



TSRTC

***TENDER FOR IMPLEMENTATION OF
ONLINE PASSENGER RESERVATION SYSTEM (OPRS)
ON TRANSACTION CHARGES BASIS ON NET SEATS SOLD,
FOR A PERIOD OF FIVE YEARS***

VOLUME -2

FUNCTIONAL AND TECHNICAL SPECIFICATIONS

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1. EVOLUTION OF ONLINE PASSENGER RESERVATION SYSTEM IN TSRTC

Initially, advance reservation system project was implemented through ACTIS (Advance & Current Ticket Issuing System) in the year 1999. ACTIS project was originally developed in COBOL. The software was subsequently developed with Oracle 8 as back end and VB 6.0 as front end. Novel Netware 4.1 was used as networking operating system.

In this system, the ticketing terminals within the Bus Station were connected to the server through a LAN and the remote terminals were connected to the server through modem and dial-up or leased lines. This project enabled the passengers to book their tickets for any service with any boarding point from any counter of that City only.

Inter connectivity system was subsequently established between four major Bus Stations viz. Mahatma Gandhi Bus Station (MGBS), Hyderabad - Vijayawada, MGBS - Visakhapatnam, MGBS - Tirupathi to issue anywhere to anywhere ticketing between these four Bus Stations. The connectivity was established through Dial Up system.

As a part of its philosophy to offer better services to the esteemed passengers, Online Passenger Reservation System (OPRS) was first introduced in the year 2008.

The OPRS Project was designed and executed to meet the present day passenger requirement and the Corporation's vision to become the choice transport Corporation to the traveling public by providing them regular, reliable, comfortable and cost effective passenger service and value added services, with an exceptional track record of safety.

2. ABOUT CURRENT OPRS

Initially, the OPRS project was implemented with a capacity to serve 1,000 concurrent users.

In view of the tremendous growth in the ticketing activity as a result of the increased patronage of passengers for advance reservation services, the system was upgraded. The OPRS project was upgraded in the year 2011 to serve 5,000 concurrent users, with a headroom of 20%, taking growth into consideration.

Advance and current ticketing activity is carried out through this system.

The Online Passenger Reservation System (OPRS) is currently implemented at 46 Bus Stations in Telangana State and 24 Bus Stations in the neighbouring States, with about 1590+ services and about 617 ATB Agents.

The OPRS application is a browser based solution in 3-tier architecture.

The important features of the project are given hereunder:

Booking of tickets through OPRS

Tickets can be booked/cancelled/pre-poned/postponed by the passengers through OPRS, at TSRTC counters / Authorized Ticket Booking Agents (ATB Agents) / B2B Corporate Agents (currently disabled) / online / B2C Franchisees, for all the identified services for which advance reservation facility is provided.

TSRTC Counters: Tickets can be booked at TSRTC operated counters wherein the passengers pay cash and collect tickets printed on type numbered pre-printed stock. Eligible amounts are refunded in the case of cancellations. Tickets on type numbered pre-printed ticket stock are currently being issued in 46 Bus Stations in Telangana State and Bengaluru Bus Station. Receipt of ticket stock at the Bus Stations, Stock management, allotment of stock to the operators and accountal of ticket stock etc. is done through the OPRS System.

ATB Agents: Agents are attached to Bus Stations. OPRS is implemented at 70 Bus Stations in Telangana and neighbouring States with about 617 ATB Agents.

ATB Agents operate on pre-paid model. The Agents top up their accounts in advance through net banking and the top up amounts are credited to TSRTC account. The Agents can issue tickets as long as sufficient top up amount is available for issue of tickets. Agents are paid commission for the tickets issued. The passengers are issued tickets printed on A4 size plain paper.

In case of cancellation, the eligible amount is refunded by the Agent, and the Agent's account is topped up by an equal amount.

B2B Corporate Agent: The Corporation has earlier appointed a B2B Corporate Agent for issue of tickets through OPRS, who in turn appointed sub agents. Operation is similar as in the case of ATB Agent but only a single account is maintained for all the agents, and top up is made only by the Corporate Agent. Currently there are no active B2B Agents. Commission on similar lines to ATB Agents was paid to the B2B Agent.

E-tickets: Tickets can be booked online by the passengers for which payments are made through Debit cards/credit cards/net banking. The ticket amount is transferred to the TSRTC account by the payment gateway provider. In case of cancellation, the eligible amount is transferred to the account of the passenger duly debiting the same to TSRTC's account.

B2C Franchisees: The Corporation has appointed B2C franchisees for issue of TSRTC tickets through their ticket reservation portals. Access to OPRS system is provided to these franchisees through an API. Commission on similar lines to ATB Agents is paid to the B2C franchisees. Currently there is one active B2C franchisee.

Payment Gateways: Credit card/Debit card/Net banking transactions are carried out through Payment Gateways. Currently payment gateways from two different providers are being used for OPRS.

SMS Gateway: The OPRS system fires SMS messages to the passengers when they book/pre-pone/postpone/cancel tickets at ATB/B2B Corporate Agents/online, whenever services are cancelled etc. These messages are sent to the passengers using the SMS gateway. Passengers are permitted to perform journey based on the strength of the SMS message. SMS messages are also fired for other predefined events.

Benefits to End Customers:

- Information is available on fingertips
- Ability to book tickets sitting at home using Credit/Debit Cards & Net Banking
- Option to Purchase Waitlisted Tickets
- Can book tickets anywhere to anywhere
- Ability to pay in cash or carry out transactions using credit/debit card & Net Banking.
- Avail Value Added Services like Accommodation and Dinner on Board etc.

Benefits to TSRTC:

- Increase its load factors (i.e., sell more tickets per bus).
- Bring down the operational costs with better management of schedules.
- Provide better quality data to plan the Extra schedules during the weekends, festivals and special occasions.
- Better cash flows due to Advance Cash Collection.
- Improve Customer service.
- Create a hi-tech image for TSRTC.
- Increased Revenues.

3. DEFINITIONS USED IN THIS DOCUMENT

- **Bus Depot:** Buses are attached to Bus Depots. Depots maintain and operate the buses.
- **Bus Station:** A Bus station is attached to a Bus Depot. Each Bus Depot can have many Bus Stations attached to it. Buses operate between Bus stations. Ticket Booking (both advance and current) is done here.
- **Service:** A service is any bus operating between two places at a particular time on a Route of a particular Bus Type. Each service has a unique number (Service ID) within the Corporation.
- **Service ID:** Unique number given to a service.
- **Bus Type:** Vennela, Garuda Plus, Garuda, Rajadhani, Super Luxury, Deluxe, Express, Pallevelugu, Metro Luxury, Pushpak, City Vestibule, City Metro Deluxe, City Metro Express, City Ordinary etc.

- **Net seats sold per day:** Net seats means, total seats sold per day minus cancelled seats, invalidated seats and pre/postponed seats.
- **Boarding points:** Places where passengers board the buses. Places apart from Bus Stations can also be boarding points.
- **Alighting points:** Places where passengers alight from the buses. Places apart from Bus Stations can also be alighting points.
- **Waybill:** A document generated and given to the service driver/conductor at the originating/intermediate points. The details of passengers (ticket number, boarding point, alighting point, seat number, fare details etc.) who have a valid ticket/reservation to travel in that service are furnished in the waybill.
- **Warranty period:** Warranty period shall be counted from the date of commercial deployment of the OPRS project (date of “go live”) to the end of contract period of five years.

4. OBJECTIVES OF THE PROPOSED SYSTEM

The proposed system shall meet the following objectives:

The proposed system shall provide “Anywhere to anywhere and anytime web based advanced/current reservation ticketing”. The benefits envisaged are:

- Easy and comfortable ticket transactions for the esteemed passengers.
 - Increase in the “Occupancy Ratio” of the buses.
 - Provide value added services which are needed for the passengers and to provide the utmost benefit to TSRTC operational environment.
- a. The system shall process information in an integrated manner and make best use of latest and cutting edge technologies for enabling the online passengers and various ticket booking counters to carry out ticketing transactions with high responsiveness.
 - b. The system shall be based on an open hardware and software architecture for interoperability with various applications in existence in TSRTC and those being planned or likely to be implemented in the future.
 - c. The hardware sizing, connectivity, bandwidth and application etc., should be so provided and designed to support 5,000 concurrent users.
 - d. Hardware, networking equipment, connectivity, bandwidth etc., for Data Center and Disaster Recovery Center should have at least 20% headroom for future expansion.
 - e. Data integrity and consistency must be ensured while migrating data from the existing OPRS application to the new application.
 - f. The system should cater to fast query retrieval.
 - g. The system architecture shall cater for scalability. In future, the system is expected to be integrated with other major systems of TSRTC like Centralized Integrated Solution, Vehicle Tracking and Passenger Information System and other departments like TS/AP ONLINE, MeeSeva/e-Seva, GPS/GPRS based intelligent TIMs (Ticket Issuing machines), Mobile/fixed reservation kiosks, SMS

based enquiry and reservation, Railways, Tirumala Tirupathi Devasthanams, Telangana State Tourism Development Corporation, NGPAY, ITZ CASH, Mobile wallets, e-wallets and other online payment modes etc. Hence, scalability at all layers of the system should be catered to, for meeting the performance requirements with increase in user base. Carrying out the required integration is in the scope of the project and shall be carried out by the successful bidder.

- h. The System should implement value added services, such as, SMS based advance reservation, Arrival and Departure module, Out Depot Cash Remittance Module, Platform Announcement System, payment Gateway services for other service providers like NGPAY, ITZ Cash etc.
- i. The OPRS project should seamlessly integrate with the ERP based Centralized Integrated Solution (CIS) which is implemented by TSRTC, wherein all present systems such as Depot Computerization project, Online Inventory management System, Financial Accounting System, Payroll and other Systems, will be revamped as a web based centralized system. The data pertaining to tickets sold (with all details), earnings realized etc., will be needed to be provided to CIS Project, service-wise. There should be provision for integration and Electronic Data Interchange (EDI) and the successful bidder shall carry out all the required activities in this regard.
- j. **High Security - The system shall cater to high security levels. Access to the system is to be strictly on the basis of securely administered lists of users on TSRTC Booking Portal. Access to various modules should be Role based. Since numerous functions have to be addressed, security permissions have to be both at the levels of application and the database; hence a proper profiling engine is to be made to validate authorized Users. Single sign on facility should be incorporated in the system.**

4.1 Bidders are to submit their optimal solutions for design, development, migration and implementation of the 'OPRS' including e-ticketing, providing and hosting of all required Servers, storage, networking and other required hardware in the Data Center and Disaster Recovery Centre, providing connectivity to the application etc., on transaction charges basis on net seats sold. This shall include:-

- a) A study of processes involved.
- b) Preparation of Project Plan.
- c) Providing and hosting of all required Servers, storage, networking and other required hardware in the Data Center and Disaster Recovery Centre, providing connectivity to the application etc. Minimum configurations of hardware required to be provided are given in Annexure-1. The bidder shall provide the required quantity of hardware to meet the SLAs and the requirements of the project.
- d) Providing Intranet/networking bandwidth required in redundancy for the Data Center and Disaster Recovery Center.
- e) The Data Centre and DRC equipment shall be hosted in a Tier 3+ data centres.

- f) The Data Centre and Disaster Recovery Centre shall be located at least 250 KMs away from each other and should be in different seismic zones.
- g) Providing of redundant leased line connectivity between DC and DRC.
- h) Installation and configuration of database, operating systems and any other applications.
- i) Installation, migration, commissioning and testing of the application.
- j) Installation, commissioning & maintenance of the required networking environment and network monitoring & management system.
- k) Design and Preparation of Test Data and System Testing.
- l) Take necessary steps and activities to migrate the existing data into the new system without any down time.
- m) User training to be provided at different levels at all implementation stages.
- n) The successful bidder shall provide a team of Software, Networking and DBA Engineers on 24 x 7 basis to design, develop, deploy and to attend day to day software and networking issues, and maintenance.
- o) Transaction-wise backup of data shall be maintained at five different locations.
- p) Reconciliation report based on total transactions and Payment gateway remittances shall be provided. The total transactions carried out through the system, by online users shall be reconciled with the amounts settled transaction-wise by the payment gateways. Soft copies of the gateway settlement reports will be provided by TSRTC. Provision shall be given for uploading the settlement reports to the application for reconciliation. Alternately a standalone application may be provided and maintained for the reconciliation activity. This application shall have a provision to download the OPRS transaction data, accept the gateway settlement reports and generate the reconciliation reports. It should be borne in mind that different payment gateway providers will be engaged by TSRTC, and they will have their own formats for settlement reports. The payment gateway providers may be changed from time to time.
- q) All the expenses for implementation of the project shall be borne by the successful bidder. TSRTC will only pay the transaction charges on the net seats sold.
- r) VeriSign signature and other security authentications to be provided by the successful bidder.
- s) Detailed documentation and User manuals for different levels of users shall be provided.
- t) Solutions can be offered on secured, reliable & scalable Cloud Architecture also.

5. The vendor must keep in view the following key requirements while suggesting the solution:

- a) The design specifications of the solution, shall be defined, complete in all respects, subject to requirements specified in subsequent sections and ensure

efficient implementation inclusive of any process management review that may be required to provide the utmost benefit to TSRTC operational environment.

- b) The solution should be extendable, open and flexible as per industry standards so that the architecture for this solution can be utilized for the new applications at a later date. The system should also provide a mechanism for error handling and robustness to scale up on demand to support future applications without major changes.

5.1 Broad Scope of the Project

- The Passenger should be able to book tickets(advance/current) in any TSRTC operated counter, ATB agent counter, B2B franchisee counter, TIM (Ticket Issuing Machine)/Mobile based ticketing in the bus, kiosks and Ticket Vending machines and any other kiosks, Point of Sales counters (cashless transactions through credit/debit cards/Wallets), online through the TSRTC ticket booking portal www.tsrtconline.in and through the web portals of B2C franchisees, mobile apps etc., based on the business rules of TSRTC from time to time. The application shall provide all these features.
- To provide “**Anywhere to Anywhere**” advance booking which means Tickets can be booked ‘anywhere to anywhere, anytime for onward and return journey’.
 - This facility will be available at all the OPRS Bus Stations having/likely to have TSRTC operated counters.
 - Cancellations, Pre/Postponements will be allowed at any of the OPRS Bus Stations and ATB/B2B Agent counters.
 - To provide accurate and easy accounting system for Inter Depot Transactions and e-ticketing.
 - To provide web enabled Advance Reservation with various types of concessions implemented from time to time, Cancellation, pre-ponement and postponement of tickets.
 - To provide Arrival/Departure information through SMS, App and Web Interfaces or through any other mode available in the market from time to time.
 - In future, Non-stop services and short distance services may also brought into the purview of OPRS during the period of contract and this requirement is also to be taken onto consideration. Mutually agreed upon transaction charges per net seat sold will be decided at the time of inclusion of these services in OPRS.
 - Providing additional hardware, System software, carrying out necessary changes in the application software as well as the tuning of the system should be done by the successful bidder throughout the contract period.

The existing system (OPRS application) user interface and design etc., should be studied in detail and overall structure understood and incorporated in the new software under the overall scope of Anywhere to Anywhere and Anytime advance reservation.

6. Stake Holder:

6.1 Passenger:

- Passenger is a traveler who uses TSRTC services for travel.
- The System should address the requirements of any traveler and should provide specific requirements of different types of commuters.
- Students are special categories of commuters who may be allowed special privileges, such as pricing, periodicity issue of tickets etc.
- Women commuters are special categories of commuters who may be allowed special privileges in terms of seating and ticket pricing, issue of seasonal passes etc.
- Children are special category commuters who may be allowed special privileges in terms of seating and pricing.

6.2 Special Passengers:

- The System should provide for special passengers and seat allotment and ticket pricing and cover people, such as, elected Representatives, Physically Challenged, Senior Citizens and any other Group as decided by TSRTC from time to time. These policies have to be dynamically configurable.
- Group passengers who may be given bulk allotment of seats including hiring of a Bus/Contract Carriages.
- The System should facilitate special concessions for selective seats for a service, selected seats for all services; for selected days, for selected days of week/ selected days of month / given period / any random days etc., and any combination of the same.
- The System should facilitate special concessions for groups of booking and for Schools and occasions like Jathara.

6.3 Enroute and Local Authorized Ticket Booking Agents:

- The Agents should provide ticketing services either Current or Advance to passengers, provide reservation information to the passengers and offer their services to the traveling public.
- The System should be able to connect to Service Providers, like e-Seva, TS/AP Online, RAJiv, ITZ CASH, NGPAY, MOBILE ticketing etc., to provide online ticketing services as well as secure and accurate statement of revenue collection made on behalf of TSRTC and provision should be made to enable the System to access and integrate with other Government Departments, such as Tourism, Endowments etc., to provide a Single Window facility for transport and accommodation etc.
- The agents operate on prepaid model. The system should be configurable for the agents' cash remittance (top up of their accounts) for prepaid or postpaid method.

6.4 **Booking Clerks:**

The Booking Clerks at various Bus Stations and also at Depots should be able to access the System to manage the services and ticketing process including viewing the service details, fare tables, cancellation, preponement, postponement both full and partial, generate Auxiliary Way Bills, Shift, Revenue etc., and also be able to carrying out the ticketing process in full.

The tickets are given on type numbered preprinted stock. The application shall provide the required facility for receipt of ticket stock, issue to the counters/users, transfer of stock from one counter to another counter, tracking the stock ticket-wise until the stock is exhausted, accountal of stock etc.

6.5 **B2B Corporate Agent:**

This type of Agent operates on lines similar to an ATB Agent. However a Corporate Agent has sub agents who carry out the actual ticketing transactions. Top up amount is however maintained at one level i.e., by the Corporate Agent.

6.6 **B2C Franchisee:**

- B2C franchisees operate on prepaid model.
- They offer ticketing for TSRTC services, along with services of other public/private sector operators, from their web portals.
- Access to OPRS is provided through an API.

6.7 **TSRTC Management:**

TSRTC Management should be able to access the OPRS application for various management activities, such as control, decision making and implementation of new policies etc.

Various Sub Systems within TSRTC, such as Manning Sub System, Ticketing Sub System under OLTAS (Online Ticket Accountal System) Module of DCP (Depot Computerization Project), Centralized Integrated Solution (CIS), Vehicle Tracking & Passenger Information System (VT & PIS) and various financial Modules should be able to interface and integrate with the OPRS at the application level.

It is expected that as a part of development of OPRS System, Bidder will study the existing Software used for reservation, cancellation, preponement and postponement, e-ticketing and Gateway payment etc., and suggest appropriate changes in consultation with the various departments concerned, within TSRTC, and implement the same.

A demonstration of the existing Online Passenger Reservation System (OPRS) Software will be arranged to the intending bidders.

7. Architecture:

Since Bus Transport Industry is mostly local in nature, it is proposed to have centralized or a distributed Architecture for implementation of the OPRS software to enable Anywhere to Anywhere, Anytime advance reservation.

In order to provide better Anywhere to Anywhere, Anytime Ticketing and also to enable OPRS application Software to deliver reliable and error free service to passengers, the OPRS application has to be developed in 3-Tier Architecture wherein the Database will hold the Data, the procedures and packages and the application tier will hold the business logic and the presentation layer will be accessed through a Browser on the Ticketing Node, by online users, Agents etc.

7.1 Service Oriented Architecture

A service-oriented architecture (SOA) will allow TSRTC to establish a flexible, robust infrastructure so the successful bidder can build, deploy and integrate services, independent of applications and the computing platforms on which they run, making the business processes more flexible.

