

## Next Generation E-ticketing System

Abdul Mateen Ansari<sup>1</sup>

Department of Information System  
King Khalid University  
Kingdom Of Saudi Arabia

Aftab Alam<sup>2</sup>

Department of Computer Science  
King Khalid University  
Kingdom Of Saudi Arabia

Mohammed Mujahid.Barga<sup>3</sup>

Department of Computer Science  
King Khalid University  
Kingdom Of Saudi Arabia

### Abstract—

*The Indian Railways' attempt to modernize its reservation systems. Since the railway has become the best modes of transportation available in the country for common people. It would be awkward to just increase the ticket fares to meet expenditure incurred due to maintenance, the huge workers and the expansion activities. The recent moves; Indian Railways have given some contracts to the IT companies to enhance their passenger reservation system, software- aided train scheduling and install Wi-Fi services in selected trains and e-ticketing via smart phones. The Railways have planned to inaugurate a new ticket reservation system that will sell 7200 tickets per minute while current system that can reserved 2000 tickets per minute and able to handle about 1.2 lakh concurrent connections on web servers simultaneously against 40,000. The railway is going to modernize itself to embrace cutting-edge technologies like cloud computing technology for better efficiency and minimize the cost. This cloud technology will be extensively employed in railway reservation. In this research we shall investigate an impact of cloud based railway reservation system on passengers as well as government. Here we explain Service Oriented Architecture (SOA) for cloud based e-ticketing railway reservation system, how IRCTC (Indian Railway Catering and Tourism Corporation) can make tatkal booking easier, features of proposed system architecture, benefits of the proposed system and issues and challenges.*

**Keywords—**Cloud Computing, IRCTC, tatkal, SOA, reservation systems, PRS

### I. INTRODUCTION

Indian Railways (IR), the largest rail network in Asia and the world's second largest under one management, spanning over 6000 stations, carries 17 million passengers every day. Only a million passengers travel with reserved seat tickets, and the remaining 16 million passengers travel each day without a confirmed seat. While reserved ticketing technology is enabled, unreserved ticketing was done primitively using printed cards [1]. By the end of this calendar year, IRCTC (Indian Railway catering and Tourism Corporation) is planning to put in place a Next Generation cloud based e-ticketing system which aims to bring about a phenomenal shift in internet rail ticketing by significantly improving the end user experience in terms of ease of use, flexibility, security, cost and convenience. The system will make use of advanced fraud control and security management tools thereby further improving fairness and transparency in disbursement of tickets [2]. Across the globe, there are adequate amounts of evidences of the revolutionary impact of technology aided solutions for railways. The IT legend IBM has already aided a strategic partnership with several global clients like Beijing-based china railway and Austrian Railways. IBM has assisted China Railway to migrating towards cloud computing technology based on its cloud infrastructure-as-a-service (IaaS) software. It has developed a high-performance solution to upgrade the hardware infrastructure of Austrian Railways to implement Virtualization technologies, while increasing hardware scalability. Some Indian IT service provider company like TCS has already engaged in large-scale partnerships with Indian railways. It has designed an ERP system for the IRCTC in the year 2006-2007. Indian technology service providers have rapidly scaled up exposed to global rail projects, combining domain and technology proficiency in the expanding area of railway automation, control, protection, and performance management to help rail customers realize more capacity from their networks and make rail travel safer, faster, and more reliable. Cognizant has a global relationship with Invensys Rail to serve the global product R&D needs of its group companies located in the UK, Australia, Spain, and the USA [2]. The Indian Railway minister delivered the speech at the parliament during the Railway budget 2013 has promised a 'paradigm change' for the IRCTC website. He acknowledged the fact that booking tickets through IRCTC website is like a Hard nut to crack. Railway minister admits that there is a need to improve e-ticketing and promised for a better and faster IRCTC website. The remainder of this paper is organized as follows: Section 2 present brief introduction about cloud computing, Section 3 present E-Ticketing Through cloud, Section 4 present Proposed Service Oriented Architecture for cloud based e-ticketing after which section 5 presents issues and challenges, section 6 presents benefits of the proposed system, section 7 conclusion.

