment. Also, cabling can be difficult.

2.2.2 Rack servers:

For a data center of any reasonable size, rack servers are recommended. Rack servers are sized in Us (which is a single 1.75″ rack unit), rack servers can range from 1U to 5U, 8U, and more.

Rack servers are placed inside racks along with other data center equipment such as backup batteries, switches, and storage arrays. Rack servers make it easier to keep things neat and orderly as most racks include cable management some kind. However, rack servers don't really simplify the cabling morass since you still need a lot of cabling to make everything work — it's just neater. Each server had to have dual power cables, keyboard, video, and mouse cables and network cables.

Like tower servers, rack servers often need KVM capability in order to be managed, although some organizations simply push a monitor cart around and connect to video and USB ports on the front of the server so that they don't need to worry about KVM.

Rack servers are very expandable; some include 12 or more disks right in the chassis and support for four or more processors, each with multiple cores. In addition, many rack servers support large amounts of RAM, so these devices can be computing powerhouses

2.2.3 Blade Server:

A blade server is a server chassis housing multiple thin, modular electronic circuit boards, known as server blades. Each blade is a server in its own right, often dedicated to a single application. The blades are literally servers on a card, containing processors, memory, integrated network controllers, an optional Fiber Channel host bus adaptor (HBA) and other input/output (IO) ports.

The blade servers have no expansion challenges when compared to the tower and rack-based options.

The blade chassis has a built-in KVM functionality. Speaking of cabling, a blade environment generally has very much less of it than tower or rack environments since a lot of the connectivity is handled internally.

Another point is adding a new server consists of simply sliding it into an available slot in the chassis. There is no need to rack a new server and deal with a bunch of new cabling. This small size makes heat dissipation a challenge. Blade chassis can generate a lot of heat.

From a cost perspective, blade servers require some initial infrastructure, such as the chassis, so the upfront cost is often higher than for servers of other types

2.2.4 High End Servers:

High End Servers have modular Board or Blade based architecture. They are specially designed for mission critical applications like CDR Billing systems, Enterprise Resource Planning applications etc. The processors used in such scenarios are either RISC or EPIC based ones specially designed to cater for such environments. They do not have internal storage and boots from external storage devices.

2.3 Choice of Servers

The choice of Server depends upon the amount of data processing required and the type of applications. High End Servers are preferred for mission critical applications like large databases etc.

3.0 Functional Requirements

3.1 Tower Server CISC Type

3.1.1 Server Hardware

Sl No.	Server Parameters		Category I	Category II	Category III
	Processor				
1	No. of CPU's	Minimum	1	1	2
2	No. of processor cores per CPU	Minimum	4	8	8
3	No. of processor cores per Server	Minimum	4	8	16
4	Clock speed	Minimum	2 GHz	2 GHz	2 GHz
5	Level 1 cache memory per Core	Minimum (instruction + data)	32 KB	32 KB	32 KB
6	Level 2 cache memory per Core	Minimum	256 KB	256 KB	256 KB
7	L3 cache memory per Socket	Minimum	8 MB	16MB	16MB
	Memory				
8	Memory Size	Minimum	16 GB expandable to atleast 64 GB	64GB expandable to atleast 128GB	128GB expandable to atleast 512GB
9	Memory Types	Minimum	DDR4	DDR4	
10	Memory slots	Minimum	4 DIMMS	8 DIMMs	16 DIMMs
11	FBWC	Minimum			1 GB
12	**Operating System**		Microsoft Windows Server/ Red Hat Enterprise Linux (RHEL)/ SUSE Linux Enterprise Server (SLES)/ Oracle Enterprise Linux (OEL) / Solaris / Unix or its derivative		
13	Instruction Set	Minimum	64 bit		
	I/O				

1.4	10/100/1000 Base T Ethernet Ports	Minimum	1	2	4
15.	10/100Base-T Ethernet port for the management network	Minimum	1	1	1
.16	PCIe 3.0 slot	Minimum	2	2	4
.17	USB 2.0 /3.0 Ports -	Minimum	2	2	4
	Storage				
18	Drive bays (SAS/SATA)	Minimum	2	2	4
19	RAID Support	Minimum	RAID levels: 0, 1	RAID levels: 0, 1	RAID levels : 0, 1 optional RAID 5, 6, 10
20	Internal storage SAS or SATA	Minimum	300 GB expandable to atleast 1TB	512GB expandable to atleast 2TB	2 TB expandable to atleast 8TB
	Deployment				
	Form Factor (fully configured)	Maximum	5U	5U	5U

3.1.2 Feature Requirements for the Tower Servers:

3.1.2.1 The Processor shall be of the latest generation.

3.1.2.2 Highest clock speed and largest cache in the proposed cores of the CPU in the respective category shall be offered.

3.2 Rack Mount Server CISC Type

3.2.1 Server Hardware

Sl No.	Server Parameters		Category I	Category II	Category III	Category IV
	Processor					
1	No. of CPU's	Minimum	1	2	4	8
2	No. of processor cores per CPU	Minimum	4	8	8	8
3	No. of processor cores per Server	Minimum	4	16	32	64

4	Clock speed	Minimum	2GHz	2 GHz	2 GHz	2GHz
5	Level 1 cache memory per Core	Minimum (instruction + data)	16 KB	80 KB (32 KB Instruction Cache and 48 KB Data Cache)	80 KB (32 KB Instruction Cache and 48 KB Data Cache)	80 KB (32 KB Instruction Cache and 48 KB Data Cache)
6	Level 2 cache memory per Core	Minimum	256 KB	1.25 MB	1.25 MB	1.25 MB
7	L3 cache memory per Socket	Minimum	8MB	16MB	16MB	16MB
	Memory					
8*	Memory Size	Minimum	32GB expandable to atleast 128GB	512 GB expandable to 4 TB (per system)	512GB expandable to atleast 4 TB	512 GB expandable to atleast 4 TB
9*	Memory Types	Minimum	DDR4 / DDR5			
10	Memory slots	Minimum	8 DIMMs	16 DIMMs	32 DIMMs	64 DIMMS
11	FBWC	Minimum		1 GB	2 GB	2 GB
12	**Operating System**		Microsoft Windows Server/ Red Hat Enterprise Linux (RHEL)/ SUSE Linux Enterprise Server (SLES)/ Oracle Enterprise Linux (OEL) / Solaris /Unix or its derivative	Microsoft Windows Server/ Ubuntu Linux / Red Hat Enterprise Linux (RHEL)/ SUSE Linux Enterprise Server (SLES)/ Oracle Enterprise Linux (OEL) / Solaris /Unix or its derivative		
13	Instruction Set	Minimum	64 bit	64 bit	64 bit	64 bit
	I/O					
14	10/100/1000 Base T Ethernet Ports	Minimum	2	4	4	8
15*	10G Fiber with	Minimum	-	4 Nos of	4 Nos of	4 Nos of

