CENTRE FOR RAILWAY INFORMATION SYSTEMS

BID DOCUMENT PART-II FOR

TENDER FOR PROCUREMENT OF DATA LAYER SOLUTION FOR NEXT GENERATION PASSENGER RESERVATION SYSTEM (PRS) OF INDIAN RAILWAYS

NEW DELHI

JUNE 2025

TENDER DOCUMENT
PART-II

SCOPE OF WORK
AND
SPECIAL CONDITIONS OF CONTRACT

The Special Conditions of Contract (SCC) as laid down in this document override the terms laid down in the General Conditions of Contract (Standard Bid Document Part-I or SBD-I (including modifications)) which are available on IREPS (Indian Railways E-Procurement System) website and can be downloaded from the site www.ireps.gov.in. All terms and conditions not specifically mentioned in the SCC shall be governed as per the terms and conditions of tender and SBD-I (including modifications).

Contents

1. Project Background

1.1. About Indian Railways

Indian Railways (IR) is amongst the largest Railway systems in the world, addressing a significant part of the country's transportation needs, both in the passenger and freight segment. The annual revenue of Indian Railways is about Rs.2,40,000 Cr.

1.2. About CRIS

Ministry of Railways established Centre for Railway Information Systems (CRIS) in 1986 as the umbrella organization for all ICT activities of Indian Railways (IR). CRIS is a project-oriented organization engaged in development of major IT systems of the Railways.

1.3. About Next Generation Passenger Reservation System (PRS)

One of the major applications of Indian Railways is the Passenger Reservation System (PRS). Reserved travel by Indian Railways is facilitated by the Passenger Reservation System (PRS). The system currently operates from 4 Data centres. These data centres are connected by a core IP network that enables universal terminals across the entire country, through which the travelling public can reserve a berth on any train, between any pair of station for any date and class. Currently there are more than 7000 terminals installed at more than 2000 points of presence across the Country, which are connected to the data centres using a state-of-the-art IP based terminal network. The system currently handles more than 900 booking/Cancellation transactions per second and 12,000 enquiry transactions per second.

This system was developed in 90's on technologies available at that time, thus, to keep pace with the technology, it has been decided to re-build the current PRS system on latest technologies. The transition to the new system will be undertaken in evolutionary manner to mitigate risks involved in migration of such a huge IT system. The main objective is to build Open standard based system which can be easily integrated with other systems/devices.

In addition to the above requirements, enhancements in the functional capabilities such as Enablement of multiple payment modes, support for integrating with smart cards, Seamless integration with business analytics and decision support system for trend analysis etc. are also required to be done in the new system. Additionally, the new system should also adhere to the basic requirements of high capacity OLTP systems i.e. high scalability, high performance, high availability, high level of security, ease of operations and high agility and should cater to much higher capacity from day one

To achieve the above objects the Next Gen PRS applications is being developed using the cloud native technologies (micro service architecture, container platform etc). The application development is being undertaken in-house by CRIS.

1.4. About Passenger Reservation System Data layer (PRS Data layer)

The PRS Data Layer is a crucial component of the Next Generation PRS application, bearing the responsibility of managing data persistence and caching. This critical function ensures the achievement of key goals such as heightened availability, scalability, and agility, all while upholding the integrity of business operations.

PRS Data layer consists of Data Persistent Layer and Cache layer for getting the data for processing and keeping the data in persistent state. If there will be some change/update in the data fetched from the Persistent Datastore and Cache as per the Business logic, then same will be update to the Data Persistent Layer and Cache layer. This layer will be highly resilient, scalable and agile. This will ensure the business integrity with high availability.

The Cache layer will be used to store the data in memory, and it will be referred by applications for faster data access and processing. This will store the train data and it will be used for enquiry such as trains

between two stations, fare, train schedule, availability etc. This layer may be used for storing the inventory and passenger data also. An insert/update for inventory and passenger data will be updated synchronously to the persistent layer also. This RFP is for procuring the Transactional Data store and its underlying Operating System, RDBMS, Cache (IMDG) solution for PRS Data Layer that can effectively handle the requirements of the Next Generation PRS application. It should be capable of handling high volumes of data and concurrent requests, ensuring high availability and scalability.

2. Scope of Work

2.1. Supply, Installation & Integration, configuration of setup including Disaster Recovery replication setup and processes, Acceptance Testing, Performance Tuning and Commissioning of following software components:

- Transactional Data Store and its underlying Operating System,
- RDBMS,
- In Memory Data Grid (caching)

as per deployment architecture (Section 3), functional requirements (Annexure III), technical specification(Annexure-IV), Schedule of Requirement (Annexure-II), Detailed Scope of Work (Section 4), Inspection and Acceptance Test procedure (Section 11) for the Data Layer Solution for Next Generation Passenger Reservation System in primary data centre at Railway Internet Data centre (RIDC), CRIS, Chanakyapuri, New Delhi and in DR Data centre located at Secunderabad Railway Station premises, Secunderabad. The delivery schedule and consignee detail provided in Section 7.8 and Section 7.9 respectively

2.2. Provisioning of required OEM technical resources (Professional services) for deployment architecture design, installation, configuration (including Disaster Recovery replication setup and processes), performance tuning activities, design, data modelling, architecture validation and recommending best practices etc for supplied software components for primary and DR data centres. Bidder should provide an undertaking from OEM in this regard. The OEM of respective product also must conduct knowledge transfer session for CRIS team on the solution implemented.

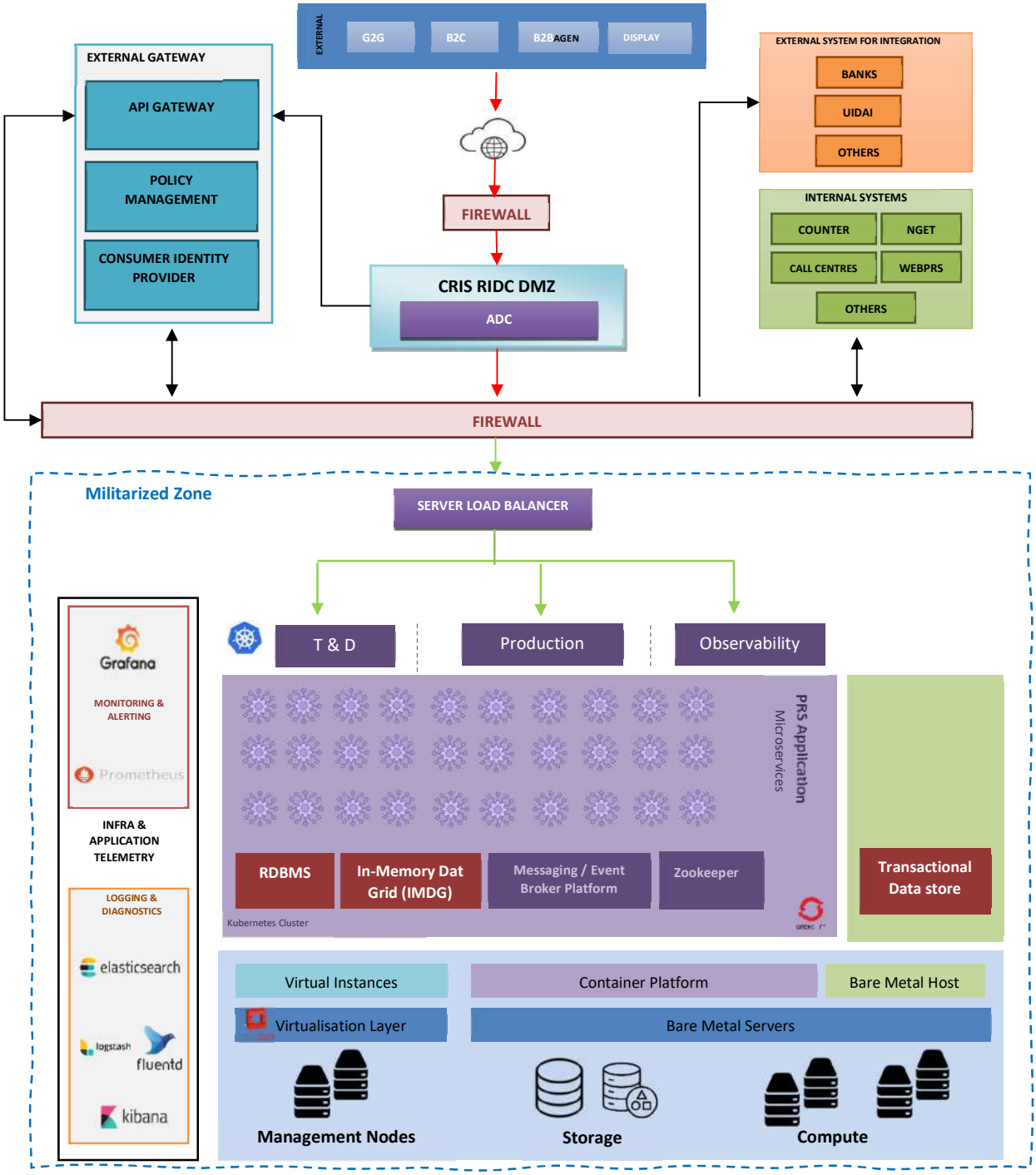
2.3. Provide required technical support and the OEM resources of the supplied software components for integration with other infrastructure components of Next Generation Passenger Reservation System either procured through separate sourcing process or open-source components. These components include Container Orchestration platform, IAM/PIAM ,SIEM ,NMS etc and details of hardware and software component list specified in Annexure – IB and Annexure XIX. The details of the Next Generation PRS System deployment architecture is provided in section 3.1.

2.4. Maintenance Support of supplied software components as per Schedule of Requirement shall be valid for a period of 03 years from the date of Commissioning of the Solution at Primary DC and DR DC, whichever is later.

3. Next Generation PRS System Deployment Architecture

3.1 Overall System Deployment Architecture

The deployment of Next generation Passenger Reservation System is planned to be done by following the architecture given below:



Note: This RFP is for the procurement of RDBMS, IMDG and Transactional Data Store Solution and it's underlying Operating System.

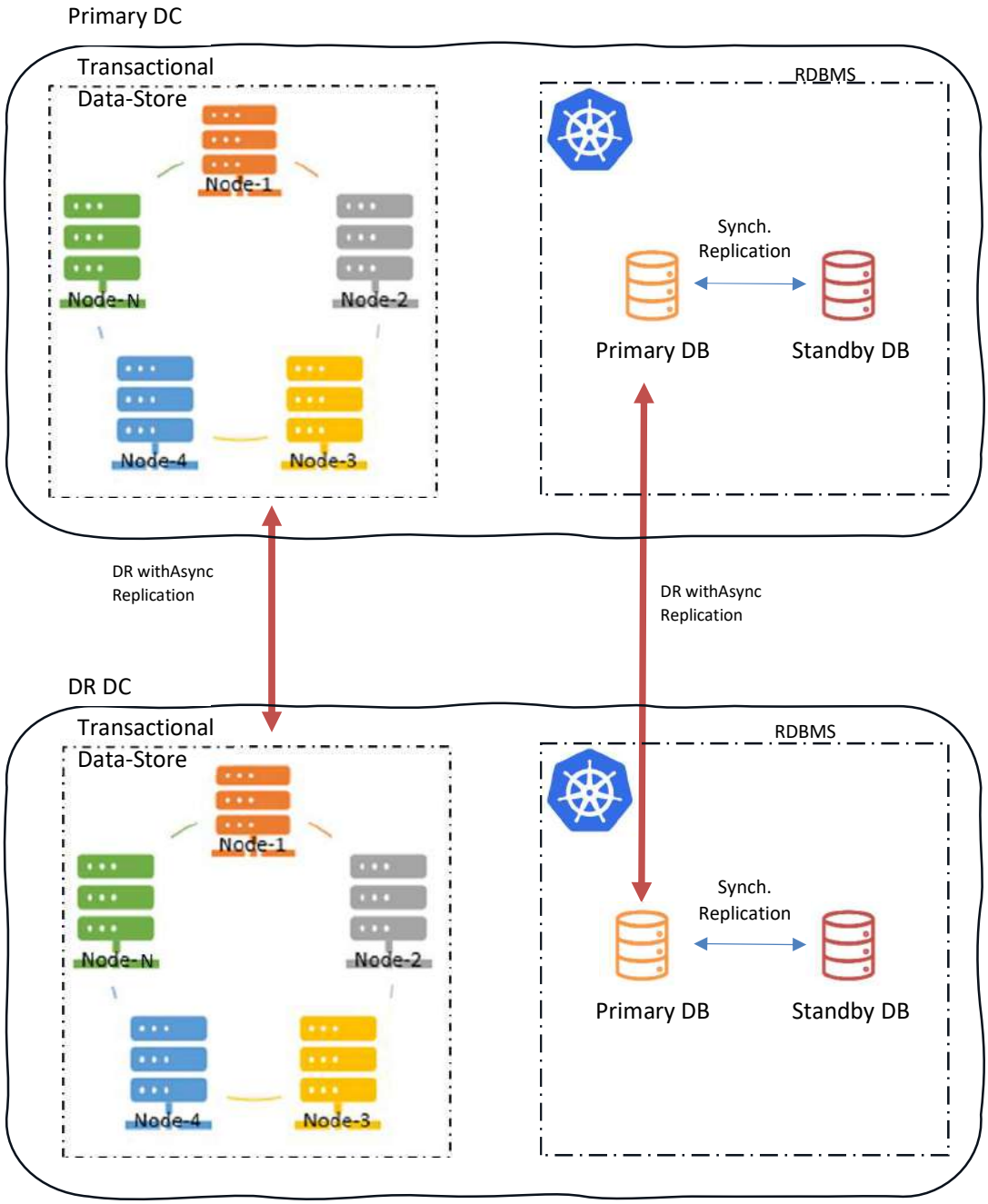
For details of deployment architecture, refer to Annexure I-E.

3.2 New PRS System Deployment Architecture for Data Layer

The deployment of data layer consists of Transactional datastore, RDBMS and In Memory Data Grid (caching) solutions.

3.2.1 Transactional Datastore

The transactional datastore solution will consist of a minimum of two clusters: one located in the Primary Data Centre (DC) and the other in the Disaster Recovery (DR) DC.



The transactional datastore solution will be deployed in production over the Bare metal servers at both the Primary DC and DR DC clusters independently. Both the clusters present at primary and DR DC will be up at all the time with asynchronous replication configured between Primary DC and DR DC. All the services of

transactional datastore solution will be available at both the data centres simultaneously with the required capability of read and write.

The design of the transactional datastore solution prioritizes data integrity, aiming to eliminate data loss within the cluster under all circumstances, while also enforcing strong data consistency for all write operations.

The replication factor /Number of Copies with in the same DC for the transactional datastore cluster will be configured in accordance with best practices provided by the Original Equipment Manufacturer (OEM) to ensure high availability

This solution should be engineered to handle high-volume workloads and should always provide uniform performance at all times and should be capable to be deployed over Kubernetes cluster, VM instances and Bare metal servers.

Additionally, the solution should offer a dashboard, providing comprehensive monitoring capabilities for all clusters. This dashboard will include but is not limited to the following critical metrics for Transactional data store:

a) Storage - Total, Usage, Free
b) Memory - Total, Usage, Free
c) Replication factor of different namespaces/databases
d) IOPS (Input/Output Operations Per Second)
e) TPS (Transactions Per Second)
f) Throughput
g) User administration
h) User role-base access control
i) RTO (Recovery Time Objective)
j) RPO (Recovery Point Objective)
k) Latency & response time

3.2.2 RDBMS

The Relational Database Management Systems (RDBMS) set-up should be configured in cluster with High Availability (HA) to eliminate any single points of failure and to ensure real-time data consistency and availability. The Standby database within a data centre should be able to serve read requests.

The Relational Database Management Systems (RDBMS) must be deployed in an active-active configuration between the primary Data Centre (DC) and the Disaster Recovery (DR) DC with asynchronous replication. These RDBMS clusters will be deployed on a container platform, specifically RedHat OpenShift, provided by CRIS in both the primary DC and DR DC.

The solution should offer the real-time monitoring of both the RDBMS deployed in primary and DR DC. The OEM should provide dashboard to perform real-time monitoring at different levels such as database instances, CPUs, Disk Storages, Memory, Statements in application including dynamic SQL, tables, locks, connection, deadlock, transactions.

3.2.3 In Memory Data Grid (caching) Solution

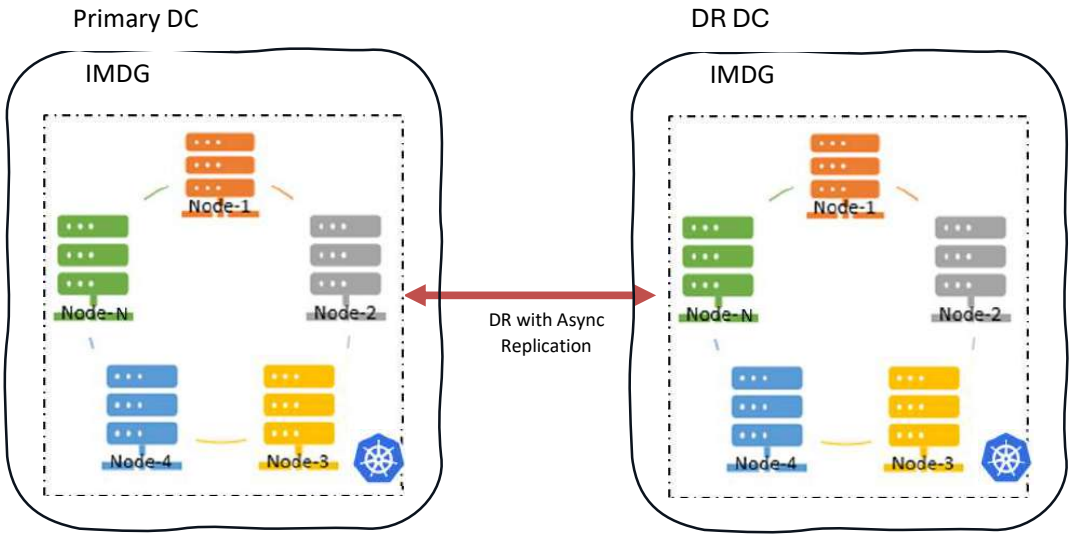
The In Memory Data Grid (caching) solution will be deployed over on a container platform, specifically RedHat OpenShift Container Platform (Version 4.14 or above) provided by CRIS in both the primary DC at Railway Internet Data centre (RIDC), CRIS, Chanakyapuri, New Delhi and in DR Data centre located at

Secunderabad Railway Station premises, Secunderabad independently. Both the clusters present at primary and DR DC will be up at all the time with asynchronous replication configured between Primary DC and DR DC for data set as per the application requirements.

All the services of In Memory Data Grid (caching) solution will be available at both the data centres simultaneously with the required capability of read and write.

The solution should provide the dashboards and monitoring tools to provide insights into the performance, health, and usage of the data grid.

a) Node Overview: Health, status, and resource utilization of each node.
b) Memory Usage: Real-time memory usage metrics, including heap and off-heap memory.
c) Cache Efficiency: Hit/miss ratios, eviction rates, and data distribution.
d) Network Performance: Latency and data transfer metrics.
e) Transaction Metrics: Operation throughput and latency.



3.2.4 Operating System (To be provided by the Bidder)

The underlying operating system for the set up will be Red Hat Enterprise Linux. Based on the requirement of the proposed transaction data store solution, i.e., deployed directly over the Bare metal servers or deployed over the Virtual machine instances, the subscription of the RHEL with smart management, premium support for 03 years need to be provisioned by the bidder.

Following are the number of servers that will be provided by CRIS for deployment of transaction Datastore for which operating system has to provided by the bidder:

Data Centre	EnvironmentType	Physical Server provided by CRIS (Server Details – Annexure I-A)
Primary Site	Production	5
	Staging	1
DR Site	Production	5

Note: - The MAF of OEM of Red Hat Operating System is required in the format mentioned in clause (Sno 4- OEM Undertaking).

3.2.5 PRS Data layer environment details with enterprise version deployment

PRS Data layer components will install with enterprise grade on all the environment as per below given table:-

	PRS Data Layer - Environment wise Enterprise version Deployment details				
	Environment Type	Physical Server provided by CRIS	Transactional Datastore with supporting and management components	In Memory Data Grid (Caching)	RDBMS
Primary Site	Production	5	Bare Metal	Container *	Container *
	Staging	1	VM	Container *	(Open-Source version) *
	T & D	0*	Container *	Container *	(Open-Source version) *
DR Site	Production	5	Bare Metal	Container *	Container*
	Staging	0*	Container *	Container *	(Open-Source version) *
	T & D	0*	Container ᵀ	Container ᵀ	(Open-Source version) *

* The deployment will be done within the container orchestration platform provided by CRIS

ᵀ The deployment for the DR Site for T & D set-up will be done over the Container platform in Staging environment using different Namespace capabilities, i.e, Staging namespace and TnD namespace.

Note: The proposed **Transactional Data Store** solution for the production environment shall be deployed across all five servers, as specified in **Annexure IA**, provided by **CRIS**. The **Bidder** must supply the necessary licenses for all these servers, as detailed in the table above.

For Transaction data Store, if the **YCSB benchmark** (Section 32.1) is conducted using more physical servers or equivalent virtual instances than those specified in the table above for production environment of primary DC, the **Bidder** shall be responsible for providing the required additional licenses along with the corresponding servers, ensuring compliance with the specifications outlined in **Annexure IA**.

3.3 Sizing Consideration for the PRS Data layer

The sizing requirements for three components i.e Transactional datastore, RDBMS and In Memory Data Grid (caching) solution are given below.

3.3.1 Transactional Datastore

The solution for transactional Data Store for Primary Data centre (DC) and Disaster Recovery (DC) will be sized based on the following sizing requirement:

Below are the key data sizing requirements for the Transaction data store:

3.3.1.1. Sizing requirement for production environment for Transactional Datastore

Solution will be design based on the following day one requirements:

a) The solution should cater 1,50,000 Reads per second.
b) The solution should cater 25,000 Writes per second.
c) The Solution should deliver low-latency performance, with a P99 latency of 2 milliseconds or less for reads and 3 milliseconds or less for writes operations for 6 TB of unique data in a DC, maintaining a Read/Write ratio of 80% reads to 20% writes.
d) The DR DC setup should be identical as Primary DC w.r.t. sizing parameters and should be capable to handle 100% of Primary DC load with same level of performance.
e) The subscription for the supplied solution should be as per the Day one performance requirement.

The solution should be capable to deploy over Kubernetes cluster, VM instances and Bare metal servers.

3.3.1.2. Sizing requirement for Staging and T&D environment for Transactional Datastore

Transactional Data Store								
Environment	**Minimum Nodes**	**Physical Core per Node**	**RAM (GB) per Node**	**Storage (GB) per Node**	**Deployment**	**Total Core**	**Total RAM (GB)**	**Total Storage (GB)**
T&D	1	4	32	100	Container	4	32	100
Staging	3	4	32	200	VM/Container	12	96	600

Note:- The sizing parameter of staging environment in DR -DC is same as above.

