

Jump Start Possibilities

Business Requirements Document

Computer Based Testing

[For EDUTEST]

Document Control

**Reference No:** EDUTEST\_CBT\_BRS

**Version:** 1.2

**Security Classification:** Restricted

**Issue Date:** March 2, 2021

**Author(s):** Rishi Choudhary

**Issuer(s):** Rishi Choudhary

Table of Contents

[1 Executive Summary 6](#_Toc20317922)

[2 Project Description 6](#_Toc20317923)

[3 Business Drivers 7](#_Toc20317924)

[3.1 Improving the Efficiency of Testing Process 7](#_Toc20317925)

[3.2 To enable EDUTEST to get additional business 7](#_Toc20317926)

[4 Current Process 7](#_Toc20317927)

[5 Proposed Process 8](#_Toc20317928)

[5.1 Client Onboarding Process (COP) 8](#_Toc20317929)

[5.2 Candidate Application Design (CAD) 9](#_Toc20317930)

[5.3 Admit Card and Score Card Design (ACSCD) 10](#_Toc20317931)

[5.4 Candidate Application (CA) 11](#_Toc20317932)

[5.5 Test Design Process (TDP) 12](#_Toc20317933)

[5.6 Question Paper Design (QPD) 13](#_Toc20317934)

[5.7 Question Paper Authoring (QPA) 14](#_Toc20317935)

[5.8 Center Onboarding Process (CEOP) 15](#_Toc20317936)

[5.9 Center Allocation Process (CEAP) 16](#_Toc20317937)

[5.10 Center Preparation Process (CEPP) 17](#_Toc20317938)

[5.11 Candidate Registration at Center (CR) 18](#_Toc20317939)

[5.12 Exam Conduct (EC) 19](#_Toc20317940)

[5.13 Post Exam Reporting (PER) 20](#_Toc20317941)

[6 Functional Requirements 20](#_Toc20317942)

[Priority 20](#_Toc20317943)

[6.1 Authentication (AUTH) 21](#_Toc20317944)

[6.2 Authorization – Role Based Access Control (RBAC) 22](#_Toc20317945)

[6.3 Audit Logging (AUDL) 22](#_Toc20317946)

[6.4 IT Asset Management (ITM) 22](#_Toc20317947)

[6.5 Test Center Management (TCM) 23](#_Toc20317948)

[6.6 Center Onboarding (CTOB) 23](#_Toc20317949)

[6.7 Temporary Human Resource Management (THRM) 24](#_Toc20317950)

[6.8 Payment Gateway Management (PGM) 25](#_Toc20317951)

[6.9 Customer Management (CUM) 26](#_Toc20317952)

[6.10 Multi-Tenancy (MT) 26](#_Toc20317953)

[6.11 CBT Management (CBTM) 27](#_Toc20317954)

[6.12 CBT Micro-Site (CMS) 28](#_Toc20317955)

[6.13 CBT Candidate Dashboard (CBTCD) 28](#_Toc20317956)

[6.14 CBT Application Form Design (CBTAD) 29](#_Toc20317957)

[6.15 CBT Roll Number Design (CBRND) 29](#_Toc20317958)

[6.16 Admit Card Design (ACD) 30](#_Toc20317959)

[6.17 Score Card Design (SCD) 30](#_Toc20317960)

[6.18 CBT Question Paper Design (QPD) 31](#_Toc20317961)

[6.19 CBT Question Paper Authoring by Customer (QPAC) 33](#_Toc20317962)

[6.20 CBT Question Paper Authoring by EDUTEST (QPAE) 35](#_Toc20317963)

[6.21 Candidate Online Registration (COREG) 35](#_Toc20317964)

[6.22 Candidate Application (CAA) 36](#_Toc20317965)

[6.23 Candidate Application Payments & Reconciliation (CAPR) 37](#_Toc20317966)

[6.24 Candidate Center Allocation (aka Assessment Planning) (CCA) 38](#_Toc20317967)

[6.25 Center Team Preparation (CTPRP) 39](#_Toc20317968)

[6.26 Center Preparation (CPREP) 39](#_Toc20317969)

[6.27 Candidate Registration at Center (CREGC) 40](#_Toc20317970)

[6.28 Candidate Attendance at Center (CATTC) 41](#_Toc20317971)

[6.29 Candidate Console Layout for CBT (CCLC) 41](#_Toc20317972)

[6.30 Test Conduct – Candidate View (TCCV) 43](#_Toc20317973)

[6.31 Test Conduct – EDUTEST View (TCEV) 44](#_Toc20317974)

[6.32 Test Conduct – Customer View (TCUV) 45](#_Toc20317975)

[6.33 Post Test Center Reports (PTCR) 46](#_Toc20317976)

[6.34 Post Test CCS Reports (PTCCR) 47](#_Toc20317977)

[6.35 Help Desk (HELP) 48](#_Toc20317978)

[7 Non-Functional Requirements 50](#_Toc20317979)

[7.1 High Availability of LCS and QPS (NFR1) 50](#_Toc20317980)

[7.2 Performance of Internet Facing Apps (NFR2) 50](#_Toc20317981)

[7.3 Performance of Computer Based Testing Offline Application (NFR3) 50](#_Toc20317982)

[7.4 Performance of Information Dashboards in Central Command Center (NFR4) 50](#_Toc20317983)

[7.5 Disaster Recovery of Data at LCS and CCS (NFR5) 51](#_Toc20317984)

[7.6 Security between servers and endpoints (NFR6) 51](#_Toc20317985)