	Virtual nic support/10G Base T./25G Ethernet Ports			10G/25G Ethernet ports	10G/25G Ethernet ports	10G/25G Ethernet ports
16	10/100Base-T Ethernet port for the management network	Minimum	1	1	1	1
17*	PCIe 3.0 /4.0/5.0 slot	Minimum	2	3	3	3
18	USB 2.0 /3.0 Ports		2	4	4	2
	Storage					
19	Drive bays (SAS/NLAS/SATA/ NVMe)	Minimum	2	8 Nos (SATA/NVMe)	8 Nos (SATA/NVMe)	8 Nos (SATA/NVMe)
20	RAID Support	Minimum	RAID levels: 0, 1	RAID levels : 0, 1 optional RAID 5, 6, 10	RAID levels: 0, 1 optional RAID 5, 6, 10	RAID levels: 0, 1 optional RAID 5, 6, 10
21*	Internal storage	Minimum	512GB expandable to atleast 1TB	960 GB expandable to at least 2 TB (SATA/NVMe)	960 GB expandable to at least 2 TB (SATA/NVMe)	960 GB expandable to at least 2 TB (SATA/NVMe)
	Deployment					
22	Form Factor (fully configured)	Maximum	2U	2U	4U	5U

***Note:** The exact requirement in these clauses will be specified by the purchaser as mentioned in Guidelines for the Tendering Authority clause No. 11.1

3.2.2 Server Rack

Sl No.	**Rack Cabinet Parameters**		**Category I**
1	Usable rack units		42 U
2	Width		19 in.
3	Depth		1000-1200mm
4	Static/ Dynamic load		800 - 1000 Lbs
5	Power Distribution Unit (Zero / One RU; single- and three-phase option)	Minimum	2

3.2.3 Additional Feature Specifications of Rack Mount CISC Servers:

1) Clustering Software for the offered operating system shall be supported. The Cluster Software for the offered operating system shall support metro/ geo/continental cluster solution. The cluster Software shall be compatible with the offered operating System.
2) The Servers shall support IO Accelerators / Flash Cards.
3) The servers shall be offered with the OEM's latest version of management software.

3.3 Rack Mount Server RISC/EPIC Type

3.3.1 Server Hardware

Sl No.	Server Parameters		Category I	Category II	Category III
	Processor				
1	No. of CPU's	Minimum	1	1	2
2	No. of processor cores per CPU	Minimum	8	8	8
3	No. of processor cores per Server	Minimum	8	16	32
4	Clock speed	Minimum	2.4 GHz	2.4 GHz	2.4 GHz
5	Level 1 cache memory per Core	Minimum (instruction + data)	32 KB	32 KB	32 KB
6	Level 2 cache memory per Core	Minimum	128 KB	128 KB	128 KB
7	L3 cache memory per Socket	Minimum	4MB	8MB	8MB
	Memory				
8	Memory Size		64GB expandable to atleast 128GB	128GB expandable to atleast 256GB	256GB expandable to atleast 256GB
	Memory Types		DDR4		
10	Memory slots	Minimum	12 DIMMs	16 DIMMs	32 DIMMs
11	**Operating System**		HP-UX/AIX/Solaris		

12	Instruction Set		64 bit	64 bit	64 bit
	I/O				
13	10/100/1000 Ethernet Ports	Minimum	2	4	4
14	10G Fiber with Virtual nics support/10G Base T. Ethernet Ports	Minimum	-	2	4
15	10/100Base-T Ethernet port for the management network		1	1	1
16	PCIe 2.0/3.0 slot	Minimum	2	3	6
17	USB 2.0 Ports		2	4	6
	Storage				
18	Drive bays (SAS/SATA)	Minimum	2	4	6
19	RAID Support	Minimum	RAID levels: 0, 1	RAID levels: 0,1 optional RAID 5, 6, 10	RAID levels: 0, 1 optional RAID 5,
20	Internal storage SAS/SATA/SSD	Minimum	512GB expandable to atleast 1TB	512GB expandable to atleast 2TB	1TB expandable to atleast 3TB
	Deployment				
21	Form Factor (fully configured)	Maximum	2U	2U	4U

3.3.2 Server Rack: Please refer to clause 3.2.2

3.4 Blade Server- CISC Type

3.4.1 Server Blade

Sl No.	Blade Server Parameters		Category I	Category II
	Processor			

1	No. of CPU's	Minimum	2	4
2	No. of cores per CPU	Minimum	8	8
3	No. of processor cores per Server	Minimum	16	32
4	Clock speed	Minimum	2GHz	2GHz
5	L1 cache memory per Core	Minimum (instruction + data)	32 KB	32 KB
6	L2 cache memory per Core	Minimum	256 KB	256 KB
7	L3 cache memory per Socket	Minimum	16 MB	16 MB
	Memory			
8	Memory Size	Minimum	64 GB expandable to atleast 256 GB	128 GB expandable to atleast 512 GB
9	Memory Types		DDR4	
10	Memory slots	Minimum	12 DIMMS	24 DIMMS
11	**Operating System**		Microsoft Windows Server/ Red Hat Enterprise Linux (RHEL)/ SUSE Linux Enterprise Server (SLES)/ Oracle Enterprise Linux (OEL) / Solaris	
12	Instruction Set	Minimum	64 bit	64 bit
	I/O			
13	10G Ethernet / FCoE Ports	Minimum	2	4
14	PCIe 2.0/3.0 slots	Minimum	2	2
	Storage			
15	Hot-swappable drive bays (SAS-2/SATA-2/NLSAS/SSD)	Minimum	2	2
16	Internal storage	Minimum	512GB expandable to atleast 1TB	512GB expandable to atleast 1TB
17	RAID Support	Minimum	RAID levels : 0, 1	RAID levels : 0, 1
	Deployment			
18	Form Factor (fully configured)		Blade	Blade

3.4.2 Blade Chassis

Quantity of the blade chassis shall be determined by the no of blade server required.

Sl No.	Blade Chassis Parameters		Category I
1	Height		6U - 12U
2	Width:	Typical	18 in
3	No. of Blades per chassis	Minimum	8
4	Redundant Cooling modules	Minimum	6
5	AC Power		200-240 V
	Interconnect Interfaces		
6	SAN Storage Interface (16Gbps)/FCoE	Minimum	4
7	10GE Optical LAN Interface/FCoE	Minimum	2
8	10/100 Base-T Management Interface	Minimum	1

3.4.3 Blade Rack

Sl No.	Rack Cabinet Parameters		Category I
1	Usable rack units	Minimum	42 U
2	Height	Typical	75 in.
3	Width	Typical	19 in.
4	Depth	Typical	38 in.
5	Static/ Dynamic load	Maximum	2300 Lbs
6	Power Distribution Unit (single and three-phase option)	Minimum	2

3.4.4 Functional Specifications of Blade Server:

3.4.4.1 The Rack/Chassis shall have internal/external 10Gbps Ethernet switch with redundancy and shall support the VMready standards

3.4.4.2 The Ethernet switches shall be of L2 and L3 and shall support the L3 functionalities such as VLAN, FCOE, Routing features etc.