3.3.2 RDBMS

3.3.2.1 Sizing requirement for production environment for RDBMS

The solution for RDBMS for Primary Data centre (DC) and Disaster Recovery (DC) will be in High availability within the data centre. The solution should be capable to be deployed over Kubernetes cluster, VM instances and Bare metal servers. The DC and the DR cluster should be in Active-Active mode. The RDBMS with 12 number of cores will be deployed in each of the primary DC and DR DC over the Kubernetes setup, i.e., the DR DC setup should be identical as Primary DC w.r.t. sizing parameters and should be capable to handle 100% of Primary DC load with same level of performance.

Total number of Subscription required for Primary and DR DC	UOM	Environments
Primary DC	Number of Cores/Nodes	12/3 nodes of min. 4 cores each
DR DC	Number of Cores/Nodes	12/3 nodes of min. 4 cores each

3.3.2.2 Sizing Details for Staging and T&D environment for RDBMS

RDBMS (Open-Source version)								
Environment	**Minimum Nodes**	**Physical Core per Node**	**RAM (GB) per Node**	**Storage (GB) per Node**	**Deployment**	**Total Core**	**Total RAM (GB)**	**Total Storage (GB)**
Staging	2	4	16	250	Container	8	32	500
T & D	2	4	16	250	Container	8	32	500

Note:-
The Staging and T & D environment RDBMS will be deployed as container on the Container Platform.
The sizing parameter of staging environment in DR -DC is same as above.

3.3.3 In Memory Data Grid (caching) solution

The solution for In Memory Data Grid (caching) solution for Primary Data centre (DC) and Disaster Recovery (DC) will be sized based on the following sizing requirement:

Below are the key data sizing requirements for the In Memory Data Grid (caching) solution:

3.3.3.1 Sizing requirement for production environment for In Memory Data Grid

a) The solution should cater 1.5 million operations per second.
b) The solution should provide response time of sub-milli second for read and write operations for 1 TB of data, maintaining a Read/Write ratio of 70% reads to 30% writes.
c) The solution at DR DC should be capable to handle 100% of Primary DC load and response time.
d) The Subscription for the supplied software should be as per the Day one performance requirement.

The solution should be capable to deploy over Kubernetes cluster, VM instances and Bare metal servers.

3.3.3.2 Sizing requirement for Staging and T&D environment for In Memory Data Grid

IMDG (Cache)							
Environment	**Minimum Nodes**	**RAM (GB) per Node**	**Storage (GB) per Node**	**Deployment**	**Total Core**	**Total RAM (GB)**	**Total Storage (GB)**
T&D	1	16	100	Container	3	16	100
Staging	3	32	100	Container	7	96	300

Note:

- OEM need to certify the various components sizing to achieve optimum performance as per details given within this section (i.e., section 3).
- The sizing parameter of staging environment in DR -DC is same as above.

4. Detailed scope of work

The bidder shall be responsible for providing all software components, operating system and services, specified or otherwise, which are required to fulfil the intent of ensuring operability, maintainability and reliability of the proposed solution covered under the deployment Architecture (Section 3 and related sections), functional requirements (Annexure -III) and technical specifications (Annexure IV) within the quoted/contract price.

To carry out the scope of work, the Bidder must nominate a Project manager (PMP certified professional) and technical team which should have expertise on all the supplied Data layer Software components i.e., Transactional Data store, RDBMS, In Memory Data Grid (caching). The OEM of each supplied Data layer Software components are also required to nominate a manger and technical team who will carry out the scope of work defined for the OEM.

Bidder shall sign Info-Sec NDA /Confidentiality Agreement as part of the larger Services Level Agreements (SLA) as per the format given in Annexure 14 of Standard Bid Document Part-I.

4.1 Deployment Architecture and detailed design

a. The PRS Data layer software shall be deployed in Primary data centre (DC) at CRIS, Chanakyapuri, New Delhi and the remote Disaster Recovery Data Centre at Secunderabad Railway Station premises, Secunderabad, as per the system deployment architecture given under section 3 above. However, this can be modified as per the finalized deployment architecture approved by CRIS.

b. The bidder along with OEM should design and architect the solution as per CRIS requirements and the requirements/dependencies of the OEMs of all the supplied software. The design should ensure the

performance requirements along with no single point of failure. To achieve a high level of stability and robustness for the solution, Industry standard best practices policies should be applied. The design should be vetted by the OEMs involved.

c. Design Workshops should be organized by the Bidder at CRIS Chanakyapuri with the CRIS team for understanding of technical and functional requirements, security features required etc. These workshops should be conducted by the OEMs expert resources of all the supplied software components. The OEMS of each supplied component shall provide their high-level design and architecture document to CRIS and bidder.

d. The Bidder shall prepare the High-Level Design document and the deployment architecture for the supplied components (Transactional Data store, RDBMS, In Memory Data Grid), it's compatibility matrix, logical component deployment diagram for all the environments (Production, Staging and T&D, all requirements/dependencies on other components and have it reviewed and approved by the OEMs and submit to CRIS for approval.

e. The Bidder shall submit implementation Plan and Project Plan detailing each task with target date and assigned resource persons (OEM/Bidder) including the plan for installation of all supplied items.

f. The Bidder will also submit the Low-level design document (LLD) of each of the supplied software components which need to be prepared and vetted by the OEM of respective component. This need to be submitted before start of installation of the component. The LLD need to revise and submitted again after deployment.

g. Once the LLD is approved and deployment is started, the bidder shall prepare all necessary Test Plans (including test cases), approved by respective OEMs, for Acceptance Testing in consultation with the CRIS team.

h. The Solution Provider will prepare a Traceability matrix for verification based on the requirements in the Design Workshop, Scope of Work and Deliverables. This matrix would be verified by CRIS after completion of work at each stage and will be signed off by CRIS team and will be produced by the bidder at the time of Final acceptance.

i. CRIS will provide five bare-metal servers for production Transactional Datastore solution (detailed server specifications mentioned in Annexure IA) for production environment at primary and DR DC and one server for staging environment at primary DC. Transactional Datastore solution along with the supplied operating system will be deploy on the CRIS provided servers. Bidder has to ensure that the proposed solution should be design to handle the sizing requirement as mentioned in section 3.3.

j. Any additional component (hardware, software or networking) required for the deployment of proposed solution should be supplied by the bidder for meeting the requirements at no additional cost. The additional component should be included in the appropriate line item. Additional physical components that can be supplied by the bidder can be maximum of 4U size. The same needs to be also done if discovered later by the bidder during implementation/testing, should be supplied without any financial implications. These additional components (hardware, software or networking) should also meet the support/uptime, Backend support from OEMs, SLA and penalty clauses in the Tender part-II section 4.9, 4.10 ,4.11 and 4.12.

Note

- OEMs should ensure successful implementation and system operations.

4.2 Software supply, Installation, Configuration and performance tuning

a. The bidder shall supply all the software components with3-year subscription. The software supplied should have enterprise level support as per backend support clause defined in Section 4.12. The subscription has to be valid for a period of 3 year from date of commissioning.

b. All the supplied Subscription certificates should be in the name of the Centre for Railway Information Systems (CRIS). All the software subscriptions supplied by the bidder should be commercially supported enterprise version.

c. Any Agreements / EULAs to be signed between the customer / end user, OEM, and / or service provider should be enclosed along with the offer. These may need to be reworded to be mutually acceptable. Any such agreement produced after placement of order will not be considered.

d. The bidder should provide the solution with details of software components required for achieving the sizing mentioned in section 3.3, taking into consideration the hardware provided by CRIS as mentioned in Annexure-IA, for the primary data centre (DC) located at CRIS, Chanakyapuri, New Delhi, as well as the Remote Disaster Recovery Data Centre (DR) at Secunderabad Railway Station premises, Secunderabad.

e. Bidder need to provision the required OEM technical resources (Professional services) for deployment architecture, design, Installation, configuration (including Disaster Recovery replication setup and processes), performance tuning and commissioning of all the supplied software component for primary and DR data centres.

f. The bidder along with the OEMs will be responsible for carrying out all tasks related to software installation, configuration, customization and integration as per items mentioned in Schedule of Requirement (Annexure-II).

g. The bidder along with the OEMs will be responsible for carrying out all tasks related to setting up the high availability, data replication, backup etc.

h. Bidder need to perform performance tuning of Transactional Datastore, RDBMS & In Memory Data Grid (caching) solutions in co-ordination with respective OEMs.

i. Bidder should have minimum tie-up of 40man-days (Professional service) for Transactional Datastore& its components,10 man-days (Professional service) for RDBMS and 30 man-days for In-memory data grid (Caching) as per Annexure XX for installation, configuration, performance tuning activities, design, data modelling, architecture validation and recommending best practices for both Primary and DR data centres. Bidder should provide an undertaking from respective OEMs in this regard. In case additional man-day are required by the OEMs to implement the scope of work defined for OEM in section 4, bidder needs to provision accordingly.

j. The installation and configuration must be performed and certified by the respective OEM and bidder has to submit the OEM certification for the same. OEMs shall be responsible for successful

implementation and system operations. Bidder shall provide an undertaking from the respective OEMs for the necessary tie-up in this regard.

k. Submission of a detailed Installation report/guide and configuration guide for the installed S/W.

l. The OEMs of respective product also must conduct knowledge transfer session along with product training for CRIS team on the solution implemented.

m. Bidder shall define DBA processes and practices (Checklist) in line with the OEM recommendations for all components supplied by the bidder.

n. Bidder shall ensure that all BYODs will be kept free of Malware and under V-M-C of CRIS /Rlys.

o. Bidder to ensure all the default credentials of softwares components installed to be changed.

p. Bidder shall ensure that all unused ports/services of equipment should be configured in deny mode. Bidder shall ensure that all default users of equipment should be in closed/disabled mode after installation of equipment.

q. Source / Program Code, Database/ Application Design is Intellectual Property of CRIS/ IR, it must be retained with CRIS & should not be taken away from CRIS Servers /Infra to Vendors Systems.

r. Bidder shall ensure that all applications which are not required must be uninstalled or disabled during installation.

4.3 Migration requirements for Transactional Data Store

a. The bidder should provide consulting man-days in addition to the requirement mentioned in section 4.2 of the provided Transactional data store solution for schema design and code migration consultation.

b. The OEM of the Transactional data store solution needs to follow its best practices in the schema design and the code provided as mentioned in clause (f) below

c. The offered Transactional data store solution should provide OEM supported Spring Data library integration with Spring Boot based applications.

d. Modules have been developed using open-source and community edition technologies of NoSQL . The Data access layer is written in Java using Spring Boot and Spring Data.

e. The existing schema design should be reviewed by the OEM for leveraging the capabilities of the offered Transactional data store to meet the performance parameter as defined in section 3.3 and suggest the new design which shall be finalised in coordination with CRIS.

f. The OEM needs to provide updated spring data code for access mechanism to perform CURD operations. In Addition, the OEM also needs to provide the code for complex queries involving Scan,

range, Filter, Sort etc. The number of such complex queries for which code need to be provided are 15. CRIS will share these queries with the OEM/Bidder.

g. The bidder and the OEM of the offered Data layer Software components i.e., Transactional Data store, RDBMS, In Memory Data Grid (caching) need to sign a non-disclosure-Agreement before the schema design and code migration process.

4.4 Monitoring Dashboard and Security requirements

a. Bidder shall provide an unified dashboard as mentioned in Section 3.2 for monitoring the system health and various metrices for both the primary and DR site using software along with alerting mechanism using visual management and other available utilities (Prometheus & Grafana will be configured for monitoring and alerting purpose in New PRS application).

b. Monitoring should adhere to global ITAM-ITSM standards and CMDB best practices, incorporating the OEM's recommended practices and frameworks. The same need to be approved by OEM.

c. Bidder shall define and implement processes for management and monitoring of the Transactional Datastore, RDBMS and In Memory Data Grid (caching) solution. The checks/monitoring of each component should be designed in coordination with respective OEMs.

d. Bidder shall provide monitoring of key indicators like memory, storage, errors, latency parameters, datastore, and cluster level statistics etc with respect to Transactional Datastore, RDBMS and In Memory Data Grid (caching) solution based on standard operation procedures and shall submit report on a periodic basis.

e. Bidder shall provide regular Monitoring log files on key indicators like memory, storage, errors, latency parameters, database, and cluster level statistics etc.

f. Bidder shall set up the User and security management to provide role-based access and authorization to Transactional Datastore, RDBMS & In Memory Data Grid (caching).
Note: - CRIS will provide the Prometheus & Grafana, the solution offered by the Bidder/SI/OEM needs to push the metrices to the Prometheus instance provided by CRIS and designed the unified Grafana Dashboards need to be designed by the Bidder/SI/OEM.

4.5 Security Requirements

a. Implementation of security policies on the supplied Software components as per security policy/guidelines of CRIS (prevalent at the time of Design Workshop), define Security Architecture (SA) and submission of the compliance report vis-à-vis the defined (SA) of CRIS. CRIS Internal Security team will do the internal /external auditing of the setup. Any gaps found will be rectified by the bidder.

b. Defining & implementing processes for management and monitoring of the entire supplied Infrastructure in accordance with the defined SA. The checks/monitoring of each component should be designed in coordination with respective OEMs. It should be as per based on the OEM

best practices / frameworks. The same need to be approved by OEM. The bidder shall also create automated scripts and maintain adequate documentation / checklists for the same.

4.6 Integration Support for the products procured through separate sourcing processor or open-source components

a. Bidder along with the OEM/s shall work out for integration of existing components/tools with the new supplied components. These tools/components include Network & Security monitoring/management tools namely NMS (Network Management System), IAM/PAMs, ITSM tool, SIEM (Security Information and Event Management), VA (Vulnerability Assessment), NTP source, OpenShift, Event streaming tools etc. Details of existing components deployed in CRIS RIDC Chanakyapuri New Delhi are given in Annexure 1-B and Annexure-XIX.

b. The bidder shall make available OEM resource of the products supplied by the bidder during finalization of deployment Architecture of other Software components mentioned in Annexure-1B (community or sourced through separate procurement process).

c. The bidder along with respective OEMs shall provide full support during the deployment of Next Generation PRS application on the integrated platform.

The bidder along with respective OEMs shall provide full support during performance tuning and Load testing services of the Next Generation PRS system.

4.7 Backup & restore process

a. Bidder needs to configure automated backup and restoration process for all components as per the details provided in Annexure ID and provide the detail documentation/SOP. These automated backup processes can be configured using either the capability of supplied product or by writing the ansible scripts or by using the combination of both. The frequency and the target backup will be decided during the LLD phase as per the proposed solution.
b. Mechanism to check the backup (and restoration of backup) regularly, also need to be implemented.

4.8 Setting and configuring of DR (Disaster Recovery) processes

Bidder need to configure DR replication and required processes for all supplied PRS Data Layer (Datastore & its components, RDBMS and In Memory Data Grid (caching)) as per OEM verified deployment architecture.

DR plans and processes (including detailed run-sheets) are to be developed by the bidder on basis of inputs provided by CRIS. The processes will be clearly documented and shall include a clear division of responsibility for each activity.

The replication of required data will be configured in Next Generation PRS using the capability of the data layer product deployed in the setup. Refer section 3.2 for more details.

4.8.1. DR parameters

Following are the parameters that need to be configure for setting up the DR for supplied PRS data layer components:

- Recovery Time Objective (RTO): 5minute
- Recovery Point Objective (RPO): 1 minute

Detailed but not exhaustive list of the essential processes is given as under.

4.8.2. Replication strategy & services

a) Proposed solution for Transaction data store should be available on primary data centre and DR data centre simultaneously (i.e., services shall be up at all the time at both sites with asynchronous replication configured across sites) with the required capability of read and write.

b) Proposed solution for In Memory Data Grid (caching) should be available on primary data centre and DR data centre simultaneously (i.e., services shall be up at all the time at both sites with asynchronous replication configured across sites) with the required capability of read and write.

c) Proposed solution for Relational Database Management Systems (RDBMS) should be available on primary data centre and DR data centre in an active-active configuration with asynchronous replication across sites.

d) The Proposed solution should be configured to provide controlled automated failover from primary to DR site and vice-versa

e) The replication should not obstruct the performance of the system at primary DC and both the primary and DR DC must be available during the replication as well.

f) For data replication across site, only single copy of data is transmitted across the sites, instead of transmitting multiple copies based on the configured replication factor.

g) DR plans and processes (including detailed run-sheets) are to be developed by the bidder on basis of inputs provided by CRIS. The processes will be clearly documented and shall include a clear division of responsibility for each activity.

h) Solution should be able to read/write data from both the data centre simultaneously with both-way replication latency in real time (in milli seconds).

i) Replication of data must be flexible and tuneable based on various business requirements.

4.8.3. Failover and Failback strategy

a) This strategy should include the components of the system that will come into play in case of a disaster / incident at the primary sites, to ensure that the required service levels continue to be provided to CRIS and its customers from facilities located at the DR site.

b) In the event of a disaster/incident (that is, an incident that disables the primary site in a manner that requires the DR site to be made operational), the system should failover to the DR site.

c) The DR site should continue to provide services for the failed primary sites, with minimum service interruption and data loss (as per parameters specified in section 4.8.1).

d) In case of the Disaster at primary DC, all the servers and communication equipment running in these sites would therefore be out of service, and the DR system would be expected to restart services adhering to the DR parameters for recovery and operation defined in section 4.8.1

e) In general, the Data Layer will be considered operational from the DR site when the services of all the supplied Data layer components are available.

f) CRIS will take further steps to make the application layer operational after the data layer components and other system software services are made available.

4.8.4. Switchover strategy

This strategy should include the components of the Data Layer that come into play when a planned switchover is made to the DR site for drill or planned maintenance purposes.

a) During DR system testing / drills, DR / BC auditing, planned maintenance of the equipment at the primary site, and other similar conditions, a planned switchover might need to be made to the DR site.

b) Switchover will be a planned activity. It might need to be executed at short notice in the case of emergent maintenance needs.

There should be no data loss in case of a planned switchover. Switchover should be possible for any one node/cluster or for all nodes/clusters simultaneously.

4.8.5. Switchback strategy

a) This strategy should include the components of the system that come into play when system operation switches back to the primary site after being operated for a time from the DR site. The following three cases should be covered.

- *Complete Disaster (destruction of equipment / data at Primary site or interruption in service lasting over 30 days)*: In this case, the primary site has to be set up afresh.
- *Partial Disaster (interruption of service from primary for less than 30 days without destruction of equipment / data at primary site)*: In this case, the primary site must be started up from the state that existed at the time of disaster.
- *Switchback from planned switchover*: In this case, the primary site must be started up from the state that existed at the time of switchover, but the overall process is much more controlled.

b) As soon as the facilities at the primary sites have been restored, the applications need to be switched back to the primary sites from the DR site.

c) Switchback should be a planned activity. There should be no data loss in the event of a switchback. The mechanism should be in place for new delta changes back to primary from DR site before switching back to Primary DC.

d) In case of Partial Disaster as described in para above, “primary – primary conflict” between the DR and primary site at the time of primary system restart should also be resolved automatically.

4.8.6. Security strategy

This strategy should clearly lay down the security measures that will be taken by the bidder to ensure that the Data Layer components and data are accorded the appropriate level of confidentiality, integrity, and availability. It should also include all aspects of network security. This shall be in-line with the CRIS security policy and jointly defined with CRIS team. Bidder need to ensure compliance to this strategy/policy.

4.8.7. Testing strategy

1. The testing strategy should ensure that recovery and switchback strategies are regularly tested.

2. At least two DR drills in a year (once every six months) and appropriate corrective and preventive measures are adopted.

3. The duration of DR will be determined based on the requirements specified by CRIS, which may vary from few hours to 3 days or according to the specific needs. The bidder is required to support the system throughout this specified period, ensuring that DR capabilities are effectively managed and aligned with CRIS's requirements.

4.8.8. Monitoring strategy

1. The monitoring strategy should lay down how the PRS Data layer software components, shall be effectively monitored throughout the contract period by the bidder.

2. Bidder will provide a single view of the PRS Data layer software components from a central web-based dashboard which should also integrate it with monitoring dashboard of primary Site for unified view.

3. All parameters such as RTO / RPO, replication status, DR status, Data lag status etc. should be monitored through this system.

4. Bidder should configure and carry out local as well as remote monitoring of the PRS Data layer software components from CRIS Chanakyapuri, New Delhi premises. The primary responsibility for the management and monitoring of the PRS Data layer software components and adherence to prescribed service levels shall remain that of the bidder.

5. The activities performed by the bidder should be logged. This log should be monitorable by CRIS staff on quarterly basis or as and when the need arises.