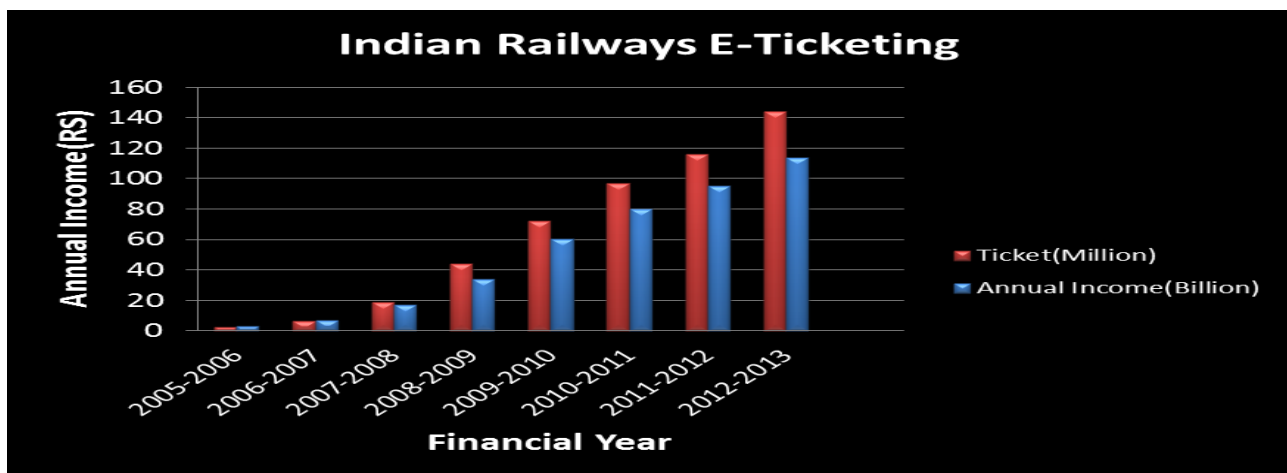


FIGURE1.IRCTC E-TICKETING INCOME: FINANCIAL YEAR 2005-2013

## II. CLOUD COMPUTING

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [3]. The essential characteristics of cloud computing are On-demand self-service, Broad network access, Resource pooling, Rapid elasticity and Measured Service.

### 1. Service Models

#### A. Software as a Service (SaaS)

Software as a Service (SaaS) is a cloud service model in which applications are hosted by a service provider and made available to subscribers over internet.



FIGURE2. SOFTWARE-AS-A-SERVICE

SaaS allows you to rent access to – and use of – the software...

#### B. Infrastructure as a Service (IaaS)

IaaS model of cloud offerings have been the most successful in recent past. It changes the way developers deploy their applications. Instead of spending time with their own data centers or managed hosting companies, they can just select one of the IaaS provider, get a virtual server running in few minutes and pay only for the resources they use[4].



FIGURE3. INFRASTRUCTURE-AS-A-SERVICE

*IaaS is... ideal for business users and IT departments who need to manage software without needing to worry about hardware.*

#### C. Platform as a Service (PaaS)

PaaS provides higher-level abstractions for cloud applications, which simplifies the application development process and removes the need to manage the underlying software and hardware infrastructure. PaaS offers automatic scalability, load balancing and failure tolerance[5].



FIGURE4.PLATFORM-AS-A-SERVICE

*PaaS includes a fully maintained operating system...*

#### 2. Deployment Models:

##### A. Private cloud

The cloud infrastructure is exclusively worked for an organization. It is managed by the third party or Organization and may exist on off premises or in premises.

##### B. Public cloud

Cloud service Provider Company develops applications and storage for common people over the internet.it may be free or accessible on a pay-as-you-go model.