3.4.4.3 The blade servers offered are to be run with an uptime of 99%.

3.4.4.4 Clustering Software for the offered operating system shall be supported. The Cluster Software for the offered operating system shall support metro/geocontinental cluster solution. The cluster Software shall be compatible with the offered operating System.

3.4.5 Functional Specifications for Blade Chassis:

3.4.5.1 Rack mountable Chassis to accommodate and Support for half/full height/wide blades in the same enclosure.

3.4.5.2 Shall provide common resources essential for the Blade Servers like Power, System Management, Cabling, Ethernet/ FCoE Management and expansion, external Fiber Channel Storage switching and connectivity.

3.4.5.3 Blade chassis shall support Blade Servers of CISC/RISC/EPIC/any combinations based blades.

3.4.5.4 The blade chassis shall be configured with redundant remote management controllers

3.4.5.5 The blade chassis shall be configured with Hot Swap IP Based KVM functionality for management or KVM Management shall be integrated in remote management controller

3.4.5.6 Hot Swap and redundant variable speed cooling fans and all fans shall be fully populated.

3.4.5.7 The enclosure shall be populated fully with power supplies of the highest capacity available with the vendor. Power Supplies shall support N+N redundancy.

3.4.5.8 The Blade System shall be able to do the dynamic Power Management of the resources as follows:

a) Automatically shut down the servers if required, based on user policies and schedules

b) Dynamically optimize the power usage and performance based on server workload policy

c) Cap the power of individual server or a group of servers

d) Intelligently assign the power to the appropriate server in the pool based on policy settings

e) Show the actual power usage and actual thermal measurements data of the servers

f) Show a historical trend of power and temperature and generate comprehensive power reports.

3.4.5.9 System management tools for configuring the Blade Servers and OS Deployment shall be provided.

3.4.5.10 The system shall provide support for remote console management, Power on/off blades, monitoring the power status, temperature, cooling fans status, I/O status, system diagnostic programs etc. provided through the management software.

3.4.5.11 The blade chassis shall be configured with cables, connectors and accessories required to connect the Power distribution units to the power supplies.

3.4.5.12 The chassis shall have LED/LCD panel to provide power-on, location, information and system error conditions. Necessary hardware management console software is to be supplied.

3.4.5.13 The chassis with all of the enclosures are to be run with an uptime of 99%

3.5 Blade Server- RISC/EPIC Type

3.5.1 Blade Server

Sl No.	Blade Server Parameters		Category I	Category II
	Processor			
1	No. of CPU	Minimum	1	2
2	No. of cores per CPU	Minimum	8	8
3	No. of processor cores per blade	Minimum	8	16
4	Clock speed	Minimum	2.4 GHz	2.4 GHz
5	L1 cache memory per Core	Minimum (instruction + data)	32KB	32KB
6	L2 cache memory per Core	Minimum	128KB	128KB
7	L3 cache memory per Socket	Minimum	4MB	8MB
	Memory			
8	Memory Size	Minimum	128GB expandable to atleast 256GB	256GB expandable to atleast 384GB
9	Memory Types	Minimum	DDR3	DDR3
10	Memory DIMM slots	Minimum	8	16
11	**Operating System**		HP-UX/AIX/Solaris	

12	Instruction Set	Minimum	64 bit	
	I/O			
13	10G Optical Ethernet Ports	Minimum	2	2
14	PCIe 2.0/3.0 Slots	Minimum	2	2
	Storage			
15	SAS-2/SATA-2/SSD drive bays	Minimum	2	2
16	Internal storage	Minimum	512GB expandable to atleast 1TB	512GB expandable to atleast 1TB
17	RAID	Minimum	OS RAID 0,1	OS RAID 0,1
	Deployment			
18	Form Factor (fully configured)		Blade	Blade

3.5.2 Blade Chassis

Please refer to clause 3.4.2 for details

3.5.3 Blade Rack

Please refer to clause 3.4.3 for details

3.5.4 Functional Specifications of RISC/EPIC Blade Server:

3.5.4.1 The Rack/Chassis shall have internal/external10Gbps Ethernet switch with redundancy and shall support the VMready standards

3.5.4.2 The Ethernet switches shall be of L2/L3 and shall supports the L3 functionalities such as VLAN, FCOE, OSPF etc.

3.5.4.3 The blade servers offered are to be run with an uptime of 99%.

3.5.4.4 The Solution shall offer clustering software as part of the OS.

3.5.4.5 The Solution shall offer capacity planning tool software as part of the OS.

3.5.4.6 Real time performance management tool is mandatory.

3.5.5 Additional Functional Specifications for Blade Chassis:

Please refer to clause 3.4.5 for details

3.6 High-end Server- RISC/EPIC Type

3.6.1 Server Hardware

Sl No.	Server Parameters		Category I	Category II	Category III	Category IV

	Processor					
1	No. of CPU Positions	Minimum	4	8	16	32
2	No. of cores per CPU	Minimum	8	8	8	8
3	Total processor cores	Minimum	32 expandable to 64	64 expandable to 128	128 expandable to atleast 256	256 expandable to atleast 512
4	Clock speed	Minimum	2.5 GHz	2.5 GHz	2.5 GHz	2.5 GHz
5	Level 1 cache memory per Core	Minimum (instruction + data)	32 KB	32 KB	32 KB	32 KB
6	Level 2 cache memory per Core	Minimum	128 KB	128 KB	128 KB	128 KB
7	L3 cache memory per Socket	Minimum	24MB	24MB	24MB	24MB
	Memory					
8	Memory Size	Minimum	1TB expandable to atleast 4TB	2TB expandable to atleast 4TB	2TB expandable to atleast 4TB	2TB expandable to atleast 8TB
9	Memory Types	Minimum	DDR3	DDR3		
10	Memory DIMM slots	Minimum	32	64	64	64
11	**Operating System**		HP-UX/ Oracle Solaris/ IBM AIX		HP-UX/ Oracle Solaris/ IBM AIX	
12	Instruction Set	Minimum	64 bit		64 bit	
	I/O					
13	10GE Ethernet Ports	Minimum	8	8	8	16
14	PCIe 2.0/3.0 bus	Minimum	8	16	16	24

Bidder can propose OEM rack also with Standard Specification to cater the solution.

3.6.2 Server Rack

Sl No.	Rack Cabinet Parameters		Category I
1	Usable rack units	Minimum	42 U
2	Height	Typical	75 in.
3	Width	Typical	19 in.
4	Depth	Typical	38 in.
5	Redundant Cooling modules	Minimum	10
6	AC Power		200-240 V
7	SAN Storage Interface (8Gbps)	Minimum	4
8	10GE Optical LAN Interface	Minimum	2
9	10/100 Management Ethernet Interface	Minimum	1
10	Static/ Dynamic load	Maximum	2300 Lbs
11	Power Distribution Unit (single and three-phase option)	Minimum	2

3.6.3 Features to be supported for the High-end Server:

3.6.3.1 The boot shall be through internal /external SAN Storage

3.6.3.2 The system shall interface with an External Storage system as described in SAN Storage to be connected for database connectivity.