6. The monitoring metrices and data has to be retained as per the CRIS policy.

4.9 Comprehensive Maintenance Support for complete supplied components for a period of 3 years

The bidder shall provide 03 year on-site comprehensive maintenance support services for the complete set of software components (RDBMS, In Memory Data Grid (caching) and Transactional data store & its components including Operating System) supplied by the bidder. This support is in addition to subscription provided by OEM. The support shall start from the date of Go-Live (Milestone M1 defined in Section 9) Primary DC and DR DC, whichever is later. The bidder shall maintain the complete software components in good working order. The maintenance services shall consist of preventive and corrective maintenance and shall include:

a) Maintenance coverage will be on 24 x 7 basis as per uptime requirements defined in section 4.10

b) Bidder shall nominate an Account Manager/Senior functionary as single point of contact for day-to-day coordination with CRIS throughout the maintenance period. The bidder also has to allocate technical team having expertise in all supplied Software components.

c) The bidder will provide escalation mechanism with complete details including address, phone number (office as well as residential), mobile number etc. of the allocated resources.

d) Bidder shall deploy one resource on 365 days basis as detailed out in section 4.9.1

e) The bidder shall provide and install updates and upgrades for the entire set of software components as and when released by the OEM (latest patches). Software updates/upgrades shall also be done keeping in view advancement in technology, shortcomings of the system, security vulnerabilities, or changes required for improving functional efficiency and security level of the system. The bidder should ensure that the security patches are applied after every re-installation/maintenance activity. The SLA defined in section 4.10.1 shall be applicable for security patches implementation. In case of breach, penalties applicable have been defined in same section. The plan for any upgrade duly approved by OEM(s), should be submitted to CRIS in advance along with rollback plan for approval. The activity should be planned in coordination and approval of CRIS. Depending on criticality of activity, on instructions from CRIS, the bidder shall arrange the OEM resource at the site. The bidder shall ensure complete rollback to original status in case of problem and shall take necessary system backups before any activity of SW upgrade/Changes in configuration etc.

f) Upgrade should be provided based on rolling upgrade to maintain the availability of the system during the upgrade process without shutting down the entire cluster but only a single node in which upgrade will be performed.

g) The bidder shall carry out the configuration changes for the complete software components as per requirement given by CRIS and shall follow Change Control Process which shall be jointly defined with CRIS.

h) The bidder shall maintain Site Management Guide for provisioned software configuration under maintenance and keep it in electronic as well as hard copy form in CRIS premises. Bidder shall be responsible to update the Site Management Guide on regular basis and reflect the latest configuration and shall also maintain the Change documents.

i) In case of a failure or degraded performance, a detailed incident report including analysis should be prepared in consultation with the OEM of the respective product(s) with an objective to avoid similar failures in future. Preliminary report should be submitted within 24 hours. A detailed technical report along with RCA will have to be submitted to CRIS within one week.

j) Bidder shall provide the required support and coordinate with the supplying agencies of existing hardware, software, network for integration between these systems/tools and the software components supplied/maintained by the bidder. The bidder shall also coordinate with the agencies responsible for maintenance of these systems for resolution of issues.

k) Bidder shall depute OEM resources, if required, for any activity planned in the Data centre affecting the working of Next Generation PRS application.

l) Bidder shall carry out a comprehensive performance analysis of all supplied softwares on a monthly basis and shall submit a report. The report should include performance analysis for all components and the recommendations for change of parameters / configuration / Resource requirement etc. if any. The parameters to be monitored and the report format shall be jointly decided along with CRIS and the OEMs resource.

m) Bidder shall carryout scheduling & monitoring of backup of Transactional Datastore, RDBMS and In Memory Data Grid (caching) as per the details provided in Annexure-ID and provide the detail

documentation/SOP. The Backup mechanism should be vetted by OEMs. Mechanism to check the backup regularly also need to be implemented.

n) Bidder shall perform periodic activity for restoration of backup of Transactional Data store, RDBMS and In Memory Data Grid (caching)on a new instance/VM provided by CRIS.

o) Bidder will also be responsible for restoration of the Transactional Datastore from backup in case of failure, setting up of new instance to same or new environment.

p) Bidder shall define and implement the purging on basis of inputs provided by CRIS team and automated purging mechanism to be developed so that data can be purged after a specified period. The purging mechanism should be duly vetted by OEMs and should not degrade the performance.

q) Irrespective of any other limitations, the Bidder/ OEM have to ensure availability of the Security patches for software supplied in CRIS for a minimum period of Five years, from the date of Installation Acceptance. To ensure this, the Bidder/ OEM are advised to supply the latest Firmware and System SW versions, irrespective of their old offers.

r) Bidder should configure software to keep user access log records for 180 days for analysis and auditing purpose. For Privileged Identity & Access Management (P-IAM): Logged (min. 180 days) auditability of Access, as per role assigned to Privileged Users (Admin/ DBA /Root) of all the software supplied by the bidder.

s) During this 3 year period, if it is observed that any of the supplied software component are not able to meet the specification & sizing given in the tender, the bidder at its own cost shall replace that component with higher end component or provide additional licences/software that meets the technical specifications and sizing requirements defined in the annexure –IV and section 3.3 respectively

4.9.1. Resident Engineer Deployment

The bidder shall deploy Resident Engineers (REs) at primary Site for carrying out day to day system maintenance and monitoring activities for the supplied components in primary data centre and DR data centre, used for Next generation PRS system. Bidder has to provide RE for a period of 03 year from the Date of go-live (Milestone M3 defined in Section 9).Following shall be the minimum number of personnel present on-site to handle the support:

	Resource required	**Number of Shifts**	**Personnel In Shifts**	**Minimum Qualification**	**Minimum Experience**
Primary DC					
Resident Engineer	1 resource every day (365 X24X7)	3 shift of 8 hours* *Minimum 5 resources required*	1	Engineer (BE/ B. Tech. Or equivalent)	Minimum 2 years of relevant experience in managing Transaction data Store. Certified in Transaction data Store offered in bid.

* Shift timing and days of week can be changed by CRIS as per requirement /activities planned

The Bio-Data of the on-site support staff shall be submitted before deployment. Only the resources approved by CRIS shall be deployed. The engineers selected as REs shall be involved by the bidder from the implementation stage so that they are able to understand the system. The onsite resources deployed should be on bidder's payroll and should have valid EmpID, eMail, ID Card with complete governance and responsibility of bidder. In case of change in man-power due to any reason, the bidder shall be responsible for handing over & taking over of the duties due to the change and also for imparting appropriate training to the new staff for performing the duties.

"The Contractor should commit to complying with all Labour Laws and indemnify CRIS against any liability on this account. In the event of CRIS being so charged, the Contractor will be liable for fulfilling all costs to CRIS in this respect including all legal charges."

4.10 Uptime requirements

The bidder shall provide the uptime for the Software and all other supplied components as detailed in section below:

a) The bidder shall provide an uptime guarantee of 99.9% on monthly basis. The system will be treated down when there is a total failure of Next Generation PRS services or degradation in system performance on account of failure/malfunctioning of software components being maintained by the bidder. In case of failures exceeding the defined uptime for the month, it shall attract penalty as defined in 'Total Service failure' item of section 4.11 – titled "SLA Breach Penalty".

• **Total Failure of the Supplied System** - "In any event where the provided system is inaccessible to the PRS Users, due to failure of any software component supplied & maintained by the bidder"

• **Degradation in the System** - "In any event where the provided system is accessible to the PRS Users, but with a low level performance due to degradation or any performance issue in any of the software component supplied & maintained by the bidder"

b) The total service failures should be limited to a maximum number of 02 in a calendar month. No failure shall exceed 0.72 hours (43.2 minutes) excluding application start-up time. If the duration of any failure exceeds 0.72 hours (43.2 minutes) it would attract penalty as defined in 'Total Service failure Section' of SLA Breach Penalty (section 4.11).

c) Irrespective of the duration of failures, if there are more than 02 failures in a month, this too shall be treated as Total Service failure and shall attract damages as defined in 'Total Service failure' column of Section 4.11.

d) For any system failure within a month total grace period in terms of downtime calculation will not exceed 0.72 hours (43.2 minutes). If in any circumstances, total downtime exceeds 0.72 hours (43.2 minutes) for first 2 failures within a month, failure duration beyond 0.72 hours (43.2 minutes) will be considered for calculating penalty. If total downtime for first two failures is less than 0.72 hours, even then no grace time will be permitted for third and subsequent failure within that calendar month.

e) Failures of any of the supplied component, which result in total service failure of the Next Generation PRS Service(s) will also attract penalty as defined in 'Total Service failure' item of the section 4.11 titled "SLA Breach Penalty".

f) For the purpose of calculating Penalty, the excess failure time shall be counted but in case number of failures exceed more than the permissible limit, complete failure period shall be counted for calculation of Penalty.

g) The planned downtime or downtime on account of failure of equipment/software not supplied by the bidder or Power/UPS failure, will not be considered for calculating uptime.

h) The planned downtime exceeding the allotted downtime for the activity of supplied components being maintained by the bidder resulting in some failure on account of bidder then the system shall be treated as down and it shall attract penalty given in the "total system failure" item of the section 4.11 – titled "SLA Breach Penalty" as applicable.

i) In case a planned activity of components being maintained by the bidder, results in unplanned downtime, system shall be treated as down and shall attract penalty applicable for total system failure.

4.10.1 Service Level Agreement (SLA) for software solutions products

The Service Level Agreement (SLA) for software subscriptions required under software solutions supplied through this tender shall be as under:

SLA Requirement	**Severity Level**	**Production Support (Time from call logging with OEM)**
Support Availability		24 hours x 7 days
Initial Response Service Level Objective	Severity-1	30 minutes
	Severity-2	30 minutes
	Severity-3	4 hours
	Severity-4	1 day

Severity 1 (Urgent): A problem that severely impacts use of the software in a production environment (such as loss of production data or in which production systems are not functioning). The situation halts business operations and no procedural work around exists.

Severity 2 (High): A problem where the software is functioning but use in a production environment is severely reduced. The situation is causing a high impact to portions of business operations and no procedural workaround exists.

Severity 3 (Medium): A problem that involves partial, non-critical loss of use of the software in a production environment or development environment. For production environments, there is a medium-to-low impact on business, but business continues to function, including by using a procedural workaround. For development environments, where the situation is causing project to no longer continue or migrate into production.

Severity 4 Low): A general usage question, reporting of a documentation error, or recommendation for a future product enhancement or modification. For production environments, there is low-to-no impact on business or the performance or functionality of system. For development environments, there is a medium-to-low impact on business, but business continues to function, including by using a procedural workaround.

4.11 SLA Breach Penalty

SLA breach penalty shall be calculated on the basis of Service failure defined in section 4.10 and 4.10.1

SLA breach penalty will be addition to LD for delay in delivery/installation mentioned in section 10.

The penalty amount will be worked out on quarterly basis and demand letter will be sent to the bidder to deposit the same with CRIS within 15 days from the date of issue of demand letter. In case the bidder does not deposit the penalty amount within stipulated time, CRIS reserves the right to recover the due amount as under:

a) From any other pending bills of the bidder in CRIS,
b) From Security deposit/ PBG Bond furnished for this contract or any other contract.

4.11.1. SLA and Penalty for Total Service failure:

SLA and Penalty shall be applied as per tables given below for the supplied components

S No	Type of Failure	Minimum uptime Required	Max Permissible number of failures per month	Max Permissible downtime without penalty per month	Penalty Charge
1	Total Service failure	99.9%	2	Total 0.72 hours (43.2 minutes) together for all components which may disrupt overall services	Rs 5,00,000/- per hour or part thereof of downtime exceeding the defined SLA

4.11.2. SLA Breach Penalty for software solutions products

Response for service requests has to be provided as per **clause 4.10.1**, failing which penalty for service failures shall be deducted from the outstanding bills or PBG as under-

SLA Requirement	**Severity Level**	**Production Support (Time from call logging with OEM)**	
Initial Response Service Level Objective	Severity-1	30 minutes	1. **Rs. 150,000 per hour (or part thereof) after 30 minutes** from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated e-mail advised by the Contractor for the purpose. 2. If persistence above exceeds two hour from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated email advised by the Contractor for the purpose, then penalty **beyond first two hour of failure will be Rs. 2,50,000/- per hour** or part thereof
	Severity-2	30 minutes	1. **Rs. 150,000 per hour (or part thereof) after 30 minutes** from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated e-mail advised by the Contractor for the purpose. 2. If persistence above exceeds two hours from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated email advised by the Contractor for the purpose, then penalty **beyond first two hour of failure will be Rs. 2,50,000/- per hour** or part thereof
	Severity-3	4 hours	1. **Rs. 10,000 per hour (or part thereof) after four hours** from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated e-mail advised by the Contractor for the purpose ; 2. If persistence above exceeds eight hours from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated e-mail advised by the Contractor for the purpose, then **penalty beyond eight hours of failure will be Rs. 30,000/- per hour or part thereof**
	Severity-4	1 day	**Rs. 5,000 per day (or part thereof) after 24 hours** from the time the same is advised to the Contractor by the Helpdesk/CRIS/IR to the designated e-mail advised by the Contractor for the purpose.
Non provision or non-performance as per SLA in section 4.12.2 of OEM manpower			Double the average per day remuneration as quoted by the bidder will be imposed as penalty for non-availability of manpower.
Non adherence to the RTO/RPO mentioned in section 4.8.1			Rs 2,00,000/- per hour or part thereof of downtime exceeding the defined SLA

4.11.3. Resident Engineer SLA and Penalty

<table>
<tr><th>S.N.</th><th>Measurement</th><th>Measurement Interval</th><th>Target</th><th>Penalty</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Submission of Monthly Reports</td><td rowspan="2">Month</td><td>All Reports for the previous month shall be submitted by the 7th of the next month</td><td>No Penalty</td></tr>
<tr><td>Delay beyond the date of submission</td><td>Rs.1000 for every day's delay on an incremental basis.</td></tr>
<tr><td>2</td><td>Manpower Absence of resource</td><td>Month</td><td>If equivalent skilled resource is provided, then no penalty will apply. Otherwise it would be treated as absence of resource and penalty will be applicable.</td><td>Absence of resource /Manpower deployed will attract a penalty as per details given below:
<table>
<tr><th>S. N.</th><th>Absence (Shifts in month)</th><th>Penalty Value (in Rs)</th></tr>
<tr><td>1</td><td>For 0-2 Shift</td><td>Rs 9,000 per shift</td></tr>
<tr><td>2</td><td>For > 2 to 5 Shift</td><td>Rs 18,000 per shift</td></tr>
<tr><td>3</td><td>For > 5 Shift</td><td>Rs 27,000 per shift</td></tr>
</table></td></tr>
</table>

Note: Penalty for technical support desk & Compliance and Reporting Procedures (as given above) shall be deducted from the instalments of REs cost to be paid half yearly. Delay due to CRIS officials/ system (e.g. approval, permission, downtime, availability etc.) will be excluded during penalty calculation.

The Bidder must ensure the Man-power continuity. In case a resource leaves before completing six months, Penalty of Rs.10,000/- per such instance will be levied.

4.11.4. Security SLA and penalty

Security patches must be deployed for all software's supplied by bidder as per below mentioned category classification and SLAs from the time of the patches are being released: -

<table>
<tr><th colspan="6">Security patch Severity</th></tr>
<tr><th>Critical (9<=CVSS <=10)</th><th>High (7<=CVSS<9)</th><th>Medium & Low (CVSS<7)</th><th>Compliance</th><th>Penalty</th><th>Criteria</th></tr>
<tr><td>Within 30 Days of Release of</td><td>Within 45 Days of Release of</td><td>Within 60 Days of Release of</td><td>100 %</td><td>For Critical severity patches penalty will be Rs 3,000/- per missing security patch</td><td>Systems will be scanned on weekly basis by bidder for identifying missing</td></tr>
</table>

Security Patches	Security Patches	Security Patches		For High severity patches, penalty will be Rs. 1,000/- per missing security patch.	security patches by Nessus or using other Vulnerability Assessment Solution which shall be provided by CRIS

In case of delay in approval of patch rollout by CRIS, then the penalty would not be charged for that period.

All SLA breach penalties in Section 4.11 are independent of each other and will be imposed separately. In case of any failure/ breach of SLA, multiple penalties as applicable will be imposed.

The cumulative penalty including penalty for SLA breach as defined in above section shall be subject to a maximum of 10% of the recurring charges i.e. Subscription cost and 24by 7 Support cost for the year applicable including taxes. This will, however, be in addition to Liquidated Damages deducted.

In case the total penalty exceeds the maximum limit, CRIS reserves the right to cancel the contract and forfeit the Performance cum Warranty Guarantee (PWG) Bond.

4.12 Backend Support from OEMs

During the ATS support period, the bidder shall have a back-to-back support from the OEMs of all components listed in SoR (Annexure-II). The bidder shall furnish documentary proof of backend support including software upgrades/updates, availability of software components required for scalability for a period of 05 (five) years from the respective OEMs of the products offered. In addition to this, this document should clearly state the following level of Support:

4.12.1 Backend support from OEM for technical support of all supplied Software

The Technical support from OEM should cover:

a) 24x7 support from OEM to be provided through Phone, Email or Site visit depending on the criticality of the problem. There should be provision to log complaints/open support cases directly with OEM. The support cases should be for unlimited number of cases.

b) Upgrades (latest versions/patches) and updates of the supplied software. Support of OEM for carrying out up-gradation and updation of supplied software to latest versions.

c) Performance Tuning i.e., resolution of performance related issues and tuning of all supplied system software.

d) Troubleshooting in case of critical failures (system or services) especially for the failures extending beyond the permissible downtime.

e) Root Cause Analysis (RCA) of failure and/or incidents along with an action taken report to preclude recurrence of similar failures/incidents in future.

f) OEM has to nominate a project manager and technical resources to ensure the above. The OEM has to share the escalation matrix.

4.12.2 OEM man-days of all supplied Software

a) The Bidder should have minimum tie-up of 35 man-days with OEM of Transactional Data store with supporting components, 5 man-days with OEM of RDBMS and 15 man-days with OEM of In Memory Data Grid (caching) for first year for performance tuning and Updates and upgrades of respective System Software for Primary DC and DR DC.

b) The Bidder should have minimum tie-up of 20 man-days with OEM of Transactional Data store with supporting components,5 man-days with OEM of RDBMS and 10 man-days with OEM of In Memory Data Grid (caching) for each second and third year for performance tuning and Updates and upgrades of respective System Software for Primary DC and DR DC.

c) The commencement of OEM man-day support validity shall starts from the successful commissioning of the entire solution and second year validity will start after the end of the first year validity and so on.

d) The OEM Man days services should be provided for minimum 1 man day (i.e. 8 hrs.).

e) The man days services should be provided by OEM professionals only.

f) CRIS shall directly invoke services from the OEM as per the requirement and these services could be invoked any time i.e. beyond office hours, on weekends or holidays depending on the criticality.

g) Bidder needs to provide the Contact details & mechanism of invoking the Professional service.

h) The resource made available should have following qualification criteria:

   i. **5+ years of experience** on respective software solution platform.
   ii. Certified professionals on supplied software solutions.
   iii. Should have Hands on experience on supplied software solutions.
   iv. Understanding of Performance Tuning and knowledge of its relevant tools
   v. Experience on software Hardening.

i) CRIS can utilize the man days for the following technical work:

   i. Architect solution.
   ii. Installation, configuration & management, performance & tuning of the product and for training the CRIS resources or as per requirement.
   iii. Root Cause Analysis of problem/ failure and their resolution, Health checkup and Onsite support.
   iv. Define and implement best practices in system administration for smoothing running of the product.
   v. Implementation of patch updates, security and new releases.

j) For utilization of Man days, scope of planned activity will be shared by the CRIS with the OEM and corresponding activity action plan with time line will be shared by the OEM. On successful completion of the planned activity, a work completion report will be submitted by the OEM at the end of the activity.

Bidder should provide an undertaking from OEMs in this regard as per Annexure 8 of SBD1

4.13 Training

a) Bidder shall arrange for OEM training for two batches of 12 engineers each for Transactional Data store and supporting components, one batch of 12 engineers for In-Memory data grid (Caching) Solution and one batch of 12 engineers for RDBMS (Administration) Software products.

b) The training for all these products shall be provided by the OEMs with curriculum as per the OEM certified Training Program or course content jointly decided by CRIS & OEM. The level of training shall be similar to those being provided by the OEMs to its vendors/SIs.

c) Training shall be provided by the OEM certified Trainers only. The resume of trainers proposed by the OEMs shall be provided to CRIS. Only the trainers selected and approved by CRIS shall be deputed as trainers for these training programs.

d) Training should also cover hands on sessions along with Security hardening, monitoring for any Security Issues etc.

e) Training material should be provided to all participants in form of electronic media/ paper documents.

f) The training shall be provided in bidder's /-OEM's Training center in Delhi /NCR on dates & Venue jointly decided by CRIS and the bidder. the name and address of their Indian Agents or the representatives they have for servicing in India.

5. Qualification (PQ) Criteria for Bidder

5.1. All the criteria given in table below are mandatory for qualification. Bids not meeting these parameters of the Qualification Criteria shall be summarily rejected.
5.2. The criteria must be met by the entity bidding for the project itself and that of the sister/associate companies shall not be considered.
5.3. Consortium/JV bidding is not allowed.

5.4. The bidder has to ensure that the requisite documents/details towards Qualification Criteria are submitted along with bid. Compliance of Qualification Criteria parameters and details of associated documents should be filled in the format as per Annexure-V. Bids not accompanied by all the required documents mentioned are liable to be considered only on the basis of the documents/details furnished with the bid. However, CRIS reserves the right to seek clarifications from the bidders wherever considered necessary.
5.5. Qualification Criteria Parameters

S No.	Parameter	Qualification Criteria	Credentials to be provided
1	Qualification Criteria: Existence of Bidding Entity: Registration Certificate	The Bidder must be a Private or Public Company or a Proprietorship, Partnership firm, LLP, or Society/ Trust. Based on the nature of entity	For Companies: Certificate of Incorporation under the Companies Act For Partnership Firms / Limited Liability Partnership (LLP):

S No.	Parameter	Qualification Criteria	Credentials to be provided
		the bidder to submit the requisite documents	Partnership Deed or Certificate of registration under the Indian Partnership Act / LLP Act For Societies / Trust: Certificate of Registration with Registrar of Societies For Proprietorship Firms: Attested certificate from Bank(s) clearly indicating the date on which the Bank account was opened in the name of the Proprietorship firm which establishes the existence of the firm for the required period. (Mandatory)
2	Existence of Bidding Entity: GST Certificate	Bidder must have a current / valid GST Certificate.	Please upload GST Certificate. (Mandatory)
3	Financial Turnover	The Bidder's average annual turnover over the last three Financial Years preceding the Financial Year in which the tender has been published must be a minimum of Rs. 58 Crores.	The bidder shall submit Certificate from a Chartered Accountant for Turnover of the Bidder for the stipulated financial years, as per 'Annexure 2: Financial Turnover of Bidder' of Standard Bid Document Part-I. Note: – i.If the balance sheet for the immediately preceding financial year has not yet been audited, the same shall be certified by the CA in the above certificate, and in such a case the Financial Turnover for the fourth preceding year shall be mentioned in the CA certificate, and the same shall be considered for the eligibility criteria. ii.For the purpose of Annual Turnover, only the revenue from operations shall be considered. Other incomes such as interest, dividend etc. are excluded from the annual turnover. iii. Credentials of affiliated companies like Parent / Holding

S No.	Parameter	Qualification Criteria	Credentials to be provided
			Company, Strategic Business Unit, Group Company, Subsidiary / Associate Company, Sister Company etc. will not be taken into consideration. (Mandatory)
4	OEM Undertaking	• The bidder shall be an original equipment manufacturer (OEM) *or* an authorized representative of the respective OEMs. Whenever an authorized Agent/Representative submit bid on behalf of the OEM, the same agent/representative shall not submit a bid on behalf of another OEM in the same tender for the same item/product. • Bidder should provide Authorization letter for all the products as per make & model offered in the bid in the SoR.	Authorization letter from the OEM specific to this tender as per sample Performa given in Annexure-XXI of RFP. In case OEM bids directly, Self-certification and any other document for being OEM. The authorization should include details of Tender No., Name and address of the OEM and the bidder authorized and details of the products for which the bidder has been authorized. (Mandatory)
5	Relevant Project/Work Experience	The Bidder should have successfully completed / executed Similar Project / Work in India for last five Financial Years preceding the Financial Year in which the tender has been published, and current financial year (up to and including the date of publishing of this tender), herein after referred to as the specified period, having value as under- a) At least one Purchase order or work order costing not less than Rs. 10 crores Or	1. The Bidder shall submit CA certificate as per 'Annexure XXIV:, detailing projects that meet the relevant Project Experience criteria. 2. Only those Contracts / Work Orders / Agreements shall be considered towards Project / Work Experience which have been issued by a. Any entity (Department / Organization / Autonomous body / PSU/ Local Body/ Authority etc.) wholly or partially owned by State / Central Government

S No.	Parameter	Qualification Criteria	Credentials to be provided
		b) At least two Purchase order or work order each costing not less than Rs. 6.25 crores Or c) At least three Purchase order or work order each costing not less than Rs. 5 crores Similar Work is defined as under: - Software/Hardware/Network equipment/IT Security equipment/telecom equipment/ Services supporting IT equipment/Servies for Network equipment/ Services for IT security software and hardware/AMC/ATS/IT Helpdesk/IT manpower for support of IT equipment and any other software/IT hardware/IT network related service or equipment like training, installation, commissioning. d) Purchase order should have been issued during defined specified period. e) work may have been completed or ongoing, both to be considered.	*Or* b. A Private sector organization which is listed in the National Stock Exchange (NSE) or Bombay Stock Exchange (BSE) in India < and> has an average annual Turnover of INR 500 Crore (revenue from operations) & above during last three (03) financial years preceding the year of publishing of tender. 3. Only those Contracts / Purchase Orders shall be accepted as Past experience wherein the contracts / purchase orders have been placed on the bidder directly by an entity belonging to one of the above categories. 4. In case the contract / purchase order / work order being presented is a composite contract (i.e. it contains items other than the ones defined in the qualification criteria as similar work), only such line items shall be considered which qualify as per the definition of similar work mentioned in the contract. In such cases the value of such line items shall be indicated by the bidder as a separate attachment to annexure XXIV. If the value of contract / line items qualifying as per the definition of similar work is not mentioned separately in such composite contracts/ line items, such contracts / line items shall not be considered towards

S No.	Parameter	Qualification Criteria	Credentials to be provided
			fulfilment of project / work experience. 5. Bidder shall submit the document/certificate issued by consignee/purchaser for the quantities supplied/activities/stages completed up to the end date of specified period. Value of successfully executed/commissioned work, up to the end date of specified period under the criteria, shall be considered as per payment terms stipulated in contract/tender for the item falling within the definition of similar work criteria. The bidder shall submit a CA Certificate for the detailed calculation of value as claimed by bidder, accordingly. 6. If the purchaser seeks any clarification related to relevant project / Work experience certificates submitted by the bidder, the bidder shall not be permitted to submit any new Contract / Purchase order/ Work order, whose details are not already provided in the original bid. Any such new Contract / Purchase order/ Work order shall not be considered. (Mandatory)
5.1	Relevant Project / Work Experience: Copies of Purchase Orders / Contracts/ Work Orders	The Bidder shall submit Copies of Purchase Order (s) / Contract (s) / Work Order (s) (including all associated documents / Annexures) for all the projects/ works mentioned in the CA certificate.	(Mandatory)

S No.	Parameter	Qualification Criteria	Credentials to be provided
5.2	Relevant Project / Work Experience: Completion Certificates	The Bidder shall submit copies of Satisfactory Completion Certificate(s)/ Performance Certificate (s) issued by the Purchaser / Consignee for all the projects mentioned in the CA certificate submitted.	(Mandatory)
6	Non-Blacklisting Declaration by Bidder	The Bidder shall submit a self-declaration of non-blacklisting clause of Standard Bid Document Part-I as per 'Annexure XXVI : Declaration of Non-Blacklisting by Bidder'.	OEMs have to submit the OEM undertaking regarding Non-Blacklisting on OEM letterhead as per the Annexure XXV of RFP. Additionally, the SIs/Bidders are required to submit the declaration/undertaking as per the Annexure XXVI on minimum INR. 100 stamp paper and duly notarized. (Mandatory)
7	Land Border with India Compliance	The Bidder shall submit a self-declaration of compliance to Land Border clause of Standard Bid Document Part-I as per 'Annexure 7 : Certificate from Bidder for Compliance to GoI Order for Countries sharing Land Border with India' of Standard Bid Document Part-I.	(Mandatory)
8	Make in India	The Bidder shall submit a self-certification of compliance to Make in India Policy as per 'Annexure 6: Self Certification by Bidder for Make in India' of Standard Bid Document Part-I.	(Mandatory)

CRIS reserves the right to verify the authenticity of the documents submitted by the bidder.