##### C. Community cloud

The cloud infrastructure is mutually accessed by many organizations that have the specific concerns like policy, security requirement, compliance considerations and mission.

D. Hybrid cloud

This infrastructure is an incorporation of at least two or more than two clouds (private, public or community) that becomes unique entities. It is accessible in two ways: public cloud providers form a partnership with service provider that deals private cloud platforms or service providers has a private cloud and formulate a partnership with a public cloud provider.

### III. E-TICKETING THROUGH CLOUD

Booking a ticket using the Indian Railways' website is nothing short of a traumatic experience for users who wish to travel by train, but this problem is set to go away if the Railway Minister has his way. During his speech at the Railway Budget presentation in the Parliament, Indian Railway Minister Pawan Kumar Bansal has promised a 'paradigm change' for the IRCTC website. Acknowledging the fact that booking tickets using the IRCTC website is a troublesome experience, Bansal said there is a need to improve e-ticketing services on the Indian Railways Catering and Tourism Company website. Bansal revealed that as Minister for Railways, he had heard about complaints regarding the site's sluggish behavior and the trouble users go through to book tickets on the site. "By this calendar year we will put in place a e-ticketing system to bring about a paradigm change," he said, promising a better and faster IRCTC website. These are lofty aims, but we've kept our fingers crossed that the Ministry will deliver on its promise.