3.6.3.3 Each server shall be configured with highest redundancy components possible in the Server portfolio.

3.6.3.4 The server shall be configured with full redundant PCI Express cards. All adapters shall be PCIe only in external I/O drawers.

3.6.3.5 Power supply shall be hot-swappable and shall be replaceable while the system is running

3.6.3.6 The virtualisation software shall not have any restriction on adding/removing cores, memory, disks and I/O resources. The virtualisation software shall be licenses to create any number of virtual partitions limited only with the hardware.

3.6.3.7 Operating System:

a) Partitions shall be configured with full core with capability to create sub-CPU partitioning also.
b) Shall have inbuilt logical volume management capability with the volume manager
c) The server shall be configured with 64-bit OEM UNIX/or its derivatives Operating System with unlimited license.
d) The vendor shall guarantee the O/S backward compatibility with applications.
e) Any configuration change in one partition shall not affect any other partition unless desired
f) An error in one partition shall not bring the entire system or other partitions down
g) Each partition shall be upgradeable separately and independently without affecting other partitions.
h) Latest version of 64-bit OEM Unix Operating System with latest patch level must be provided.
i) It shall include: Volume Management & OS based File System
j) The Unix Operating Systems shall be licensed to support unlimited users. Future Patches and upgrades shall also be licensed.
k) Partition management software having dynamic configuration feature with GUI / Web interface
l) Management Consoles for the same shall be provided.

3.6.3.8 The system shall support PCI error handling.

3.6.3.9 The system shall support Redundant, hot-swap/pluggable I/O interconnect modules.

3.6.3.10 Server main components shall be Fault-tolerant.

3.6.3.11 The system shall support Redundant AC input.

3.6.3.12 The system shall support Dynamic power management

3.6.3.13 Server shall be populated with full capabilities for highest redundancy.

3.7 General Features to be supported for the Rack Mount / Blade / High End Servers

3.7.1 The Processor generation will be specified by the purchaser as mentioned in Guidelines for the Tendering Authority clause no. 11.1.

3.7.2 Latest and better clock speed and largest cache CPU available shall be offered.

3.7.3 Each server shall be populated and configured with minimum supported CPUs. The term "CPU" here refers to one physical socket which may be containing minimum. Cores as specified in the different categories.

3.7.4 All servers shall be provided with the capability of being partitioned through virtualisation; each partition shall have its own operating system instance, host name and IP address.

3.7.5 Each partition using virtualisation shall be able to run same or different versions of OS kernel, patch levels, etc. independently. Any configuration change in one partition shall not affect any other partition.

3.7.6 Each partition shall have the capability to start-up and shutdown independently without affecting any other partition on the same server.

3.7.7 The OS of each partition shall be upgradeable separately and independently without affecting the other partitions.

3.7.8 The server shall support necessary virtualization software to create partitions and manage these partitions.

3.7.9 Necessary virtualization, cluster configuration and management software are to be provided with unlimited users.

3.7.10 The virtualisation software shall not have any restriction on adding/removing cores, memory, disks and I/O resources. The virtualisation software shall be licenses to create any number of virtual partitions limited only with the hardware.

3.7.11 Operating system/Virtualisation software offered shall include the following features:

a) Virtualisation functionality to allow the creation of multiple shared processor partitions within the server

b) Workload management for simplification and enhancing the capabilities for managing a system's workload

c) Patch management system for identifying, acquiring, installing, and verifying patches

d) Dynamic multipath I/O for fiber channel and SCSI I/O paths for disk and tape devices.

3.7.12 The Server shall support memory sparing/mirroring and lockstep technology.

3.7.13 The server shall support Agent less management.

3.7.14 The server shall support out of band Management.

3.8 Server Performance Requirements applicable to Blade Servers and High End Servers

3.8.1 The Server shall provide unified performance state view in single console, integrate network, server and performance management.

3.8.2 The Server shall support TCP based server agents to ensure availability and performance for target server nodes and deliver scalable, real-time management of critical systems.

3.8.3 The Server shall monitor various operating system parameters such as processor, memory, files, processes, file system, etc. using agents on the servers to be monitored.

3.8.4 It shall be possible to configure the operating system monitoring agents to monitor based on user-defined thresholds for warning/critical states.

3.8.5 The server shall be capability to be integrated with network performance management system and support operating system monitoring.

3.8.6 The Server shall manage the following parameters:

a) **Processors:** Each processor in the system shall be monitored for CPU utilization. Current utilization is compared with user-defined warning and critical thresholds.

b) **File Systems:** Each file system shall be monitored for the amount of file system space used, which is compared with user-defined warning and critical thresholds.

c) **Log Files:** Logs shall be monitored to detect faults in the operating system, the communication sub-system, and the applications. System agents also analyse the log files residing on the host for specified string patterns.

d) **System Processes:** System agents shall provide real-time collection of data from all system processes. It identifies whether or not an important process has stopped unexpectedly. It can also automatically restart Critical processes.

e) **Memory:** System agents shall monitor memory utilization and available swap space and shall raise an alarm in event of threshold violation.

3.8.7 The Server shall provide automated management to detect, isolate and resolve problems autonomously.

3.8.8 The Server shall provide monitoring wherein it will track critical status such as

a) CPU utilization

b) Memory capacity

c) File system space

3.9 Green Server Requirements

3.9.1 Power Supply Efficiency

The efficiency and power factor of the Power Supplies shall be as per Energy Star or Environment Protection Agency [EPA] Gold standards.

3.9.2 The Power Supply shall meet the Energy Star or Environment Protection Agency [EPA] Gold Requirement for idle state efficiency.

3.9.3 **CPU Power Saving Technology:** The CPU shall support speed throttling and power saving technology (DVFS – Dynamic Voltage and Frequency Scaling) that reduces the processor's clock rate and voltage when the processor is idle. The aim is to minimize overall power consumption and lower heat generation, allowing for slower (and quieter) cooling fan operation.

3.9.4 Operating System features for Power Saving

a) The operating systems shall take advantage of hardware features to deliver optimal power efficiency for any given workload running on the server.

b) The OS shall continuously alter the power states of the processors in the system in response to the utilization level of the workload. This ensures that processor power usage maps to the needs of the workload, with minimal impact on performance.

c) The Operating Systems shall achieve additional power savings by combining processor power state control with features that consolidates work onto a smaller number of processor cores when workload utilization is low. This feature places unused processor cores into a deep sleep state, effectively scaling the number of processor cores in active use.

d) The OS shall also support features which shall extend the time that processor cores stay in deep sleep states by avoiding waking cores unnecessarily.

e) The System shall support automatic fan speed management

f) The System shall support Power Saving Measures in High End / Blade Server Configurations such that the Blades/Boards are switched ON/OFF during low workload periods.