5.6. Guidelines for Start-up Firms

As per CRIS SBD-I (including modifications)

6. Technical Requirements

All the technical criteria given in table below are mandatory for qualification. Bids not meeting these parameters of the technical requirement shall be summarily rejected. The bidder is required to use the formats and guidelines provided in the Annexure VI to provide information on the technical requirement.

The bidder/OEM must ensure that validity of certificates asked under technical specification of item quoted, if any, shall be valid on the date of closing of tender.

Bids are liable to be considered only on basis of the documents/details furnished with the bid. However, CRIS reserves the right to seek clarifications from the bidders wherever considered necessary.

S. No.	Parameter	Technical Requirements	Documents to be provided
1	Solution document	Proposed solution along with deployment Architecture in accordance with the minimum requirement specified in deployment architecture defined in section 3 and related Annexures.	Bidders need to submit the solution document along with deployment architecture and also compliance to CRIS proposed architecture and sizing of Data layer (section 3.2) duly vetted by respective OEMs. **Note:** The solution document should clearly present the deployment architecture, including detailed replication mechanisms, a high availability (HA) strategy to ensure zero data loss, backup strategy, comprehensive dashboard and monitoring capabilities, and any other relevant components necessary to fulfil the specified requirements.
2	Schedule of Requirements (Non-priced SOR)	Make/Version/Model of the offered products as per format given in Annexure II.	Bidder need to clearly specify the Make/Model and details as per format given in Annexure II, for each Item in Schedule of Requirements and mention details of additional products offered to meet the requirements in the remark column of <non-priced>Schedule of Requirements provided in technical bid. No price element to be mentioned otherwise the bid will be summarily rejected.

3.	Technical Compliance	Compliance from OEM for detailed technical specifications of all the Products are given in Annexure IV.	The bidder must submit an item wise compliance for the technical specifications duly vetted by the respective OEMs specific to this tender. The Model and Make/Version of the offered products should be clearly specified in this compliance document.
4.	Bill of Material (BoM)	Bill of material (BOM) of offered products.	The bidder must furnish the complete Bill of Material (BoM) of all the products on the letter head of the OEM duly vetted by the respective OEM.
5.	Technical Use Case report for YCSB for transactional data store	Proposed Solution should provide YCSB benchmark reports given in Annexure XI along with the product used to implement the solution.	Bidder to submit documents for YCSB benchmark report for workload types (as per format given in Annexure XV) having following information: ● Hardware utilization report based on **nmon** csv format for workload types. ● Product(s) used to implement the workload types for YCSB benchmark report. ● Compliance Certificate from the OEM(s) on their letterhead as per format given in Annexure XVI, whose product is used to implement the solution for the respective workload types. Refer Annexure XI for YCSB benchmarking Criteria, Workload types CRIS reserves the right to ask for the demonstration of the YCSB benchmark to implement the workload types given in Annexure XI
6.	Product Support life cycle	The bidder should submit valid letter from all the OEMs	Documentary evidence such as from all OEM/Vendors whose products are being quoted by the Bidder need to be submitted as per

			sample format given in Annexure **XXI**
7.	Product deployment	The key products offered in the subject tender –Transaction Datastore & its components, RDBMS and In Memory Data Grid (caching) should have at least 02 deployment in India for each product in single project or in independent project in the preceding 3 financial years and current year i.e. during 2022-23 ,2023-24,2024-25 and current financial year up to the date of closing of tender	OEM of each of the product need to submit undertaking in this regard which should be duly signed by authorized signatory. The undertaking should give details of the installation such as product installed, customer name and financial year , size of installation of deployment of product as per format given in Annexure-VIII Note: In case, the OEM is unable to share the Customer details due to binding of Non- Disclosure Agreement (NDA) signed with the Customer, the OEM needs to mention the same in the above undertaking and provide all other required information.
8.	Quality management System	Bidder should have a valid ISO 9001:2015 Quality Management Certification on the date of closing of the Tender	Valid Certificate of each type from the certifying organization.
9.	Bidder or OEM support offices availability	Bidder or OEM should have Customer Support offices in the Delhi / NCR region and Secunderabad. In case bidder does not have offices in these places , The bidder may give an undertaking to have offices in these places in case the tender is awarded. The office should be opened within four weeks from the date of awarding of the Tender.	Documents giving complete detail of customer support office. The details of customer support office should include details such as postal address / telephone no., contact nos., qualification & skill set of the engineer/s in the support office as per format given in Annexure 15 of SBD-1.
10.	Technical Resource Capability	Bidder to ensure availability of OEM Certified Man-power if the contract is awarded.	Declaration from bidder or details of certified Engineers along with supporting documents clearly giving the certification details, if engineers are available.

11.	Declaration of inclusion of OEM Services	The bidder should submit a letter on their letterhead stating required OEM services have been considered as per the terms & conditions of this RFP	The bidder should submit a letter as per Annexure-XVII specific to this tender.
12	Functional Requirement	Compliance from Bidder for detailed functional requirement of all the Products given in Annexure III.	The bidder must submit an item wise compliance for the functional requirement.

7. Instructions to Bidders

7.1 Availability of Tender

Bidding process will be on-line through E-Procurement System (www.ireps.gov.in). Bidder may please see instruction to Tenderers for E-Tender, CRIS SBD-I (Including modifications) and Tender Document etc. on www.ireps.gov.in before quoting the tender. The bidders shall be solely responsible for checking website of e-procurement i.e., www.ireps.gov.in for any addendum/amendment/corrigendum issued subsequently to the bid document and take into consideration the same while preparing and submitting the bids/offers.

7.2 General Conditions

7.2.1. The bidder should be registered with GST department of the Govt. of India. Copy of valid GSTIN number should be enclosed.

7.2.2. The bidder must specify Item-wise Compliance to technical specification duly vetted by the respective OEMs. The Model and Make of the offered product should be clearly specified.

7.2.3. The bidder/OEM must ensure that certificates, including certificates of technical specifications asked, are valid on the date of closing of tender.

7.2.4. It shall be the responsibility of each bidder to fully acquaint himself with all the Central and State Laws and Rules & local factors which may have any effect on the performance of the contract. The purchaser shall not entertain any request for clarifications from the bidder regarding such Central / State laws, Rules and local factors.

7.2.5. No request for change of rates / price shall be entertained after the bidder submits the offer.

7.2.6. The bidder should quote the rates strictly in accordance with the columns /fields provided as per format available on IREPS i.e., www.ireps.gov.in.

7.2.7. CRIS will not be responsible for any delay on the part of the vendor in obtaining the terms & conditions of the tender or submission of online bids. The bids submitted by telex/telegram/fax/E-mail /manually etc. shall not be considered. No correspondence will be entertained on this matter.

7.2.8. Incomplete, vague and conditional bid/offer shall not be accepted on any ground and shall be rejected straightway. If any clarification is required, the same should be obtained before submission of the bids.

7.3 Compliant Offers / Completeness of Response

7.2.9. Bidders are advised to study all instructions, forms, terms, requirements and other information in the Tender documents carefully. Submission of the bid shall be deemed to have been done after careful study and examination of the Tender document with full understanding of its implications.

7.2.10. Failure to comply with the requirements of this paragraph may render the offer noncompliant and the offer may be rejected. Bidder must:

- Include all documentation specified in this RFP;
- Follow the format of this RFP and respond to each element in the order as set out in this RFP
- Comply with all requirements as set out within this RFP.

7.4 Submission of Bids

7.4.1 The bids will be submitted electronically in two packets (Techno-Commercial Bid + Financial Bid) system. These two packets will be submitted together electronically before the date of tender closing. The bidder should follow the instructions to bidder document available on www.ireps.gov.in.

7.4.2 Bid received without EMD will be rejected straightway unless it is established that they are exempted under the law. However, it is the responsibility of the bidder to establish through submission of documentary evidence that they are exempted from submission of EMD.

7.4.3 Please note that prices should not be indicated in the Technical Bid but should only be specified in the Financial Bid.

7.5 Pre-bid Conference

The pre-bid conference will not be conducted.

7.6 Site Visit

Bidders may visit the site to obtain additional information before filling the tender at their own cost and responsibility. For that purpose, the bidders should intimate CRIS minimum two days in advance in writing.

7.7 Evaluation of offers

This is a two-packet tender with e-RA. Bids shall be techno-commercial and financial. The bid evaluation process shall be as per Standard Bid Document Part-I

7.8 Delivery schedule

Delivery shall be made as per quantity mentioned in SoR for the Primary Data Centre and DR Data Centre within 4 weeks from the date of purchase order to consignee at the address given in section 7.9

All the supplied equipment and subscription should be in the name of the Centre for Railway Information System (CRIS).

7.9 Consignee, Delivery Address and Installation Location

S.N.	Data Centre Location	Consignee	Delivery Address & Installation Location
1	New Delhi – Primary DC	GM/PRS	Centre for Railway Information System, Chanakyapuri, New Delhi 110 021. Tel: 011-24104125
2	Secunderabad – DR DC	GM/PRS/SC	Centre for Railway Information Systems, Computerised Reservation Complex, 1st floor, South Central Railway, Secunderabad - 500025

8. Performance cum Warranty Guarantee (PBG) Bond

It will be applicable as per Standard Bid Document Part-I

9. Project Deliverables and Timelines

The delivery schedule is distributed across PRS data centres (section 7.8 and 7.9).

The work shall be executed as per timelines defined below. The following is the broad time Schedule in weeks:

S.No.	Task Description Schedule	Weeks from date of issue of Purchase Order (D) for completion	Milestone	Dependency on other milestones	Related item S No. of SoR (Annexure – II)
T1	Supply of all Software components as specified in SoR for primary and DR site	D + 4		**NIL**	Item no. 1 to 36
T2	Installation, configuration of all supplied items at primary and DR site and setting up of Replication along with preparation of installation report along with application migration w.r.t supplied Transaction Data Store	D + 8		**T1**	Item no. 37
T3	Final Acceptance Test Procedure at primary and DR site deployment.	D + 10		**T2**	Item no. 37
T4	System go-live at primary and DR site	D + 14		**T3**	Item no. 37
T5	Commissioning of the system at primary and DR site after 28 days of successful operations.	D + 14	**M1**	**T3**	Item no. 1 to 37
T6	OEM Training	D + 14	**M2**	**NIL**	Item no. 38

T7	Commencement of comprehensive maintenance services at Primary and DR Site for 3 years	D + 14	**M3**	**T5(M1)**	Item no. 39 to 41
T8	Commencement of OEM man-day support at Primary Site and DR Site for 3 years	D + 14	**M4**	**T5(M1)**	Item no. 42 to 50

9.1 Responsibility matrix

A broad-level responsibility assignment matrix is given below, where all key activities are mentioned. Each activity is mapped out every task, milestone or key decision involved in implementation of the Data Layer Solution for Next Generation Passenger Reservation System. Further, it also covers which roles are Responsible for each action item, which personnel are Accountable, and, where appropriate, who needs to be Consulted or Informed.

i. CRIS: Customer who has floated the bid document.
ii. SI: Selected SI through the bid document.
iii. OEM : OEM of the Technology provided in the solution.

[R]esponsible: This party oversees completing the task.
[A]ccountable: This party endorses the result of the task.
[C]onsulted: This party needs to be asked for feedback, and feedback needs to be considered.
[I]nformed: This party needs to be kept up to date with the progress of the plan development.

S.No.	**Activity to be performed**	**CRIS**	**SI**	**OEM**
1	Signing of the Contract	R,A	R,A	R,I
2	Supply of all Software components as specified in SoR for primary and DR site	C,I	R,A	R,A
3	Submission of Project plan	C	R,A	R,C
4	Submission of the High-level Design document and deployment architecture for all the supplied components and have it reviewed and approved by the OEMs in consultation with all the stakeholders	C,I	R,A	R,C
5	Submission of Functional Requirement specification, Software Requirement specification, HLD, and LLD, as per the bid document Scope of work for all Software components of PRS Data layer.	C,I	R,A	R,C
6	Traceability matrix for verification based on the requirements in the Design Workshop, Scope of Work and Deliverables.	C,I	R,A	R,C

7	Software installation , configuration and Integration by OEM technical resources as per the approved project plan.	C,I	R,A	R,A
8	Provisioning of Monitoring Dashboard for all the software components as per the bid document	C,I	R,A	R,A
9	Provisioning , management and administration for all security services as per the bid document	C,I	R,A	R,A
10	Integration of PRS data layer software components with CRIS existing systems and applications & other applications in Indian Railways	C,I	R,A	R,A
11	Provisioning and Management of Backup services as per the bid document.	C,I	R,A	R,A
12	Configuration of DR replication and required processes for all supplied software components of PRS Data Layer	C,I	R,A	R,A
13	Final Acceptance Test Procedure at primary and DR site deployment.	R,C	R,A	R,A
14	System go-live at primary and DR site	R,C	R,A	R,A
15	Commissioning of the system at primary and DR site after 28 days of successful operations.	R,C	R,A	R,A
16	Technical training sessions of all software components for PRS Data layer to CRIS Tech Team.	C,I	R,A	R,A
17	Commencement of comprehensive maintenance services including Resident Engineers (REs) at Primary and DR Site for 3 years	C,I	R,A	R,A
18	Commencement of OEM man-day support at Primary Site and DR Site for 3 years	C,I	R,A	R,A

Note: N/A refers Not Applicable

Note: - a) The week counts mentioned herein are inclusive of all type of non-working days (Central Government).

10. Liquidated damages in Delay in Delivery and Commissioning

Any delay by the bidder in the performance of the delivery obligations shall render him/her liable to Liquidated Damages as follows:

S.No.	Task Description Schedule	Weeks from date of issue of Purchase Order (D) for completion	Milestone	Related item S No. of SoR (Annexure – II)	LD (In case of delay in delivery /execution)
(1)	(2)	(3)	(4)	(5)	(6)
T1	Supply of all Software components as specified in SoR for primary and DR site	D + 4		Item no. 1 to 36	NIL
T2	Installation, configuration of all supplied items at primary and DR site and setting up of Replication along with preparation of installation report along with application migration w.r.t supplied Transaction Data Store	D + 8		Item no. 37	NIL
T3	Final Acceptance Test Procedure at primary and DR site deployment.	D + 10		Item no. 37	NIL
T4	System go-live at primary and DR site	D + 14		Item no. 37	NIL
T5	Commissioning of the system at primary and DR site after 28 days of successful operations.	D + 14	**M1**	Item no. 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34 and 37	@ 0.5% of the total value of related SoR items in column (5) for each week or part thereof for each data center. The

					total LD shall not exceed 10% of the total value of related SoR items in column (5) for each data center
T6	OEM Training	D + 14	**M2**	Item no. 38	NIL
T7	Commencement of comprehensive maintenance services at Primary and DR Site for 3 years	D + 14	**M3**	Item no. 39 to 41	NIL
T8	Commencement of OEM man-day support at Primary Site and DR Site for 3 years	D + 14	**M4**	Item no. 42 to 50	NIL

* Total LD on all milestones put together shall not exceeds 10% of the total contract value.

11. Inspection and Acceptance Test Procedure (ATP)

The inspection and acceptance procedure (ATP) for the item supplied as per SoR shall be carried out jointly by the consignee or its nominated representative and the vendor as per details given below. Performa for Preliminary Test Certificate and Final Acceptance & Commissioning Certificate are given in Annexure -IX of this document. It will be separately carried out for Primary and DR Site. Thus, for each of following 2 certificates shall be issued one for Primary Site and other for DR site.

11.1. Preliminary Testing

11.1.1.1. Physical verification of equipment/components as per the Bill of Material (BoM) supplied against SoR.

11.1.1.2. Physical inspection of the equipment/components for any physical damage.

11.1.1.3. Physical verification of software media, licenses and documentation (which shall also include Installation tie-up and ATS certificates from OEM) as per tender.

11.1.1.4. Preliminary Testing certificate (as per format in Annexure-X (31.1)) to be signed jointly by CRIS and the successful bidder.

11.1.1.5. The date of issue of Preliminary test certificate shall be termed as date of Preliminary Testing.

11.2. Final Acceptance Testing

Following are the activities completed, before starting the final acceptance testing process:

1. Design Workshop conducted by Bidder with OEM and CRIS for understanding Functional, Technical, security and migration requirements along with System Study and finalization of Deployment architecture for Primary and DR Site.

2. Submission of Low-level Design Document, Deployment Architecture, DR Replication (for Primary and DR Site), implementation Plan and Project Plan detailing each task with target date and assigned resource persons (OEM/Solution Provider) including the plan for installation of all supplied items and integration with existing infrastructure.

3. Supply of all Software components as specified in SoR for primary and DR site

4. Application migration w.r.t supplied Transaction Data Store

5. Installation and configuration of all supplied items at primary and DR site and setting up of Replication along with preparation of installation report.

The final acceptance testing shall be carried out jointly by CRIS and the bidder for all the items in the SoR to verify the following:

a) Verification of item-wise compliance on technical specifications from respective OEMs for all the items of SoR.

b) Technical specifications of all the Software and it's supporting components from the SoR will be verified thorough physical inspection or verification from product brochure or manufacturer certification / document or Certificate / Report from respective regulatory agency or conducting a test as per Annexure

c) Installation and configuration of complete solution as given in scope of work (section 4) and deployment architecture specified in section 3.2.

d) Installation and configuration of products supplied by vendor services as per finalized deployment architecture.

e) Verification of "No Single Point of Failure" in overall solution.

f) Verification of "No Data Loss" in overall solution.

g) Demonstration of functional requirements of all the Software and it's supporting components (Annexure III).

h) Evaluation of Technical use cases of all the Software and it's supporting components (Annexure XI)

i) The bidder will have to demonstrate with suitable tools the above defined performance level.

i) Compliance to Security Requirements as per section 4.5 and submission of report.

j) Configuration of Backup and restore process as specified in section (section 4.7)

k) Setting and configuring of DR process (Only for Final acceptance testing of DR Site at Secunderabad) and associated documentation as per section 4.8.

m) Submission of report on processes to be defined for Management & Monitoring of product supplied by the bidder.

n) Final acceptance certificate (as per format in Annexure-X (31.2))) to be signed jointly by the CRIS representative and the successful bidder.

o) The date of issue of Final acceptance certificate shall be termed as date of final acceptance and system will be considered as Date of Final Acceptance.

Following are the activities to performed post Final Acceptance:

i. Application Deployment at primary and DR site and testing by CRIS with technical support by Bidder and OEM

ii. Fine tuning of supplied software w.r.t. Security and submission of the compliance report vis-à-vis the defined Security Architecture (SA) at primary and DR site

iii. Defining & Implementing processes for management and monitoring of the entire ICT Infrastructure in accordance with the defined SA for primary and DR site.

iv. System go-live at primary and DR site and commencement of comprehensive maintenance services at Primary and DR Site.

11.3. System Commissioning

11.3.1 The System commissioning certificate shall be issued only after ascertaining that the system is performing satisfactorily for a continuous period of 4 week after Date of Final Acceptance.

11.3.2 The entire system will be considered as commissioned once the acceptance testing has been completed successfully and the system performs satisfactorily for a continuous period of 1 month post completion of acceptance testing.

11.3.3 Submission of a final Installation Report clearly indicating the installation, Detailed Connectivity Diagram, finalized deployment architecture etc.

11.3.4 Re-Submission of documents/Reports submitted in Final Acceptance stage after incorporating CRIS review comments.

11.3.5 The comprehensive maintenance support services shall commence from the Date of System Commissioning. All the Subscriptions& OEM ATS dates shall be verified in accordance and should be valid for 3 years from date of commissioning.