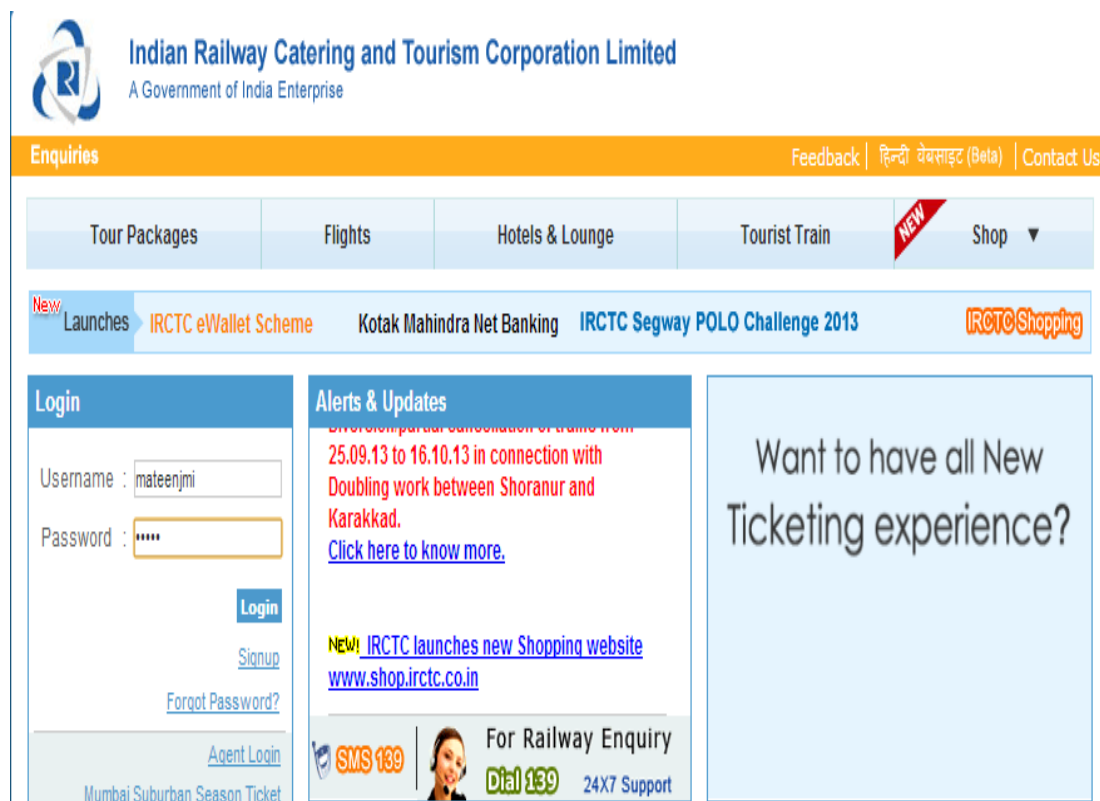


FIGURE5. IRCTC LOGIN PAGE

Mr.Bansal also said that the Railways will try to ensure that the transactions on the website are safe and secure, and aims to make the new system free of fraudulent methods to improve ticket sales. The new system is not just for consumers who wish to book tickets, said Mr.Bansal; it also serves as a platform for pensions and other financial transactions for employees. One out of five online users in India visits the Indian Railways site, which has almost 12 million monthly unique visitors, and the majority of the traffic is seen between 10 am to 12 pm. It is during this time that IRCTC allows you to book Tatkal tickets, which are tickets reserved for people with last-minute travel plans, travel emergencies and so on. But that's exactly where IRCTC has always fallen short[6].

### IV. PROPOSED SERVICE ORIENTED ARCHITECTURE (SOA) FOR CLOUD BASED E-TICKETING

CRIS (Centre for Railway Information Systems) will develop and maintain an enhanced website for passenger reservation system (PRS) that facilitate browser based interface to customer for booking of tickets over the internet through online payment rendered via the IRCTC portal. The motive behind IRCTC revamping is to adopt better technology to enhance the existing features of the IRCTC portal, cater to users increasing demand to reserve tickets during peak and non-peak hours. Whatever the current functionality is available in the current portal [www.irctc.co.in](http://www.irctc.co.in) for e-ticketing will remain incorporated with enhanced portal.



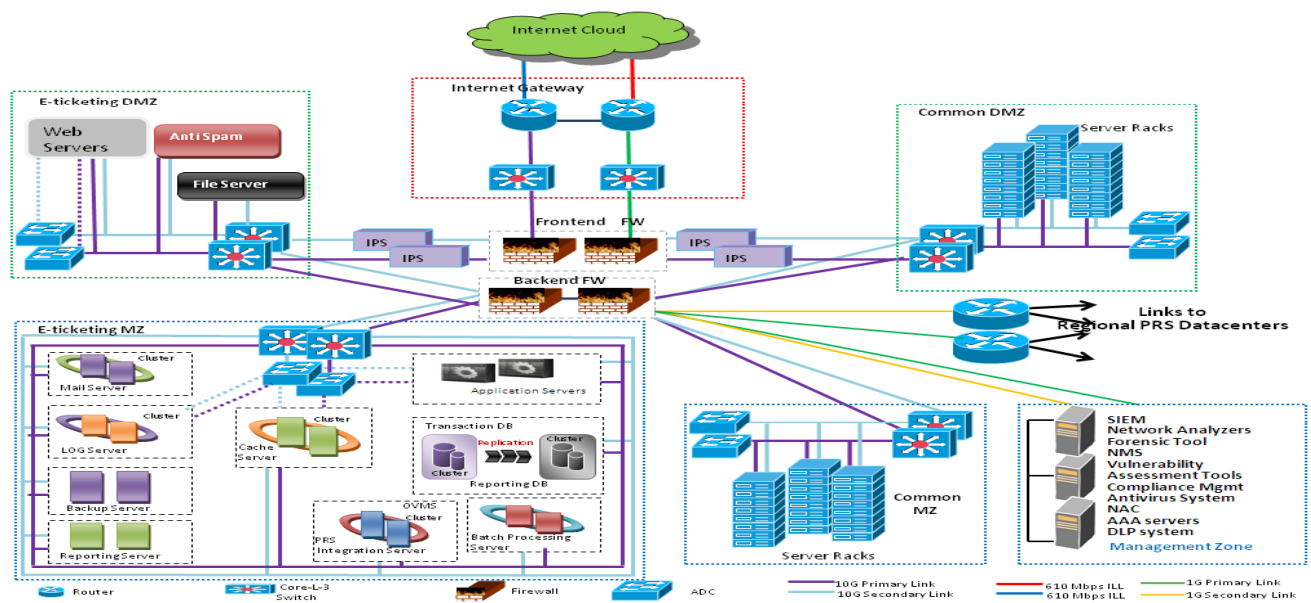


FIGURE6. SERVICE ORIENTED ARCHITECTURE FOR CLOUD BASED E-TICKETING [7]