A service-oriented architecture (SOA) will also ensure that services are able to be both provided and consumed, now and in the future as the system scales and further integration with existing or new systems is required. The use of SOA will also ensure that connectivity to services will be as flexible as required and that applications will not be tightly bound to each other.

As a part of Service Oriented Architecture framework the Business Logic will be separated into components. The components will be developed separately and clustered to operate them as a solution. The clustering will be a loose-coupling. This makes Operation & maintenance easy.

The following aspects have to be kept in mind while designing the appropriate architecture.

- a) The system should scale with adding necessary hardware, software, networking and bandwidth for catering to the need of nonstop bookings at the local booking centers also through this system.
- b) The MIS of the Non-stop booking should be synchronized with the centralized system at a periodicity to be defined in the SLA, when non-stop booking is brought into the OPRS project.

The bidder can also suggest alternate architecture, with due justification. The clear advantages, reliability etc., have to be clearly spelt out, after studying the working of the system and the needs.

Most suited architecture and plan of action for prevention of virus attack/corruption and loss of data is a prerequisite. Crisis and disaster management are an integral part and essential requirement so that minimum time is lost in the event of Disaster for Recovery of data and restarting the system. These issues have to be fully addressed at appropriate stages of the project. A demo has to be arranged by the vendor on the proposed OPRS system with Disaster Recovery Center during the technical evaluation stage.

Further, it is utmost desirable to work out the most feasible model for implementation of the software as the success of the project largely hinges upon the following:

- Development of software after in-depth study of the prevailing ground conditions. Its versatility for future upgradation, user-friendliness etc.
- Providing of hardware, networking equipment, connectivity and bandwidth etc., at the Data Center and Disaster Recovery Centre to handle 5,000 concurrent users.
- Software compatibility with the present and future hardware.
- Transaction-wise Backup (in case of crash due to Hardware, storage, virus attack etc.), after sales support for the software/hardware so that down time is minimum.
- Setting up of Disaster Recovery center with sufficient capacity (at least 50% of DC capacity), providing of required bandwidth with redundancy and leased lines between DC and DRC.
- Availability of knowledgeable, trained and committed manpower from Software, Hardware and Networking for 24 x 7 monitoring, attending to problems, carrying out modifications from time to time etc.
- The bidder has to obtain certification to the effect that the OEM for hardware, system software etc., will support them for next Six years.

7.2 Terms of reference are given below:

The Proposal has to be prepared after a clear understanding of the Scope of Work. The proposal shall outline the Architecture best suited for TSRTC, Technologies proposed and the reasons for proposing the same, infrastructure required in terms of Hardware and Communication facilities in detail. A detailed architecture shall be submitted covering aspects such as the Server requirements viz. Database servers, Application servers, Web servers etc.; storage requirements, SAN; Routers, Firewall, load balancers etc.; Software requirements including Operating Systems, Network Management, Firewall, Application, Database, Directory, Cache, online payment facility, SMS facility and web Servers, mail servers, load balancers

etc. Hardware that is proposed including the number of cores, CPUs, memory, hard disks etc., have to be given in detail. It shall also include acceptance and testing requirements of the hardware, software and cover training, documentation and site requirements. Security, backup and restoration of application requirements need to be covered in detail. The successful bidder has to host the hardware (DC hardware and DRC hardware) at Tier 3 plus Data Centre, for which the bidder has to furnish proof of Certification.

Hardware and Networking equipment, connectivity, bandwidth etc. for DC and DRC proposed should have at least 20% headroom for future expansion.

A transition strategy is a must as the new reservation System is phased in, as the methodology to populate the existing data should be in place and implemented to migrate the existing data into the new system.

The architecture of new OPRS is given below:

- a. It shall be based on open, interoperable standards and should be highly scalable, open ended and capable of delivering high performance with security. The solution / application must be able to work in any Operating System / Open standards.
- b. The architecture shall be completely web enabled.
- c. The OPRS will work in a networked environment. It should be able to run with equal efficiency in a network having thin client architecture.
- d. The vendor should design the web interface using latest available technologies, standard processes with high security. However, providing any software component that may be required, for functioning of the system, is the responsibility of the successful bidder and is included in the scope.
- e. The successful bidder shall supply a certificate stating that the software is free from any virus, worm, Trojan, trap door or any other type of malicious code with security.

The system will be essentially characterized by the following features:

7.3 Flexibility:

The system should be adaptable to the changing commercial practices, reduce the total cost of ownership.

7.4 Open Architecture:

The system should be open to allow interoperability with general-purpose software and have facility to Export/Import data files from other applications and interact with other applications as mentioned earlier.

7.5 Object-oriented:

The system design should be based on object oriented approach.

7.6 Integrated:

The system should be fully integrated across departments and functional areas and also across geographical location of sites.

7.7 Workflow-integration approach:

The system should adapt workflow management techniques.

7.8 Simplicity:

The overall application should be developed keeping in mind simplicity as the key, so as to enable easy maintenance and operation of the application by the end user.

7.9 Manageability:

The OPRS application should cater for easy manageability by the system Administrator.

7.10 Scalability:

OPRS will be utilized across all the Bus Stations of the Corporation and in Bus Stations in neighbouring States, apart from ATB Agents, B2B Agents, B2C Franchisees and online users. To be able to cater to all this load, it is a mandate requirement that the OPRS should be scalable at modular level. The System should scale to about 25,000 services and a minimum of 5000 concurrent users. The recommended products proven in the field to scale well in order to meet large enterprise requirements have to used. Key components such as servers, application servers and network etc., should be of modular design to ensure scalability of the system. Major scalability may be required for Application and Database servers, but independent study may be taken for proper assessment.

A cloud computing architecture (Private cloud only) may also be examined for its adaptability and needs of the OPRS project.

Since OPRS is a critical application, only private cloud will be permitted. Public cloud will not be permitted. The cloud infrastructure (DC as well as DR) should be in India. The total capacity of the servers proposed on cloud shall be utilized for TSRTC OPRS project only and shall not be shared with any other application.

However, the Database Servers should be on physical servers and should not be on the cloud.

A separate server shall be provided to enable the Bus Stations/ATB Agents to generate Waybills, Reservation Charts and other Reports, without disruption, in situations where the load on the regular servers is high. This is required to ensure timely dispatch of services.

7.11 Reliability:

Solution shall be implemented with clustering technology to ensure the system reliability. Portal server and Integration server are to be clustered at application level and Database server shall be clustered at Operating System level. Transaction-wise back up should be taken at five different places to restore the application at any point of time.

7.12 Availability:

System behavior in the failure of CPU, memory, applications - Availability shall be ensured with system level redundancy including the communication and network equipment.

7.13 Stability & Robustness:

System behavior on high stress / over use, wrong use - Load balancers shall be used in the solution to share the load and thereby ensure stable operation.

7.14 User-friendliness:

Intuitive portal design features of the Portal products will enhance the customer stickiness to the portal service. The portal content design will include advance graphic and plug & play modular display objects available with the Portal product and Java/relevant technologies.

Suitable Content Delivery Network shall be used for handling the load.

7.15 Interoperability:

Customer demand for enterprise interoperability solutions continues to escalate the need to maximize return on investments, and the need for standards-based solutions. OPRS, interoperability software can help enterprises get maximum value from their current resources and applications investments by extending both existing skill and code bases, allowing for maximum application reuse in the fastest time possible. OPRS shall support Web Services and XML based data exchange, which would make it easy to integrate with third party software, customer-created, or legacy security solutions. This way OPRS system assures the best approach for integration over discrete systems.

7.16 Optimization:

Server Load balancing techniques will get the best possible performance from the Web servers. OPRS shall choose the right CPU, memory, storage, cache, load balancing, etc., and increase the performance of the Portal. This can help significantly increase the efficiency of hardware, software and Internet service and improve reliability. In addition to the Hardware sizing and software tools to increase the OPRS portal performance, the system should also follow the following steps to optimize the web performance:

- Stop unwanted/unsecured content over the network.
- Secure OPRS network from web-based threats such as DoS, DDoS attacks, intrusions, etc.
- Manage Internet traffic to optimize network bandwidth.

7.17 Additional Features

- a) **Security:** The security overlay for the access to the server must be provided centrally with suitable authentication and profiling engine. Suitable encryption mechanism must be used at the application layer. The functions shown in this document will be applicable to various users based on Role, which will be specified during Requirement analysis phase. Audit trail is must for all data updates/amendments and deletions for security audit. Encryption mechanism wherever required must be built in. For all critical activities of master and service data, a log file shall be generated for every activity. For every change/modification of the service data in the application a related pop up message shall be displayed on the screen immediately.

The application and its various layers shall be so designed to be not prone to attacks like SQL Injection, Cross Site Scripting, Credential/Session prediction, OS commanding, Redirection, Insufficient session expiration, Cross Site Request Forgery (CSRF) etc.

- b) **Backup and Recovery:** A rugged backup policy with detailed procedures should be formulated. The system should maintain a backup of all programs, data, documents, procedures, etc., on transaction and timely intervals. Verification procedures for backup taken should be in place. Appropriate Disaster Recovery tools should be provided for recovery of the system and database with minimum down time of less than one hour.
- c) **General & Adhoc Queries in Proposed Solution:** General queries that have not been explicitly mentioned in the user requirements based on data that is captured should be made available based on functionalities explained in next section. Provision to generate ad-hoc queries by joining data in a flexible and user-friendly manner should be made available.

Facility shall be provided to select/deselect fields/columns while generating the reports so that a report with fields for the requirement on hand is generated.

- d) **Print and Online Help options:** Proposed system must have the facility to have print options for the reports and other specified forms in general / pre-printed formats agreed and approved by TSRTC. Online help for all users and administrators should be part of software. For all the modules mentioned below, there must be adequate internationally accepted standard reporting features that enable high quality graphics and user interactivity. The reports must have facility to be ported in standard office automation suites like excel, word documents, Adobe Reader etc. Facility to export the reports to MS Excel, and CSV formats shall be available.

8. Suggested Methodology for the Project Execution

- Team formation.
- Thorough study of all aspects of the existing OPRS project
- Visit(s) to the TSRTC Ticketing Counters/area of operation
- Understanding the business processes and data flows.
- Data collection methods, frequency of data flow and quality of data assessment.
- Planning for providing the required hardware, software, networking, connectivity and hosting the same in a Tier 3 plus Data Centre for 5,000 concurrent users
- Planning for providing the required hardware, software, networking, connectivity for Disaster Recovery and hosting the same in a Tier 3 plus Data Center, for 5000 concurrent users.
- Frequency review, daily, fortnightly, monthly and yearly.
- Conceptualization/Formulation/selection of application software and system Software based on business process understanding.

- Implementation Plan (penalties for delays, both for implementation and beneficiary organizations are applicable), Road Map (phasing of emerging applications) to be furnished.
- Sizing of hardware, networking based on phasing of applications proposed to be submitted.
- Assessment of Manpower requirements their training, modules of training as per the proposed applications.
- Final review and demonstration to TSRTC.

The Anywhere to Anywhere, Anytime Ticketing system will require management of the highest standard. Management processes must be appropriate to the Service type and must provide a high degree of visibility and responsiveness. A project plan will be required from the Bidder as a key element of responses.

This plan must cover the development phase of the project, including test activities and must include all aspects of project management, including but not limited to:

- Project definition and scope
- Work breakdown structure
- Risk breakdown structure
- Risk management process
- Assumptions
- Constraints to the project
- Acceptance Criteria
- Deliverables definition
- Project schedule
- Quality plan
- Resource plan
- Cost breakdown
- Identification of items to be supplied by Government or agents of Government
- Integration plan, test plan

The Anywhere to Anywhere, Anytime Reservation System will have the following other service providers to issue tickets.

- TSRTC Booking Clerks at TSRTC Bus Stations and Bus Stations in the neighbouring States;
- TSRTC Authorized Ticket Booking Agents within and outside Telangana State;
- TSRTC B2B Agents/Sub-Agents;
- E-Seva/Mee Seva Counters, TS/AP Online, RAJiv kiosks;
- Website/Online Users;
- GPRS based ticket issuing machines;
- Mobile phone based advanced and current ticketing in the buses;
- Reservation through NG Pay, PayPal, ITZ cash etc;

- Ticket Vending machines;
- Mobile Apps for Android, iOS etc.
- Provision for Value added services to be added on regular basis;
- Mobile ticketing, SMS based ticketing, TIM integration to be implemented for reservation in the very near future.
- Multiple payment gateway option to be provided.
- SMS gateway integration.
- Integration to third party ticket portals like makemytrip.com, busindia.com, etc.
- Hotel/accommodation booking facility.
- Package tours
- Capability to add Kiosk booking infrastructure at strategically viable locations.

Support includes but is not limited to

- Development team during the entire contract period to support / implement changes requested by TSRTC, attend to issues etc.
- 24 x 7 support for application maintenance
- 24 x 7 maintenance teams, including DBA's and Network Administrators to monitor the application and attend to issues;

The hybrid Architecture is the suggested Architecture to ensure business continuity and a good throughput and also enabling centralized data availability of reservation tickets for analysis, audit etc.

9. Functional Modules of the OPRS System

Broad details are specified in subsequent paragraphs. The detailed scope would be finalized at SRS stage. Each module should have facilities for generating reports, the formats for which could be obtained from TSRTC.

9.1 Point of sales:

- a) Seat reservation & Cancellation
- b) Pre/postponement.
- c) Waitlist tickets
- d) Refunds
- e) Reservation Enquiry
- f) Operators Reports
- g) System In-charge reports.
- h) Seat vacancy position.
- i) Issue of reservation tickets to general public, PHC, Senior Citizen, Retired employees (different categories with different types of concessions), Journalists, Freedom fighters, CAT cards, Vihari cards etc.
- j) Schedule and real time seat Displays

- k) Booking profile (Passenger preferences, ticketing & invoicing, seat assignment).
- l) Sales Statistics (Yield) & Logs.
- m) Client Profile, Lists and Queues.
- n) Check-in.

9.2 System Administration (ADMN)

- a) Vehicle / Seat management/modification.
- b) Route creation/management/modification.
- c) Service creation/management/modification
- d) Status of available ticket, Seat status update/modification.
- e) Ticket/Booking management/modification.
- f) Enquiry.
- g) Fare change or update or preference.
- h) Advance booking enquiry.
- i) Database Administration.

9.3 System Maintenance

- a) Delay time and cancellation entry.
- b) Bulk message (SMS & mail) transmittal.

9.4 MIS

- a) Statistical Reports
- b) TSR (Ticket Sales Reports) (Daily, Weekly, Monthly, given period Sales counter or shift-wise, route-wise, sector-wise, origin to destination-wise, service type-wise, destination-wise, journey date-wise, booked date-wise, service-wise etc., and a combination of the same)
- c) Occupancy data reports
- d) Powerful Inquiry Tools
- e) Real-time statistical output
- f) Agent-wise reports
- g) Exception reports
- h) Trend Analysis Reports
- i) Reconciliation reports for Gateway payments.
- j) Inter-depot transaction reports etc.

9.5 Central Monitoring System

- a) Bus Station-wise operation monitoring.
- b) Real time monitoring.
- c) Pre-emptive operational alerts.
- d) Anywhere to Anywhere transaction details.
- e) Log reports for critical and non-critical item modifications.

- f) Monitoring ticketing (real-time status on booking, cancellations etc., at all bus stations).

9.6 Internet Booking and Information System

- a) Web based information system and E-mail.
- b) Reservation rules.
- c) Web inquiry.
- d) e-Booking.
- e) Ticket delivery through print and mail.
- f) SMS to passenger
- g) Site map of the whole system.
- h) Cancellation of e-ticket.
- i) Refund of amount for cancellation ticket.
- j) E-ticketing sales reports payment gateway-wise.
- k) E-wallet based ticketing.

9.7 Reports

The various reports required from the modules as existing in the current system. The formats and details of actual reports shall be worked out jointly by the successful bidder and TSRTC during System design stage.

Apart from regular reports like waybills, reservation charts, window scroll reports, etc., generation of various reports for monitoring and planning is a major activity which is done on a regular basis. The system resources required for this activity will be quite high at times. Proper care shall be taken to generate the reports depicting the correct information (real time or near real time) and to ensure that this activity does not have any adverse impact on the ticketing activity.

The distribution of data into three databases namely transaction, search and reporting may also be examined for better performance of the whole system.

9.8 Vendor Responsibility:

The bidder is expected to provide detailed documentation covering various views of the application software such as use case, design, process, implementation, migration and deployment views with detailed descriptions of use cases, business modeling, and analysis. Details of various international Standards used shall be referred to and copies submitted along with the bid.

The vendor will be responsible for carrying out the following major activities:-
(The list is only indicative and the vendor shall carry out all other activities, which will be required to achieve the objectives described above).

- a) Carry out business process study and information need analysis of TSRTC's processes to achieve the mission-critical objectives defined earlier. Shall study and analyze the system requirements and business process for the functional modules required.
- b) Prepare and submit a project plan with detailed activity schedules and time-bound action plan for project and change management, as required, to implement the system and help the bidder to monitor and execute the plans. All milestones are to be broken down into sub activities. This plan is to be reviewed every fortnight and at other periodicities as mutually agreed to.
- c) The reservation application and underlying components should support both horizontal and vertical scalability.
- d) Migration of the existing data into the new system. The data migration should be 100% accurate. Data migration should be done before Go-Live. All data from February, 2012 should be migrated. All data from 02.06.2014 should be available in the Live System.
- e) Supply the SRS document in soft and 3 hard copies before starting the design of the system.
- f) Supply design documents in soft and 3 hard copies as part of system design phase.
- g) Deliver the specified number of copies of all Legal Licenses, Registration documents, user manuals, technical manuals, system manual and training manuals in hard copies and on three sets of CDs.
- h) Conduct training programs at project site and at any other designated venues for all levels of users so as to make them conversant with the system and enable them to run the system independently. Vendor should also submit written training schedule, training manual and courseware. A core group of TSRTC shall be given full scale all level training in all the modules.
- i) Design and preparation of test data and arranging for the acceptance test of the entire system in a manner mutually agreed.
- j) Maintenance of the total project Hardware, Software middleware and application, Network equipment and connections etc., of Data center and Disaster Recovery Center during the entire contract period.
- k) The look and feel of the application should be as similar as possible to the existing application to minimize the learning curve.

9.9 TSRTC's Responsibility.

TSRTC will be responsible for providing information, all relevant documents and data related to the functional and other procedures as may be relevant for the design and development of the OPRS and can be made available as required in accordance with the project plan. The vendor must maintain necessary secrecy and confidentiality of the data provided by TSRTC during the process of execution of the project.

9.10 List of Deliverables

Vendor shall provide the following deliverables for the software system. They may specify any alternative list of milestones and corresponding deliverables with appropriate justifications for changes:

Milestones	Deliverables
Acceptance of SRS document by TSRTC.	Approved copy of SRS document.
Project planning.	Project plan
Acceptance of system design by TSRTC.	Bidder will submit Design document and the acceptance of the same by TSRTC will mark the culmination of this milestone.
Acceptance of user interface prototype	Bidder will submit the prototype for approval and the acceptance of the same by TSRTC will mark the culmination of this milestone.
User and administrative manual	User and administrative manuals in consultation with TSRTC, including installation manuals and any other manual relevant for the operational utility of the system. The receipt of adequate number of <u>approved documents</u> would mark culmination of this stage.
Training	Training plan and training schedule.
Quality Assurance Plan, Acceptance Test Plan, Acceptance test Schedule	Module-wise test document as approved by TSRTC.
Testing of all installed modules.	Test data design methods, test data and test reports, error and correction reports at the time of testing for the entire application including the various modules of the system.
Backup plan	Backup plan document as approved by TSRTC.
Live run	Live run report including migration of existing data to the new system.
Malicious Code Certificate	To be furnished by the successful bidder before final acceptance of the system.
Source Code for the developed application	Source code of the developed application in its entirety, on CDs/DVDs with additional information as deemed relevant by the bidder for the same.
Application Delivery	3 Copies of Developed Application CDs/DVDs in the format approved by TSRTC.