11.3.6 A System commissioning certificate as per Performa given in Annexure-X (31.3)))

12. Payment Terms

The Schedule of payments to the Successful bidder will be as under:

S. No.	Payment Stage	Project Implementation Milestone		Payments as % of total value
1	System Commissioning at Primary Site and DR Site	**M1**	Successful System Commissioning at primary and DR Site Following documents are required to be furnished for primary and DR Site: - 1. Successful completion of Preliminary Testing certificate (Annexure –X section 31.1). 2. Final Acceptance Certificate (Annexure –X section 31.2). 3. System Commissioning Certificate (Annexure –X section 31.3). 4. Consumption of OEM Man-days, if any (attendance sheet duly verified by CRIS). 5. Confirmation of the validity of PBG as per SBD-1	Payment will be made annually for first year, second year and third year of the cost of ICT Components (Software and Hardware) supplied at primary Site and DR Site (As per SoR, S No. 01 to 36). Payment of first year (As per SOR, S. No. 01, 04, 07, 10, 13, 16, 19, 22, 25, 28, 31 and 34), second year (As per SOR, S. No. 02, 05, 08, 11, 14, 17, 20, 23, 26, 29, 32 and 35),_and third year (As per SOR, S. No. 03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33 and 36) will be done from commencement of first, second and third year respectively from system commissioning date 100 % of the Implementation cost (As per SoR, S. No. 37).
2	Training Cost	**M2**	100% cost of Training shall be paid after completion of training to the satisfactions of the consignee and upon furnishing the following documents: - 1. Training Completion certificate from CRIS team (Training should be initiated in parallel to implementation) 2. Confirmation of the validity of PBG as per SBD-1	100% of the training cost (As per SoR, S. No. 38)

S. No.	Payment Stage	Project Implementation Milestone		Payments as % of total value
3	Comprehensive maintenance support for 03 years	**M3**	Payments for comprehensive maintenance support cost will be made every quarter at the end of the quarter on submission of certificate of satisfactory maintenance Confirmation of the validity of PBG as per SBD-1	Payment will be calculated after deducting penalties if any. Payment will be made on quarterly basis on completion of Help desk support subject to submission of performance certificate (As per SoR, S No.39 to 41).
4	OEM Man-days for First year, Second year and third year	**M4**	On OEM man-day consumption basis to be paid half yearly on submission of OEM man-days consumption certificate. Confirmation of the validity of PBG as per SBD-1	On submission of documentary proof for OEM Man-days consumption on half yearly basis (As per SoR, S No. 42 to 50) from solution provider.

12.1. Enhancement and reduction of quantities

The option clause allowing for the Enhancement and reduction of 30 % quantities of procurement order (as per Para 21 of the CRIS SBD-I) will not be applicable for this tender.

13. Documentation

Bidder shall submit the following documents during the lifecycle of the project:

13.1 Requirements document as per Design Workshop conducted by Bidder and OEM.
13.2 High Level Design Document.
13.3 Low level Design document including Deployment Architecture document with diagram as well as descriptions for both the Primary and DR DC.
13.4 Implementation Plan
13.5 Testing Plan and Test Cases
13.6 Traceability Matrix

13.7 Installation Reports
13.8 Documentation of complete setup including installation, configuration, customization, Administration, Maintenance.
13.9 Product Manuals.
13.10 Training Materials.
13.11 Document of Knowledge Transfer (KT)
13.12 Document of Design Best practices and P&T
13.13 Any other relevant document

* The equipment must be accompanied by original documentation and full set of accessories given by the manufacturer.

14. Role of CRIS

14.1 Shall provide the infrastructure as mentioned in section 3.2.5 for Installation of software products supplied by the bidder.
14.2 Shall provide sitting space for the implementation team & onsite resident engineers.
14.3 Review and finalization of the detailed Project implementation plan prepared by the bidder / OEMs shall be done by CRIS.
14.4 Review and finalization of the system deployment architecture prepared by the bidder / OEMs shall be done by CRIS.
14.5 Shall provide the queries for migration.
14.6 Development, deployment, performance tuning and maintenance of IR New age PRS Application deployed on this setup shall be done by CRIS.
14.7 Review and finalization of all training curriculum for CRIS team.
14.8 Final Acceptance Testing to verify compliance to all functional requirements (Annexure III), technical specifications (Annexure IV) and use cases (Annexure XI) specified in the Tender shall be done by CRIS jointly with Bidder & OEM.

15. Make in India Compliance

As per CRIS SBD-I (including modifications) .

16. Land Border with India Compliance

As per CRIS SBD-I (including modifications) .

17. Other Terms & Conditions

As per CRIS SBD-I (including modifications) .

18. Annexure IA – Details of Physical servers for PRS Transaction Data store which are available to be used at Primary DC & DR DC

Following are the details of Physical servers that are available to be used in Next Generation PRS Data Layer Transactional data store (as mentioned in section 3.3.1).The 2.5 NVME SED SSD disk based SAN Storage will also be provided.

A1-Hardware for Primary DC				
S no.	**Item Description**	**Product Offered (Make)**	**Product Offered (Model/Version)**	**Quantity (Nos)**
1	Database Nodes with 3-year warranty for Primary DC	DELL	PowerEdge R750 Server	5- Production Environment 1 – Staging Environment
A2-Hardware for DR DC				
2	Database Nodes with 3-year warranty at DRDC	DELL	PowerEdge R750 Server	5

Model	Dell PowerEdge R750 Server
Mother Board	R750 Motherboard with Broadcom 5720 Dual Port 1Gb On-Board LOM
Processor	2 * Intel Xeon Platinum 8358 2.6G,32C/64T
Memory	1 TB (16 * 64GB RDIMM, 3200MT/s, Dual Rank, 16Gb)
Disk	2 * 1.92TB SSD SATA
	4 * 3.84TB NVMe
Network Card	6 * 25GbE (SFP28 SR Optic)
HBA Card	1 *Emulex LPE 35002 Dual Port 32 Gb Fibre Channel HBA, PCIe Low Profile
	1 * Emulex LPE 35002 Dual Port 32 Gb Fibre Channel HBA, PCIe Full Height

19. Annexure IB – List of Software and Hardware Components

Following are the list of Software and Hardware components that will be used in Next Generation PRS:

Sl. No.	Software Component	Purpose	Component Edition	Model &Version	Sourcing process
1	Container orchestration Platform (Kubernetes) with capabilities of SDN, Backup capabilities of environment, Service Mesh (ISTIO) and Kubernetes Monitoring	Environment	Enterprise	Red Hat OpenShift Container Platform (Version 4.12 or higher)	Already Procured through separate RFP
2	Virtualization layer	Environment	Enterprise	(Redhat OpenStack 17.1 or higher)	Already Procured

					through separate RFP
3	Operating System	Environment	Enterprise	RHEL 9.x	It will be procured through this RFP for Transactional data Store servers
4	Container Registry	CI-CD	Enterprise bundled with KUBERNETES	Red Hat Quay	Already Procured through separate RFP
5	IAM (Open ID Connect)	Authorization and Authentication	Enterprise		Separate RFP
6	SAN Storage Orchestrator (Kubernetes Complaint)	Environment	Enterprise bundled with KUBERNETES	Dell EMC PowerStore 5x00T	Already Procured through separate RFP
7	Hardware Load Balancer Orchestrator (Kubernetes Complaint)	Environment	Enterprise bundled with Hardware load balancer	F5	Already Procured through separate RFP
8	Argo CD	CI-CD	Enterprise bundled with KUBERNETES		Already Procured through separate RFP
9	HELM Chart	CI-CD	Community		Open Source product
10	GIT Gogs	CI-CD	Community		Open Source product
11	Tekton	CI-CD	Enterprise bundled with KUBERNETES		Already Procured through separate RFP
12	MinIO	Object Storage	Community	Dell EMC ECS Storage EX500	Already Procured through separate RFP
13	Streaming platform - KAFKA (as part of Event broker and streaming platform Solution),	Event	Enterprise	Red Hat Application Foundations, Cluster Edition	Already Procured through separate RFP
14	AMQP (with Streaming Capabilities)	Messaging and Streaming	Enterprise	Solace	Already Procured through separate RFP
15	In Memory data Grid (IMDG)	Caching	Enterprise		It will be procured through this RFP

16	RDBMS	Static and Config DB	Enterprise		It will be procured through this RFP
17	Backup Software	Backup	Enterprise	NA	Separate RFP
18	ELK/EFK	Application Logging	Community		Open Source product
19	Prometheus	Monitoring	Community		Open Source product
20	Grafana	Monitoring	Community		Open Source product
21	Transactional Data store & Its components	Transactional DB	Enterprise		Through this RFP
22	API Gateway	Third party integration	Enterprise	WSO2	Procured through separate RFP
23	External DNS	PRS DNS	Community		Open Source product
24	Cert-Manager	Kubernetes certificate management controller	Community		NA
25	Kafka Manager	Kafka Management UI	Community		NA
26	Goofys	S3 File system. Used as gateway for SFTP to S3	Community		Open Source product
27	Zookeeper	Distributed synchronizatio n	Community	3.6	Open-Source product
28	Object Storage	Object Storage	Enterprise	Dell EMC ECS EX500 Storage	Procured through separate RFP
29	SAN storage	SAN storage	Enterprise	Dell EMC PowerStore	Procured through separate RFP

20. Annexure IC – Details for DR Site Data Replication

The replication of required data will be configured in Next Generation PRS using the capability of the product deployed in the setup. Following are the details of product to be deployed in DR site along with replication requirement and it's mechanism.

Sl. No.	Software Component	Deployed at PR Site	Deployed at DR Site	Replication Required	Replication mechanism	Responsibility
01	RDBMS	Y	Y	Y	Replication will be configured using product capability	Respective RFP - OEM/Bidder to configure the

						replication mechanism
02	Data store for Transactional Data	Y	Y	Y	Replication will be configured using product capability	Respective RFP - OEM/Bidder to configure the replication mechanism
03	In Memory Data Grid (caching)	Y	Y	Y	Replication will be configured using product capability	Respective RFP - OEM/Bidder to configure the replication mechanism

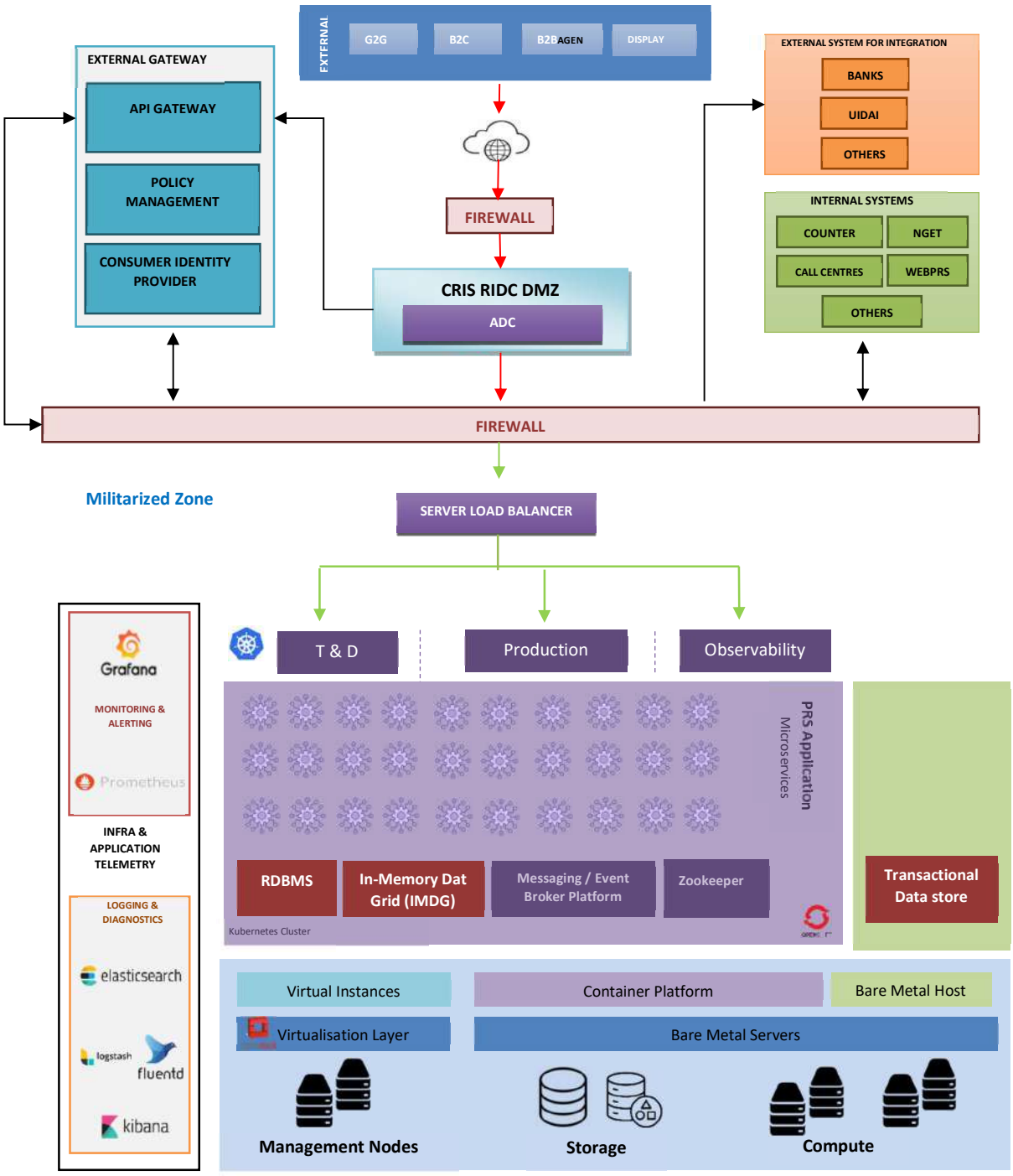
21. Annexure ID – Backup Details

Following are the indicative details of Data Backup that need to be taken along with Methodology. Detail plan along with frequency of backup will be decided during the design phase as per the proposed solution.

Sl. No.	Software Component	Backup Data Details	Methodology
1	RDBMS for Static & Config Data	Configuration and Data	To be configure as per proposed OEM methodology
2	Data store for Transactional Data	Configuration and Data	To be configure as per proposed OEM methodology
3	In Memory Data Grid (caching)	Configuration	To be configure as per proposed OEM methodology

22. Annexure IE - Details of components of Overall System Deployment Architecture

The deployment of Next generation Passenger Reservation System is planned to be done by following the architecture given below:



Following are the components that will be deployed in the Next generation Passenger Reservation System

22.1. Physical Servers

The next generation PRS is deployed using the x86 based commodity servers. These servers will be primarily classified as:

- Management Nodes
- Compute nodes for Application workload

22.2.1. Management Nodes

The Management nodes will be used for, the deployment of the management components of various software products and its portals, offer in the bid. These management components need to be configured in high availability with active-active mode, following are the indicative management components that needs to be deployed on these nodes:

1) Infrastructure Services
    a) DHCP servers
    b) NTP servers, should be deployed in bare-metal servers
    c) DNS servers
    d) HTTP Proxy servers
    e) Air gaped mirror instances
2) Kubernetes Master Nodes along with etcd
3) Kubernetes monitoring related components e.g., Prometheus, Thanos, etc.
4) Kubernetes Dashboard
5) Kubernetes RBAC manager related components
6) Cluster Log shipping related components e.g., Fluentd etc
7) Cluster Auto scalers to scale Kubernetes cluster nodes up and down
8) Hardware Load-Balancer Orchestrator related components to configure load balancing of Kubernetes service in hardware load balancer
9) Virtualization Management, Automation, Monitoring and its Components
10) Virtualization SDN Management, Automation, Monitoring and its Components
11) Container Platform Management, Automation, Monitoring and its Components
12) Container Platform SDN Management, Automation, Monitoring and its Components
13) Container Image Registry and its components
14) VM & Operating System Repo along with patch management
15) SAN Storage Management and its Components
16) LDAP and Identity and Access Management and its Components
17) Help Desk Management and its Components
18) Backup Management and its Components
19) Any Kind of Operations Management and its Components
20) And any other Management related Components

All logs will be preserved for 180 days for Network and Security equipments and for all other hardware and software 1 year logs shall be kept.

22.2.2. Compute Nodes for Application Workload

The Compute nodes will be used for running the application. These Nodes can be categorised as:

- Kubernetes Worker Nodes
- Transaction Database Nodes

22.2.2.1. Kubernetes Worker Nodes

These compute nodes will be the part of the Kubernetes cluster and these nodes will act as a worker node. On these servers, various micro-service application will be deployed with their multiple layers like, data layer (IMDG and Static DB), business layer, service layer and presentation layer. These servers would be high compute capable, as application workload would be running on these servers.

22.2.2.2. Transaction Database Nodes

These compute nodes will be used to deploy the NoSQL Database used for online transaction processing purpose.

22.2. SAN Storage

The SAN Storagewill be used as the Storage layer and all the application data, logs and monitoring data will be stored on this layer. For high performance, set of NVMe disk pool will also be configured in this layer. Additionally, SAN storage will be used for storing data for analytics purpose. SAN storage needs to provide Volumes to Bare-Metal, VMs and Kubernetes workloads.

The SAN storage should have capability to provide raw partition, shared partition, LUN to Bare-Metal servers and VMs

22.3. Container Platform

The next generation PRS will use Kubernetes as a Container platform which will provide a framework to run distributed systems resiliently. Kubernetes will provide capabilities like:

- Service discovery and load balancing
- Storage orchestration
- Automated rollouts and rollbacks
- Automatic bin packing
- Self-healing
- Secret and configuration management

Multiple micro-services mapped to various business services will be deployed as a container on this setup and will scale-out as per the application load. To handle the peak load, Kubernetes setup will burst to cloud (on-prem and public) setup on need basis. The Kubernetes setup with the capability of deploying across multiple Datacentres will provide the benefits of Disaster Recovery Site.

22.4. Service Mesh

A *service mesh* is a configurable, low-latency infrastructure layer designed to handle a high volume of network-based inter-process communication among application infrastructure services using application programming interfaces (APIs). A service mesh ensures that communication among containerized and often ephemeral application infrastructure services is fast, reliable, and secure. Service mesh reduces the complexity associated with a microservice architecture and provides functionalities like:

- Load Balancing
- Service discovery
- Health checks
- Authentication
- Traffic management and routing
- Circuit breaking and failover policy
- Security
- Metrics and telemetry
- Fault injection

22.5. Application Service Gateway

The services of Next generation PRS deployed over Kubernetes will be access by multiple client application. These client applications can be primarily classifieds as:

- ***Internal Client Application***are the application that are deployed within the CRIS datacentre but outside the Kubernetes cluster. These applications will access the services over the CRIS internal network.
    - Counters – Ticket booking counters located at Railway Premises or Non-Rail Head.
    - NGET - Next Generation E-Ticketing (NGET) application is the enhanced internet ticketing Web Site for Rail ticket booking system
    - Web PRS (indianrail.gov.in)- PNR enquiry, Train schedule, availbaility enquiry, Journey planner, Fare enquiry, Mobile nos for SMS services & call centre
    - Others i.e.
        - i. PMS -PNR details,Dog cat booking.
        - ii.NTES/ICMS- Train cancellation, delay.
        - iii.WECRS- For TDR refund.
        - iv.HHT- Web Service for Vacant Berth (Not turned up passenger) Release, FTP of chart files.
        - v.HRMS-Integration with HRMS for pass booking .
        - vi.GST- Integration using TIBCO .
        - vii.Retiring Room - Integration during booking and cancellation, PNR enquiry is given to Retiring room.

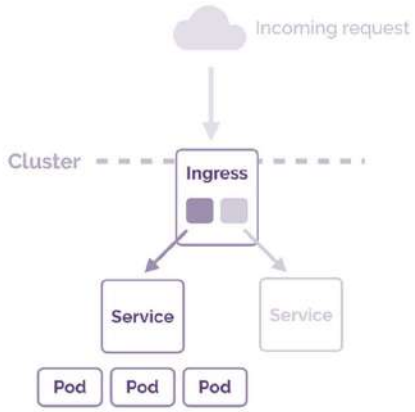
- ***External Clients Application*** are the third-party application deployed outside the CRIS datacentre. These applications will access the services over the internet.

    a. Banks –CPG (POS,UPI,QR code), NCM card-POS, UPI during booking. Offline refund initiation next day.
    b. UIDIA - Aadhaar validation during user registration
    c. Others i.e.
        i. B2B-Business to Business Agents
        ii. B2C-Business to Consumer Agents ex. Make My Trip, Yatra etc
        iii. G2G-Government to Government ex. CGDA, CRPF, BSF etc
        iv. G2C-Government to Consumer (G2C)

Following components will be deployed to provision access to the services to different client application:

22.5.1. Ingress Controller

In Kubernetes, an Ingress Controller is an object that allows access to your Kubernetes services from outside the Kubernetes cluster. Configure access by creating a collection of rules that define which inbound connections reach which services.



The internal client application will access the next generation PRS services through Ingress Controller or Hardware Load-balancer.

22.5.2. API Gateway

An API gateway takes all API calls from external clients coming over internet, then routes them to the appropriate microservice with request routing, composition, and protocol translation. Typically, it handles a request by invoking multiple microservices and aggregating the results, to determine the best path. It can translate between web protocols and web-unfriendly protocols that are used internally. The API gateway will forward the request to Ingress controller or Hardware Load-balancer for service access.

22.5.3. Hardware Load Balancer

Hardware based Load Balancer will forward all the south bound traffic to the Kubernetes clusters and to any other service provisioned to be load balanced.

Hardware based Load Balancer should provision load-balancing for Kubernetes service of type “Load Balancer”, it should integrate with Container Management Platform for the same.

22.6. Data Layer

The data layer of Next Generation PRS will be polyglot and will depend on the requirements of the micro-service. Based on the performance, consistency and persistency needs following are the components that will be present:

22.7.1. In-Memory data grid

For services requiring faster data access, IMDG will be used for storing the service data and will be deployed in Kubernetes.

22.7.2. Database

- To maintain static and configurable data, relational database will be used and will be deployed in Kubernetes.
- To manage the online transactional data, NOSQL database will be used deployed over the bare metal servers outside the Kubernetes Cluster. Configuration will be done to achieve optimum communication between this database and application deployed over the Kubernetes cluster.

22.7. Event Broker Platform

Event Broker platform is required for following functional requirements:

- Main transaction flow
    a. Saga pattern (Orchestration and Choreography)
    b. Chained request - response mechanism -
        i. Controller microservice will initiate the booking transaction and post the transaction data in the event broker topic. Desired service will consume, process and post the data in the desired topic.
        ii. Next service will consume for the topic and process. This flow will execute subsequently till the end of transaction with final response will be consumed by Controller micro-service.
- To implement CQRS by updating the read query database through separate micro-services
- Charting - Read multiple record from DB and send to charting application through the event Broker platform
- Data Change History / Journaling - for post facto analysis
- Add-on services - like
    2. SMS
    3. Mail
    4. Catering etc

22.8. Monitoring & Alerting

Prometheus & Grafana will be configured for monitoring and alerting purpose for deployed PRS applications.