#### A. Deployment Architecture

Servers will be installed in multiple zones with DB servers, Web servers in the DMZ (de-Militarized Zone) and other servers such as Reporting server, Management Servers Mail servers, SMS servers, etc., deployed in different zones in the DC (Data Centers). This assures that infrastructure that is not required to be publicly accessible and will secure and protected. Hardware load balancer (ADC's (Application Delivery Controllers)) will be deployed for balancing concurrent sessions between multiple web and application servers. The same technique will be used for the other services mail and SMS gateway. The web servers will be designed in no clustered mode and will be capable to scale horizontally. The application server shall be configured in standalone mode with no clustering among the several instances. This layer is competent to scale up vertically as well as horizontally. The management and monitoring module will be responsible to provide a single dashboard for managing and monitoring all the instances of the application server. RTR (Reliable Transaction Router) will be used to communicate with PRS interface and will be installed on every application server box and the licenses will be given by CRIS.

Centralized cache server shall be responsible for store static as well as dynamic nature data. The Cache layer will be used for faster access of information. It will be made in a way that the part of or full contents of a specific cache object can exist in at the application server. If the required information is not present in the local cache of the application server then only the same will be retrieved from the central cache. The E-Ticketing application's database will be installed to accomplish high availability with reliable performance and replication.

Database divided into two types:

- (1) Transaction Database: It will be responsible to perform real time transaction on the database.
- (2) Reporting Database: It will be used for inquiries and reporting purposes.

Both databases would be deployed in the cluster configuration individually and a replication process would be assembled between the reporting databases to the transaction databases.

In an incident of failure of transaction database, the applications will be failed over to the reporting database. When the transaction database resumes again, then the system will be capable to start reversing replication and can fail back to the transaction database for reporting database. The mail server shall be installed in Militarized Zone (MZ) and anti-spam would install in de-Militarized Zone (DMZ). For each and every application server instance, a message oriented middleware (MOM) based separate local queue for mail and SMS will be configured.

The batch processing server shall be responsible for asynchronous communication with internal and external interfaces such as pulling of files from PRS system and from the bank for reconciliation purpose. The operating system cluster will be installed between Log servers, and it will process the request in an active-active configuration using a load balancer. Operating system features like SYSLOG will be configured to write the application logs onto the log files [7].

#### B. Features of proposed system architecture

- Highly scalable application and system architecture
- Established dedicated Zones for enhance e-ticketing for high performance and security
- Secure payment gateway interface with several banks.
- Non-blocking 10 Gigabit LAN Switching fabrics for prompt performance and result.

- Logging, Mail, SMS will be done in a-synchronous mode with the help of MOM.
- Easy to management and maintenance.
- Multilayered network security with IPS (Intrusion Prevention System), web Application Firewall, Front-end and Back-end Firewalls etc.
- Three-tier application architecture including Database, Web and Application server layer.
- The entire set of ICT (Internet Computing Technology) equipment shall be deployed in High Availability mode to preclude single point of failure.
- Multi-site deployment for load balancing and disaster recovery.