3.9.5 Measurement of Power Parameters

a) The supervisory power management system shall be enabled by default

b) The system shall have the capability to measure real-time power use, Processor utilization, Temperature etc

3.10 IPv6 Requirements: The supplied operating system of the Servers shall meet the IPv6 requirements as per RFC8200, RFC 4861, RFC 4862, RFC 8201 and RFC 4443.

3.11 Synchronisation:

a) The Server shall Support Network Time Protocol (NTPv4 as per RFC 5905) for synchronizing with a central NTP server.

b) The Server shall support Precision Time Protocol (PTP) as per IEEE 1588-2008 for synchronizing with a central PTP server. This is optional. However exact requirement will be specified by the purchaser as mentioned in Guidelines for the Tendering Authority clause no. 11.1.

4.0 Interconnectivity and Inter-Operability Requirements

The interconnectivity interfaces for the Servers shall be as per the following Standards.

4.1 General

1) The Server shall be based on commercially available pluggable SFP optics for all optical interfaces and Pluggable SFP for Electrical Interfaces.
2) The Server shall support full duplex capabilities on all Ethernet ports
3) All Ethernet interfaces shall be based on IEEE 802.3 Standards

4) **Physical Interface**: The instrument shall support atleast the following physical interfaces [The exact requirement of the interfaces shall be specified by the purchaser]
   i. 10/100 Ethernet interface
   ii. 10/100/1000 Ethernet auto sensing as per IEEE 802.3 full duplex
   iii. 1G Optical interface
   iv. 10G Optical interface
   v. 10G electrical interface
   vi. 16 GE fiber channel interface towards SAN
   vii. 32 GE fibre channel interface towards SAN
   viii. 25 GE Optical Ethernet Interface

4.2 10/100 Ethernet Interface

1) 10/100 Base-T, 100mt, autosensing

4.3 10/100/1000 Ethernet Interface

1) 10/100/1000 Base-T, 100mt, autosensing

4.4 1GE Optical Interface

1) Wavelength: 850 nm multi-mode
2) Distance coverage: 500 m

4.5 10GE Optical Interface

1) Wavelength: 850 nm multi mode
2) Distance coverage: 200 m
3) The interface shall be based on SFP+

4.6 10 GE Electrical Interface

4.7 16 GE Fiber Channel Interface towards SAN

1) Wavelength: 850 nm multi mode
2) Distance coverage: 100 m
3) Fiber Channel Interface shall be as per standards of T11 Technical Committee of the International Committee for Information Technology Standards (INCITS), an American National Standards Institute (ANSI)-accredited standards committee.

5.0 Qualitative Requirements (QR):

The system shall meet the following qualitative requirements:

5.1 The manufacturer shall furnish the MTBF value. Minimum value of MTBF shall be specified by the purchaser. The calculations shall be based on the guidelines given in either QA document No. QM-115 {January 1997} "Reliability Methods and Predictions" or any other international standards.

5.2 The equipment shall be manufactured in accordance with international quality management system ISO 9001:2015 or any other equivalent ISO certificate for which the manufacturer should be duly accredited. A quality plan describing the quality assurance system followed by the manufacturer would be required to be submitted.

5.3 The equipment shall conform to the requirements for Environment specified in TEC QA standards QM-333 {Issue- March, 2010} (TEC 14016:2010) "Standard for Environmental testing of Telecommunication Equipment" or any other equivalent international standard, for operation,

transportation and storage. The applicable environmental category A or B to be decided by the purchaser based on the use case.

6.0 EMI/EMC Requirements

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report from accredited test lab shall be furnished from a test agency.

a) Conducted and radiated emission (applicable to telecom equipment):

Name of EMC Standard: "CISPR 32 (2015) with amendments - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment".

Limits:-

i) To comply with Class B of CISPR 32 (2015) with amendments for indoor deployments and Class A of CISPR 32 (2015) with amendments with amendments for outdoor deployments.

b) Immunity to Electrostatic discharge:

Name of EMC Standard: IEC 61000-4-2 {2008) "Testing and measurement techniques of Electrostatic discharge immunity test".

Limits:-

i) Contact discharge level 2 {± 4 kV} or higher voltage;

ii)Air discharge level 3 {± 8 kV} or higher voltage;

c) Immunity to radiated RF:

Name of EMC Standard: IEC 61000-4-3 (2010) "Testing and measurement techniques-Radiated RF Electromagnetic Field Immunity test".

Limits:-

For Telecom Equipment and Telecom Terminal Equipment without Voice interface (s)

Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz.

d) Immunity to fast transients (burst):

Name of EMC Standard: IEC 61000-4-4 {2012) "Testing and measurement techniques of electrical fast transients/burst immunity test".

Limits:-

Test Level 2 i.e.

a) 1 kV for AC/DC power lines;

b) 0. 5 kV for signal / control / data / telecom lines;

e) Immunity to surges:

Name of EMC Standard: IEC 61000-4-5 (2014) “Testing & Measurement techniques for Surge immunity test".

Limits:-

i) For mains power input ports : (a) 2 kV peak open circuit voltage for line to ground coupling (b) 1 kV peak open circuit voltage for line to line coupling

ii) For telecom ports : (a) 2kV peak open circuit voltage for line to ground (b) 2KV peak open circuit voltage for line to line coupling.

f) Immunity to conducted disturbance induced by Radio frequency fields:

Name of EMC Standard: IEC 61000-4-6 (2013) with amendments) "Testing & measurement techniques-Immunity to conducted disturbances induced by radio- frequency fields”.

Limits:-

Under the test level 2 {3 V r.m.s.} in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines.

g) Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any):

Name of EMC Standard: IEC 61000-4-11 (2004) “Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests”.

Limits:-

i) a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500 ms)

ii) a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) and

iii) a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s.

iv) a voltage interruption corresponding to a reduction of supply voltage of >95% for 10s.

h) Immunity to voltage dips & short interruptions (applicable to only DC power input ports, if any):

Name of EMC Standard: IEC 61000-4-29:2000: Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests.

Limits:-

i. Voltage Interruption with 0% of supply for 10ms. Applicable Performance Criteria shall be B.

ii. Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms. Applicable Performance Criteria shall be C.

iii. Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms. Applicable Performance Criteria shall be B.

iv. Voltage dip corresponding to 40% & 70% of supply for 100ms, 300 ms and 1000ms. Applicable Performance Criteria shall be C.

v. Voltage variations corresponding to 80% and 120%of supply for 100 ms to10s as per Table 1c of IEC 61000-4-29. Applicable Performance Criteria shall be B.