22.9. Logging and Diagnostics

For logging and diagnostics, ELK (Elasticsearch, Logstash, Kibana) or EFK (Elasticsearch, Fluentd, Kibana) stack will be implemented

22.10. Identity access management

An Identity and access management solution will be used for authentication and authorization of underlying infrastructure, virtualization platform and container platform. Bidder need to integrate with the existing IAM and PIAM solution (details mentioned in Annexure XIX). In case the provided container or virtualisation platform does not integrate with the existing solution, than bidder need to provision the required solution.

22.11. Data Backup

Backup of Configuration and application Data in a specific frequency need to be configure in the system. The indicative list of Configuration and application Data is defined in Annexure ID.

23. Annexure – II: Schedule of Requirements

S. No.	Item Description	Technical Spec Number	UoM	Qty	Line item wise scope of work defined	Product offered	Remarks
A1 - Data layer for Primary DC -Mandatory							
1	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for first year - for Primary DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV

2	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for second year - for Primary DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
3	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for third year - for Primary DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
4	Transactional Data Store -with supporting components and underlying Operating System for Staging environment -Annual Subscription Cost for first year - for Primary DC Note:-If the bidder does not required Subscription for Staging for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
5	Transactional Data Store -with supporting components and underlying Operating System for Staging environment -Annual Subscription Cost for second year - for Primary DC Note:-If the bidder does not required Subscription for Staging for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV

6	Transactional Data Store -with supporting components and underlying Operating System for Staging environment -Annual Subscription Cost for third year - for Primary DC Note:-If the bidder does not required Subscriptionfor Staging for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
7	Transactional Data Store -with supporting components for T & D environment -Annual Subscription Cost for first year - for Primary DC Note:-If the bidder does not required Subscriptionfor T&D for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
8	Transactional Data Store -with supporting components for T & D environment -Annual Subscription Cost for second year - for Primary DC Note:-If the bidder does not required Subscription for T&D for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
9	Transactional Data Store -with supporting components for T & D environment -Annual Subscription Cost for third year - for Primary DC Note:-If the bidder does not required Subscription for T&D for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV

10	RDBMS - with supporting components - Annual Subscription Cost for first year - for Primary DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		
11	RDBMS - with supporting components - Annual Subscription Cost for second year - for Primary DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		
12	RDBMS - with supporting components - Annual Subscription Cost for third year - for Primary DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		
13	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost for first year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
14	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format

	for second year - for Primary DC						given in Annexure XIV
15	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost for third year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
16	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for first year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
17	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for second year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
18	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for third year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
19	IMDG (Cache Software) - with supporting components for T & D environment - Annual Subscription Cost for first year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV

20	IMDG (Cache Software) - with supporting components for T & D environment - Annual Subscription Cost for second year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
21	IMDG (Cache Software) - with supporting components for T & D environment - Annual Subscription Cost for third year - for Primary DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
B - Data layer for DR DC-Mandatory							
22	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for first year - for DR DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
23	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for second year - for DR DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
24	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Annual Subscription Cost for third year - for DR DC	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
25	Transactional Data Store -with supporting components for Staging environment - Annual	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software

	Subscription Cost for first year - for DR DC Note:-If the bidder does not required Subscription for Staging for solution then fill cost as Rs. 1.						component) as per format given in Annexure XIV
26	Transactional Data Store -with supporting components for Staging environment - Annual Subscription Cost for second year - for DR DC Note:-If the bidder does not required Subscription for Staging for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
27	Transactional Data Store -with supporting components for Staging environment - Annual Subscription Cost for third year - for DR DC Note:-If the bidder does not required Subscription for Staging for solution then fill cost as Rs. 1.	S-1	Solution	1	Clause 3 and 4		Provide breakup details of Solution (Software component) as per format given in Annexure XIV
28	RDBMS - with supporting components - Annual Subscription Cost for first year - for DR DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		
29	RDBMS - with supporting components - Annual Subscription Cost for second year - for DR DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		

30	RDBMS - with supporting components - Annual Subscription Cost for third year - for DR DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of Cores	12	Clause 3 and 4		
31	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost for first year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
32	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost for second year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
33	IMDG (Cache Software) - with supporting components for Production environment -Annual Subscription Cost for third year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
34	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for first year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
35	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for second year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format

							given in Annexure XIV
36	IMDG (Cache Software) - with supporting components for Staging environment - Annual Subscription Cost for third year - for DR DC	S-3	Solution	1	Clause 3 and 4		Provide breakup details of Solution (i.e. node details) as per format given in Annexure XIV
C -Installation, Support and Services -Mandatory							
37	Installation and commissioning Charges of supplied productsat primary and DR DC		Lumpsum	1	Clause 4.1 to 4.8		
38	Training Charges				Clause 4.13		
39	Bidder Charges for Comprehensive support charges for first year				Clause 4.1 to 4.12		
40	Bidder Charges for Comprehensive support charges for second year				Clause 4.1 to 4.12		
41	Bidder Charges for Comprehensive support charges for third year				Clause 4.1 to 4.12		
42	OEM Man days charges for First year for Transactional Data Store		man-days	35	Clause 4.12		
43	OEM Man days charges for Second year for Transactional Data Store		man-days	20	Clause 4.12		
44	OEM Man days charges for Third year for Transactional Data Store		man-days	20	Clause 4.12		
45	OEM Man days charges for First year for RDBMS		man-days	5	Clause 4.12		
46	OEM Man days charges for Second year for RDBMS		man-days	5	Clause 4.12		
47	OEM Man days charges for Third year for RDBMS		man-days	5	Clause 4.12		
48	OEM Man days charges for First year for IMDG (Cache Software)		man-days	15	Clause 4.12		

49	OEM Man days charges for Second year for IMDG (Cache Software)		man-days	10	Clause 4.12		
50	OEM Man days charges for Third year for IMDG (Cache Software)		man-days	10	Clause 4.12		
D - Optional Items for Primary DC							
51	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Subscription for 4th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 1		
52	Transactional Data Store -with supporting components and underlying Operating System for Staging environment - Subscription for 4th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 4		
53	Transactional Data Store -with supporting components for T & D environment - Subscription for 4th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 7		
54	RDBMS - with supporting components - Subscription for 4th year - for Primary DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of cores	12	Clause 3 and 4 Ref: SOR item No. 10		
55	IMDG (Cache Software) - with supporting components for Production environment -Subscription for 4th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 13		

56	IMDG (Cache Software) - with supporting components for Staging environment - Subscription for 4th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 16		
57	IMDG (Cache Software) - with supporting components for T & D environment - Subscription for 4th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 19		
58	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Subscription for 5th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 1		
59	Transactional Data Store -with supporting components and underlying Operating System for Staging environment - Subscription for 5th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 4		
60	Transactional Data Store -with supporting components for T & D environment - Subscription for 5th year - for Primary DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 7		
61	RDBMS - with supporting components - Subscription for 5th year - for Primary DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of cores	12	Clause 3 and 4 Ref: SOR item No. 10		

62	IMDG (Cache Software) - with supporting components for Production environment -Subscription for 5th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 13		
63	IMDG (Cache Software) - with supporting components for Staging environment - Subscription for 5th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 16		
64	IMDG (Cache Software) - with supporting components for T & D environment - Subscription for 5th year - for Primary DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 19		
Optional Items for DR DC							
65	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Subscription for 4th year - for DR DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 22		
66	Transactional Data Store -with supporting components for Staging environment - Subscription for 4th year - for DR DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 25		
67	RDBMS - with supporting components - Subscription for 4th year - for DR DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of cores	12	Clause 3 and 4 Ref: SOR item No. 28		
68	IMDG (Cache Software) - with supporting components for Production environment	S-3	Solution	1	Clause 3 and 4 Ref: SOR		

	-Subscription for 4th year - for DR DC				item No. 31		
69	IMDG (Cache Software) - with supporting components for Staging environment - Subscription for 4th year - for DR DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 34		
70	Transactional Data Store -with supporting components and underlying Operating System for Production environment - Subscription for 5th year - for DR DC	S-1	Solution	1	Clause 3 and 4 Ref: SOR item No. 22		
71	Transactional Data Store -with supporting components for Staging environment - Subscription for 5th year - for DR DC	S-1	Solution		Clause 3 and 4 Ref: SOR item No. 25		
72	RDBMS - with supporting components - Subscription for 5th year - for DR DC Note:- In case of node-based solution ,bidder should calculate the price of total nodes offered and divide it by 12 to quote its equivalent price per core.	S-2	Number of cores	12	Clause 3 and 4 Ref: SOR item No. 28		
73	IMDG (Cache Software) - with supporting components for Production environment -Subscription for 5th year - for DR DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 31		
74	IMDG (Cache Software) - with supporting components for Staging environment - Subscription for 5th year - for DR DC	S-3	Solution	1	Clause 3 and 4 Ref: SOR item No. 34		
Optional OEM Man days for 4th and 5th Year							

75	OEM Man days charges for 4th year for Transactional Data Store		Days	20			
76	OEM Man days charges for 5th year for Transactional Data Store		Days	20			
77	OEM Man days charges for 4th year for RDBMS		Days	5			
78	OEM Man days charges for 5th year for RDBMS		Days	5			
79	OEM Man days charges for 4th year for IMDG (Cache Software)		Days	10			
80	OEM Man days charges for 5th year for IMDG (Cache Software)		Days	10			

Note:

1 If the bidder does not required licences for Staging and T&D for solution then fill cost as Rs. 1.

2. The bidder has to provide breakup details of Solution (Software component) including operating system as per format given in Annexure XIV

24. Annexure – III: Functional Requirement

24.1. Transactional Datastore Solution Functional Requirements

1. Transactional datastore solution will consist of two clusters one in Primary Data Centre (DC) and the other in Disaster Recovery (DR) DC.

2. The deployment of the transactional datastore solution will utilize all the five physical servers provided by CRIS in the Primary Data Centre (DC) (Annexure IA). If any additional software resources are deemed necessary for the successful implementation of the solution, it is expected that the bidder responding to the RFP will be responsible for furnishing these resources.

3. Both DC and DR cluster of the transactional datastore solution must be configured for zero data loss and maintain consistent write operations.

4. Both the clusters present at primary and DR DC will be up at all the time with asynchronous bi-directional replication configured between Primary DC and DR DC. All the services of transactional datastore solution will be available at both the data centres simultaneously with the required capability of read and write.

5. The bidder should demonstrate addition and removal of bare-metal node from both clusters.

6. The ANSI SQL querying features, provided by a distributed query engine, are used by the CRIS application to generate real-time ticket transaction reports based on various parameters such as payment mode, journey details, passenger type, and other financial transactions from the transactional datastore.

The functional requirements of data processing and aggregation in a transactional datastore solution using these ANSI SQL features, powered by a distributed query engine:

- **Data Aggregation** - using functions like ***SUM, MAX, MIN, CEILING, ROUND, COUNT*** etc.
- **Conditional Data Processing** - using ***CASE WHEN*** expressions.
- **Data Grouping** - by using ***GROUP BY*** clause to support multiple levels of **grouping and aggregation** for different financial and passenger categories
- **Nested Queries and Derived Tables** - The application can use **nested queries** (subqueries) to pre-process and derive intermediate results before final aggregation. The querying mechanism shall allow complex calculations inside **derived tables** for improved query efficiency.
- **Filtering and Data Selection** - using the ***WHERE*** clause to filter **records based on multiple conditions**.
- **String and Numeric Data** - using CASE WHEN for categorization, shall support string concatenation, sting and numeric comparison operations.
- **Conditional Aggregation** – using SUM with CASE WHEN expression.
- **Aliasing for Readability** - shall use **aliasing (AS)** to rename columns for better readability in reports and query results.
- **Numeric Calculations** - shall support arithmetic *operations (***+, -,* , /***)* in query calculations for accurate financial and passenger data processing.
- **Multi-Level Aggregation** - shall perform **nested aggregation** at different levels of processing (inside subqueries and final queries)
- **Joins** – shall support INNER, LEFT OUTER, RIGHT OUTER, FULL OUTER, CROSS and LATERAL joins.

Note: - The Transactional Data Store solution consisting of components required to comply the technical specification either through the Transactional Data Store product or by integrating with third party tool. The complete supplied solution shall be supported as defined in the section 4.9 of the RFP.

7. The bidder should implement all the technical use cases mentioned in annexure XI.
8. A monitoring dashboard should be provided to monitor both the clusters. This dashboard will include but is not limited to the following critical metrics:
    a. Storage - Total, Usage, Free
    b. Memory - Total, Usage, Free
    c. Replication factor of different namespaces/databases
    d. IOPS (Input/Output Operations Per Second)

e. TPS (Transactions Per Second)
f. P99 response time for read and write transactions
g. Throughput
h. User administration
i. User role-base access control
j. RTO (Recovery Time Objective)
k. RPO (Recovery Point Objective)

9. Configuration of the backup and restoration process for the transactional datastore solution.

10. The transaction datastore OEM need to provide verification of datastore models and adherence to development best practices as it is essential for creating reliable and scalable data-driven applications, the following support need to be provided but not limited to: -
    a. Schema Validation
    b. Data Integrity
    c. Normalization & De-Normalization of data models
    d. Indexing
    e. Scalability
    f. Code Review
    g. Security
    h. Performance Optimization
    i. Testing and Test Automation
    j. Backups and Disaster Recovery Plan and process
    k. Maintenance Plans

11. The transaction datastore should integrate with IAM &PIAM provided by CRIS as mentioned in Annexure-XIX.

24.2. RDBMS Solution Functional Requirements

1. The RDBMS Solution will be deployed on the container platform.
2. The RDBMS solution should be based on enterprise version of open source or community version to avoid vendor lock-in.
3. In primary data centre (DC) the RDBMS solution will be deployed in primary and stand-by mode with synchronous replication.
4. The replication between multiple instances of RDBMS in the same data centre should be in synchronous and writes should be consistent.

5. The RDBMS solution in both DC and DR should be configured in High Availability (HA)
6. The storage for the RDBMS solution will be configured through Kubernetes Persistence Volume Claim (PVC)
7. The RDBMS solution should define read-write service, to connect the application to only primary server of the cluster.
8. The RDBMS solution should define read-only service, to connect the application to any of the instances for reading workloads.
9. The RDBMS solution must implement connection pooling for database scalability and transparent application connection to one or more database instances.
10. Configuration of the backup and restoration process for static & config RDBMS solution.
11. A monitoring dashboard should be provided to monitor both the clusters in DC & DR. This dashboard will include but is not limited to the following critical metrics:
    a. Database instances status
    b. CPU stats
    c. Disk status - Total, Usage, Free
    d. Memory - Total, Usage, Free
    e. Replication status
    f. Statements
    g. Table locks
    h. Dead lock transactions
    i. User administration
    j. User role-base access control
    k. RTO (Recovery Time Objective)
    l. RPO (Recovery Point Objective)

12. The static & config RDBMS should integrate with IAM/PIAM provided by CRIS as mentioned in Annexure-XIX.

24.3. In Memory Data Grid (caching)Solution Functional Requirements

1. The IMDG cache need to be deployed in a container platform (Redhat Openshift).
2. The IMDG deployed on container platform should adhere to CPU and RAM “request” and “limit” values of the resource management for pods.
3. The IMDG should provide performance monitoring dashboards.

4. Submission of final installation report to be done by the bidder.
5. The bidder should implement all the technical use cases mentioned in annexure XI.

25. Annexure – IV: Technical Specification

25.1. Transactional Data store

Sr. No.	Technical Specification	Compliance (Yes/No)
General Features		
1	The data-store technology should be developed on the open standards of NoSQL or NewSQL technology.	
2	The data-store technology should be based on enterprise version of open source or community version to avoid vendor lock-in.	
3	The data-store should have capability to get deployed on-premises, Public/Private cloud, or in a hybrid model.	
4	The data-store should have zero data loss feature.	
5	The data-store should allow for active/active reads and writes across multiple geo-separated data centres.	
6	The data-store solution MUST be able to push data to open-source databases platform for online and offline analytics using BI/Analytics tools. The technology should be based on open source to avoid vendor lock-in.	
7	The data-store solution should be a masterless or equivalent share nothing distributed solution.	
8	The proposed data-store should support distributed architecture i.e. data should be distributed across multiple nodes.	
9	The data-store need to be able to scale linearly as you add servers to the cluster.	
10	The data-store should be able to support general Commodity Hardware, Virtual machines, Containers.	
11	The data-store when scaling by adding servers, no re-sharding on the user side should be necessary, and should automatically be done transparently on the data-store side.	

12	The data-store should scale to multiple data centres with an ability to seamlessly scale.	
13	The data-store solution should have search and indexing capability. It must provide capability to create primary and secondary indices.	
14	The data-store should Natively support TTL of data so that it can be purged after a specified period of time.	
15	The data-store must support strong, immediate consistency to prevent any conflicting writes and ensure that reads the most recently committed data.	
16	The enterprise support is required for all the connectors used for Technical compliance of the solution	
Replication		
17	The data-store should be capable of allowing real-time replication (in milli seconds) of data within and across data centres to provide redundancy and high availability.	
18	The data-store should have provision for cross geo, cross data centre replication in asynchronous/synchronous modes.	
19	The data-store should provide consistency of data and it must be across distributed geographical regions, across data centre in synchronous/asynchronous mode based on the requirement.	
20	The data-store should provide automated node/availability zone failover across multiple geo-separated data centres.	
21	The data-store replication and consistency of data has to be flexible and tuneable based on various business requirements.	
Development & Integrations		
22	The data-store should have pre-built library for various programming languages like C, C#, C++, Go, Java, JavaScript(Node.js), Python, R, Spring Boot and Java Clients	
23	The offered data-store should have a supported library to integrate with Spring Boot and Spring Data.	
24	The data-store should have feature for bulk data loading and integrated stream processing capability to ensure data portability.	
25	The data-store should offer robust support for various Data Models, allowing developers to work seamlessly with a wide range of NoSQL and NewSQL data models.	
26	The data-store solution should have ability to store and query (full-text search, faceting, and geospatial search) existing data in the data-store in a relationship or graph oriented way.	

27	The offered solution should reduce learning curve for getting productive through the abstraction of data-store specific concepts by supporting popular API options such as REST, GraphQL and schema-less JSON out of the Box.	
28	The offered solution should reduce learning curve for getting productive through the abstraction of data-store specific concepts by supporting popular API options such as REST, GraphQL and schema-less JSON out of the Box.	
SQL Querying		
29	The data-store should have SQL or SQL like quarriable capability for querying through command line interface.	
30	The data-store solution should also provide supported UI based ANSI SQL based querying tools.	
Performance		
31	The data-store should support partitioning of storage for faster write and read of data.	
32	The data-store must be optimized for high-availability, ensuring continuous operation and data accessibility. **It should consistently maintain 2 millisecond or less latency for read and 3 millisecond or less latency for write operations (P99 latency)**, demonstrating efficiency and reliability, even under peak load conditions.	
33	The data-store solution should have capability to support 1 million transactions per second.	
34	The data-store should support zero data loss while scaling down the cluster.	
35	Proposed data-store technology must support hybrid storage architecture i.e. able to store data on DRAM, SSDs, Flash Drives, NVMe, PMEM etc.	
36	The data-store should support rack aware cluster to know which rack has the available data.	
37	The data-store should have dynamic cluster management feature to handle node membership management, handling node management trigger at network fault, node addition or removal.	
38	In case of node failure, system should have capability to automatically rebalance the objects and data to other nodes without impacting required performance.	
39	In case of services in the node stops, system should not loose the data in RAM and quickly restart as and when the services are restart.	
40	The data-store should support zero data loss while scaling down the cluster.	

41	The data-store should have capability for compression algorithms like LZ4, Snappy ,Zstandard for data storage.	
42	The data-store should provide high availability with uptime of 99.9 or more.	
43	The data-store system should smartly distribute data evenly across all the nodes.	
CDC and Real-time streaming		
44	The data-store solution should be able to natively de-duplicate the data and send it to downstream application for further processing like search, analytics, backup, etc.,	
45	The data-store solution should provide tools to bring in and out the change data capture(CDC) into data platform on real-time basis.	
46	The data-store should provide integrated solution to transform, join, merge, etc., data in real-time bases.	
47	The data-store should support Kafka integration for both upstream and downstream data in real time.	
48	The data-store should integrated pub-sub tools to provide stream data into and out of underlying data store.	
Analytics Requirements		
49	Should integrated with Spark analytics that allows for hybrid transactional/analytical transaction processing and Spark streaming.	
50	Should support integrating with an external Spark system.	
51	Native capability to Spark stream and spark batch without requiring multiple drivers to be installed.	
Security Requirements		
52	Secure data and protect privacy using encryption, role-based access control, and single sign-on.	
53	Detect and prevent potential breaches through configurable auditing and log scanning and filtering	
54	Should support role based authentication (RBAC)	
55	Should support integration with LDAP	
56	Provide the ability to audit data-store operations	
57	Provide data-store level transparent data encryption	
58	Proposed data-store must support data encryption in motion (TLS 1.2) and encryption at rest (AES - 126 and AES 256)	
59	data-store should also support TLS/SSL features	
Manageability		

60	Should include a comprehensive monitoring dashboard for centralized cluster monitoring and offer a set of dashboard or command-line tools for efficient cluster management.	
61	Should support provision, upgrade, Backup/Restore and manage the cluster through a central dashboard or command-line.	
62	The data-store should provide central dashboard or command-line tools to do various day-to-day operations like patching, rolling upgrades, backup & restoration, data-store cluster management and monitoring.	
63	The data-store should support rolling upgrades so that system should not be down while troubleshooting, upgrade or applying patches.	
64	The data-store solution should provide central dashboard to perform real-time monitoring at different levels such as data-store cluster, data-store instances, CPUs, Disk Storages, Memory, Clients.	
65	The data-store central dashboard for monitoring system should be able to generate alerts when a certain set threshold is crossed and should be able to generate notifications about alerts.	
Backup		
66	The data-store solution should provide full/snapshot and incremental backup features.	
67	The data-store solution should also provide backup restoration feature.	
68	Users should be able to take complete data-store backup online and in parallel. The restoration of the complete data-store should also be possible in parallel.	
69	The data-store solution should have built-in backup & recovery feature, disaster recovery feature, mechanism to transfer backed up data across to other systems for backup/archival.	
70	The data-store solution should have a feature of backup to a S3 complaint object store and full recovery of the backup from an existing backup in an object store.	
Performance Requirements for Day One		
71	The data-store must demonstrate the capability to sustain high throughput, supporting up to 1,50,000 read transactions per second. Each transaction should be processed with a P99 latency of 2 milliseconds or less for reads operations. It must also ensure high availability and fault tolerance, maintaining consistent performance and data integrity in various operational scenarios.	

72	The data-store must excel in handling write-intensive workloads, capable of managing up to 25,000 write transactions per second with a P99 latency of less than 3 milliseconds or less for writes. It must also ensure high availability and fault tolerance, maintaining consistent performance and data integrity in various operational scenarios.	
73	The data-store must have capacity to provide usable storage for 6TB of unique data.	
74	The data-store must meet all the criteria mentioned in points 71, 72 and 73	
Scalability in performance to meet future demands with additional Hardware and Software		
75	The data-store must have the capability to sustain high throughput, supporting up to 2,50,000 read transactions per second. Each transaction should be processed with a P99 latency of less than 2 milliseconds or less for reads operations. It must also ensure high availability and fault tolerance, maintaining consistent performance and data integrity in various operational scenarios.	
76	The data-store must excel in handling write-intensive workloads, capable of managing up to 40,000 write transactions per second with a P99 latency of less than 3 milliseconds. It must also ensure high availability and fault tolerance, maintaining consistent performance and data integrity in various operational scenarios.	
77	The data-store must have capacity to provide usable storage for 12TB of unique data.	
78	The data-store must meet all the criteria mentioned in points 75,76 & 77	
Case studies		
79	At least two live Case studies of large scale implementation in the travel/Transport/finance industry in the OLTP environment worldwide.	