#### **V. ISSUES AND CHALLENGES**

*Problems (Bugs) in existing IRCTC e-ticketing portal:*

- There is no provision to check the availability of seats on home page. User is forced to login to check seat availability.
- User name instead of E-mail Address for Login. E-mail address is easy to remember.
- No provision to check PNR status/Search Train on home page. These are the most frequently used features but available on the website
- The interaction for plan my travel form is not applied to search result in real time. User need to press find trains every time he changes a parameter from the plan my travel form
- No seat Availability status. User need to click on trains randomly to check the availability of seats.
- For place which contains more than one station like Delhi there should be an option to sort the trains for selected stations. In this kind of scenario the user do not need to go back to the trains list and again need to check theater the trains is running from that particular station or not.
- It's difficult to find the starting point – especially for a novice user [8].
- You can get logged out without warning any time.
- Even if a user manages to reach the end of the process, more often than not the tickets would have been sold out. Worse, there are times when the money is deducted from the user's bank account or credit card but the ticket is not issued [9].
- 70 lakh users with multiple / fake IDs booted

#### **VI. BENEFITS OF THE PROPOSED SYSTEM**

- The website's ticket-processing capacity will see a 275 per cent jump up from the current 2,000 tickets a minute to 7,200 tickets and investment is also expected to raise IRCTC's daily revenue from the current Rs 54 lakh to Rs 90 lakh, an increase of 67 per cent.
- The changes in the new website include separate connection with the banks regarding the payments, hence making payment systems separate from the booking servers. This will enhance speed and performance, with less probability of the payments being stuck in the midst of a transaction [10].
- The system will advance the fraud and security detection and one can also begin again where you left off incomplete transaction lost due to connectivity problems.
- An enhanced web portal will hit the business of ticket agents.
- 10 GB fiber pipe for higher bandwidth.
- Different servers to handle different functions such as search.
- Scalable architecture allows more servers to be added on the fly to handle traffic.
- Contents delivery networks (CDN) allow faster delivery of content through servers in different parts of the globe.
- Different servers handle different parts of a transaction such as validation, search, booking and so on.
- Use of elastic cloud hosting platforms for adding /reducing resource on the fly.

#### **VII. CONCLUSION**

Indian railways are considered as an essence of the India for transportation of passengers as well as goods. It is the most inexpensive and trustworthy for travelling anywhere in the country. But due to the enhancement in the technology and huge burden on Railways required to straighten out their services and upgrade it and cloud computing is the best suited for it. The cloud based Passenger Reservation System (PRS) is a striking example of how cloud computing can be render to deliver transparency and convenience to users on a very large scale and is a rejuvenating e-governance across the country.

#### **REFERENCES**

- [1] <http://www.sybase.com/detail?id=1063530>
- [2] <http://blogs.nasscom.in/rail-budget-2013-what-does-it-mean-for-the-indian-it-industry/>

- [3] [http://predeveloper.att.com/home/learn/enablingtechnologies/The\\_NIST\\_Definition\\_of\\_Cloud\\_Computing.pdf](http://predeveloper.att.com/home/learn/enablingtechnologies/The_NIST_Definition_of_Cloud_Computing.pdf)
- [4] Subashini S., and Kavitha V., A survey on security issues in service delivery models of cloud computing. Journal of Network and Computer Applications, July 2010
- [5] Grance T., and Mell P., NIST definition of cloud computing, National Institute of Standards and Technology, January 2011
- [6] <http://tech2.in.com/news/web-services/rail-budget-2013-faster-irctc-website-free-wifi-promised/786192>
- [7] IRCTC\_e-ticketing\_tender\_ver4\_27Dec2012\_-\_CRIS\_final11
- [8] <http://www.slideshare.net/mishraavilash/design-assignment-recreation-of-irctc-booking-system-in-andriod-platform>
- [9] [http://articles.timesofindia.indiatimes.com/2013-08-04/india/41056575\\_1\\_eight-lakh-railway-tickets-the-irctc-indian-railway-catering](http://articles.timesofindia.indiatimes.com/2013-08-04/india/41056575_1_eight-lakh-railway-tickets-the-irctc-indian-railway-catering)
- [10] [http://www.business-standard.com/article/current-affairs/irctc-to-spend-rs-100-cr-to-revamp-ticketing-portal-113070200693\\_1.html](http://www.business-standard.com/article/current-affairs/irctc-to-spend-rs-100-cr-to-revamp-ticketing-portal-113070200693_1.html).