In addition to the above, providing of all hardware, Software, (OS, RDBMS, Application Servers, etc.,) networking and allied equipment, integration of all the same at the Data Center and Disaster Recovery Center, integration, migration, deployment of the application software on the hardware, tuning and configuration of hardware network, software and the application software, will be part of the deliverables, as well as maintaining and operating the total system, carrying out required software modifications from time to time during the entire contract period of **FIVE** years.

The following are the major requirements that are to be incorporated in the OPRS application.

9.11 The software shall have the following main features. However, it is to be noted that there will be additional requirements from time to time based on the changes in the business logic, the need for providing better facilities to the passengers and directives of the Government etc., and the same are to be incorporated from time to time at no additional cost. The requirements given include both the immediate requirements as well the future requirements which will have to be addressed within the contract period, as and when desired by TSRTC. The design should take into account the future requirements also. All the facilities available in the existing project, even if not explicitly mentioned, shall be included:

- a) Web / any Browser, mobile app based ticketing facility for computerized reservation of Non Stop services, current, advance tickets with/without concessions.
- b) The web browser based application (ticketing part for online users) shall be designed for both Desktop as well as mobile phones.
- c) Reservation of concession tickets with / without physical tickets.
- d) Facilitate ticket issue on “travel anywhere” basis.
- e) Enabling Blocking, Return Journey reservation with/without concession route-wise, service-wise, cancellation (full/partial), pre/postponement of tickets anywhere.
- f) Enabling bulk blocking/releasing of seats in a given service, for a particular/ a group of agents, to enable only those Agents to issue tickets for these blocked seats, and also facilitate commissions accordingly.
- g) Blocking/releasing seats by operators (by name/by MAC id). These seats will be visible only to the respective operator for booking.
- h) Stock management - For **preprinted** ticket stock.

9.12 The system shall have the following features:

9.12.1 The system should be conceptualized and architected in such a way that the passenger can book their tickets from “Any Where to Any Where at Any Point of Time” keeping in mind the short term and long term goals of TSRTC.

- 9.12.2 The solution must provide a robust and customizable security solution that meets the application requirements of Anytime Anywhere Booking including e-ticketing.
- 9.12.3 An open, extensible architecture and well documented application programming interfaces (APIs) shall be used. A platform that will grow with additional application deployment and scales as user traffic grows, while providing the highest level of reliability is required.
- 9.12.4 The administration module in the application should provide the TSRTC stake holders the power to manage the entire traffic and operations through the system.
- 9.12.5 The application should be designed in such a way that administration of all Categories of Users, e-ticket users, Rate and Fare, Flexi fares, Combi-tickets, Routes, Services, Seasons, Franchises, Bus Stations, Depots, Regions, Zones, Divisions etc., can be efficiently managed to provide the end user with a foolproof system.
- 9.12.6 The system should have the web / browser based facility for Advance Booking, Current Booking, Cancellation (full/partial), Pre/postponement, Blocking/releasing seats, levies, concessions, TIM, Mobile, ITZ cash, e-wallet etc., based ticketing.
- 9.12.7 E-wallet system has to be implemented for online users. The online users will transfer amount to the TSRTC account through net banking, from OPRS application, through secure login. Tickets will subsequently be booked against this amount till the amount is exhausted. Top up facility has to be provided to replenish the wallet. In case of cancellations, the refund amount will be added to the wallet balance. Facility should be provided for giving Redeem points/ Reward points.
- 9.12.8 The application shall be available on mobile phones for Android & iOS etc., through Mobile Apps, for carrying out ticket transactions and enquiry, by the passengers. The successful bidder shall develop the Apps, make them available in the respective App Stores and maintain them throughout the contract period.
- 9.12.9 Currently App based ticketing is available for Vajra Services. Passenger App facilitates the passengers to locate nearby boarding points on Map, select boarding and alighting points on map, book tickets for Vajra Services, cancel tickets and track the service on Map on their date of journey etc. Tickets can be booked up to 30 minutes before the scheduled departure of the service from the selected boarding point. Further, a driver App is also available to enable the driver to know the details of passengers who have booked tickets for the service, issue tickets in the bus, get route map for service, get navigation for service, GPS tracking of the service etc. The passenger App is available for Android and iOS platforms. A web based application is also available to enable the TSRTC management to track the services and obtain back history. Apps (Passenger & Driver, along with web based tracking facility) with all the existing features shall be developed by the successful bidder. The mobile apps for Vajra Services will be maintained by the existing vendor up to 04.05.2018. The successful bidder shall provide

the necessary integration to the existing Apps & vehicle tracking application, with the new OPRS System. The new App in the lines of the App available for Vajra Services should be made ready for implementation, by the successful bidder before 04.05.2018. Charges for Google Map licenses will be borne by TSRTC.

- 9.12.10 The successful bidder shall create and maintain an App for operation of AC mini buses in Hyderabad City (Bus Aggregator).
- 9.12.11 Shall have a provision for Call Centre to book tickets for failure transactions.
- 9.12.12 Shall have IVR calling facility once waybill is generated, for public to enquire about driver.
- 9.12.13 The application shall be integrated with third party Apps for enabling ticket transactions. Integration with third party Apps like Jio Money App, PayTM App shall be carried out by the successful bidder as and when desired by TSRTC.
- 9.12.14 Link ticket facility shall be provided to enable the passengers to book multiple tickets in a single transaction for journeys wherein direct bus facility is not available between the origin and destination for their journey.
- 9.12.15 The system shall be integrated with Vehicle Tracking & Passenger Information System module to enable the users to see ETA & position of buses. The details shall be available on the OPRS portal as well as the Mobile Apps. The integration shall be carried out with the existing vendor and with all future vendors, as and when required.
- 9.12.16 The system should support booking of luggage and parcel at Bus Stations and franchisee counters in respect of accompanied or unaccompanied baggage.
- 9.12.17 Should support different fare structures for operations in different States.
- 9.12.18 Integration and accessibility to various service delivery points such as ATB agents, Sub agents, e-Seva/Mee seva, RAJiv kiosks, POS machines, TS/AP Online portal & other G2C portals, B2C franchisees and the necessary account of tickets and revenues.
- 9.12.19 Integration with other departments like Tourism, other STUs, Railways etc., for providing a composite/ combined ticket.
- 9.12.20 The system should provide facility to enquire about the availability of services, departure / arrival timings, booking counters, franchisees, service driver phone number etc.
- 9.12.21 Facility to print various Operational, Revenue, Commission, and MIS reports for a specific period (daily, weekly, fortnightly, monthly, quarterly, half yearly, and annually) and option to generate the reports based on various criteria like Bus Station-wise, Service-wise, Operator-wise, Franchisee-wise, Depot-wise, Region-wise, Zone-wise, Route-wise, Sector-wise etc.
- 9.12.22 The system shall provide reconciliation of amounts realized and amounts for tickets sold.
- 9.12.23 The system should support display and printing in English, Telugu and Hindi.
- 9.12.24 Facility to earmark the seat in special colour for Ladies, Senior Citizens, PHC, MLAs/MPs, Conductor, etc. and facility for blocking these seats.

- 9.12.25 Facility to capture Passenger information such as name, gender, age, GSTIN, Nationality & Passport number in case of foreigners etc., and to deduce patterns on travels related to frequency and branded services.
- 9.12.26 Provide centralized control of Fares, Concessions, Cancellation Slabs, etc., and access based on the role defined in the system for these functionalities and provision for multiple type of concessions like seat-wise concession, group concession, seasonal concession, etc.
- 9.12.27 The solution must provide scalable access services to the System / Solution, including scalability in terms of number of users, user groups, concurrent users, resources, and access control policies. In addition, it must be scalable to legacy and future applications / resources that are attached to the portal.
- 9.12.28 Multi-level user authorization and authentication with appropriate User Profiles, Rules, and Roles.
- 9.12.29 The security solution must be capable of comprehensive logging of the traffic through the network and applications under its control. It should be capable of logging unauthorized access attempts to the network and the System internal resources, and attempts to login that fail. It should also be capable of notifying appropriate parties including the organization users/department users/ System Security Administrators etc., of suspicious activity, Prevention of DoS and DDoS attacks.
- 9.12.30 Provision shall be made for display of status notification on Arrival, Departure of Buses, availability of seats on a Service, wait list of seats on TSRTC Portal. Such alerts must be capable of being delivered on any user devices such as mobile phones / PDA (Voice calls & SMS alerts), web notification, emails, broadcast to franchisees, call centers and IVR enabled information dissemination facilities.
- 9.12.31 Facility of payment through Credit/debit cards, Net Banking, online payment through third party Payment Gateway services, e-wallets and other wallets.
- 9.12.32 Facility for wait listing and allotment against cancellations.
- 9.12.33 Facility for providing configurable bus station-wise/Agent-wise/route-wise (between given two stages)/stage-wise quota seats for services.
- 9.12.34 The commission that has to be paid to the ATB Agents shall be configurable. This shall be configurable based on the bus station they are attached to, Agent-wise, Route-wise, service type-wise, service-wise, peak/slack/selected days based, between two selected stages of a service, number of seats sold/earnings realized by an agent etc., or a combination of two or more of these. The commission can be percentage based or fixed amount based or any other rule in force from time to time.
- 9.12.35 Comprehensive audit trail, logging and reporting.
- 9.12.36 Data Warehousing and Data Mining facility for Dynamic and effective decision making.
- 9.12.37 Package Tours, Accommodation, dinner on board and other value added services to be incorporated in the web portal where applicable.
- 9.12.38 The system should support remote management. It shall be possible to monitor and tune the system remotely.

- 9.12.39 The OPRS system administration shall facilitate generation of various kinds of reports - HTML/Excel/Text and graphical. The reports will be of use to various stakeholders such as the Corporation, Identified Management Officials, Service Access, network, payment gateway, authentication, back office and other service providers. While some such reports could be planned in advance, the system should provide for creation of additional reports online.
- 9.12.40 The solution must enhance the overall management of security, by providing the officials concerned of TSRTC an easy way to manage users and their corresponding profile information; while also maintaining the ability to manage at the application level. The centralized control should allow for web-based maintenance of organizational level controls such as user management, role management and overall administration control.
- 9.12.41 System shall facilitate booking entire bus for use of group of passengers' tourist / Corporate or any other citizens. The information like vehicle type, hire charges and other terms and conditions shall be provided online and the system shall facilitate online booking of entire bus.
- 9.12.42 System should facilitate payment for ticket booked through Credit Card, Debit Card, Net Banking, Cash deposits, Bulk payments in cash / cheque / Demand Draft in authorized Banks, ITZ Cash, NG Pay etc., and entering data from such receipts / challans into the system, Special coupons or any other payment mechanism as and when introduced. The system shall have necessary interfaces in conformance with the standards and protocols specified by such third party payment gateway service providers. Such payments received will provide appropriate interfaces for the backend accounting and financial systems to access the payment collection data.
- 9.12.43 Integration with intelligent TIMs (iTIMS) to issue tickets online in the bus. All the necessary data from OPRS application like waybill data, ticket issue/cancellations etc., shall be provided through API. The successful bidder shall carry out necessary integration of iTIMS API with OPRS application at its end.
- 9.12.44 The system should support printing using any printer - dot matrix, laser, inkjet and on type numbered pre-printed or plain paper.
- 9.12.45 Pre-printed tickets may be made available to the franchisees and other travel agents including ISPs as per policies of TSRTC, who will have to maintain inventory and submit requests online for replenishments from TSRTC. Accountal of the same shall be done through the system.
- 9.12.46 The system shall facilitate capturing feedback from users of TSRTC services and provide an option for TSRTC management to get alerts on feedback posted on the site for immediate attention and action.
- 9.12.47 The system shall provide user management services and service enrolment features to enable the user to register with the portal. It should also provide secured mechanism for user identification, transaction integrity, security and non-repudiation.

9.13 The system will be essentially characterized by the following features

- a) Flexibility: The system should be adaptable to changing commercial practices and reduce the total cost of ownership.
- b) Open Architecture: The system should be open to allow interoperability with general purpose software and have facility to Export/Import data files from other applications and interact with other applications as mentioned earlier.
- c) Object Oriented: The system design should be based on object-oriented approach.
- d) Integrated: The system should be fully integrated across departments and functional areas and also across geographical location of sites.
- e) Workflow integration approach: The system should adapt workflow management techniques.
- f) Distributed application: The system should support functionally distributed computing, allowing distributed applications across different locations.
- g) Simplicity: The overall application should be developed keeping in mind simplicity as the key, so as to enable easy maintenance and operation of the application by the end user.
- h) Manageability: The OPRS application should cater for easy manageability by the system administrator.
- i) Scalability: OPRS will be deployed across all the Bus Stations of the Corporation. As the Bus Stations vary in size and functionality it is a mandate requirement that the OPRS should be scalable at modular level.

9.14 The bidder should provide the list of Hardware proposed to be hosted in the Data Center and Disaster Recovery Center. Also they should provide the details of the network proposed to be provided; they should give in detail the provision for redundancy at all levels. Similarly, they should also detail the system Software, Application Software, Database proposed and merits of the same. The details of utilization of Hardware should also be specified such as for Database, Application, HTTP Servers, Edge Servers, mail servers, load balancers, LDAP server, SAN if any etc.,

9.15 Solutions can be offered on secured, reliable & scalable Cloud Architecture also.

9.16 Automatic releasing of predefined quota seats based on configurable time, place or condition with a provision for manual releasing.

9.17 Facility of payment through Credit cards/Debit cards, Net banking, on-line payment through third party Payment Gateway services like NG pay, ITZ cash etc.

9.18 Centralized control of routes, fares, concessions, cancellation slabs, reports etc., and the application software.

9.19 Agent-wise commissions, agent-wise cancellations, cancellations before and after departure (based on the rules from time to time), universal stock accountal etc., and Agents cash remittance through prepaid and postpaid methods which should be configurable.

- 9.20 Integration and accessibility to various service delivery points such as ATB agents, Sub agents, B2B Agents/Sub Agents, B2C franchisees, e-Seva/Mee Seva, TS/AP Online, RAJiv kiosks, GPRS based ticket issuing machine, mobile based advance & current reservation system and necessary account of tickets and revenues.
- 9.21 The Infrastructure provided shall be sized so as to support a minimum of 5 B2C franchisees and 3 B2B Corporate Agents apart from Mobile Apps. Necessary assistance to the B2C franchisees/B2B Corporate Agents shall be provided by the successful bidder for carrying out the required integration with OPRS and testing of the integration.
- 9.22 Reconciliation of Inter Bus Station/Depots transactions based on issue date or journey date.
- 9.23 Anywhere to anywhere Bus Station-wise transaction reports daily, weekly, fortnightly, monthly and yearly.
- 9.24 The system shall facilitate display of departure / arrival timings as well as the facility to drill down to view the arrival / departure timings en-route.
- 9.25 There shall be provision for implementing EQ / quota system service-wise, station wise, issue point wise.
- 9.26 Tickets to be printed in bilingual mode **English and Telugu, based on the need.**
- 9.27 Multi-level user authorization and authentication with appropriate User Profiles, Rules & Roles, MAC level, One Time Password valid for one day, etc. The One Time Passwords shall be sent to the Agents, TSRTC operators/users/officials concerned through SMS and e-mail.
- 9.28 All Operational, MIS and Revenue reports for a specified period Bus Station-wise, Service-wise, route-wise, service type-wise, sector-wise, journey date-wise, booked date-wise, Operator-wise, other agents and e-ticketing, payment gateway-wise etc.
- 9.29 Comprehensive audit trail, logging and reporting log on important events in application like waybill generation/cancellation and other reports etc., and on critical parameters. High water marks for concurrent application users, module of application, page of application.
- 9.30 There shall be facility of reconciliation report or tool between RTC vs agents, RTC vs Payment Gateways, similarly RTC vs other channel providers.
- 9.31 Main unit of application is Service, it shall be extended or shrunk either side. Majority of parameters are based on the service and shall be configurable.
- 9.32 Ladies seats to be earmarked in different colour and facility for blocking these for ladies only. Special blocking for MLAs/MPs etc., to be provided. Blocked seats release time to be configurable.
- 9.33 Dynamic configuration provision of earmarked seats like Senior Citizens, PHC etc., quota seats in a service.
- 9.34 Facility to capture Passenger biographic data such as Name, Gender, age etc. and to deduce patterns on travels related to frequency and branded services.
- 9.35 Maintenance of passenger profile to facilitate CRM.

- 9.36 The Reservation and cancellation facility should be made available through mobile, ticketing issuing machines, SMS, ticket vending machines, Kiosks, mobile app based booking confirmation alerts etc.
- 9.37 The System should have an option to provide refunds to passengers according to the upgradation and downgrading of service/class.
- 9.38 Automatic refunds should be implemented.
- 9.39 Seat-wise concessions, Service-wise concessions, type-wise concessions, sector-wise concessions, route-wise concessions, group concessions, and seasonal concessions etc., to be provided.
- 9.40 Dynamic/static configuration of concessions or increase in fare i.e., implementation of flexi-fares for a few days in a week, few days in a month, for selected days, for a given period, for a part of the service etc., based on the business rules in force from time to time.
- 9.41 The System shall have a facility for seat vacancy position sector-wise, route-wise, service type-wise, between a given source and destination or a combination of these, and provision for automatic Platform Announcement system.
- 9.42 The system shall have the facility of Out Depot cash remittance module. Services originate from a Depot and return back to the Depot after completion of the service/ set of services. The bus crew is supposed to remit the earnings at the parent depot after completing their spell of duty. In case the bus cash with the crew is high, for safety reasons, the crew generally remits the earnings at other than their parent Depot viz. another Depot or a Bus Station, duly collecting a receipt (on pre-printed type numbered stock) which will be submitted in the parent Depot. This is called out depot cash remittance.
- 9.43 Facility to provide information and alerts on timings, fare, service cancellations, payment gateway transactions, e-ticketing booking and cancellation, late arrivals and departures to passengers on mobile phones through voice calls or SMS, web notification, e-mails etc.
- 9.44 After creation and implementation of a Service in the application, for every modification of critical data(like Master data) Route-wise, Service-wise, user-wise, fare changes, Kilometers changes, stage changes shall be intimated to the Chief Admin and Admin roles through mail and pop ups immediately.
- 9.45 Error pop up must be generated with correct related messages wherever required and shall be popped up.
- 9.46 Facility of dynamic fare changes across the board throughout the computerized Bus Stations centrally.
- 9.47 Data Warehousing and data mining facility for dynamic and effective decision making.
- 9.48 Based on the above data the software shall generate various reports on daily, fortnightly, monthly and yearly basis etc. The requirement of types of reports and their formats are liable for change from the time to time.
- 9.49 Accommodation and other value added services to be incorporated in the ticket for services where applicable with/without concession.
- 9.50 The administrative interface shall support web enabled, browser based interface and standalone interfaces.