Note: - For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC/SD/DD/EMC-221/05/OCT-16 (TEC 11016:2016) and the referenced base standards i.e. IEC and CISPR standards and the references mentioned therein unless otherwise specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (h) and TEC Standard TEC/SD/DD/EMC-221/05/OCT-16 (TEC 11016:2016). The details of IEC/CISPR and their corresponding Euro Norms are as follows:

IEC/CISPR	Euro Norm

CISPR 11	EN 55011
CISPR 32	EN55032
IEC 61000-4-2	EN 61000-4-2
IEC 61000-4-3	EN 61000-4-3
IEC 61000-4-4	EN 61000-4-4
IEC 61000-4-5	EN 61000-4-5
IEC 61000-4-6	EN 61000-4-6
IEC 61000-4-11	EN 61000-4-11
IEC 61000-4-29	EN 61000-4-29

7.0 Safety Requirements

The equipment shall conform to relevant safety requirements as per IS/IEC 62368-1:2018 or Latest as prescribed under Table no. 1 of the TEC document 'SAFETY REQUIREMENTS OF TELECOMMUNICATION EQUIPMENT": TEC10009: 2024. The manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.

8.0 Security Requirements

8.1 Physical Security

a. There shall be lock and Key arrangement for the Server Rack

8.2 Security of the Operating System

a. The OEM shall identify the vulnerabilities periodically using standard tools. No proprietary tools shall be used.

b. The OEM shall supply and assist in the installation of patches in time for all the known vulnerabilities

c. It shall be possible to remove unnecessary services, applications, and network protocols such as File and printer sharing services, Wireless networking services, Remote control and remote access programs, Directory services, Web servers and services, Email services (e.g., SMTP), Language compilers and libraries, System development tools, System and network management tools and utilities, including Simple Network Management Protocol (SNMP) etc

d. It shall be possible to configure OS user authentication such as Remove or Disable Unneeded Default Accounts, Disable Non-Interactive Accounts, Create the User Groups, Create the User Accounts, Configure Automated Time Synchronization, Check the Organization's Password Policy, Configure Computers to Prevent Password Guessing

e. It shall be possible to configure resource controls appropriately.

f. The Server shall not permit remote monitoring from outside the network.

8.3 Security of the System Software

8.3.1 It shall be possible to secure the system software in the following way:

a. Install the server software either on a dedicated host or on a dedicated guest OS if virtualization is being employed.

b. Apply any patches or upgrades to correct for known vulnerabilities in the server software.

c. Create a dedicated physical disk or logical partition (separate from OS and server application) for server data, if applicable.

d. Remove or disable all services installed by the server application but not required (e.g., gopher, FTP, HTTP, remote administration).

e. Remove or disable all unneeded default user accounts created by the server installation.

f. Remove all manufacturers' documentation from the server.

g. Remove all example or test files from the server, including sample content, scripts, and executable code.

h. Remove all unneeded compilers.

i. Apply the appropriate security template or hardening script to the server.

j. For external-facing servers, reconfigure service banners not to report the server and OS type and version, if possible.

k. Configure warning banners for all services that support such banners..

l. Configure each network service to listen for client connections on only the necessary TCP and UDP ports, if possible

m. Limit the access of the server application to a subset of computational resources.

n. Limit the access of users through additional access controls enforced by the server, where more detailed levels of access control are required.

8.3.2 Typical files to which access shall be controlled are as follows:

a. Application software and configuration files

b. Files related directly to security mechanisms:

i) Password hash files and other files used in authentication

ii) Files containing authorization information used in controlling access

iii) Cryptographic key material used in confidentiality, integrity, and non-repudiation services

c. Server log and system audit files

d. System software and configuration files

e. Server content files.

8.3.3 Server host OS access controls shall be used to enforce the following:

a. Service processes are configured to run as a user with a strictly limited set of privileges (i.e., not running as root, administrator, or equivalent).

b. Service processes can only write to server content files and directories if necessary.

c. Temporary files created by the server software are restricted to a specified and appropriately protected subdirectory (if possible). Access to these temporary files is limited to the server processes that created the files (if possible).

8.4 Maintaining Security of the System

8.4.1 Logging

1. Logging is a cornerstone of a sound security posture. Capturing the correct data in the logs and then monitoring those logs closely is vital. Procedures and tools need to be in place to process and analyze the log files and to review alert notifications.

2. Server logs shall provide—

a. Alerts to suspicious activities that require further investigation
b. Tracking of an attacker's activities
c. Assistance in the recovery of the server
d. Assistance in post-event investigation
e. Required information for legal proceedings.

3. All servers shall use time synchronization technologies, such as the Network Time Protocol (NTP), to keep their internal clocks synchronized with an accurate time source. This provides accurate timestamps for logs
4. It shall be possible to back up and archive the Log files regularly.
5. Many servers receive significant amounts of traffic, and the log files quickly become voluminous. Automated log analysis tools shall be supplied to ease the burden on server administrators. These tools analyze the entries in the server log files and identify suspicious and unusual activity.

8.4.2 **Server Backup**

a. Server shall support RAID feature
b. The server shall support full, incremental, and differential backup.
c. **Full backups** include the OS, applications, and data stored on the server (i.e., an image of every piece of data stored on the server hard drives).
d. **Incremental backups** reduce the impact of backups by backing up only data that has changed since the previous backup (either full or incremental).
e. **Differential backups** reduce the number of backup sets that must be accessed to restore a configuration by backing up all changed data since the last full backup.

8.5 The Server shall comply to the security guidelines issued by DoT vide letter no. 10-54/2010-CS-III (ILD) dt.31/05/2011 and subsequent amendments if any. Approval against this GR shall not be construed as an authorization to evade surreptitiously, regulations including toll-bypass concerning the use of telecom

services. Functioning or intended use of the SERVER shall conform to the prevailing license conditions/laws/regulation/instructions of Govt. of India.

9.0 Other Mandatory Requirements

9.1 Engineering Requirements: The system shall meet the following engineering requirements:

a) The equipment shall be fully solid state and adopt state of the art technology.

b) The equipment shall be compact, composite construction and light weight. The actual dimensions and weight of the equipment shall be furnished by the manufacturers.

c) All connectors shall be reliable, low loss and standard type so as to ensure failure free operations over long operations.

d) The equipment shall have adequate cooling arrangements, if required.

e) Each sub-assembly shall be clearly marked with schematic reference to show its function, so that it is identifiable from the layout diagram in the handbook.

f) Each terminal block and individual tags shall be numbered suitably with clear identification code.

g) All controls, switches, indicators etc. shall be clearly marked to show their circuit diagrams and functions.