25.2. RDBMS

Sr. No.	Technical Specification	Compliance (Yes/No)
General Features		
1	The RDBMS should be an open source RDBMS or based on an Open Source Stack.	

	The RDBMS solution should have capability to get deployed using Helm charts and Kubernetes Operators CRD's	
2	Databases should have built-in capabilities necessary to integrate and manage other data sources for structured, unstructured and NoSQL/NewSQLdatabases and deploy rapidly across multiple environments	
3	The RDBMS system should conform to the ANSI-SQL:200n standard.	
4	The RDBMS should have fundamental database features such as full ACID compliance, referential integrity, triggers, functions, procedures.	
5	The RDBMS should have all standard relational data types as well as native storage for: JSON, XML, TEXT, Document, Images, Audio, Video, Location Data and Complex Spatial Data.	
6	The RDBMS should be available to function in Redhat Linux and OpenShift Container Platform.	
7	RDBMS should be Fully SQL compliant.	
8	The RDBMS should have provision for automatic read load balancing.	
9	The RDBMS should provide controlled data access down to the row-level so that multiple users with varying access privileges can share the data within the same physical database or table.	
10	The RDBMs should have an in-built mechanism to prevent from SQL Injection attacks and should not be dependent on application.	
11	The RDBMS should have obfuscate server side code, protecting proprietary algorithms, data handling procedures, or intellectual property.	
GeoSpatial Capabilities		
12	The RDBMS should provide for spatial data formats within the database	
13	The RDBMS should be OGC compliant for Simple Features specification of SQL.	
Container Platform Integration		
14	Direct integration with Kubernetes API server for High Availability, without requiring an external tool	
15	Self-Healing capability, through: a) failover of the primary instance by promoting the most aligned replica b) automated recreation of a replica	
16	Planned switchover of the primary instance by promoting a selected replica	
17	Scale up/down capabilities	
18	Definition of an arbitrary number of instances (minimum 1 - one primary server)	

19	Definition of the read-write service, to connect your applications to the only primary server of the cluster	
20	Definition of the read-only service, to connect your applications to any of the instances for reading workloads	
21	Declarative management of RDBMS configuration through CRD's	
22	Declarative management of RDBMS roles, users and groups	
23	Support for Local Persistent Volumes with PVC templates	
24	Reuse of Persistent Volumes storage in Pods	
25	Support for PVC	
26	Support for Separate volume for transaction log files for replication and crash recovery ensuring data integrity	
27	Rolling updates for minor versions	
28	In-place or rolling updates for operator upgrades	
29	TLS connections and client certificate authentication	
30	Support for custom TLS certificates (including integration with cert-manager)	
31	RDBMS deployments across multiple Kubernetes clusters, enabling private, public, hybrid, and multi-cloud architectures	
32	RDBMS must support connection pooling for database scalability and transparent application connection to one or more database instances.	
33	Support for node affinity via nodeSelector	
34	Native customizable exporter of user defined metrics for Prometheus through the metrics port (9187)	
35	Automatically set readOnlyRootFilesystem security context for pods	
Performance		
36	The RDBMS solution should have capability of examining a database's activity through a native GUI tool and help diagnosing the long running SQL commands and frequently running SQL commands .	
37	The RDBMS should have High performance tools to do bulk data loading and should have an option of loading data in parallel.	
38	The RDBMS should have a resource manager for CPU and I/O to manage different workloads base done the priority.	
39	The RDBMS should have options of different partitioning schemes within the database (for ex. Range, List, Hash etc) to split large volumes of data into separate pieces or partitions, which can be managed independently. The partitioning should enhance the performance, manage huge volumes of data.	

40	The RDBMS should provide a rich variety of partitioning schemes to address the business requirement of the application. Partitioning should be embedded tightly into the core database engine and supported by many administrative tools. From an application perspective, it should be completely transparent which means no or minimal changes should be needed to be made to the application or to the SQL statements in order to use it.	
High Availability		
41	The RDBMS should provide Active-Active clustering across datacenters. Should also have provision for automatic failover between two database instance in Active-Active configuration.	
42	The RDBMS should have synchronous replication of data feature i.e. a transaction commit should wait at the primary database server/site till it is written on secondary database server/site.	
43	The RDBMS should have feature of replicating data Asynchronously.	
Backup		
44	Users should be able to take Complete Database Backup Online and in Parallel. The restoration of the Complete Database should also be possible in Parallel.	
45	The RDBMS solution should have built-in Backup & Recovery feature, Disaster Recovery Feature, Queue Mechanism to transfer data across to other database on homogeneous or heterogeneous Operating Systems and platforms.	
46	The RDBMS solution should have a feature of continuous backup to a S3 complaint object store and full recovery and Point-In-Time recovery from an existing backup in an object store	
Disaster Recovery		
47	The RDBMS should have native disaster recovery capability without any third party support using cost effective option of automatically synchronizing the transaction logs to disaster site, which in case of fail over should provide the availability of all data.	
48	The RDBMS should have built-in DR solution to replicate the changes happening in the database across multiple DR Sites with an option to run real-time reports from DR Sites without stopping the recovery mechanism.	
Manageability		
49	The RDBMS should provide automatic patch and security updates mechanism for the database and associated components such as replication tools, database servers etc.	
50	The RDBMS should have tools to perform real-time monitoring at different levels such as databases, instances, CPUs, Disk Storages, Memory, Statements in application including dynamic SQL, tables, locks, connection, deadlock, transactions.	

51	The RDBMS monitoring system should be able to generate alerts when a certain set threshold is crossed and should be able to generate notifications about alerts.	
52	The RDBMS should provide in-built auditing for allowing database administrators, security administrators, auditors, and operators to track and analyze database activities. These activities should include database access and usage along with data creation, change, or deletion.	
Case studies		
53	At least two live Case studies of largescale implementation in the travel/Transport/finance industry in the OLTP environment worldwide.	

24.3.In Memory Data Grid (caching)

Technical Specification for In Memory Data Grid (caching) solution			
Sl. No.	**Software Specification**	**Compliance (Yes/No)**	**Remarks (if any)**
1	The Caching software to be on open standards-based platform and participant in the JSR 107 and well defined roadmap for JSR 107 compliance		
	Minimize Amount of Refactoring		
2	The cache product should integrate with the following application servers and frameworks: a. Spring Boot c. Hibernate d. JPA (Java Persistence API) - with async back store scenario e. webLogic Application Server f. JBoss Application Server g. Web Sphere Application Server (including the Virtual Enterprise edition)		
3	Product should be compatible to run over Kubernetes based container setup for server and client instances.		
4	Product shall be able to support application data models without requiring any changes given the data meets Java serialization requirements.		
5	Product shall enable a continuous integration development environment.		
6	Product should minimize vendor lock-in.		

7	The developer should be shielded from the inner workings of the distributed cache; cache should however allow access to its inner workings should greater control be required.		
	Distributed Data Structures and Utilities		
8	The product should have the following distrubuted data structures and concurrency utilities.		
a)	**Map** - is the distributed implementation of java.util.Map		
b)	**Queue** - is the distributed implementation of java.util.concurrent.BlockingQueue		
c)	**Ringbuffer** - is implemented for reliable circular queue system.		
d)	**Set** - is the distributed and concurrent implementation of java.util.Set		
e)	**List** - similar to above set the only difference is that it allows duplicate elements and preserves their order		
f)	**Multimap** - is a distributed data structure where you can store multiple values for a single key		
g)	**Replicated Map** - it does not spread data to different cluster members. Instead, it replicates the data to all members		
h)	**Distributed Lock**- is the distributed implementation of java.util.concurrent.locks.Lock		
i)	**Distributed Semaphore**- is the distributed implementation of java.util.concurrent.Semaphore		
j)	**Distributed Atomic Long**- is the distributed implementation of java.util.concurrent.atomic.AtomicLong		
	Performance at Steady State		
9	Product should be able to deliver consistent throughout and latency under peak load scenario and circumvent execution environment specific issues like GC.		
10	Product must allow an unlimited number of nodes to scale horizontally in support of an individual cache.		
11	Product must have the ability to scale vertically and perform equally as well with a single node installation, if provided sufficient CPU, memory, and I/O as a multi-node deployment.		
12	Product should be able to scale horizontally and able to handle more application throughout and larger data size by runtime augmentation of additional computers/nodes		
13	Product should have ability to maximize the available RAM utilization and remain agnostic to Java GC issues		
	Performance during Warm-up		
14	The product should perform well as the cache is warming up.		
	Cache Startup Time		

15	The product shall startup quickly, so that clients are able to use it very soon after it is launched.		
	Data Affinity with application nodes		
16	Product shall have the ability to locate data as close to where it is needed as possible, and in an efficient format for where it is needed		
17	The product shall support data affinity when total cached data size is very large.		
18	The product should support in memory access time of micro second latencies for a very large distributed data set without impacting the JVM GC behavior		
19	The product shall guarantee the cluster wide consistency of data that is having affinity with application nodes. It should do so with no/minimal impact on performance		
20	The product in process cache should always be in sync with latest updates in cluster.		
	Component Failure and Recovery		
21	Product shall have the capability to automatically detect and recover from failure. Caching infrastructure should allow tunable SLAs against different kind of infrastructure failure.		
22	Product shall have the capability to dynamically add new servers/cache instances to the system and rebalance data across the cache instances while the system is running.		
23	While the system is recovering from a modification to its configuration, performance as seen by cache clients should be minimally affected for a minimal duration.		
24	Addition of new cache nodes to a running cache environment should also minimally impact cache clients.		
25	The product shall allow clients to be dynamically switched to an alternate server, if the server they are communicating with has a high processing load or becomes unavailable.		
26	Product must handle split brain issues (where a network or switch break causes the system to split into two “networks” that temporarily cannot communicate with each other but can communicate with some subset of client applications).		
	Data distribution and data consistency semantics across the cache		
27	The product shall efficiently distribute data across the cache for high performance and robustness.		
28	The product should be fully JTA standard compliant.		

29	The product shall support replicating a cache across a LAN/WAN. The replication should be highly available and should supports network outages or network slowdowns. The product should support both Active-Passive and Active-Active multisite		
30	The product shall guarantees data safety and availability during unplanned/planned data center shutdown. The data stored inside Distributed cache should be able to recover without dependency on any external data source. This feature should be configurable so that we can do same for some specific caches(use cases like train static data, availability etc)		
31	The product shall have the ability to support clustering and caching of web session.		
	Cache Techniques and Access Methods		
32	The Product shall facilitate uploading of data in bulk to the distributed cache. While data is being uploaded, performance of the cache should be minimally affected so clients can use the cache while the uploading is taking place. This feature should also include the ability to bulk update or bulk delete cache data.		
33	The product shall allow “trigger-like” notification for create/update/delete operations. That is, as a cache entry is created, updated or deleted, notifications could be sent out to either servers or clients so that application code can react to changes in the cache without having to poll the cache.		
34	Product shall allow querying of cached objects using multiple value elements and/or keys and/or metadata simultaneously.		
35	The product shall support queues and topics for persistence. (asynch write to backend)(write behind) The product should support asynchronous write to backend persistence store		
36	The product shall support multiple API calls simultaneously (multi-threading)		
37	The product shall support versioning of objects in the cache		
38	The product shall support assignment of running embedded code in specific cache nodes or with specific objects in the cache.		
	Support for Caching Standard		
39	The product should participate and conform to JSR 107 caching standards.		
	Database / Data source integration		

40	The product should be readily integrated with the major ORM frameworks like hibernate.		
41	The product should be capable of acting as second level caches in hibernate		
42	The product should support common access patterns including: -Cache Aside - Read Through -Write Through - Write Behind		
43	The product should have write behinds that will guarantee updates going to the database irrespective of failures.		
44	The product should not have any dependency on external database management systems		
45	The product shoiuld support near cache in the client, backed by a distributed cache. When ever the cache entries in the distributed cache is updated the near cache in all the clients should also be updated.		
	Development IDE		
46	The product must support the Eclipse IDE (Spring Source Tool Suite in particular).		
	Availability of features in the product		
47	The product should provide all the specifications out of the box/ configuration /OEM build custom code to provide the feature.		
48	The product should support both cloud based as well as non-cloud (stand alone) based deployment.		
	Admin, Operations and Maintenance		
49	The product to provide separation of duties across administrator types using role-based security and authorization features.		
50	The product shall support : - Viewing cache activity and metrics. For example, when a node has been added or removed, an administrator should be able to tell when rebalancing is complete. - altering cache contents - security administration		
51	The product to be compatible with Application performance monitoring tools. These should not negatively impact the operation of the cache.		
52	The Product should be patched without a major outage to the distributed cache.		

53	The product shall provide tools capable of troubleshooting problems, provisioning storage, and managing the configuration. The tools should have a GUI as well as command line utilities.		
54	The command line utilities should allow scripts to be written to perform repetitive administration tasks, or tasks that must be applied across many cache nodes and components.		
55	The product shall expose the monitoring capabilities through standard interfaces so that caching solution can be monitored and managed through customer own monitoring and management tools		
56	Monitoring should have minimal impact on the runtime performance of the application		
57	**Console should have overview panel which should display summarized information of cache nodes with following columns**		
a)	Node – The address of the client where the current Cache Manager is running.		
b)	Caches (Use Cases) – The number of caches resident on the client.		
c)	Enabled – The number of caches that are available to the application. Get operations will return data from an enabled cache or cause the cache to be updated with the missing data. Get operations return null from disabled caches, which are never updated.		
d)	Statistics – The number of caches from which the console is gathering statistics. Viewing cache statistics by day, week, month, quarter and year.		
57	**Console should display Cache Statistics Usage Graphs –line graphs**		
a)	Cache Hit Ratio – The ratio of cache hits to get attempts. A ratio of 1.00 means that all requested data was obtained from the cache (every put was a hit). A low ratio (closer to 0.00) implies a higher number of misses that result in more faulting of data from outside the cache.		
b)	Cache Hit/Miss Rate – The number of cache hits per second (colored) and the number of cache misses per second (colored)		

c)	Cache Update Rate – The number of updates to Objects in the cache, per second. The current value is overlaid on the graph. A high number of updates implies a high eviction rate or rapidly changing data.		
d)	Cache Put Rate – The number of cache puts executed per second.		
58	**Console should display Cache Statistics Table- a snapshot of statistics for each cache**		
a)	Name – The name of the cache as it should be configured in the Cache Manager configuration resource.		
b)	Hit Ratio – The aggregate ratio of hits to gets.		
c)	Hits – The total number of successful data requests.		
d)	Misses – The total number of unsuccessful data requests.		
e)	Puts – The total number of new (or updated) elements added to the cache.		
f)	Expired – The total number of expired cache Objects.		
g)	Removed – The total number of evicted cache Objects.		
h)	In-Memory Size – The total number of Objects in the cache on the client selected in Select View. This statistic is not available in the cluster-wide view.		
59	**Console should display Cache Statistics Search Graphs-**The search-related historical graphs provide a view into how quickly cache searches are being performed. The search-rate graph displays how many searches per second are being executed.		
60	**Console should display Cache Statistics JTA Graphs -**The JTA historical graphs display the transaction commit and rollback rates as well as the current values for those rates. For more information about transactional caches		
61	**Write-Behind Statistics**		
a)	Total number of writes in the write-behind queue.		
b)	Maximum number of pending writes, or the number of Objects that can be stored in the queue while waiting to be processed		
62	**Console should display Size of Cache-** The cache solution should display the Size of all caches in local as well as server tier.		
63	**Editing Cache Configuration -**The cache solution should provide following editable configuration properties for each cache		
a)	Cache – The name of the cache as it is configured in the System configuration resource.		
b)	Time-To-Idle (TTI) – The maximum number of seconds an Object can exist in the cache without being accessed.		

c)	Time-To-Live (TTL) – The maximum number of seconds an Object can exist in the cache regardless of use.		
64	**Cache Cluster run time statistics**		
a)	Real-Time Performance Monitoring- Tool allows to spot issues as they develop in the cluster.		
b)	Client Flush and Fault Rate Graphs- Client flush and fault rates are a measure of shared data flow between Cache servers and clients. These graphs can reflect trends in the flow of shared objects in a Cache cluster.		
c)	Cache Miss Rate Graph- The Cache Miss Rate measures the number of client requests for an object that cannot be met by a server's cache.		
65	Product should have option for selectively applying compression feature while storing the objects in memory and during network transfer		
66	In case of using multiple cache instances for storing huge data in cache, Product provides a common/single monitoring console to manage the entire cluster.		
67	Product has feature to automatically Increase the cache data size of any magnitude without any down time and manual intervention		
68	Product provides option to control the number of instances for storing data in cache		
69	Product provides feature for multi value hash maps in which we can put more than one value for same key.		
70	Product provides web based monitoring console for all the requirements, so that product there will be no need to install the same at all monitoring locations.		
71	Monitoring console of product should be able to provide the data present (in key value format) in cache, Product should have proper security mechanism for accessing the cache data		
72	Product is complied with all mentioned technical specifications out of the box without customization		
	Implementation and Support		
73	The product vendor should have L1-L3 support team /development office in India		
	Performance Requirement		
a)	**Day one performance requirement**		

i)	The solution must fulfill the day one performance requirement of handling 1.5 million transactions per second, with a ratio of 70% read operations and 30% write operations, and a data capacity of 1 terabyte.		
b)	**Scalability in performance to meet future demands with additional Hardware and Software**		
ii)	The design of the solution should be capable of accommodating future increases in load, up to 3 million transactions per second, maintaining a ratio of 70% read operations and 30% write operations, while also supporting a data capacity of 2 terabytes.		
	Case studies		
74	At least two live Case studies of large scale implementation in the travel/Transport/finance industry in the OLTP environment involving dynamic cache worldwide. The OEM to certify that the case studies submitted handles 1 million cache operation per second including get and put		

Note:- For 73-b-**Scalability in performance to meet future demands with additional Hardware and Software**) -As per the future demand for 3 million TPS, the additional hardware, software and subscription will be procured in a separate RFP by CRIS.

26. Annexure – V: Format for submission of Details of credentials/ documents furnished towards compliance of Qualification Criteria

S No.	Parameter	Details of credentials/ documents furnished			
		Description of Credential	**No. and date of document**	**Other Details**	**File name of the corresponding document attached with the bid on ireps**

27. Annexure – VI: Checklist for submission of Technical Evaluation

S. No.	Parameter	Details of credentials/ documents furnished	
		Documents to be provided	**File name of the corresponding document attached with the bid on ireps**

28. Annexure – VII: Support Office Details in Delhi/NCR and Secunderabad

Refer Annexure 15 of Standard Bid Document part-1

29. Annexure – VIII: OEM Product Deployment Undertaking

Details of credentials/ documents furnished towards undertaking of product deployment

SNO	Product	OEM Name	Project completion year	Details of product deployed – model/version & Quantity	Customer Name	File name of OEM undertaking attached with the bid on IREPS be mentioned here.
1						
2						
3						

OEM undertaking to be attached should be given by on company letter head. The letter should clearly state the information as described above along with declaration from OEM that the information provided is correct & the product was successfully commissioned.

30. Annexure – IX: Final Acceptance Testing Procedure

30.1. Transactional Datastore

Submission of a detailed installation report clearly indicating the installation of Transactional Datastore, configuration of replication, configuration of servers, operating system parameters, detailed deployment diagram, details of all supplied software installation with key parameters in accordance with the finalized deployment architecture of both the DC and DR cluster.

These test case need to be performed on both the DC and DR cluster of transaction datastore.

1. Put data on the datastore for testing.
2. Query data that have been added.
3. Use test application (CRIS to provide) to continuously write and query the datastore.

4. Pull one instance out of the transactional datastore cluster: - The test application should continuously write and query the datastore cluster without any failure and no loss of data should be observe.
5. Put the above instance back to the cluster: - The test application should continuously write and query the datastore cluster without any failure and no loss of data should be observed.
6. Pull one physical machine out of the transactional datastore cluster: - The test application should continuously write and query the datastore cluster without any failure and no loss of data should be observed.
7. Put the above physical machine back to the cluster: - The test application should continuously write and query the datastore cluster without any failure and no loss of data should be observed.
8. Power off any one machine of transactional datastore cluster: - The test application should continuously write and query the datastore cluster without any failure and no loss of data should be observed.

30.2. Transactional Datastore DR

These test case need to be performed in addition to defined in section 30.1 on DRSite:.

1. From the above test case check whether data is available in the DR site.
2. Showcase how to migrate to DR site.
3. Showcase how to switch back to DC site from DR site.
4. No loss of data should be there while performing the above test cases.

30.3. RDBMS

Submission of detailed installation report clearly indicating the installation of RDBMS, configuration of replication, configuration of RDBMS containers, details of all supplied software installation with key parameters in accordance with the final deployment architecture of both the DC and DR cluster.

These test case need to be performed on both the DC and DR cluster of RDBMS.

1. Load data on RDBMS for testing.
2. Query the loaded data.
3. Check application connectivity to the database using JDBC.
4. Use test application (CRIS to provide) to continuously write and query the database.
5. Delete one of the RDBMS pod: - The test application should continuously write and query the RDBMS cluster without any failure and no loss of data should be observed.
6. Power off the physical machine where RDBMS pod is running: - The test application should continuously write and query the RDBMS cluster without any failure and no loss of data should be observed.

30.4. RDBMS DR

These test case need to be performed in addition to defined in section 30.3 on DR Site:.

1. From the above test case check whether data is available in the DR site.
2. Showcase how to migrate to DR site.
3. Showcase how to switch back to DC stie from DR site.
4. No loss of data should be there while performing the above test cases.

30.5. In Memory Data Grid (caching)

The final ATP shall be carried out jointly by CRIS and the bidder for verification of the following:

Submission of detailed installation report clearly indicating the installation of Caching software and configuration of Caching software containers, Kubernetes parameters, detailed deployment diagram, details of all supplied software installation with key parameters in accordance with the final deployment architecture of both the DC and DR cluster.

1. Technical specifications of Caching software and it's supporting components from the SoR will be verified thorough physical inspection or verification from product brochure or manufacturer certification / document or Certificate / Report from respective regulatory agency or conducting a test as per Annexure IX.
2. Installation and configuration of complete solution as given in scope of work (section 4) and deployment architecture specified in section 3.2.
3. Installation and configuration of products supplied by vendor services as per finalized deployment architecture.
4. Verification of "No Single Point of Failure" in overall solution.
5. Verification of "No Data Loss" in overall solution.
6. Demonstration of functional requirements of Caching software (Annexure III).
7. Evaluation of Technical use cases of Caching software (Annexure XI)
8. Compliance to Security Requirements and submission of report.
9. The above points from 30.5.1 to 30.5.8 should also apply to DR setup too.