- 9.51 The OPRS system administration shall facilitate generation of various kinds of reports - text and graphical. The reports will be of use to various stakeholders such as the Corporation, Identified Management Officials and Service Access, network, payment gateway, authentication, back office and other service providers. Such reports could be planned in advance, the system should provide for creation of additional reports online.
- 9.52 The solution must enhance the overall management of security, by providing Authorized Officials of TSRTC an easy way to manage users and their corresponding profile information; while also maintaining the ability to manage at the application level. The centralized control should allow for the web based maintenance of organizational level controls such as user management, role management and overall administration control.
- 9.53 The solution must provide scalable access services to the System / Solution, including scalability in terms of number of users, user groups, concurrent users, resources, and access control policies. In addition, it must be scalable to legacy and future applications / resources that are attached to the portal. The ability to transport this solution for all future web-enabled services with minimal effort reduces future implementation costs and ensures a structured / proven security environment.
- 9.54 The System should be able to capture MAC & IP addresses of the customer logged in. Access for certain types of users will be restricted based on the MAC.
- 9.55 The System should provide log reports of login and logout of various users at the specified intervals of time.
- 9.56 The solution must provide a robust and customizable security solution that meets the application requirements of Anytime Anywhere Booking. It is hard to anticipate all present and future requirements. An open, extensible architecture and documented Application Programming Interfaces (APIs), Web services enable site developers to customize an access control system to their specific requirements. A platform that will grow with additional application deployment and scales as user traffic grows, while providing the highest level of reliability is required.
- 9.57 The security solution must be capable of comprehensive logging of the traffic through the network and applications under its control. It should be capable of logging unauthorized access attempts in to the network and the System internal resources, and attempts to login that fail. It should also be capable of notifying appropriate parties including the organization users/department users/ System Security Administrators etc., of suspicious activity.
- 9.58 The bidder has to provide VeriSign certification for security check in the application throughout the contract period.
- 9.59 There shall be provision for issue of e-ticketing through any number of payment gateways.
- 9.60 The provision to enter the number of passengers traveled stage-wise in the bus (Service) shall be made available at the destination / origin bus station and a report to be provided for this purpose.

- 9.61 The system shall have a facility for carrying out cash based and cashless (payment through credit/debit cards) transactions at the counters for issue of tickets. The facility shall be provided at all counters including ATB agents.
- 9.62 TSRTC as part of its business development policy may offer reservation facility on mobile, TIMS, Vending machines, Kiosks. The access to the reservation will have to support wireless interface to the system through an ISP or any other relevant technology.
- 9.63 The system should support printing, using any type of printer - Dot Matrix, Laser, Inkjet and on pre-printed or plain paper through any browser.
- 9.64 Pre-printed tickets may be made available to the franchisees and other travel agents including ISPs as per policies of TSRTC, who will have to maintain inventory and submit requests online for replenishments from TSRTC.
- 9.65 The system shall also provide an option for delivery of tickets through courier at an extra charge which should be configurable.
- 9.66 The System shall send the details of the generated ticket to the e-ticket user through mail and SMS. The system shall also send SMS and e-mail to the passengers for ticket booked at the Agents counters. Provision should also be available for sending SMS in case of tickets booked at TSRTC counters. This should be configurable dynamically. Event based SMSs also need to be fired for example when a service is cancelled, when waitlisted ticket is not confirmed, details of service driver once waybill is generated etc.
- 9.67 Event based SMS messages shall be sent to the identified officials/group of officials for events like more number of cancellations/bookings by an agent, high value top-up by the Agents, Service cancellations etc.
- 9.68 Required SMS gateway integration shall be carried out by the successful bidder. The SMS gateway providers may be changed from time to time and the successful bidder shall carry out the integration as and when required.
- 9.69 Issue of concessional tickets for Journalist Passes, Retired Employees Passes, CAT cards etc., through OPRS application and validation of such passes during issue of tickets to the pass holders.
- 9.70 The system shall display the ticketing activity to the passenger who is at the counter through slave monitor with selective information. As such the passenger will select his required seat/ type of service for his journey.
- 9.71 The system should have interface with Ticket Issuing Machines (TIMs) for issue and account of tickets and revenue. The TIM should be able to get seats availability from the Central Server and should be able to issue tickets through the TIM and update the Central Server. The communication with the TIM to the Central Server will be through GPRS, GSM or other communication media. Provision shall also be made available for carrying out these transactions through mobile phone based ticketing.
- 9.72 To incorporate advertisements in the home page and modification of the same whenever changes are made by TSRTC. However, the bidder shall have no rights to claim on the revenue generated through advertisements and his scope is limited to uploading the ads only. As far as possible, the content should be changeable on the fly.

- 9.73 The vendor has to maintain and change the website home page periodically to make it more attractive with animation, as and when required by TSRTC.
- 9.74 The Bus Station-wise and Type-wise Time Table to be provided in the Home page.
- 9.75 Flash messages, SMS and e-mails to be generated automatically and immediately in the application, whenever a service is cancelled or introduced, schedule time or pickup point is modified etc.
- 9.76 To provide bus station wise quota seats in all services.
- 9.77 Systems should check valid parameters defined by TSRTC such as current booking time, cancellation timings, minimum travelling distance, concessions etc., and all other business rules for booking of ticket in a service.
- 9.78 The bidder has to deploy manpower 24 x 7 with sufficient team of Software Engineers, Database Administrators, Network Administrators etc., for design, development, implementation, migration with necessary equipment & tools and to attend day to day problems immediately.
- 9.79 Additional and final requirements will be finalised during the preparation of the System Requirement Specifications.
- 9.80 TSRTC is looking for an end to end solution for software design, development and deployment for OPRS; providing required hardware, software, networking, connectivity & bandwidth for Data Centre and Disaster Recovery Centre, and hosting the equipment in a Tier 3 plus Data Centre; installation, migration etc.
- 9.81 The successful bidder shall provide documentary evidence of having provided the hardware and software, as indicated in the bid. TSRTC officials reserve the right to inspect/visit the Data Centre and DRC for ensuring that the required infrastructure, as per the specifications given in the bid are provided.
- 9.82 At the end of the contract period, the successful bidder shall provide all the required assistance for migrating the data to the subsequent new application.

10. Operational Requirements for OPRS

This section sets out the operational requirements of the OPRS Project including project management requirements, acceptance testing & certification, OPRS application, maintenance & support including Data Centre and Disaster Recovery Center requirements, man power deployment and MIS reporting requirements etc. Service Level Metrics are provided in this document which shall be used for measuring and monitoring the quality of the services provided by the successful bidder.

Following is the summary of operational requirements for OPRS which are elaborated in the following sections.

10.1 Summary of Operational Requirements of OPRS Solution

Successful bidder shall implement, operate and manage the OPRS solution in accordance with the service level metrics defined for the project. Successful

bidder shall coordinate and provide complete support to the OPRS Project Manager of TSRTC in conducting the solution acceptance testing and certification.

The successful bidder shall provide operational support and maintenance services during the entire contract period of **five years** from the date of commencement of commercial operations, for overall system stabilization, software and IT infrastructure maintenance, system administration, security administration, database administration, network administration and end-user problem resolution. The operational support will have to ensure that the OPRS solution is functioning as intended and all problems associated in operation of the application system are attended promptly.

The successful bidder is required to train the OPRS staff nominated by OPRS Project Manager, designated Department's technical and end-user staff, franchisees of TSRTC and other identified partner organizations of TSRTC to enable them to effectively operate the OPRS system. The successful bidder shall also be responsible for re-training the OPRS and department staff whenever changes are made in the software.

Preparation of documents including User Manuals, Operational Manuals, Technical and Maintenance Manuals etc., as per acceptable standards will be part of the requirements.

Following outlines detailed specifications for OPRS operational requirements:

10.1.1 Requirement to comply with Service Level Metrics

To ensure that all the stakeholders discharge their roles and responsibilities in an agreed manner to achieve the common goals, a set of Service Level Metrics are defined for OPRS project. These technical, functional and operational requirements are specified in the RFP to enable all the bidders to understand the dimensions of the OPRS project on a level playing field and propose appropriate solutions and proposals. In case of an ambiguity or conflict, the relevant component of the Service Level Metrics will be used as the touchstone and will prevail. Refer to Section 12 for the Service Level Metrics expected to be maintained and achieved by the successful bidder for OPRS project. The successful bidder has to enter into comprehensive Service Level Agreement, which will be finalized at the time of entering into Agreement.

10.1.2 Project Management

The OPRS project is a multi-user, multi-location initiative. Its implementation is complex involving a number of stake holders; especially the successful bidder is required to design and implement a comprehensive and effective project management methodology. To have an effective project management

methodology in place, it is necessary for the successful bidder to use a Project Management Information System (PMIS). The successful bidder shall address the following at the minimum using PMIS:

- Create an organized set of activities for the project.
- Establish and measure resource assignments and responsibilities.
- Construct a project plan schedule including milestones.
- Measure project deadlines, budget figures, and performance objectives.
- Help communicate the project plan to stakeholders with meaningful reports.
- Help to detect problems and inconsistencies in the plan.

During the project implementation the successful bidder shall submit to the Project Manager, OPRS the following reports:

- a) Results accomplished during the period.
- b) Cumulative deviations to date from schedule of progress on milestones as specified in the RFP read with the agreed and finalized Project Plan;
- c) Corrective actions to be taken to return to planned schedule of progress;
- d) Proposed revision to planned schedule provided such revision is necessitated by reasons beyond the control of BIDDER;
- e) Other issues and outstanding problems, and actions proposed to be taken;
- f) Progress reports on a weekly/fortnightly basis.

Interventions which the successful bidder expects to be made by the Project Manager, OPRS Project and actions to be taken by the Project Manager, OPRS before the next reporting period, Project quality assurance reports etc.

10.1.3 Acceptance Testing & Certification

Project Manager of OPRS will undertake an exercise of Testing, Acceptance and Certification of OPRS project either through his team or through a third party with the assistance of the team from the successful bidder, as soon as the successful bidder declares the OPRS system to be ready for deployment. The testing shall be carried out at the cost of the successful bidder.

The primary goal of Acceptance Testing & Certification is to ensure that the project meets requirements, standards, specifications and performance prescribed by the RFP and the SLA, and shall include the following acceptance tests.

Performance

Performance is a key requirement for the Project. The deployed solution is supposed to be a highly scalable solution, which is designed in a scale up/out

model at each layer. This will provide the model for future growth. This test process will include the following activities.

- a) Determination of performance.
- b) Designing performance tests.
- c) Development of workload.
- d) Performance testing and sizing study.
- e) Identification of bottlenecks and providing solutions.
- f) Determining final performance figures.
- g) Communication of final results to all stakeholders.
- h) Final output of this process would be a sizing guide for the solution tested. The sizing guide will document the details of the performance tests, test data, bottlenecks identified, alternate solutions provided, and the final performance data. This document will provide the scalability data of the solution for various loads. This will become the authentic guide for future scale up/out plans of the Project.

Availability

The OPRS solution should be designed to remove all single points of failure. The solution should provide the ability to recover from failures, thus protecting against many multiple component failures. This test process will include the following activities.

- a) Designing tests for high availability testing.
- b) Execution of high-availability tests.
- c) Assessment of transaction/data losses in relation to Disaster Recovery system.
- d) Communication of final results to all stakeholders.
- e) High Available clustering at all Web, Application and DB server level will be targeted at 99.5 % availability.
- f) Security.

Security certification process will include

- a) Audit of Network, Server and Application security mechanisms.
- b) Assessment of authentication mechanism provided in the application/ components/ modules.
- c) Assessment of data encryption mechanism.
- d) Assessment of data access privileges, retention periods and archival mechanisms.
- e) Final output of this process would be a comprehensive audit report including all the Network, Server and Application security features incorporated in OPRS 3-Tier Project.

Manageability

Manageability Requirements of OPRS will be tested and certified for the following:

- a) Remote Monitoring of Status and Statistics of all high-level components.
- b) Management capability to start/ stop/ restart services & systems.
- c) Auto discovery of all components manageable through SNMP.
- d) Auto discovery of all other system components.
- e) Ability to track changes in configurations of the system components to help track Service.
- f) System disruptions.

Final output of this process would be a manageability compliance document for the OPRS application deployed.

10.2 OPRS application Maintenance and Support

The successful bidder shall be responsible for the overall management of the OPRS application including the software and related IT Infrastructure. The successful bidder shall be responsible for the operation and maintenance of OPRS solution, which includes application solution management and IT Infrastructure management including security management, network management, server management, storage management etc. Following includes but is not limited to the various activities to be performed by the successful bidder during the maintenance of the OPRS application.

10.2.1 Application Management

The successful bidder shall provide warranty for OPRS application software, Hardware, Network and all equipment for a period of sixty months, commencing from the date of commercial deployment. The warranty should include that the solution supplied under this contract shall have no defect arising from design or workmanship or from any act or omission of the successful bidder that may develop under normal use of the supplied application.

During the warranty period, successful bidder shall be completely responsible for defect free functionality of OPRS application software and shall resolve any OPRS application related issues including bug fixing etc., within duration agreed between OPRS Project Manager and the successful bidder.

Successful bidder shall provide the latest updates, patches/ fixes, version upgrades relevant for the OPRS application components periodically.

Successful bidder shall be responsible for software version management, software documentation management reflecting current features and functionality of the application. The Successful Bidder shall also be responsible in securing appropriate number of licenses and annual maintenance contracts with software, hardware, vendors in case of bought out software and hardware. Training of TSRTC personnel on latest version of software as applicable in their operations is also the responsibility of the Successful Bidder.

10.2.2 Infrastructure Management

This includes the design of an appropriate System Administration policy with precise definition of duties and adequate segregation of responsibilities and obtaining the approval for the same from the Project Manager, OPRS. System Administration includes the following activities:

- a) Overall management and administration of infrastructure solution including servers, networking & security components, storage solution etc., for Data Center and Disaster Recovery Center.
- b) Performance tuning of the system as may be needed to comply with Service Level Metrics requirements on a continuous basis.
- c) Security management including monitoring security and intrusions into the application.
- d) Monitor and track server and network performance at Data Center and Disaster Recovery Center and take corrective actions to optimize the performance on a daily and hourly basis.
- e) Escalation and coordination with other vendors for problem resolution wherever required.
- f) System administration tasks such as managing the access control system, creating and managing users etc.
- g) Data storage management activities including backup, restore and archival etc.
- h) Attend to Department's user request for assistance related to usage and management of OPRS application.

The successful bidder undertakes to ensure that daily transaction-wise back-up copies and total dump backup of OPRS and related data are created and maintained safely. Access to the backup data shall be provided to the Project Manager, OPRS and shall also be provided as and when requested.

Other important activities related to Data Center and Disaster Recovery Center shall include but not limited to:

- a) Daily maintenance of system configuration.
- b) Implementation of system security features.
- c) Overall security of the network.
- d) Day-to-day disk space management.

- e) Tracking the servers performance and taking remedial and preventive actions in case of problems.
- f) Proper upkeep of storage media for taking backups.

10.2.3 Network Management Services

Design of Network Administration Policy and getting it approved from the Project Manager, OPRS for effective and efficient management of Network resources at Data Center and Disaster Recovery Center. Network Administration, consists broadly of the following activities:

- a) Network devices configuration, management and tuning for optimum performance.
- b) Tracking the network status, availability and taking remedial and preventive actions in case of problems.
- c) Network fault isolation and resolution.
- d) Monitoring of network performance and escalation of performance deterioration to concerned authorities and take remedial actions to resolve such issues.
- e) Implementation/modification of network routing policies, IP addressing policy as required.
- f) Real time monitoring and deployment of network security measures 24x7x365.
- g) Documentation related to network configuration, routing policies, IP addressing schema etc.
- h) Bandwidth monitoring and trending for the network.

10.2.4 Information Security Services

The successful bidder is responsible for implementing measures to ensure the overall security of OPRS solution and maintenance of confidentiality of the OPRS data. The successful bidder shall monitor production systems for events or activities, which might compromise (fraudulently or accidentally) the confidentiality, integrity or availability of the OPRS application. This monitoring shall be through the security controls including:

- a) Real-time intrusion detection tools.
- b) Audit review tools.
- c) Manual processes.

Successful bidder shall develop a detailed security policy for OPRS application implementation & maintenance. The security policy developed by the successful bidder shall be updated to keep the security recommendations current and the same shall be implemented for the OPRS solution.

The successful bidder, with the cooperation of appropriate, appointed representatives of TSRTC and the participating departments will manage the

response process to security incidents. The incident response process will seek to limit damage and may include the investigation of the incident and notification to the appropriate authorities. A summary of all security incidents shall be made available to OPRS Project Manager on a weekly basis. Significant security incidents will be reported on a more immediate basis.

The successful bidder shall produce and maintain system audit logs on the system at which point they will be archived and stored as desired by the Project Manager, OPRS. The successful bidder will regularly review the audit logs for relevant security exceptions. The successful bidder has to purchase and integrate the security certification from VeriSign signature to the OPRS application throughout the contract period.

10.2.5 Project and MIS Reporting Requirements

OPRS shall provide a system for generating and viewing online, real-time project and MIS reports Route-wise, Service-wise, Sector-wise, counter-wise, centre-wise and e-ticketing transactions payment gateway-wise etc., handled daily, weekly, fortnightly, monthly and yearly and transaction density trends during any specified periodicity. The online MIS reporting system shall be an integrated system which shall provide web-based reporting for TSRTC and various stakeholders.

The system shall provide MIS reporting with multiple “Slice & Dice” options to generate reports in flexible formats based on user specific needs. The online MIS reporting requirements can be stated from the following perspectives:

- From the OPRS portal perspective, the reports should present real time, historical, statistical and predictive views in addition to the daily/weekly/monthly/yearly views.
- Portal usage statistics related to registered users, business entities, online transactions etc., payment gateway-wise for reconciliation.
- Trend analysis reports detailing the user behavior patterns providing forward-looking predictions of business user interests in OPRS portal.
- A few indicative reports which the successful bidder should take into account are:
 - Date Wise transactions.
 - Transactions since inception.
 - User-wise, counter-wise, Bus Station-wise transactions.
 - Quality of Service Report outlining the performance of the individual front end service providers in processing the user requests in comparison with Service Level Metrics requirements.
 - Total page views per category.
 - For online events: peak simultaneous users, total users logged in, (average stay per user), Gateway-wise reports.

- The online MIS reporting requirements for OPRS Data Center activities include providing graphical views for information such as: collections for each center, statistical/trend view (rate of growth of transactions and predictive growth of transactions), historical view (collections till date).
- The following are indicative reporting requirements that the successful bidder should take into account while designing an appropriate solution:
 - Hourly/Daily/Weekly/Monthly / Yearly transactions/collections by center.
 - Day-wise and Shift-wise collection summary reports.
 - User-wise summary for the day reports.
 - Transaction based alerts.
 - Service-wise, route-wise, destination-wise, service type-wise, sector-wise reports
 - All Users and all centers collection reports.
 - Service cancellation and tickets cancellation reports.
 - Bus Station-wise Anywhere to Anywhere transaction reports.
 - Gateway-wise Reconciliation statement for e-ticketing.
 - Generation of service wise MTD 141.
 - Inter Depot, Inter Region Transaction reports.
 - Corporation summary report daily/fortnightly/monthly/yearly.
 - All the reports to be generated in the form of HTML, PDF, Text, Excel, CSV formats.
 - All the reports to be generated in from - to date option facility.
 - Any other reports required by the Project Manager, OPRS time to time.
 - Any report in any format subject to availability of data in the Database.

The successful bidder shall provide transactional data, to TSRTC, at prescribed intervals and as and when required by TSRTC.