9.2 Operational Requirement (OR): The system shall meet the following maintenance & operational requirements:

a) The equipment shall be designed for continuous operation.

b) The equipment shall be able to perform satisfactorily without any degradation at an altitude upto 3000 meters above mean sea level.

c) Suitable visual indications shall be provided to indicate the healthy and unhealthy conditions.

d) The design of the equipment shall not allow plugging of a module in the wrong slot or upside down.

e) The removal or addition of any cards shall not disrupt traffic on other cards in case of card type line driver, except in case of Rack Server, for which this clause is not applicable.

f) Special tools required for wiring shall be provided along with the equipment.

g) In the event of a bug found in the software, the Manufacturer shall provide patches and firmware replacement if involved, free of cost. Compatibility of the existing hardware shall be maintained with future software/firmware.

h) In the event of a full system failure, a trace area shall be maintained in non-volatile memory for analysis and problem resolution.

i) A power down condition shall not cause loss of connection configuration data storage.

j) The system hardware / software shall not pose any problem, due to changes in date and time caused by events such as changeover of millennium / century, leap year etc., in the normal functioning of the system.

k) Wherever, the standardized documents like ITU-T, IETF, QA, TEC etc. documents are referred, the latest issue and number with the amendments shall be applicable.

l) Power Supply:

i) The equipment shall be able to function over the range specified in the respective chapters, without any degradation in performance.

ii) The equipment shall be protected in case of voltage variation beyond the range specified and also against input reverse polarity.

iii) The derived DC voltages shall have protection against short circuit and overload.

9.3 Documentation, Installation and Maintenance:

9.3.1 Documentation:

This chapter describes the general requirements for documentation to be provided for Servers. All technical documents shall be in English language both in CD-ROM and in hard copy.

9.3.1.1 The documents shall comprise of:

i) System description documents.

ii) Installation, Operation and Maintenance documents.

iii) Training documents.

iv) Repair manual.

9.3.1.2 System description documents: The following system description documents shall be supplied along with the system:

a) Over-all system specification and description of hardware and software.
b) Equipment layout drawings.
c) Cabling and wiring diagrams.
d) Detailed specification and description of all Input / Output devices.
e) Adjustment procedures, if there are any field adjustable units.
f) Spare parts catalogue of OEM supplied hardware modules and interconnect cables to be provided.
g) The list of software/ firmware installed on the Server along with versions and brief description to be provided.
h) The list of application software packages installed on the Server along with versions and brief description to be provided.
i) Program and data listings.
j) Graphical description of the system. In addition to the narrative description a functional description of the system using the functional Specification.

9.3.1.3 System operation documents: The following system operation documents shall be available:

a) Installation manuals and testing procedures.
b) Precautions for installation, operations and maintenance.
c) Operating and Maintenance manual of the system.
d) Safety measures to be observed in handling the equipment.
e) Man-machine language manual.
f) Fault location and troubleshooting instructions including fault dictionary.
g) Test jigs and fixtures required and procedures for routine maintenance, preventive maintenance and unit / card / sub-assembly replacement.
h) Emergency action procedures and alarm dictionary.

9.3.1.4 Training Documents:

a) Training manuals and documents necessary for organizing training in installation, operation and maintenance and repair of the system shall be made available.

b) Any provisional document, if supplied, shall be clearly indicated. The updates of all provisional documents shall be provided immediately following the issue of such updates.

c) The structure and scope of each document shall be clearly described.

d) The documents shall be well structured with detailed cross-referencing and indexing enabling easy identification of necessary information.

e) All diagrams, illustrations and tables shall be consistent with the relevant text.

9.3.1.5 Repair Manual:

a) List of replaceable parts used.

b) Detailed ordering information for all the replaceable parts.

c) Procedure for trouble shooting and sub-assembly replacement.

d) Test fixtures and accessories for repair.

e) Systematic trouble shooting charts (fault tree) for all the probable faults with their remedial actions.

9.3.2 Installation:

a) All necessary interfaces, connectors, connecting cables and accessories required for satisfactory installation and convenient operations shall be supplied. Type of connectors, adopters to be used shall be in conformity with the interfaces defined in this GR.

b) The diagnostic software utilities and support required for carrying out the testing of the equipment before final commissioning shall be supplied with the equipment

c) All installation materials, consumables and spare parts to be supplied.

d) All literature and instructions required for installation of the equipment, testing and bringing it to service shall be made available in English language.

e) For the installations to be carried out by the supplier, the time frames shall be furnished by the supplier including the important milestones of the installation process well before commencing the installations.

f) The equipment shall have:

i) Proper earthing arrangement.

ii) Protection against short circuit / open circuit.

iii) Protection against accidental operations for all switches / controls provided in the front panel.
iv) The racks housing the server should have the protection against entry of dust, insects and lizards

9.3.3 Software Maintenance:

9.3.3.1 All the software updates shall be provided on continuous basis for a minimum period of 5 years from the date of induction of system in the service provider's network. These updates shall include new features and services and other maintenance updates.

9.3.3.2 The software for the support of all protocols and interfaces mentioned in this GR shall be ensured in the devices.

9.4 MINIMUM EQUIPMENTS FOR TYPE APPROVAL TESTING

Any Type and Category of Servers can be offered for Type Approval Certificate at least with the minimum configuration and the same shall be mentioned in the Type Approval Certificate. The Type Approval certificate shall be issued for the offered Type and category.

10.0 Desirable Requirements

This chapter describes the desirable requirements for the Servers and will depend upon the application of the Servers. Hence the tendering authority may choose out of the features mentioned below as per requirement.

10.1 Database Management Requirement applicable to Servers planned for Database Applications

10.1.1 The Server shall have the capability to automate monitoring, data collection and analysis of performance from single point.

10.1.2 The Server shall set threshold and send notifications when an event occurs, enabling database administrators (DBAs) to quickly trace and resolve performance-related bottlenecks.

10.1.3 The Server shall have the Database performance management solution for Distributed RDBMS includes hundreds of predefined scans for monitoring various database, operating system and network resources. This minimizes the need to write and maintain custom scripts. One can

modify an existing script to meet a special monitoring situation or requirements.

10.1.4 The Server shall Report conditions that exceed threshold with respect to user-defined parameters and automatically takes corrective actions.

10.1.5 The Server shall send alerts for an array of server conditions, including inadequate free space, runaway processes, high CPU utilization and inadequate swap space.

10.1.6 The Server shall provide threshold and alarms to proactively react to problems.

10.1.7 The Server shall create real-time, historical custom graphs and stacks for comparison, correlation and trending across any collected database or database server.

10.1.8 After installation, the Server shall identify database changes automatically.

10.1.9 The Server shall support historical archive store for performance information in a compressed time-series form. DBAs can drill down through layers of data to discover the cause of a condition occurring with the databases, operating system or network. The historical reports shall be used to perform trend analysis and capacity planning.

10.1.10 The Server shall support trace, analyse and tune resource consuming SQL statements.

10.1.11 The Server shall support platform independent, browser based console to monitor performance, analyse and take corrective actions from remote locations.

10.2 Cloud Ready features

10.2.1 Infrastructure management

a) The Server shall have the capability to provide proactive notification of actual or impending component failure alerts. Automatic Event Handling shall be supported to configure actions to notify appropriate users of failures through e-mail, pager, or Short Message Service (SMS) gateway.

b) The Server shall have automatic execution of scripts or event forwarding to NMS as per TEC GR.

c) The Server shall support task initiation on multiple systems or nodes from a single command on the management system to eliminate the need for tedious, one-at-a-time operations performed on each system.

d) The Server shall provide the option of a browser-based GUI or a command line interface (CLI) to make it easy to incorporate into your existing management processes.

