

## SUCCESS STORY

# Staff Selection Commission of India

## Reimagining SSC: Strategic Development and Implementation of Scalable Microservices Infrastructure

Company Name:  
**Staff Selection Commission**

Industry:  
**Recruitment**

Location:  
**India**

Impact  
**Scalable, Efficient and Transparent**

Application  
**SSC Web Portal and Mobile Application**

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## Staff Selection Commission of India

### A CASE STUDY

Reimagining SSC: Strategic Development and Implementation of Scalable Microservices Infrastructure

#### Background

The Staff Selection Commission (SSC) is a critical organization under the Government of India, established in 1975, tasked with recruiting staff for various posts in Ministries, Departments, and Subordinate Offices. The SSC website is integral to its operations, used for inviting online applications, providing examination information, declaring results, and handling candidate queries. However, the current IT system faced several significant challenges like frequent crashes due to heavy traffic and unorganised architecture. These issues hinder the SSC's ability to effectively manage its examination processes and ensure a smooth and secure candidate experience.



### Our Approach

#### Advanced Microservices Architecture and Iterative Development Solution for SSC

Our strategy involved building a cutting-edge microservices framework that delivered reliable performance and system stability. We began by conducting a complete examination of SSC's current infrastructure, using a detailed planning matrix to ensure accurate resource allocation. By working directly with SSC, we ensured seamless integration and resource availability, while also proactively preparing for future scalability. We used an iterative development technique to leverage each stage of the examination cycle to incrementally modify and optimize the solution, ensuring that it meets SSC's changing needs efficiently.

### Challenges Faced

#### • System Architecture

The existing system utilized a Dotnet framework and followed a monolithic architecture approach. This approach contributed to frequent crashes and delays in the SSC examination process. Any crash in any component results in the entire website, including admin related functionalities becoming non-functional.

#### • Capacity Constraints

The current system could handle 15,000 simultaneous sessions and 150,000 online applications per day. However, this capacity needs to be tripled to meet growing demands.

#### • Data Management

The infrastructure was disorganized, with repetitive information stored across all data servers, leading to heavy data loads. Despite having multiple databases and servers, the system struggled to balance the load effectively.

#### • Identification of Fraudulent Activities

Significant challenges in preventing candidates from registering and appearing for examinations more than once. This issue arose due to the system's inefficiency in detecting and eliminating duplicate registrations and unverified photographs. As a result, candidates were able to exploit these loopholes, leading to multiple fraudulent applications and impersonation during examinations.

#### • Confidentiality Concerns

Confidentiality concerns existed, in terms of how sensitive information was handled and communicated. All data and communication exchanges occurred via email, involving both SSC's Internal team and external vendors, including result processing and other examination-related activities, exposing SSC to several vulnerabilities due to reliance on email communication with third-party vendors.

### Solutions

- **Transition to Scalable Microservices-Based Architecture:** Transitioned to a microservices-based architecture. This involved converting the existing Dotnet code to Angular and PL/SQL code to Python for more efficient data processing. By creating centralized data masters on the servers and employing APIs for data access, we minimized data duplication and reduced server load, thereby preventing frequent crashes and improving system reliability.
- **New UI/UX Approach:** Implemented a fresh UI/UX approach tailored which included designing intuitive interfaces that simplify navigation, enhance usability, and prioritize accessibility features such as screen reader compatibility and Bilingual Website Development in both Hindi and English for language localization.
- **Role-Based Segmentation for Improved Stability:** Implemented a segmentation strategy based on five user roles: General Website, Candidates, Admin/Super Admin, Regional Officers, and External Vendors. This ensured that each component operated independently, improving load balancing and system stability.
- **Two-Factor Authentication:** Implemented role-based access for users, coupled with two-factor authentication login functionality, sending separate OTPs to both email and phone, ensuring a more secure verification process.
- **One-Time Registration (OTR) Module:** Enhanced the One-Time Registration (OTR) module, enabling candidates to register once and apply for multiple examinations without repeatedly entering their details.
- **Live Photograph Capture:** We developed a system flow requiring candidates to click a live photograph while filling out their application forms. This measure ensures that the photograph is current and reduces the risk of identification issues due to unstandardized images.
- **Mobile Application:** We developed and designed MySSC app, built in Kotlin for more enhanced accessibility with easy live photograph capture for candidates, achieving a 4.0-star rating on the Play Store.
- **Work Order Module:** Developed an in-built Work Order module for SSC to communicate requirements and track progress with internal team members and third-party vendors, streamlining the communication process, allowing SSC to manage tasks efficiently and securely without relying on unsecured email exchanges.
- **Court Case Modules:** Developed a Court Case Module specifically for SSC to easily add, view, and manage court cases by candidates, replacing the manual process done using Excel, thereby improving efficiency and accuracy.
- **Comprehensive DME/RME Module:** Developed and designed the DME/RME Module on the Commission's website, for the secure candidate's data upload of Medical Examination results and required documents by authorized medical personnel. We digitized the medical examination data, improving overall efficiency and reducing the risk of data discrepancies.
- **Faster Result Processing:** Revamped the result-processing system by implementing Python-based logic. Python's efficient data processing capabilities allowed us to reduce the result processing time dramatically. We decreased the processing time from a minimum of 2 days (48 hours) to nearly 2 hours representing a 95.83% decrease in processing time.
- **Dossier Tracking System Module:** We implemented a Dossier Tracking System Module allowing admins to access selected candidates dossier details and create and upload offer letter on selection by entering examination name, year, and other relevant information for the respective officer on the portal itself, safeguarding the selected candidate's details misuse and eliminating the need for manual creation of dossier.
- **Roll Number Generation and Venue Allocation:** We integrated to do venue allocation with defined criterions to py venue allocation for the candidates, by normalizing candidate's data based on category and then randomizing them. Then based on venue and center allocated, Roll Number generation was done for the candidate.