10.2.6 Requirements of participating users

OPRS being a multi-location, multi-user initiative, it is imperative to provide online MIS reporting capabilities tailor-made to the requirements of the various participating departments. The successful bidder should gather the requirements for online MIS reporting from the individual participating users and design the application accordingly.

10.2.7 Training Requirements

Training is an important activity for the successful implementation of OPRS project. To make OPRS project a success and robust, the following training programs are to be arranged by the successful bidder from time to time depending on the requirement and understanding of the various stakeholders, Official users and end users etc. For all these training programs the successful

bidder has to provide necessary course material, user manuals, troubleshooting manuals, system admin manuals and refreshments to the trainees etc. The following are the trainings to be imparted by the successful bidder at his own cost:

- The successful vendor has to involve Supervisors/staff of Information Technology Department, TSRTC, identified by the CE(IT & IE) in design & development of application, deployment and implementation in all stages of the project duly imparting necessary training for not less than three months.
- The successful bidder must impart training to all the OPRS nominated staff/Supervisors, so that they gain thorough knowledge of all the operations of the OPRS application ensuring smooth running of OPRS Software implementation at all the locations.
- The Successful bidder shall also be responsible for retraining the OPRS nominated staff whenever changes are made in the software and it is the responsibility of the successful bidder to ensure that the operators are familiar with new versions of OPRS application and its allied services.

10.2.8 Training of the participating Users' Employees

The successful bidder must impart training to the department personnel in IT awareness and basic IT skills, usage of applicable OPRS application components and generation of their MIS reports, maintenance of user logins and operations of the backend server policies and procedures. The successful bidder shall train 10 employees of each participating department in each location and shall provide the relevant training material on a 1:1 basis which should contain the detailed procedures for operating the applicable modules in the solution.

The duration of training for department users shall be for a period of 2 weeks prior to deployment, and training shall be conducted at the respective state/district head-quarters for each department.

11. Common Services

11.1 Authentication

Description

OPRS will offer its administrative users a single authentication service for all transactions. Once a user has successfully registered, they will be able to access the services using a common user ID or digital certificate.

The interface between OPRS and authentication services must provide interoperability with any such Government approved authentication service. It must also be scalable to support the requirements of continuously emerging services. The authentication interface will require secure connectivity. Bidders

are required to outline how such connectivity will be offered to authentication service providers. The selected service provider will be required to work cooperatively with a wide range of 3rd party authentication service providers across the public and private sectors, in addition to any value-added ancillary service providers which may be required (such as specialist time-stamping services for example). In particular, the selected service provider will be required to co-operate in adopting common standards and procedures for connection of authentication service providers.

Bidders will be required to ensure that authentication services accessible from OPRS and available for use are available to all channels that require it. In addition to user authentication, OPRS will be required to authenticate itself to delivery channels (and vice-versa). It will also be required to authenticate itself to back office processes and authorization service providers.

11.2 Operational Requirements

- The authentication mechanism deployed shall guarantee the highest degree of trustworthiness.
- Once a user is authenticated, the administrative user shall be granted access to authorized services.
- Shall Support connection to third-party authentication services.
- Scale to support an undefined number of authentication service providers.
- Secure network connectivity between OPRS and diverse authentication services.
- Establish OPRS authenticity to other delivery channels, front office service accesses, back office processes, authentication service providers, other OPRS access providers, and other services.
- Interface to authentication services will observe the relevant published standards of the Government or the standards of such authentication service providers as accepted by the Government.

11.3 Authorization Services

Access to services shall support multiple levels of authorization covering:

- User registration-based (User ID and Password) services for users who opt for registration based service access.
- Corporate users who may register the organization, authorized representative, who may be allowed to access the services only through PKI certification mechanism.
- Administrative users from the Corporation who shall be allowed only through authentication mechanisms.

11.4 Payment Gateway Support

Description

OPRS should provide necessary and appropriate connectivity to third party payment gateway services as a back end operation, to service the payment of ticket fares to the Corporation and ATB/B2B/B2C Agent Top up. It is envisaged that payment gateway providers are screened and pre-approved based on price, service and commercial specifications.

The transaction engine should handle all transactions efficiently. OPRS will:

- Provide for online payment/top up function that aggregates payment for multiple passengers/Agents and/or multiple routes that can be paid online.
- Not build or manage its own Internet payment gateway or Electronic Bill Presentment and Payment (EBPP) service.
- Not operate as a proxy merchant (collect payments on behalf of the Corporation).
- As there are manual methods of effecting payment and financial institutions involved, OPRS should provide mechanism to track information relating to offline payment.

11.5 Operational Requirements

- The payment interface shall be easily extensible to allow for newer forms of payment and to incorporate increasing number of e-payment vendors.
- It shall be ensured that all online payments be performed in a trusted and secure manner (through VeriSign signature).
- It shall be guaranteed that the online payment information shall not result in loss of money to either of the parties involved in the business transaction and any other information, which may be sensitive to the transaction will not be released to unauthorized parties.
- Liability and fraud prevention issues must be addressed (By complying with the provisions of IT Act 2000, for similar such services and its providers).
- OPRS interface may have to adopt the standards for e-Payment.
- Provide a proposal for working with other connection service providers (if any) to facilitate E-payment.
- Proposal, as to how various payment mechanisms, - manual and automated - could be handled, including links to financial institutions (for payment concerns) by PRS, in conjunction with the E-payment vendor.
- The process for selection of payment gateway providers and the norms for their selection.
- Payment gateway integration shall be carried out by the successful bidder. Integration will be required with multiple payment gateways. The Gateway providers may be changed from time to time, by TSRTC, and the successful bidder needs to carry out integration with the new gateway provider as and when required.

- Integration with additional payment gateways with open wallet facility, like Reliance Jio, Paytm, Payu money etc., shall be carried out as and when required.
- Apart from online cancellations by the passengers in which the activity shall happen without manual intervention, there will be cases (transaction succeeding at the gateway but ticket not issued, partial cancellation of service etc.) where in refunds have to be initiated separately. The application shall provide a facility for carrying out such refund transactions through the system.

11.6 Compliance to e-Governance and other Standards

- OPRS-Unify initiative will be required to interoperate with several other national level / state level projects envisaged under major e-government initiatives of the States and accordingly the OPRS Solution should be based on an architecture that allows for loose coupling with the information systems of all the departments involved.
- OPRS should adopt open interoperable standards so as to provide for addition of new services, agencies and delivery channels in an effortless manner in future.
- It is expected that various world-wide Standards relating to front-end interfaces, message exchange mechanisms will be part of the specifications. It is expected that the vendor clearly explains in the bid proposal various standards that are proposed to be adopted and the reasons for following a set of standards in the event that there are more than one such standard.

12. Service Metrics for the Online Passenger Reservation System (OPRS)

SLA to be delivered and shown periodically.

OPRS	
OPRS Application Availability	99.5 %
Functional requirements upgrade	< 7 days
Client access upgrades	<30 days
Computing accuracy	100%
Hosting Centre	
Concurrent Connects to the OPRS	>5,000
Availability of systems at Data Centre	99.5 %
Resumption of online OPRS services in case of issues	<1 hr
Update of portal contents from decision to Implementation	<2 hrs
Billing accuracy	100%
Data availability	100%

Data accuracy	100%
Capacity of the Data Base Server	Handle 50,000 service transactions /hr
Capacity of the Application Server	Handle 50,000 service transactions /hr
Availability of the agreed services over the Internet.	100%
Time to restore servers from failure	<1 hr
Network	
Network availability at Data Center	99.95 %
Network Latency	Average of < 75 milliseconds
Client Access	
Average time per transaction (Total system response time) for a reservation transaction / cancellation / pre-postponement.	< 60 seconds
Average OPRS page loading.	<5 sec
Request response time.	<5 sec
TSRTC Client access availability.	99.5 %
Business Development	
Percentage of increase in the reservations every year(estimated)	5% (approx.)

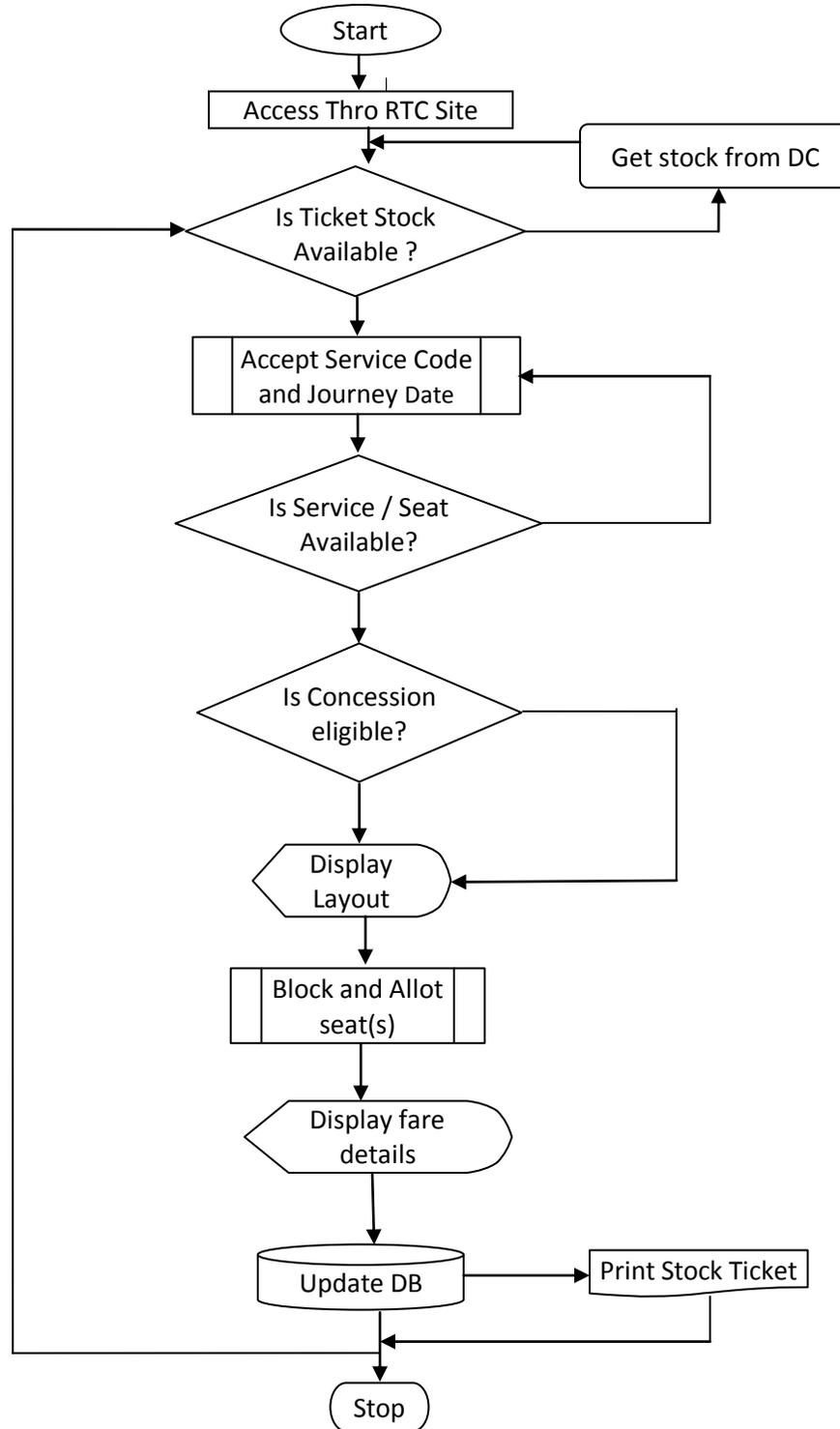
The SLA should be demonstrable as and when required by TSRTC. The SLA shall be maintained on a monthly basis.

The System should scale up to 5,00,000 transactions per day and be able to complete a reservation / cancellation / pre-postponement and e-ticketing transactions in less than a minute when connected on a 512 kbps broadband Internet connectivity. These service metrics are indicative and will be finalized at the time of agreement. Service metrics are demonstrable in a production system. The system should be scalable to handle additional concurrent users duly enhancing the hardware of Data center/Disaster Recovery center during peak days, without changes to application Software.

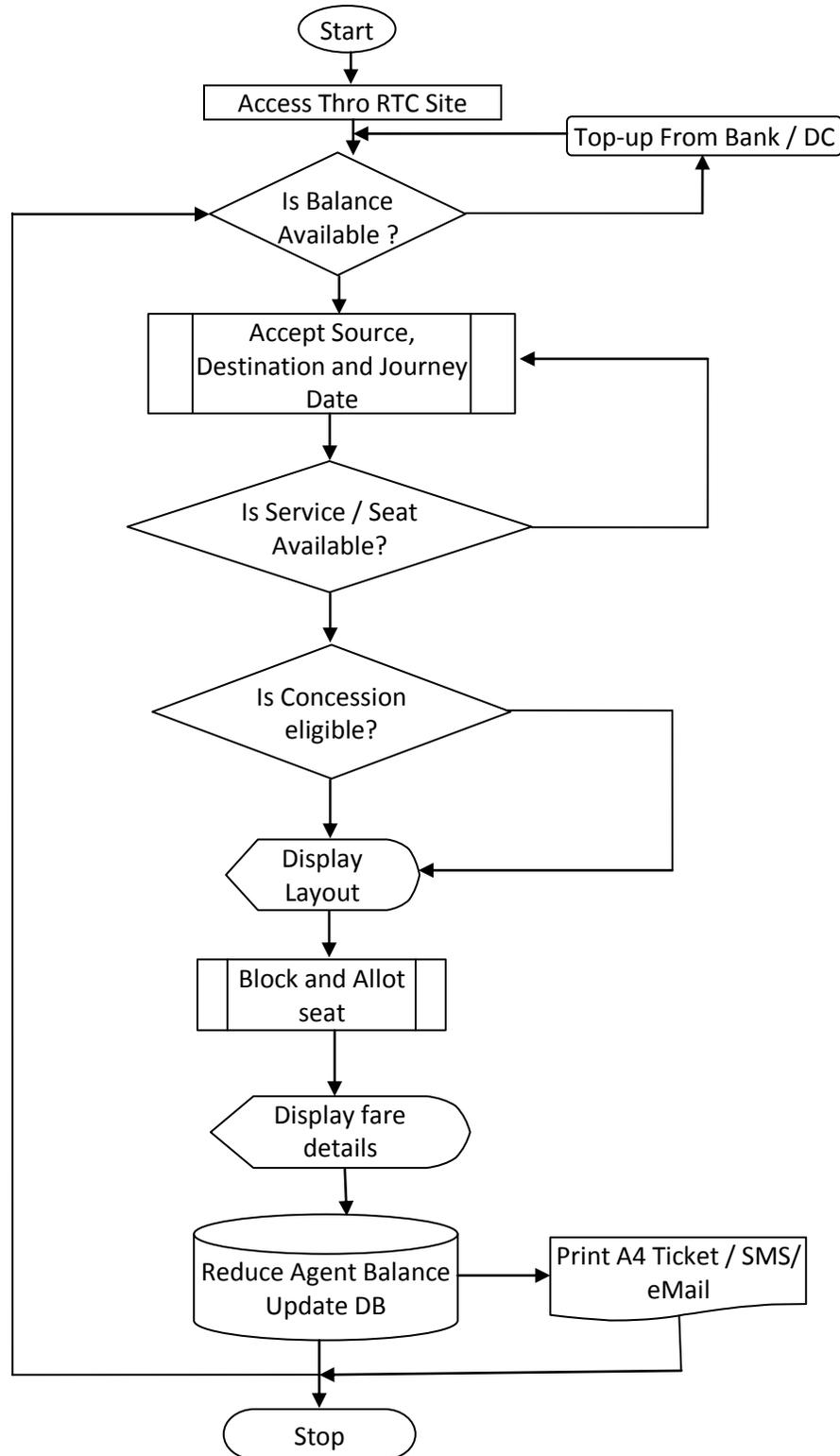
13. Flow Charts

The proposed Flow Charts for the main activity of Reservations, Cancellations and Pre/Postponement is given below as an indication of the requirements:

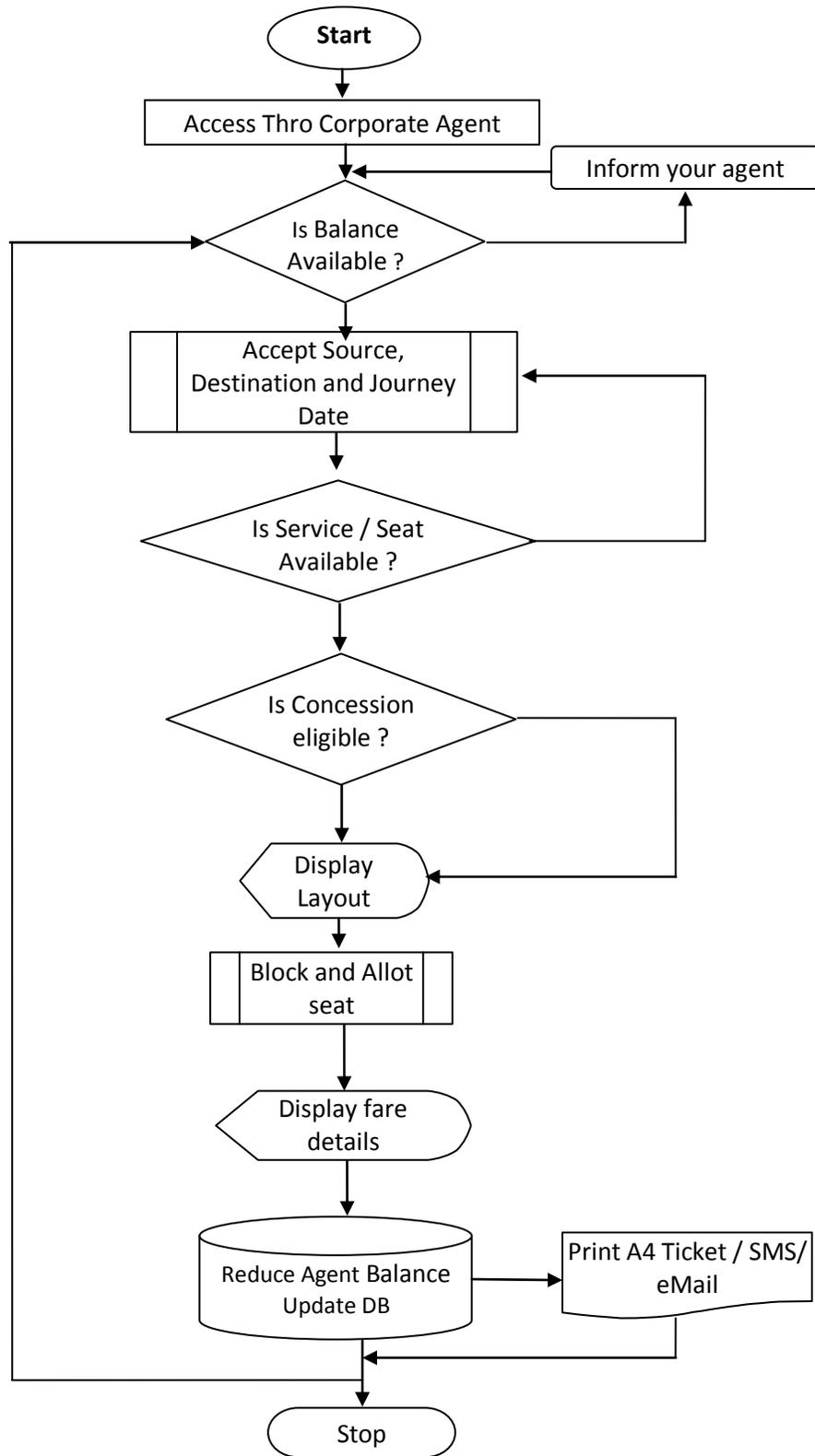
Passenger Ticket Booking Process Flow - RTC Counter