10.2.2 Remote Management

a) The Server shall support embedded hardware Graphical Remote Console capabilities of the servers that can turn a supported browser into a virtual desktop, giving the user full control over the display, keyboard, and mouse of the host server.

b) The Server shall support integration with enterprise-class directory services like Microsoft Active Directory and LDAP to provide secure, scalable, and cost effective user management.

c) The server shall support real time Virtual KVM functionality and be able to perform a remote Power sequence. The server shall support both Java / Java-free browsing options.

d) The server shall be able to connect using popular mobile devices like Apple IOS and Android based devices

e) The server shall support management of core system components out-of-band without involving SNMP or WBEM on operating system

f) The server shall have the ability to map the remote media to the server. The server shall support file transfer from the user's desktop/laptop folders to the remote server with only the Lights-Out network connectivity.

g) The server shall have the ability to capture the video sequence of the last failure and the boot sequence and also playback the video capture

h) The server shall have the ability for multiple administrators across remote locations to collaborate on the remote session even in a server lights-out mode (with a maximum of 6 sessions)

10.2.3 **Power Management**

a) The server shall be able to show the actual power usage and actual thermal measurements data of the servers. Must also show a historical trend of power and temperature and generate comprehensive power reports.

b) The server shall support integration with facilities management software to enable planning on actual power consumption.

c) The server shall be able to automatically shut down the servers if required, based on user policies and schedules

d) The server shall be able to dynamically optimize the power usage and performance based on server workload policy.

e) The server shall be able to cap the power of individual server or a group of servers. The server shall be able to intelligently assign the power to the appropriate server in the pool based on policy settings.

f) The server shall be able to support power discovery of servers and blades to help visualize data centre thermals.

10.2.4 **Performance Management & Alerting**

a) The server shall have the ability to perform a hardware level (32 bit & 64 bit) measurement. The server shall also monitor CPU, I/O, Memory, Storage & Network

b) The server shall have ability to compare the hardware performance with known performance capabilities of each component.

c) The server shall have the ability to provide comprehensive recommendations for the issue and the resolution.

d) The server shall have the ability to automatically trigger events and alerts based on performance issues or thresholds set

e) The server shall be able to events when the performance state of a server changes. Should detect these changes early, displaying a warning before an actual bottleneck happens.

10.2.5 **Deployment**

a) The server shall have the capability of deploying Operating Systems on multiple servers simultaneously and also be able to schedule deployment as and when needed.

b) The server shall have the capability to perform scripted installation of most popular Operations Systems to reduce the time required in deployment.

c) The server shall have the capability of capturing and deploying OS images

d) The server shall have the capability of configuring the hardware and changing system settings such as RAID level before the deployment of the Operating System. The server shall also have the capability of capturing the hardware settings and replicating it across servers.

10.2.6 **Integration with Enterprise Management software**

a) The server shall have the ability to get event and traps from the Datacentre equipment and enterprise management software.

b) The server shall have the ability to send the alerts directly to the vendor via a secure connection for a quick fix.

10.2.7 **Server Migration**

a) The server shall have ability to perform a Physical-to-virtual (P2V) migration (Migrates a physical machine to a virtual machine guest in a virtual machine host) and Virtual-to-virtual (V2V) migration. (Migrates a virtual machine guest between virtualization layers)

10.2.8 **Virtual Machine Management**

a) The server shall be able to provide control functions for virtual machines from a single management software

b) The server shall be able to provide failed hosts recovery by assigning alternate hosts to VMs

c) The server shall be able to provide central management and control for virtual machines hosted on Microsoft Hyper-V server, VMware ESX Server, or Xen on RHEL or SLES.

10.2.9 **Reporting**

a) The server shall be able to generate various reports based on formats using the latest industry standards

b) The server shall support reporting. Reports communicate power and thermal information -- from individual server utilization to data-centre-level summaries and analysis. Reports on under-utilized servers identify those that are power hogs, are idle but still running, or are decommissioned but not powered off.

c) The server shall have the ability to generate reports for system bottleneck state and overall performance utilization

10.2.10 **Cloud Security Features:**

The cloud security features as per international standards shall be supported.

CHAPTER 2

11.0 Tendering Information

11.1 Guidelines for the Tendering Authority:

The tendering authority shall specify the following parameters:

1.	Type of Server
2.	Category of Server
3.	Type of input Power Supply i.e. AC, DC or Both
4.	Requirement of Operating System in case of CISC Servers
5.	No of Blades to be populated in case of Blade Server OR No of Blades to be populated shall be decided by the supplier based on the specified performance objectives required for the application
6.	No. of CPU cores and Memory size to be equipped in case of High end server. OR The CPU core and Memory requirement shall be decided by the supplier based on the specified performance objectives required for the application (E.g. No. of CDR's to be processed in a CDR application or No. of Customers to be supported in a CRM application etc)
7.	Requirement of Memory Size corresponding to clause 3.2.1 (8)
8.	Requirement of Memory Type corresponding to clause 3.2.1 (9)
9.	Requirement of Type & Number of Ethernet port supported corresponding to clause 3.2.1 (15)

10.	Requirement of Type & Number of PCIe Slots corresponding to clause 3.2.1 (17)
11.	Requirement of Internal Storage Capacity corresponding to clause 3.2.1 (21)
12.	Processor Generation corresponding to clause 3.7.1
13.	Support for Precision Time Protocol (PTP) corresponding to clause 3.11(b)
14.	Requirement of Type & No. of Physical Interfaces corresponding to clause 4.1 (4)
15.	Requirement of database management for servers to be used as database servers as per clause 10.1
16.	Requirement of cloud ready features as per clause 10.2
17.	Requirement of clustering software
18.	For optional features, the requirement if any may be stipulated by tendering/purchasing authority

GLOSSARY

BICC	Bearer Independent Call Control
BSNL	Bharat Sanchar Nigam Limited
CD ROM	Compact Disk Read Only Memory
DOT	Department of Telecommunications
GSN	Gateway Serving Node
GUI	Graphical User Interface
IETF	Internet Engineering Task Force
ISN	Interface Serving Node
ITU-T	International Telecommunication Union- Telecommunication Sector
Megaco	Media Gateway Control Protocol
MGCP	Media Gateway Control Protocol
MTNL	Mahanagar Telephone Nigam Limited
NL SAS	Near Line SAS
PSTN	Public Switched Telephone Network
QA	Quality Assurance
RAS	Registration, Admission and Status
RTCP	Real-Time Control Protocol
RTP	Real-Time Transport Protocol
SAS	Serial Attached SCSI (Small Computer System Interface)
SATA	Serial Advanced Technology Attachment
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SIP-T	Session Initiation Protocol for Telephony
TEC	Telecommunication Engineering Centre
TSN	Transit Serving Node
UDP	User Datagram Protocol
VoIP	Voice over Internet Protocol