### Challenges Faced

#### • Result Processing

Result processing as initially it was done using PL/SQL. The process was time-consuming and prone to technical delays, which impacted the overall efficiency and accuracy of result generation. On average, it took a minimum of 2 days to process the results, causing delays in the examination cycle and candidate notifications.

- **Photo Comparison Module:** To combat impersonation, we developed a photo comparison module using advanced Python logic that compares the live photo captured during application submission with the photograph taken by a third-party vendor at the examination venue.
- **Debarred Candidates:** Developed "Debarred Candidates" module to manage and track candidates marked as impersonators, safeguarding the integrity and fairness of the examinations.
- **Data Exchange Module:** We created a Data Exchange module specifically for external vendors, enabling them to view and download necessary data securely, ensuring confidential examination materials and schedules are shared through a controlled and secure platform.
- **SSC Help Desk and Help Desk Manager Support:** Developed a comprehensive Help Desk Management System, including a module for help desk users and managers. Our dedicated team managed and provided support over call and emails to resolve candidate's issues and queries
- **Notification via Email/SMS Functionality:** We implemented a Notification via Email/SMS functionality for active candidate update related to examination related activities and support to resolve candidate's issues.
- **Portal Management for routine updates and management:** Responsible for development and updating portal management for routine updates of notices, vacancies, results, etc. on the portal for the candidates, ensuring that all information was up-to-date and accessible.

- **Streamlined Management of Physical Efficiency and Standard Tests:** We developed a dedicated PET/PST Module on the Commission's website. This module enables authorized personnel conducting these tests to access the system using secure usernames and passwords, ensuring data integrity.
- **Biometric Verification Module:** Initially manual, it now includes electronic thumb impression and photograph capture, adhering to ISO standards. It also compares biometric data from previous exam stages, ensuring accurate and efficient verification.
- **Document Verification Module:** This new module was built to preview and validated all the required documents uploaded by candidate w.r.t examination applied by the nodal or regional officer ensuring that candidates' documents are thoroughly reviewed and validated.
- **Integration with UMANG:** Enhanced accessibility by integrating the SSC Portal with the UMANG Platform of the Ministry of Electronics and Information Technology (MeitY). This integration brings various SSC Portal modules directly to users, ensuring easy access to essential services and information.
- **Integrated Payment Processing System:** Enhanced the current payment processing system for collection and reconciliation of application fees for SSC examinations. Implemented features to handle multiple payment gateways, automated fee verification, and real-time status updates for candidates.
- **Vacancy Collection:** Developed new Vacancy Collection Module for Regional and Nodal Officers to notify them about upcoming vacancies and collect vacancies for examinations via Mail/SMS.
- **Advanced Reporting Tool for Enhanced Data Insights:** Designed to facilitate access to Management Information System (MIS) reports and Statistical reports, empowering users with comprehensive data analysis capabilities. Users can easily select, generate, and export reports tailored to their needs, enhancing decision-making and operational efficiency.

## Business Outcomes

#### Million active Users

**6.4 M** active Users, demonstrating the platform's scalability and strong engagement across the target demographic.

#### Server Uptime

**100%** through robust cloud infrastructure and real-time monitoring, ensuring uninterrupted service availability.

#### Average Page Load Time Improved

**58%** through frontend optimization and backend load balancing, leading to faster and smoother user experiences.

#### Bounce Rate Improved

**33%** reduction in bounce rate due to improved content relevance, faster performance, and a more intuitive user interface.

#### Reduced Application Rejection Rate

**30%** Reduced application rejection rate by integrating smarter form validation and user guidance mechanisms.

#### Increase in imposter detection accuracy

**50%** using AI-driven identity verification & advanced anomaly detection algorithms.

#### Data-sharing Improvement

**40%** through secure APIs and streamlined interdepartmental workflows.

#### Improved Result processing

**70%** automated backend pipelines and optimized database queries.

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## Key Areas of Expertise Demonstrated

#### • System Architecture Design and Implementation

Demonstrated expertise in designing and implementing a scalable microservices architecture for the SSC web portal and mobile application by utilizing advanced technologies like Kotlin for Android app development and Python for backend frameworks.

#### • Workflow Automation and Optimization

Streamlined operational workflows through automation, reducing manual intervention and enhancing efficiency in application processing, result management, and candidate communication.

#### • Data Management and Analytics:

Developed modules for generating MIS reports and candidate performance analytics, providing actionable insights to SSC management for decision-making.

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