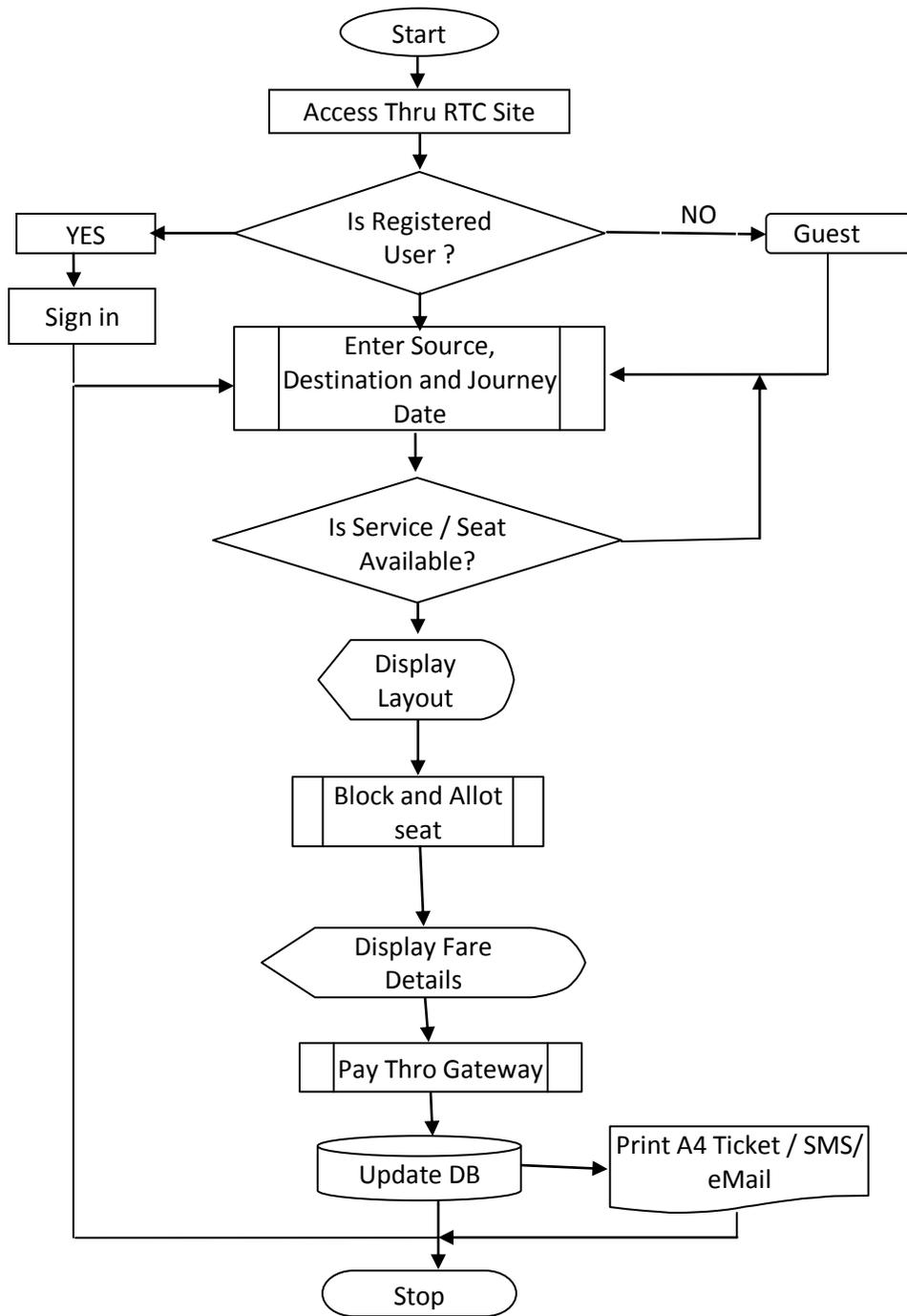
ATB Agent Ticket Booking Process Flow



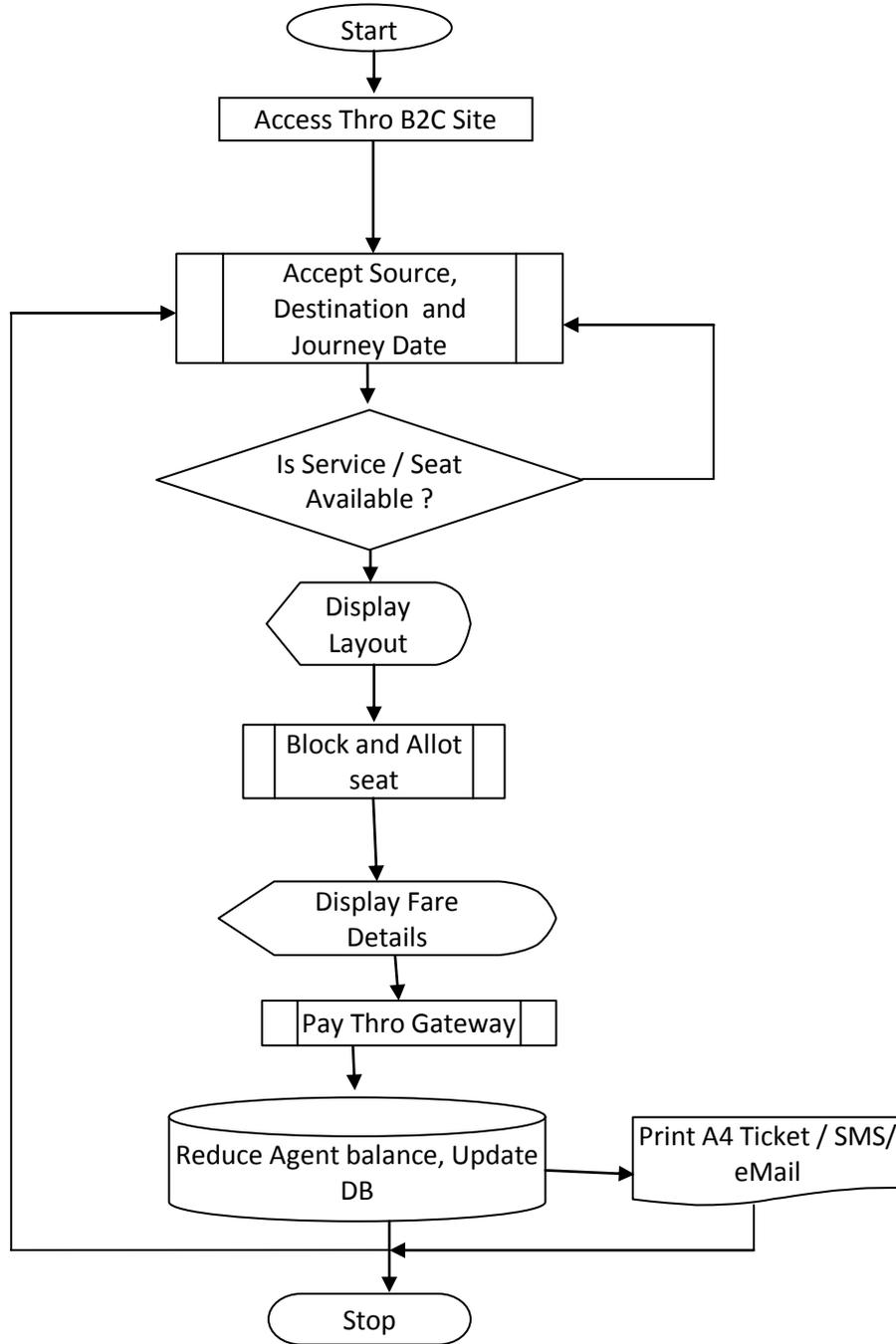
B2B Ticket Booking Process Flow



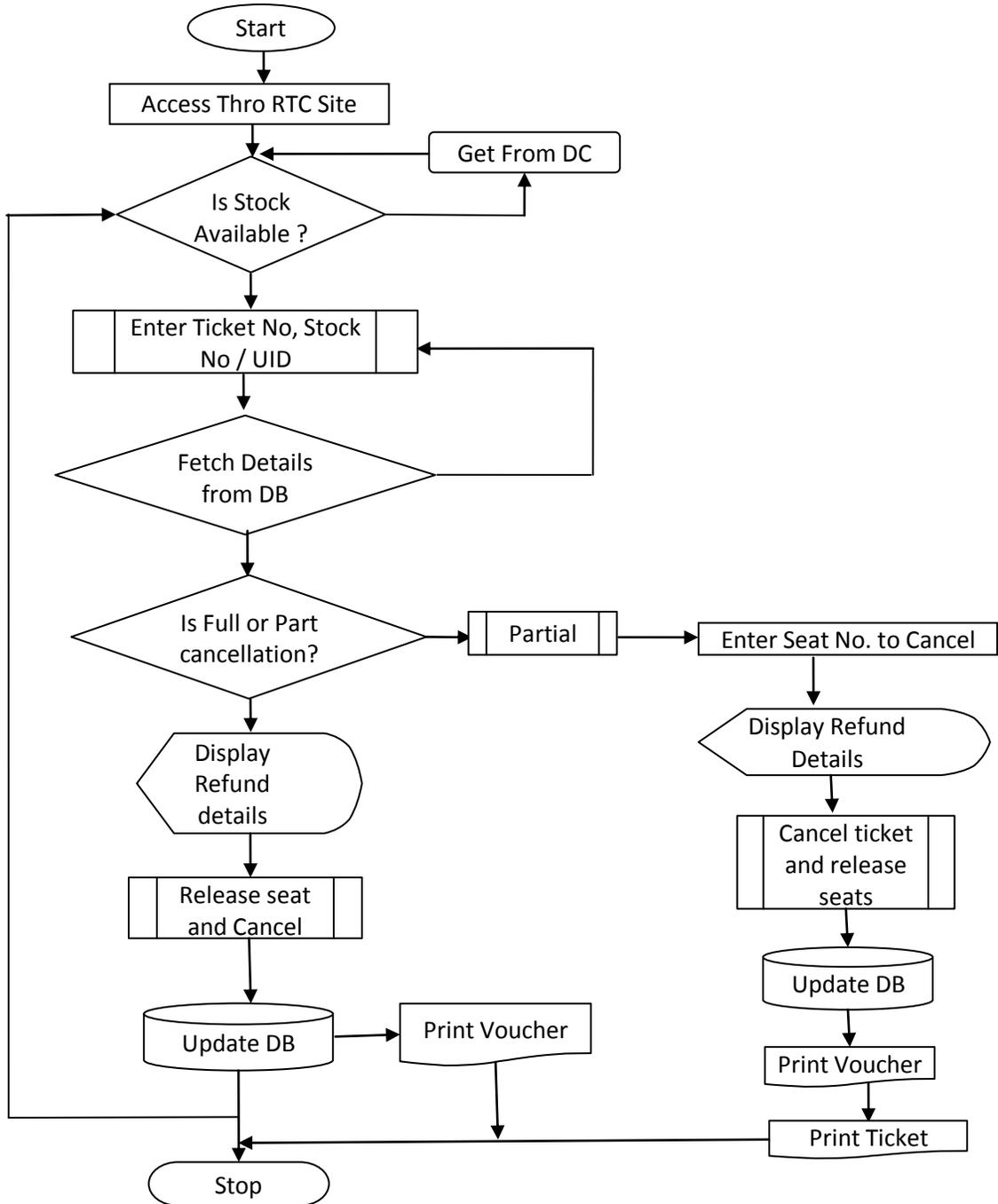
Passenger eTicket Booking Process Flow



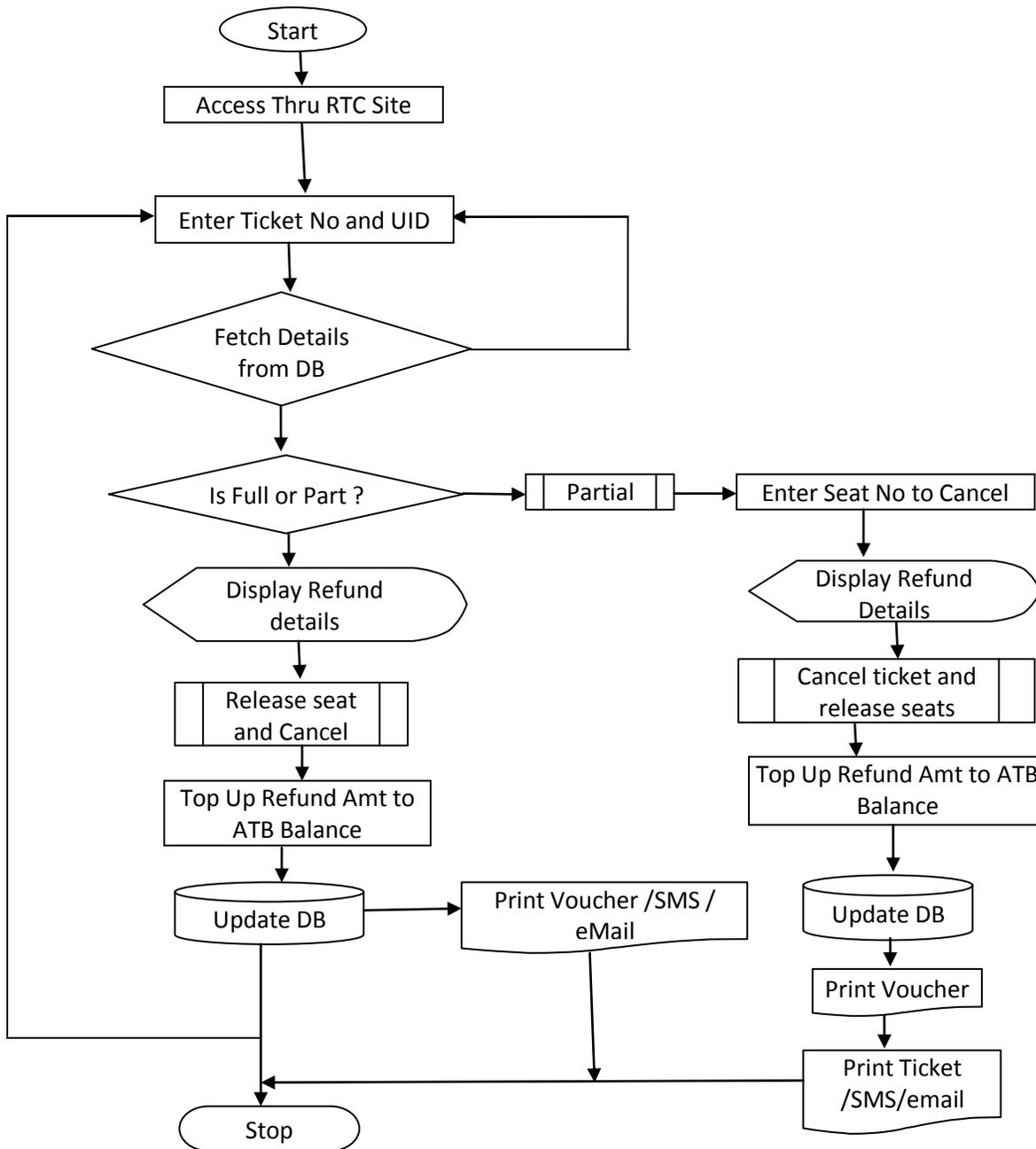
B2C eTicket Booking Process Flow



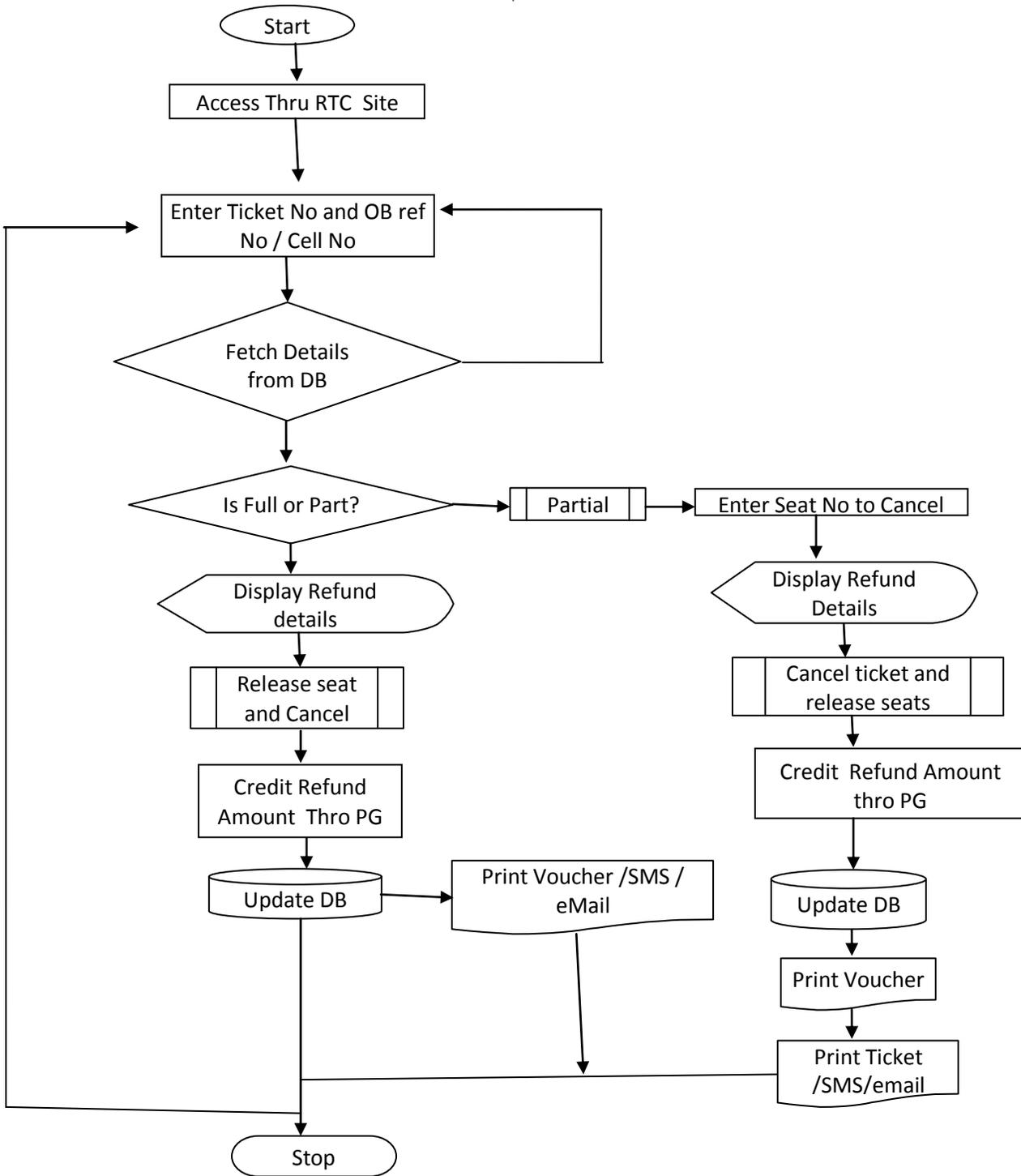
Stock Ticket Cancellation Flow RTC Counter