31. Annexure – X:Test Certificates

31.1. Preliminary Test Certificate

SUB: Preliminary Test Certificate

PURCHASE ORDER NO: _____ **Dated: _____**
Bidder Name: _____

Name of consignee: _____

Name of site: _____

Against the above mentioned purchase order, the items detailed below have been received on _____..

S. No.	PO - Item No.	Item	Qty.	Physical Check(Media & License)	S/W Manual	Subscription certificates from OEM	OEMs Man Days	Remarks

It is certified that the above mentioned items confirms the specifications/requirements of the purchase order and all the items required as per purchase order, have been delivered to consignees as per terms and conditions of purchase order.

Bidder Representative **CRIS Representative**

Signature:

Name:

Designation:

Date:

31.2. Final Acceptance Testing Certificate

SUB: Final Acceptance Test Certificate

PURCHASE ORDER NO: _____ Dated: _____

Bidder Name: _____

Name of consignee: _____

Name of site: _____

Date of Final Acceptance: _____

Against the above mentioned Purchase Order, the items detailed below have been successfully completed the final acceptance testing

For each items supplied as per SOR

S. No.	PO - Item No.	Item Name-Description	Qty.	Installation Status	Acceptance testing Status	Performance tuning done	Date of installation

It is certified that the above-mentioned items confirms the specifications/requirements of the purchase order and all the items required as per purchase order, have been successfully installed, configured, tested and made operational an as per requirements of purchase order.

The Vendor has successfully demonstrated

a. Functional requirements (Annexure III).
b. Technical use cases (Annexure XI).
c. Configuration of Backup and restore process as specified in section (section 4.7)
d. DR process (Only for Final acceptance testing of DR Site at Secunderabad)(Section 4.8)

The vendor has submitted detailed installation report, Acceptance Test, security compliance Report and all relevant document as specified in the tender.

Bidder Representative **CRIS Representative**

Signature:

Name:

Designation:

Date:

31.3. System Commissioning Certificate

SYSTEM COMMISSIONING CERTIFICATE

Sub: System commissioning certificate for release of payment of 100% of the cost of software items supplied for SoR Item for First year and 100 % of the Implementation cost as per SoR, S. No. 37).

PURCHASE ORDER NO: _____ **Dated: _____**

Name of site: CRIS, New Delhi Name of client: CRIS/PRS

Date of Final acceptance: _____
Vendor Name:_____
Date of System Commissioning _____

Against the above mentioned purchase order, the items detailed below have been successfully commissioned after installation and testing and is performing satisfactorily for a continuous period of past one month.
The warranty services (subscription) shall commence from the date < _____ > and are valid for 03 years from the date of commissioning.

For each Software item supplied as per SORS. No.	PO - Item No.	Item description	Qty.	System Commissioning Status	Status after 1 months	Remarks

The vendor has submitted OEM Subscription support documents for all equipment & software.

The Vendor has successfully done knowledge transfer session of the implementation of entire solution.

Bidder Representative CRIS Representative

Signature:

Name:

Designation:

Date:

32. Annexure – XI: Technical Use Cases

32.1 Technical Use cases & Benchmarking criteria for Transaction data store

32.1.1 Technical use case report for YCSB

The transactional datastore OEM should provide YCSB benchmark reports. The YCSB report should be based on the same version of the software being offered in this RFP.

The benchmark report should be based on the following workload types:

1. Workload A – 50% read and 50% write.
2. Workload B – 80% read and 20% write.
3. Workload C – 90% read and 10% write.

32.1.2 Benchmarking criteria

a. The report should clearly state the hardware and software configuration details used in the YCSB benchmark.

b. The report should provide the YCSB client hardware and runtime configuration details used in the benchmark.

c. The server-side hardware configuration should be based on the server specification mention in Annexure – IA.

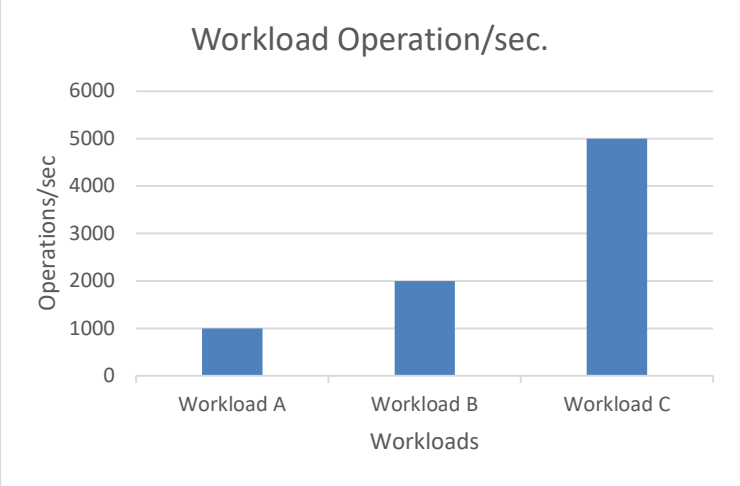
d. Minimum five physical servers or virtual instances, equivalent to minimum 320 physical cores/640 vCPUs and minimum 5 TB RAM should be used in the YCSB benchmarking.

e. The execution time for all the workloads with client request should be 4 hours.

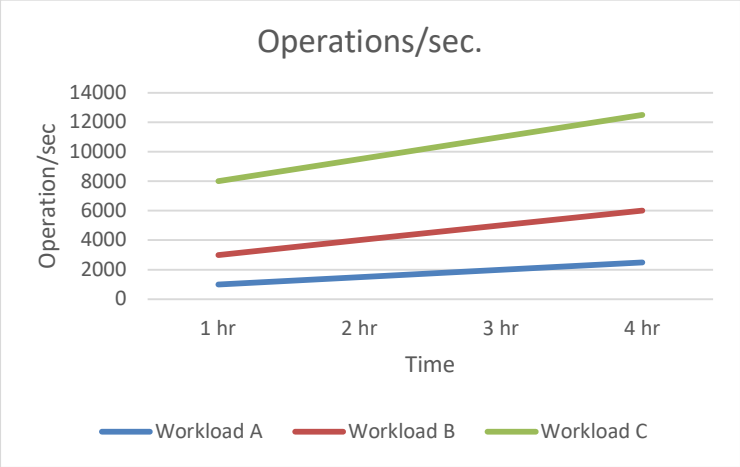
f. The report should clearly state the start time of each workload (A, B and C) so that it can be co-related with **nmon** reports of the servers and clients.

g. Data size for all the above workloads should be of 6 TB.

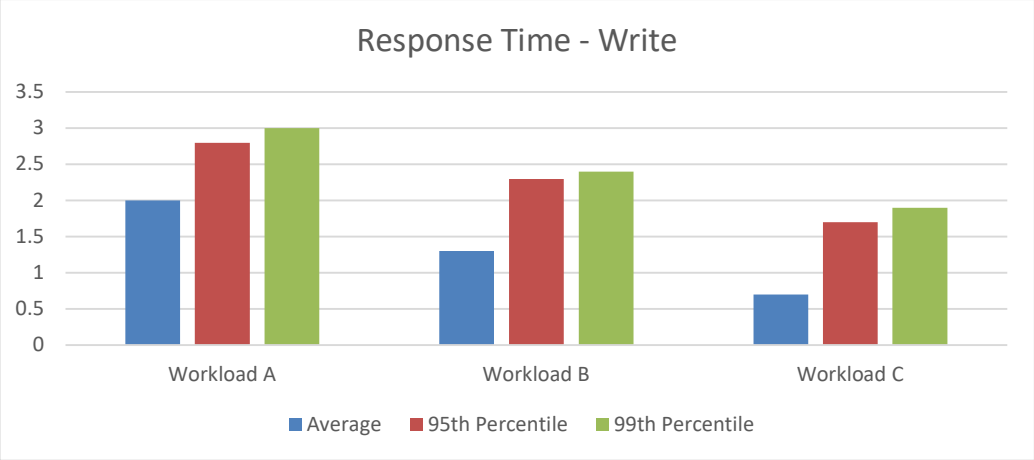
h. The report should provide operations/sec. chart in the following manner.



- The report should provide hourly based operations/sec. chart in the following manner.



- The report should provide response time chart for read operations and write operations separately in the following manner.



- The report should provide the hardware utilization report based on **nmon** csv format (batch mode with 60 seconds frequency). For all the hardware used in the YCSB benchmark (client and server both)
- The YCSB report for proposed transaction data-store solution must demonstrate following capabilities:
  - Minimum 1,50,000 Reads per second and minimum 25,000 Writes per second
  - Response time of P99 of 2 milliseconds or less for reads and 3 milliseconds or less for writes operations for 6 TB of unique data in a DC, maintaining a Read/Write ratio of 80% reads to 20% writes (Workload B).

32.2 Technical Use cases for In Memory Data Grid (caching)

32.2.1 Technical use case

It is planned to carry out the test cases which shall demonstrate the product features and capability and also the Application specific business cases. The details of the test cases planned to be performed under this category are listed in the table below.

ID	Feature	Test case	Remarks
1.	Capability	Data stored by client on one instance of Spring Boot Application is available to another instance of Application, although the instances are not in application server cluster	
2.	Capability	Ability to store the existing application data structures in cache	
3.	Capability	Once data brought into local machine, it is served all the request from local machine till the time of update in central cache or TTL/TTI	
4.	Capability	latest updated data is available on local machines (data updated from any machine is universally available on local machine)	
5.	Capability	Option to dynamically change the cache configuration (modify TTL at run time)	
6.	Capability	Ability to control the size of local cache based on application needs.	
7.	Capability	Write-behind or other database integration features should be available	
8.	Monitoring	Real time monitoring of the system(for faults at local machine/size of elements/TPS/client connections/machine Id's/ server status etc (complete list shall be shared before carrying out the POC)	
9.	Performance Benchmarking	Performance achieved after Use of cache solution does not breach the Application benchmarking defined by CRIS.	
10.	Performance Benchmarking	Application throughput of 35000 (24000 gets/sec, 11000 put/sec) no of requests it can handle simultaneously.	
11.	Performance Benchmarking	Increase in Memory usage (size) after implementing the cache solution is not more than 10 to 20%.	
12.	High Availability – JVM	JVM Stopped - Cache contents still available(All the data elements stored in central cache by application are available)	
13.	High Availability	Cache contents are available and application working seamlessly even after stopping one of the nodes of central cache server	
14.	High Availability	Entire cluster failure - Cache contents are still available after cluster restart	

32.2.2 Benchmarking Criteria

During performance benchmarking activity, following two types of tests shall be performed.

a) Application performance test - This shall be performed as per workload profile defined by CRIS. The results of this run should match the SLA's achieved by CRIS during the benchmarking activity of the application. The resource utilization on server should not exceed the resource utilization achieved during benchmarking activity.

b) Sample application benchmarking for through put and performance – In this a sample application without any business logic/user Interface and which shall have only API calls for accessing the cache to simulate the following cases shall be executed.

- Test Case 1: Search of the value with a key from Huge data pool to check response time behaviour of the of cache solution.
- Test Case 2: To check concurrency of cache product, Multiple Gets or reads can be done.
- Test Case 3: To check concurrency of cache product, Multiple Puts or writes can be done.
- Test Case 4: If big object is updated at central cache then how the product will send same objects from central cache to local cache.

33. Annexure XII: Certificate from Bidder for Compliance to GoI Order for Countries sharing Land Border with India

Refer Annexure 7 of Standard Bid Document Part-I

34. Annexure-XIII: NON-DISCLOSURE AGREEMENT (NDA)

Refer Annexure 14 of Standard Bid Document Part-I

35. Annexure-XIV: Data layer Solution (Software component) – Breakup Detail Format

Please refer Annexure – II: Schedule of Requirements for the S-1, S-2 and S-3 and provide the following information against each of the product.

S. No.	Software Component Name	Complied Tech Spec No. of S-1	UoM	License Type (Subscription)	Qty	Product offered (Model/ make)	Remarks
Total							

Note: - For Transactional data store , the details of all the components including the Operating system of the solution should be provided In the table above.

S. No.	Software Component Name	Complied Tech Spec No. of S-2	UoM	License Type (Subscription)	Qty	Product offered (Model/ make)	Remarks
Total							

S. No.	Software Component Name	Complied Tech Spec No. of S-3	UoM	License Type (Subscription)	Qty	Product offered (Model/ make)	Remarks
Total							

36. Annexure-XV: Format for Bidder to submit solution for each technical use case solution

<table>
<tr><td>TUC No.</td><td></td></tr>
<tr><td>Use Case</td><td></td></tr>
<tr><td>Component(s) Used</td><td>
<table>
<tr><th>S. No.</th><th>Component Name</th><th>Product Offered/Used (Model/Make/Version No.)</th><th>OEM</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Detail Design</td><td></td></tr>
</table>

37. Annexure-XVI: Format for OEM compliance certificate for technical use case solution

To be provided by OEM on their letter head

TUC No.	Use Case	Component Name	Product Offered (Model/Make/Version No.)	OEM Compliance and certification of usage of their product to implement the solution

38. Annexure-XVII: Declaration of inclusion of OEM Services by the Bidder

Declaration Letter, On Company letterhead

Dated : _____

To,
GM/PRS
CRIS, Chanakyapuri,
New Delhi – 110021.

Tender Reference: _____

Dear Sir/Madam,

We M/s _____ declared that we have include the services of theOEMs as per the table given below:-

Sr. No.	OEM	RFP clause Number
1.		
2.		
3.		

We ensure that we have included all the cost w.r.t to products and its respective service as per the conditions mentioned in the tender.

Yours faithfully,

(Signature, Name, designation, Contact information)

39. Annexure-XIX: Existing Infrastructure & Enterprise level Tools already deployed in CRIS PRS Primary DC, Chanakyapuri, New Delhi.

S. No.	Item Description	Make & Model
2	NMS	MicroFocus NMS (NNMi10, OMi, Network Automation version 10, Site Scope version 11)
3	SIEM	McAfee ESM 5600, ERC 3450
4	VA Tool	McAfee MVM-3200
5	IAM/PIAM	MicroFocus NET IQ

40. Annexure – XX: Details of minimum OEM man days (professional services) for installation, configuration & performance tuning activities for Primary and DR DC

Component	Minimum OEM Man-Days
Data Store & supporting components as per solution	40
RDBMS	10
In Memory Data Grid (caching)Solution	30

41. Annexure XXI: OEM's Authorisation to Bidder and Undertaking for Backend Support

Centre for Railway Information Systems

Annexure 8: OEM's Authorisation to Bidder and Undertaking for Backend Support

(To be submitted on the OEM's letterhead along with the bid)

Date: / /-------

To

Managing Director,

CRIS, Chanakyapuri,

New Delhi - 110021.

Ref: Tender No.....

For•.....*Name of Work*.....

Sir/Madam,

We, (Name of OEM], having our registered office at *[Address of OEM],* are an established and reputed manufacturer of below tabled components having factory(s) at *[Address of OEM Factory]* do hereby declare/undertake as under:

1. We hereby authorize *(Name of Bidder] *,* having registered office at *[Address of Bidder],* to bid, negotiate and conclude the Contract on our behalf with CRIS, for the tender under reference for the items listed below.

   *(*In case OEM is participating in this tender as a bidder, OEM shall fill "self" in place of bidder's name for products that are manufactured by them)*

2. We hereby confirm that the software and tools provided with the offered goods are fully licensed and will be supported for the entire duration of the Contract.

3. We further commit to providing backend support including software updates, upgrades and ensure availability of spares), *for the entire contract period (including Warranty/AMC period).*

   Below is the list of Components, for which this authorization/undertaking is being issued: #

	Component	Make	Model
1.			
2.			
3.			

Important: The specific make/ model of the offered products should be mentioned. Expressions like 'to be decided, 'standard make, 'reputed brand', etc. shall not be accepted.

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4. We shall be providing our service support to *Name of Bidder]* from all our service centres located across India. We assure you that, in the event, *(Name of Bidder]* is not able to fulfil its obligations as the service provider for our products, we will continue to provide OEM warranty / ATS services through an alternate suitable arrangement.

5. *We shall ensure that the supplied components do not suffer end of life or end or support during the validity of the contract (including Warranty / AMC period). In case the same cannot be ensured, we shall ensure performance of all contractual obligations, through alternate means (with prior approval of CRIS), for the entire contract period (including Warranty/AMC period).*

   Note: OEM(s) are required to provide Power of Attorney / certified Board Resolution, confirming the authority of their authorised signatory to act on behalf of their firm. It shall be the responsibility of the Bidder to verify these details/documents before submission of their bids.

Declaration by the signatory:

I hereby declare that I am duly authorised to make this representation on behalf of my organisation.

Yours faithfully,

[Seal & Signature of the Authorized Signatory] [Name of the

OEM's authorized Signatory] [Designation of the OEM's

authorized Signatory] For & on behalf of

[Name of the OEM]

42. Annexure – XXII: Self Certification by Bidder for Make in India

Refer Annexure 6 of Standard Bid Document Part-I

43. Annexure-XXIII: Installation and configuration – Breakup Detail Format

S. No.	Category (Bidder/OEM Professional Service)	UoM	Company Name	Qty	Remarks
Total					

44. Annexure XXIV: Past Performance Details of Bidder

Past performance details of the bidder to be submitted along with the offer on the letter head of Statutory Auditor or Chartered Accountant of the bidder.

Date: _ _/_ _/_ _ _ _

To

Managing Director,

CRIS, Chanakyapuri,

New Delhi – 110021.

Ref: Tender No. ……

For : …… *Name of Work*……

Sir/Madam,

After conducting a thorough examination of the project experience details of **[Name of Bidder]** having their registered office at **[Address of Bidder]**, it is hereby certified that **[Name of Bidder]** has successfully completed the following Contracts / Purchase Orders

1. Past Performance Details - I

Contract / PO Number & Date				
*Contract Issuing Authority – Name – Type **				
Project Name				
*Role of Bidder in the Project ***				
%age share of bidder in the above contract				
Total Value of the Contract (INR)				
Total Quantity ordered	*Quantity Supplied / commissioned during the relevant period ****	*Current Status of the Contract*	*Copy of Purchase Order Attached (Yes/ No)*	*Copy of Completion Certificate (Yes / No)*

2. Past Performance Details - II

Contract / PO Number & Date	
*Contract Issuing Authority – Name – Type **	
Project Name	
*Role of Bidder in the Project ***	
%age share of bidder in the above contract	
Total Value of the Contract (INR)	

Total Quantity ordered	*Quantity supplied / commissioned during the relevant period ****	*Current Status of the Contract*	*Copy of Purchase Order Attached (Yes/ No)*	*Copy of Completion Certificate Attached (Yes / No)*

*(*More blocks may be added for additional project experience details, if needed).

Important Notes:

1. *Contract Issuing Authority Type shall be one of the following

Type 1) Any entity (Department / Organization / Autonomous body / PSU/ Local Body/ Authority etc.) wholly or partially owned by State / Central Government

Type 2) A Private sector organization which is:

i. Listed in the National Stock Exchange (NSE) or Bombay Stock Exchange (BSE) in India,

and

ii. Has an average annual Turnover of INR 500 Crore (revenue from operations) & above during last three (03) financial years preceding the year of publishing of tender.

Important: Only those Contracts / Purchase Orders shall be accepted as Past experience wherein the contracts / purchase orders have been placed on the bidder directly by an entity belonging to one of the above types.

2. **** Role of the bidder** in the project shall be selected from one of the following options

i. . Sole Bidder

3.* Relevant Period** shall be as mentioned in the tender document.
In case any contract / purchase order is a composite contract (i.e. it contains items other than the ones defined in the qualification criteria as similar work), the quantity supplied / commissioned and the value of the same shall also be indicated separately.

Declaration by the signatory:

i. I hereby certify that the past performance details provided above have been verified and are accurate.

Seal & Signature of the Chartered Accountant/Statutory Auditor:

Name:

CA Registration Number:

UDIN:

Date:

45. Annexure XXV: Declaration of Non-Blacklisting for OEM

To be submitted along with the bid separately by all OEMs of Key Components on their Letterheads

Date: _ _/_ _/_ _ _ _
To
Managing Director,

CRIS, Chanakyapuri,
New Delhi 110021.

Ref: Tender No. …….

Name of Work/Tender Title ……

Sir/Madam,

In response to the above mentioned tender, I/We as an authorised signatory **of [Name of the OEM]** having our registered office at **[Address of the OEM],** hereby declare that I/We is / are not blacklisted or debarred by CRIS, or Ministry of Railways or any other Ministry / Department of the Govt. of India from participation in tenders, on the date of submission of bids, either in individual capacity, or as HUF, or as a member of the partnership firm / LLP/ Joint Venture / Society / Consortium / Trust etc.

If this declaration/undertaking is found to be incorrect, CRIS/IR shall have the right to take legal/administrative action against us, including but not limited to blacklisting/debarment/ recovery of pecuniary losses, or any other recourse available under the Law.

Declaration by the signatory:
I hereby declare that I am duly authorised to make this representation on behalf of my organisation.

[Seal & Signature of the Authorized Signatory]

[Name of the authorized Signatory]

[Designation of the authorized Signatory]
For & on behalf of

[Name of the OEM]

46. Annexure XXVI: Declaration of Non-Blacklisting by Bidder

(To be submitted along with the bid on minimum INR. 100 stamp paper, duly notarized)

This declaration is to be signed by any / all persons / entities indicated below as per the nature of the bidding entity:
-Authorized signatory of Company / Proprietor of Proprietorship firm / Karta of HUF/ All partners of Partnership firms and LLP / All members of a JV/Consortium
Date: _ _/_ _/_ _ _ _
To
Managing Director,
CRIS, Chanakyapuri,
New Delhi 110021.

Ref: Tender No. …….
Name of Work/Tender Title ……

Sir/Madam,

In response to the above mentioned tender, I/We **[Name of Bidder]** having my/our registered office at…*[Address of Bidder]….*, hereby declare that I/We is/are not blacklisted or debarred by CRIS, or Ministry of Railways or any other Ministry / Department of the Govt. of India from participation in tenders/contracts as on the date of submission of bid either in individual capacity, or as HUF, or as a member of the partnership firm / LLP/ Joint Venture / Society / Consortium / Trust etc.

I/We also certify that none of our OEMs for this tender are blacklisted or debarred by CRIS, or Ministry of Railways or any other Ministry / Department of the Govt. of India from participation in tenders/contracts as on the date of submission of bid either in individual capacity, or as HUF, or as a member of the partnership firm / LLP/ Joint Venture / Society / Consortium / Trust etc.

I/ We understand and accept that If this declaration is found to be incorrect then without prejudice to any other action that may be taken by the Purchaser, my/ our EMD/ Security Deposit/ BG may be forfeited in full, my/our offer against the tender may be ignored, and the tender if any to the extent accepted may be cancelled.

Declaration by the signatory:
I hereby declare that I am duly authorised to make this representation on behalf of my organisation.

[Seal & Signature of the Authorized Signatory]

[Name of the authorized Signatory]

[Designation of the authorized Signatory]

For & on behalf of
[Name of the Bidder]