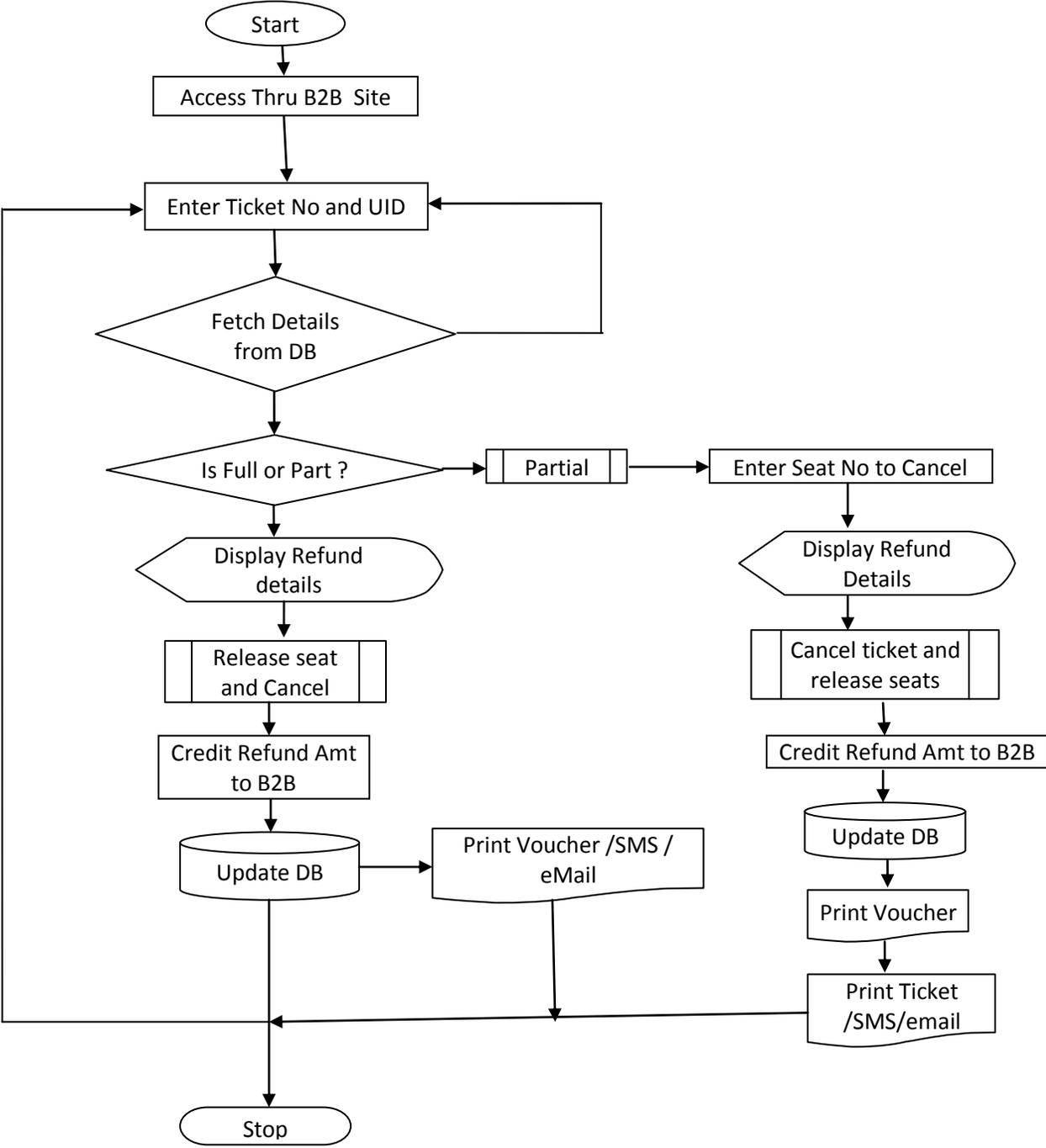
ATB Ticket Cancellation flow



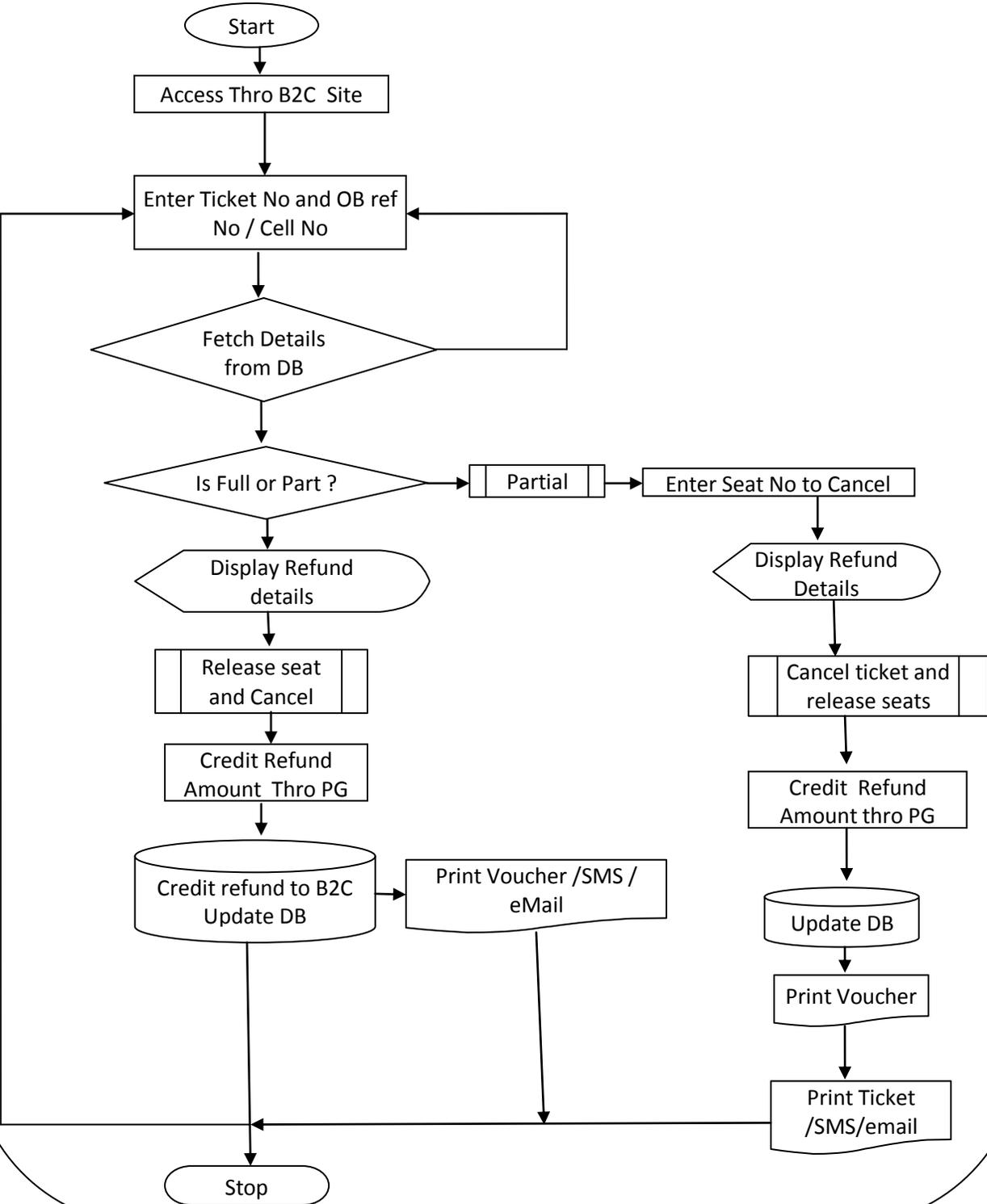
e-Ticket Cancellation flow



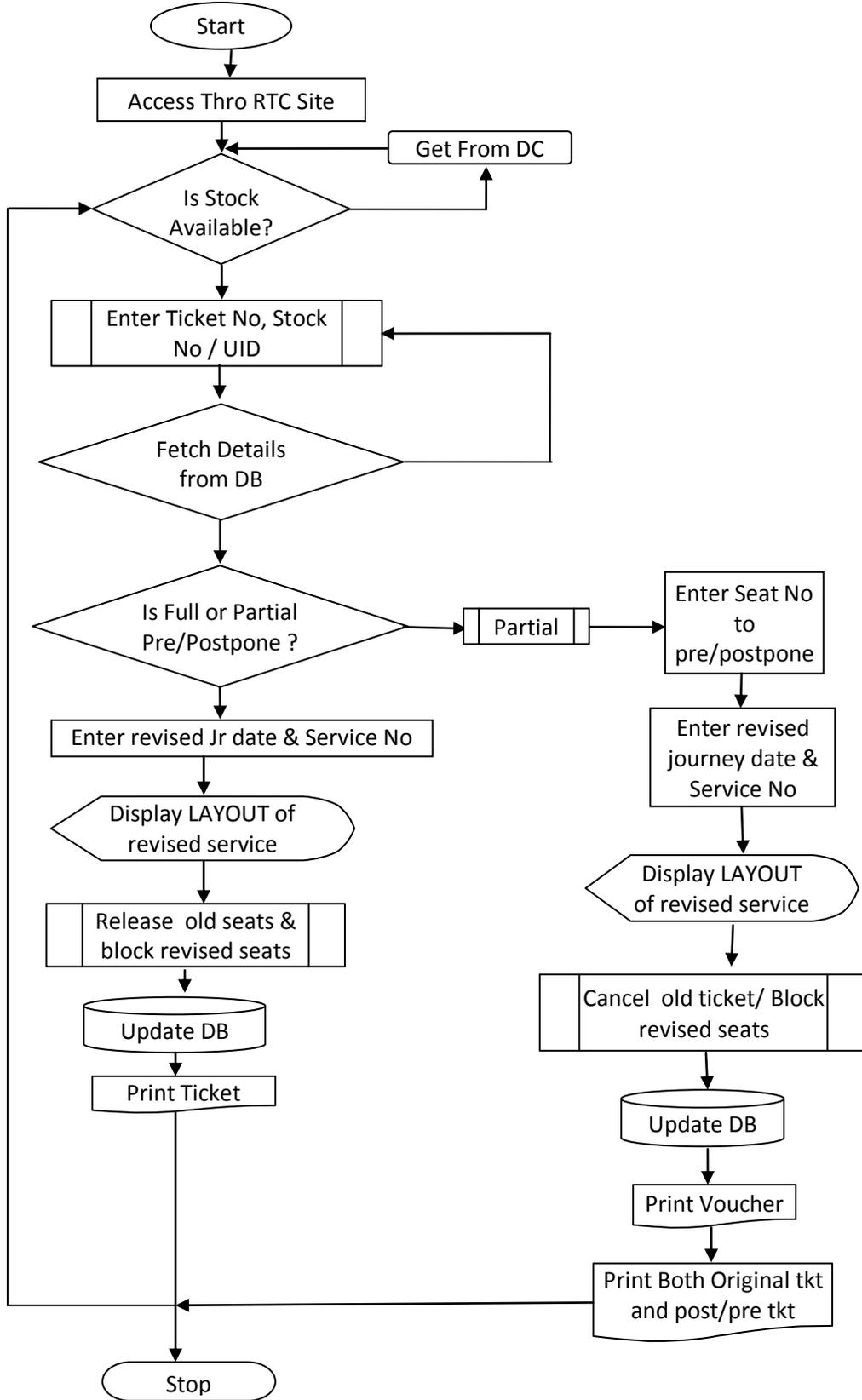
B2B Cancellation flow



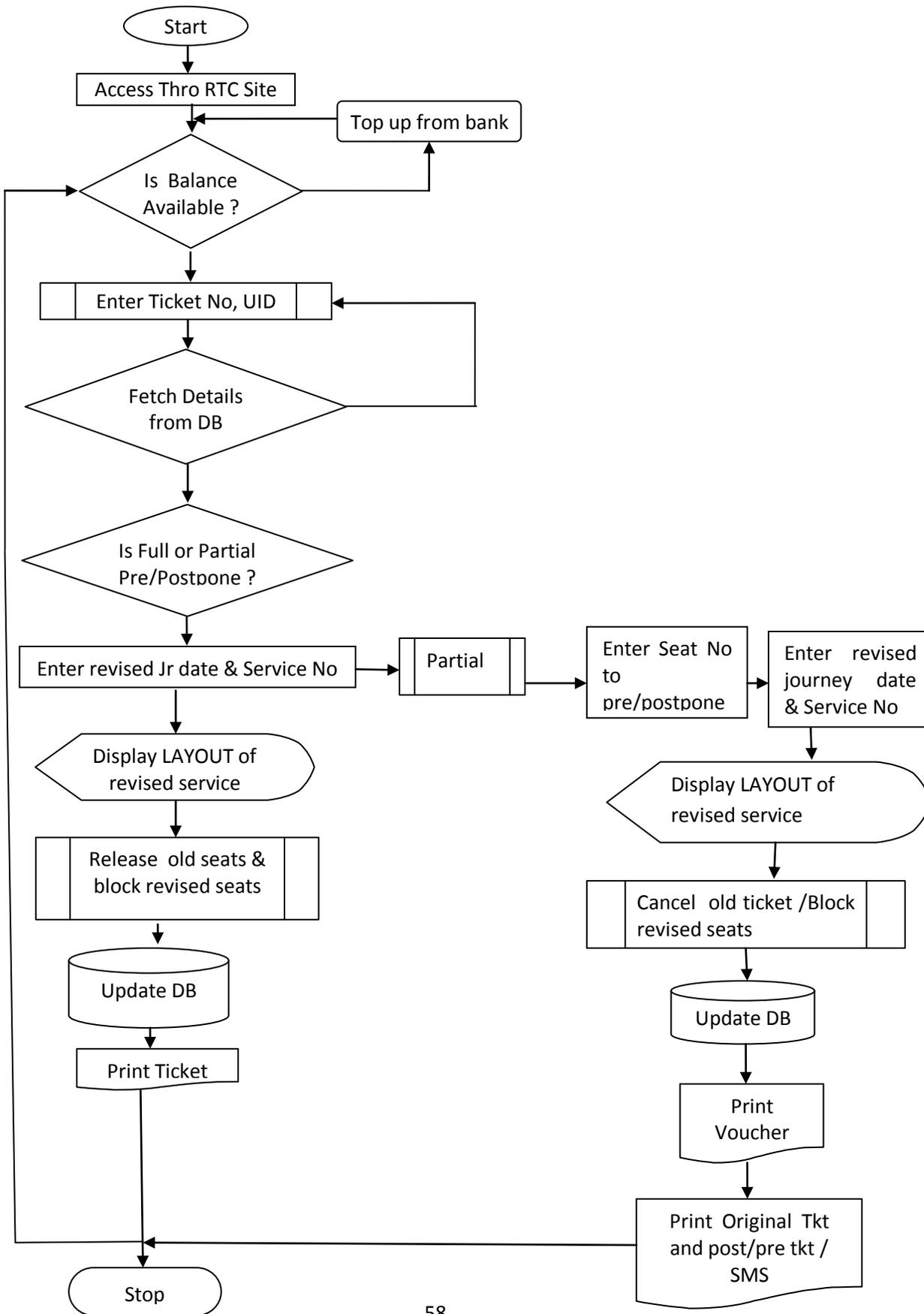
B2C Ticket Cancellation flow



Stock Ticket Pre-pone & Post-pone Flow RTC Counter



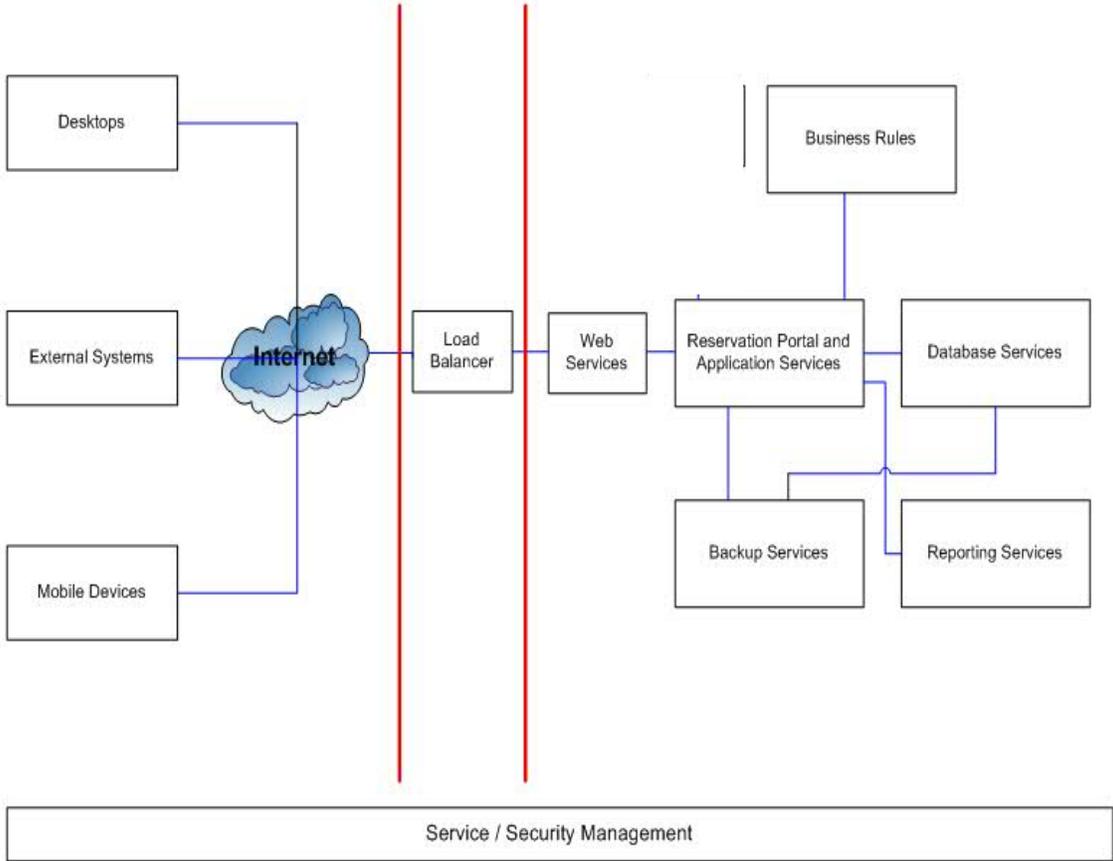
ATB Ticket Pre-pone & Postpone Flow



14. Software Product Specifications

The successful vendor shall provide necessary licensed software like Operating System, Database, Web application, Network software and management, Anti-virus and any other required software. The software and hardware licenses shall be valid up to end of the contract period.

Logical Architecture



N-tier: The Proposed application will be N-tier Service oriented Architecture - with separation of business logic from application, database and presentation.

Load Balancer: Load balancer application will be the first component which will intercept the user request and spray it to Web Server. This ensures the load is distributed evenly across Web Server.

Web Servers: This component provides the front end to the solution. It allows for greater concurrency and resource offloading from the Portal Server tier, by serving static content (HTML pages, for example) and dynamic content.

Application Services: Main functionality of this component is to host and run the Reservation application.

Portal Services: Its main function is to serve the Portal Server framework to the desktops and mobile devices of portal users. This component creates an environment that provides the connectivity, administration, and presentation services that are required. Portals serve as a simple, unified access point to web applications. Portals also provide valuable functions like security, search, collaboration, and workflow. A portal delivers integrated content and applications, plus a unified, collaborative workplace. A complete portal solution provides users with convenient access to everything needed to complete their tasks virtually anytime, anywhere.

Web Content Management: This component empowers TSRTC team by providing an environment that allows them to create, edit, and publish Web content. This enables TSRTC Team to have less dependence on technical resources and they can publish content in a more timely and efficient way by using the Web Content Management component.

Database Services: This component stores data in support of Reservation systems and it needs to be deployed in Active-Active mode.

Directory Services: This component stores user information in LDAP standard compliant directory server.

Business Rules: This component provides the capability to keep Business Rules outside of the core application and enables the Business users to manage Rules on their own.

Backup Services: This component protects TSRTC's data from hardware failures and other errors by storing backup and archive copies of data on offline storage. This will also play a key role in Disaster Recovery.

Reporting Services: This layer provides reporting, analysis, score carding, dash boarding, business event management, and data integration.

Service/Security Management: This layer provides services such as Identification, Authentication, Authorization, and Access control, System Management, Network Management and SLA Management.

System Environments

TSRTC requires the successful bidder to implement three system environments.

Test Environment:

This would allow the successful bidder to deliver initial development releases, subsequent system updates and to enable TSRTC to carry out system and integration testing. This would be a scaled down version of the eventual production Environment. Whilst the functionality would parallel that of the Production Environment, the system throughput capacity and resilience would be significantly less. The environment shall be available throughout the contract period and should be accessible to TSRTC.

Pre-Production Environment:

The second system proposal is for a Pre-Production Environment. This would provide TSRTC with functionally similar to Production environment. This is used for UAT and data loading. This would be a scaled down version of the eventual production Environment. This system should be used for initial load testing and UAT. Whilst the functionality would parallel that of the Production Environment, the system throughput capacity and resilience would be less.

Production Environment:

The Third system environment is for a Production Environment. This would provide TSRTC Online Passenger Reservation System functionally. This system throughput capacity would be significantly larger than the earlier environments and shall meet all the requirements of the system.

Specifications

The bidders must provide responses in written form, providing a descriptive or informational response in comments column. The specifications given are indicative. The bidders can suggest alternatives (with proper justification), which will meet the project requirements and SLAs.

Application Server

Application server is needed to provide secure, scalable, and resilient application infrastructure needed for Service Oriented Architectures (SOAs). Application server provides platform to deploy, integrate, and manage applications.

Application Server should Support the following:

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUSTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	Run Time Engine should support Session Initiation Protocol (SIP) Servlet.		
2	Container should include support for running JSR 168 or JSR 286 compliant portlets.		
3	Should support Multiple deployment options from single server to clustered, highly available, high-volume configurations, Workload Management. Has support for load balancing and failover capability		
4	Should have Web Services Support i. UDDI v3.x Support ii. HTTP 1.1 or better, Client Support iii. Extended SOAP Element support		
5	Should provide Web services gateway		
6	Should have support for Java Server Faces (JSF)		
7	SOA Building block: a. Build Web services with confidence of easy integration b. Extend Existing Java Assets as Web services c. Find and publish Web services securely d. Consistently deliver transactions, no matter how the transaction happens within the network		
8	Should have broad cross-platform support - MS-Windows, Linux, AIX, Solaris, HP-UX and UNIX		

9	Should provide High Availability Manager which enables highly available active server clusters by reducing the amount of time it takes to recover and service client requests. Should provide integrated Monitoring tools for performance etc.		
10	Should provide full XML support including Java API for XML-based RPC (JAX-RPC), XML Signature, and XML Encryption		
11	Should provide Enhanced authentication and authorization through single sign-on and support for LDAP		
12	Should provide Advanced authentication and authorization, such as JAAS and JCE for enhanced security.		

Portal

Portal provides TSRTC with a user interface and single point of access to Web based resources by aggregating those resources in one place and log in only the portal itself.

Sl. No.	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUSTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	Should adhere to Web 2.0 standards		
2	Should support JSR 168 standards or equivalent/better		
3	Should Support all leading browsers such as Internet Explorer, Firefox, Google Chrome, Safari, Opera etc.		
4	Should support multiple interfaces based on delivery channels (Internal Portal, Extranet Portal, Internet Portal, Dashboards)		
5	Should support HTTP and HTTPS protocol & LDAP directory server		

6	Should provide protocol switching support (HTTP to HTTPS)		
7	Should be able to integrate with interfaces from third party payment gateways.		
8	Should use open standards based on XML for managing application data		
9	Should support caching for performance. It should also store favorites, frequently typed fields, etc., in the cache.		
10	Should support Ajax and Ajax Security		
11	Should be able to personalize contents based on roles, access rights and service		
12	Should support dynamic generation of contents as provided by Web Content Manager		
13	Should provide integration between the personalization engine and the search engine		
14	Should support dynamic generation of Forms and interactive forms for data entry and modification. Should support W3C standard e-Forms.		

Database

Database management software with in memory database solution is the core of Reservation system. Business Intelligence solution provides TSRTC with complete, multipurpose environment that allows access, analyze and act on real-time information, operational and transactional, real time and historical.

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUSTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	Database must provide the solution of storing data types, like ASCII, Hexadecimal, Binary, etc.		

2	It must have ability to define & store Large Objects in tables and retrieve them with the flexibility to place Large Objects separately from the Rest of the Data in Tables and queried using simple SQL functions.		
3	Database should have a cost-based and rule-based optimizer as well as query Optimizer to provide most optimum access path.		
4	Lock Wait/Timeout: Facility for Lock to be released after a certain amount of time and Locked row available for use by others.		
5	Unicode support for Database.		
6	Database must support Schemas, Role Based Privileges & Authentication		
7	Database must provide various Security features like Encryption on Wire, data level encryption and Auditing controls.		
8	Database must have support for JDBC & ODBC.		
9	Database should support creation of an index on the column of the table which stores XML in its native format.		
10	Should support Active-Active clustering		
11	Support for database replication between primary cluster server and stand-by DR server. Vendors to provide the technical details to achieve the data replication.		
12	Support for Backup and Recovery. Vendors to provide the Backup and Recovery features to ensure the database recovery from the point of failure.		
13	XML support should be provided and it should support XML storage in native format.		
14	Support for high compression by the database. Vendors to provide the details for the compression support.		
15	Support for Spatial database management. Vendors to provide various features available for spatial database management.		
16	In memory database solution to achieve high performance.		

Backup & Recovery Management

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUSTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	Should be available on various OS platforms such as Server versions of MS-Windows, Linux and UNIX platforms and be capable of supporting backup / restores from various platforms including Windows, Unix and Linux. Both Server and Client software should be capable of running on all these platforms.		
2	Ability to backup data from one platform and restore it to another (limited to genera of operating systems (Unix to Unix, Windows to Windows) (Open Tape format) to eliminate dependence on a particular OS machine and for disaster recovery purposes.		
3	Software should support cross platform Device & Media sharing in SAN environment.		
4	Software should have true Disk Staging, wherein the backup continues to take place even when the disk space allocated is full. The backup software must be intelligent enough to flush out the data from the disk and migrate the same to the tape automatically		
5	The Backup software must have an integrated RDBMS as the catalog and must not use Flat file system to store the backup data. This database must also be capable of being mirrored and also allow for two-phase commit		
6	The software must have the capability of monitoring and controlling the tape sent offsite, or data sent across by WAN through Electronic Vaulting.		

7	The Backup software must ensure rapid restoration during a recovery need, by reducing the number of tapes to be mounted onto the drives in the library by not taking repeated full backups.		
8	The Software must also provide for creating a Disaster Recovery Plan or DRP in case of the Backup server and all other servers in the backup network being destroyed in a possible disaster. This should be a scheduled and Automated activity on the backup server.		
9	The backup software must support SAN based LAN-FREE Backup. The migration from a LAN based backup to the LAN-FREE backup must only effect purchasing/installing additional modules, and not warrant any installation/licensing charges/changes on the base backup software.		
10	The backup software must allow network-efficient backup of remote users' data on WAN		
11	The backup software must include encryption of the backed up data or archived data.		
12	The Backup software must not have any restrictions on the number of drives that can be attached in the tape library. There should be no additional licensing if the number of tape drives is increased in order to reduce the backup window.		
13	Should have firewall support.		
14	Ability to perform "Hot-Online" backup for different type of Databases		
15	Software should have an inbuilt feature for Tape to tape copy feature (cloning, within the tape library) to make multiple copies of the tapes without affecting the clients for sending tapes offsite as part of disaster recovery strategy.		
16	Should support different levels of User access, Administrator, User, Operator, so that only the authorized personnel can make changes or view the status based on		

	the rights they have.		
17	Should have the ability to retroactively update changes to data management policies that will then be applied to the data that is already being backed up or archived.		
18	Should provide details logs on both the Clients as well as the Server to support in advanced troubleshooting without any performance implications.		

Reporting Software Specifications

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
	General		
1	Application shall be web-based accessible through browser.		
2	Should seamlessly integrate with leading RDBMS such as Oracle, DB2 etc.		
3	Facility to record and maintain audit-Trail of each activity including login, query etc.		
	Ad Hoc Analysis		
	Facility to perform following kinds of analysis on data		
4	Trends across dimensions over time evident in the fact records, drill-down across hierarchy of levels within a target dimensions, drill-across dimensions for selected records, slice and dice of data sets, sorting and filtering.		
5	Facility for different levels of nesting to integrate several rows and columns of data eg. build analysis by geography and allow to nest analysis by entity and time within a geography.		

6	Should allow derived or calculated data like ratios that is not available in the data source for the purpose of comparison or analysis.		
7	Ranking: Arithmetic (sum, difference, roundup or down etc.), Percentage(% difference, % total, etc.), Analytic (max, min, average, etc.), Statistical (standard deviation, percentile, quartile, etc.)		
8	Should allow creation of logical grouping of data based on user defined criteria. eg. pattern matches, value thresholds.		
9	Facility to define rules and set thresholds-based alerts for the same on the data used for query and analysis.		
10	Business rules shall be defined in simple business terms with logical conditions like IF, ELSE, AND, OR etc.		
	Ad Hoc Querying		
11	Facility to create ad hoc queries through use of simple business terms for querying the data sources.		
12	Facility to save the queries and edit the same in future to derive new queries.		
13	Ability to create templates		
14	Availability of ready to use templates and layouts for report.		
15	Facility to save and export the generated reports in file formats like RTF, HTML, PDF, Excel and CSV etc.		
16	Provide Wizard-driven query capabilities		
	Performance Management and Dash boarding		
17	Facility to add, update, track and delete metrics and score cards based on the user privileges		
18	Facility to generate reports of MIS, Dashboards in file formats like HTML, PDF, Excel, CSV etc.		
19	Facility to generate reports images of visual display of metrics in the form of dials, graphs, etc.		

	Microsoft Office Integration		
20	Application must provide an ability to embed up-to-minute application data in MS office documents while preserving security policy to access data.		

Business Rules Management Software

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUTOZIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	Should support open standards like - Oracle JVM, IBM JVM, JDK versions, J2EE, .Net etc.		
	Rules definition		
2	Ability to define rules based on - Logical conditions, Mathematical computations, Combination of conditions like AND / OR, Combination of above		
3	Ability to trigger business rules based on following : Event Based, Condition based, Ability to support integer, boolean, and floating point constrained variables		
4	Ease of use : The application should provide user-friendly interface and rule editing functionalities		
5	Controls : The application should have the ability to manage collaboration with role based permissions and administrative role-based access control		
6	The application should have the ability to trace and audit implemented rules and view complete history of all rule changes and deployments		

7	The application should have a simulation environment for testing the rules defined in the rules engine using :		
	- Simulation scenario building		
	- Unit and regression testing of the rules engine		
8	Ability to manage rules from a single interface and repository including single platform for modeling, coding, debugging and deploying		
9	Ability to define nested rules with multiple rules within a rule		
10	Ease of Use: Ability to write rules in a rule language that is aligned to the natural business language		
11	The application should provide inbuilt assistance for rule creation e.g. templates, point and click editor		
12	The application should provide syntactical error checking facilities for defined rules		
13	The application should provide rules consistency validation tools (e.g. checks for logical errors, infinite loops)		
14	The application should have the ability to diagnose rules overlapping and subsuming the business rules		
15	Ability to predict impact of changes by testing rules against simulated business conditions.		
16	Ability to define a parent-child role generation.		
17	The application should provide a flexible mechanism to define and control the life-cycle of the business rules from creation through validation and deployment.		
18	Ability to configure the rule life cycle management by defining		

	role capabilities and permission associated with each rule.		
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Enterprise System Management Specifications

The bidder will be responsible for providing Enterprise Wide System Management. The Enterprise Management System should be capable of managing a heterogeneous mix of Network components and servers through a Windows type GUI with simple user interaction.

EMS Specifications

S.NO	REQUIREMENT	COMPLIANCE (Y/N/ SUPPORTED THROUGH CUSTOMIZATION)	COMMENTS (INCLUDING ELABORATION OF EFFORTS OF CUSTOMISATION EFFORTS IF ANY)
1	<p>Should dynamically and automatically discover and correlate event, topology and metrics data.</p> <p>Provide single, consistent, and holistic view of the entire IT ecosystem covering virtualization technologies, cloud infrastructure, third-party products, applications, servers, storage, networks etc.</p> <p>Identify trends and pinpoint issues by using easy-to-create charts with replay, which correlates disparate data over any time period visually with ease.</p> <p>Automated log analytics feature to automatically distill millions of logs to the relevant logs.</p> <p>Predictive analytics to provide behavior trends from metrics and log data, leveraging historical trends and seasonality to predict future performance and identifying problems before users are impacted.</p>		

2	The System must have layered architecture with all aspects of Management being provided by a series of layers built on top of the base layer.		
3	It should be possible to gradually build the Management System in a layered fashion without causing any disruption to the facilities being provided by the previous layers. It should have a modular approach but still in an integrated fashion. The integration between the modules should be seamless.		
4	Based on the applications that are then proposed to be deployed, it should be possible to add layers on top of the base layer providing the desired System Management functionality.		
5	All the System Management (except Network Management) should preferably be based on TCP/IP stack and should be event driven and not based on Polling.		
6	The System should be able to perform all its functionality by making an optional utilization of bandwidth (being event driven as far as possible and not Polling) since it is expected that the Enterprise Management System functions will be performed by the System in the background with the bulk of the bandwidth being made available for traffic on the Network.		
7	Security aspects should be able to build into the system. It should provide delegated System Administration functions.		

8	The System should be capable of reporting / logging the network events and alarms as on a real time basis.		
9	Should provide Enhanced authorization and authorization through single sign-on and support for LDAP.		
10	It should have a web based health console to view both near real time and historical data for the system being monitored.		
11	Monitoring solution shall include a portal that can be accessed through a highly customizable desktop or browser client for viewing and monitoring the end-to-end enterprise.		
12	It must collect monitoring data about applications and resources of the system and subsystems from the monitoring agents and other sources, then pass the data on to the management server for data collection, filtering, correlation and root-cause analysis.		
	Unix Monitoring		
13	System identification and activity, CPU, System virtual memory, Disk use, Networks, Processes, File, Network File System and remote Procedure Call.		
	Database Monitoring		
14	The tool should provide monitoring of key parameters for the Database proposed such as: Buffer pools, Database, Locks and other details about lock resources Server key events, Tablespace, Database Usage, Database State and Errors.		

	Proposed EMS Should have		
15	Server Desk		
16	Problem Management.		
17	Incident Management.		
18	Desktop Management.		
19	Software Distribution.		
20	IT Asset Management.		
21	Patch Management.		
22	Network Monitoring.		
	SLA Management		
23	The SLA Monitoring function of the EMS is one of the most important requirements of this Project. Report from this will be used to measure the performance of vendor against SLA parameters given in RFP.		
24	Service level analysis should have the capability to report on effect of different outages and failures to the overall SLA parameters given in RFP.		
25	EMS should integrate with the application software component of portal software that measures performance of system against the following SLA parameters: Response times of Portal, Uptime of data center.		

Helpdesk

Solution should allow for a feature to quickly submit a Service Desk ticket by just entering a description or attaching a screenshot. Solution should intelligently populate other fields such as category or affected services by extracting and analyzing the content that you entered in the ticket.

Solution should allow Analytics on top of In-tool reporting results to provide more insight based on the unstructured data.

Disaster Recovery and Business continuity Solution

The goal of any disaster protection planning is to protect the most business-critical processes and minimize unplanned downtime of Reservation system.

For achieving Business Continuity with highest uptime, there is a need of setting up of Disaster Recovery Site, which will be the replica of all the components of the system.

Business continuity planning and disaster recovery planning under this project are vital activities.

Disaster recovery site

For uninterrupted operation of Reservation application, certain fallback mechanisms and Disaster Recovery site are to be developed. The establishment of such facilities enhances the operational efficiency of the department. The DR site for this project should be situated at Tier 3 plus facility located at a distance of more than 250 kms away from the DC and in a different seismic zone. DR Site needs to be configured as HOT SITE.

In case of a Disaster, the users should be able to connect to DR site and work as the production site immediately.

Business Continuity Planning (BCP)

Successful bidder in consultation with TSRTC management team should analyse all the processes and categorize them as critical and non-critical (non-urgent) functions/ activities. Accordingly, the Recovery Point Objective (RPO) and Recovery Time Objective (RTO) for both critical and non-critical components should be considered as mentioned below:

For the critical components: RPO for each activity of solution should be designed to recover the last saved data by user and RTO for each activity of the solution be designed to restore the function within minutes.

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**MINIMUM CONFIGURATIONS OF HARDWARE REQUIRED TO BE PROVIDED FOR
IMPLEMENTATION OF OPRS PROJECT
(ALL OTHER REQUIRED HARDWARE FOR IMPLEMENTATION OF THE PROJECT AS PER
THE RFP SHALL INVARIABLY BE PROVIDED)**

Application Servers & Web Servers:

2* E7-4850v4 (2.1GHz, 16-Core) Processors and scalable to 4 Processors, 128GB Memory scalable to 6TB, 3*600GB 6G 10K RPM HDD, Raid Controller with 4GB FBWC/BBWC, 1 Dual Port FC HBA, Redundant Power Supply, NIC - 4*1Gbps & 2*10Gbps, 5 years 24x7 onsite support and support should be provided by OEM directly during warranty period.

DB Servers & Other Servers

2*E7-4809v4(2.1GHz, 8-Core) Processors and scalable to 4 Processors, 128GB Memory scalable to 6TB, 3*600GB 6G 10K RPM HDD, Raid Controller with 4GB FBWC/BBWC, 1 Dual Port FC HBA, Redundant Power Supply, NIC - 4*1Gbps & 2*10Gbps, 5 years 24x7 onsite support and support should be provided by OEM directly during warranty period

SAN Storage :

Unified storage with 64GB Cache having single O/S for file, block and Object services. Should have atleast 12 Gbps end to end for front end ports to backend engines. Should be configured with 5TB Capacity with RAID 5 using SAS Drives scalability to at least 400TB Using 1800GB Drives. Should have active-active Controllers and 4 host ports @ 16Gbps, Quad 10Gbps IP ports or 8X 1Gbps ports for file servicing. Should have QOS. Thin Reclaim should be automatic. Should support online firmware. 5 years 24x7 onsite support and support should be provided by OEM directly during warranty period

SAN Switch:

02 nos. each switch should have at least 12 ports scalable to 24 ports @ 16 Gbps. Non cascading scalability of switches required. Should deliver 8Gbit /Sec non blocking with 1:1 performance upto 24 ports. Should support autosensing of 4,8,16 Gbps /sec. 5 years 24x7 onsite support and support should be provided by OEM directly during warranty period

Required Storage with redundant controllers and storage should be provided.

The above specifications are only indicative and the vendor has to provide all the necessary hardware & infrastructure to meet the SLAs.