[7.7 Security of Data at rest (NFR7) 51](#_Toc20317986)

[7.8 Data Consistency within LCS, QPS and CCS (NFR8) 51](#_Toc20317987)

[7.9 Fraud Detection (NFR9) 51](#_Toc20317988)

[7.10 Number of Candidates (NFR10) 51](#_Toc20317989)

[7.11 Number of Centers (NFR11) 51](#_Toc20317990)

[7.12 Hardware configuration for Candidate Console (NFR12) 52](#_Toc20317991)

[7.13 Software configuration for Candidate Console (NFR13) 52](#_Toc20317992)

[7.14 Hardware configuration for LCS (NFR14) 52](#_Toc20317993)

[7.15 Installation of Monitoring Test Agent (MOTA) (NFR15) 52](#_Toc20317994)

[7.16 Installation ease for LCS (NFR16) 52](#_Toc20317995)

[7.17 Data Synchronization between QPS and CCS (NFR17) 53](#_Toc20317996)

[7.18 Data Synchronization between LCS and CCS (NFR18) 53](#_Toc20317997)

[7.19 Data Synchronization between CCS and LCS (NFR19) 53](#_Toc20317998)

[7.20 Whitelisting of CBT Applications (NFR20) 53](#_Toc20317999)

[7.21 Crowd Management (NFR21) 53](#_Toc20318000)

[7.22 Tracking of lapsed Exam time (NFR22) 53](#_Toc20318001)

[7.23 CCS shall be cloud service provider agnostic (NFR23) 53](#_Toc20318002)

[7.24 Adequate logging of important System Events (NFR23) 54](#_Toc20318003)

[7.25 Summary of Non-functional Requirements 54](#_Toc20318004)

[8 Recommended Architecture 55](#_Toc20318005)

[8.1 Deployment Architecture 55](#_Toc20318006)

[8.2 System Building Blocks 56](#_Toc20318007)

[8.3 Service Components 57](#_Toc20318008)

[9 Recommended Software Framework 58](#_Toc20318009)

[9.1 Technology 58](#_Toc20318010)

[9.2 Software Stack 58](#_Toc20318011)

[10 Glossary 59](#_Toc20318012)

[11 References 59](#_Toc20318013)

[12 Document History 59](#_Toc20318014)

# Executive Summary

This Business Requirements Document (BRD) outlines the requirements for the Computer Based Test Solution project. It contains both functional and non-functional requirements, an overview of the current process, as well as the proposed process once the solution is implemented. It would be used to determine what needs to be done, and as a starting point for the solution design.

# Project Description

The purpose of Computer Based Test Solution Project is to develop, deploy and run a solution for conducting computer-based testing for the clients of EDUTEST. The clients of EDUTEST are currently engaging EDUTEST to conduct paper and pencil-based tests for selecting candidates for admission to their institutes, recruitment of staff to companies and government, and for assessment of skill and proficiency levels. Over the next few months a majority of EDUTEST clients have expressed the desire to migrate to a computer-based testing setup. The advantages of having a computer-based testing are:

* Flexibility: Organizations conducting the tests have the flexibility of varying the length of the test, the type and format of questions without affecting the logistics of conducting the test.
* Quality: Organizations conducting computer-based tests can get a better control over the quality of testing. For example, they can create multiple sets of papers to deter candidates from indulging in cheating/copying from each other.
* Security: Computer based testing enhances the security of question papers as there are no physical papers to be stored and handled through the pre and post-test scenarios.
* Speed: Computer based testing enhances the speed at which the tests can be conducted and the results announced, thereby accelerating the testing cycle.

EDUTEST has undertaken this project to prepare itself to meet the needs of their clients in future. In addition to preparing it for the future, a computer-based testing system can also enable EDUTEST to seek and expand its business to new markets and customers.

# Business Drivers

The key business driver that is moving EDUTEST to invest on creating a Computer Based Testing solution for its clients is to improve the efficiency of the testing process. An extension to this business driver would be the quest for additional business to enable EDUTEST to target a wide range of companies and assessments.

## Improving the Efficiency of Testing Process

The conduct of a Computer Based Test is more efficient than that of a paper and pencil-based test. This is because a computer-based test enables the testing organization:

* To keep a tight control on the test preparation and administration process. There are no physical papers to be handled in pre and post-test processes and the entire process happens under a secure environment. The test papers and the candidate responses will be in a secure digital format in the safe custody of EDUTEST.
* The logistics cost of transporting the physical papers to the Test Centers and back for evaluation is eliminated.
* The risk of physical papers being leaked from safe custody while being transported to the Test Centers and back from there is eliminated.
* The test results can be compiled, tabulated and announced at a faster pace than that when a paper and pencil test is conducted.

## To enable EDUTEST to get additional business

Conducting Computer Based Tests will open up many opportunities with a new set of clients to EDUTEST. Certain types of tests like proficiency in software like MS-Office, can only be conducted through computers.

Many of the existing paper-based testing formats are moving to computer-based testing. By introducing a Computer Based Testing Software, EDUTEST would be able to position itself to retain its existing clientele when these clients decide to move to computer-based testing. This will also enable EDUTEST to get additional clients who may move because of the inability of their existing service provider to provide a reliable computer-based testing service.

# Current Process

The current process of EDUTEST involves running paper and pencil tests. This process of conducting a computer-based test would be very different from the process of running a paper and pencil test. Therefore, the description of the current process is beyond the scope of this document.

# Proposed Process

This section describes the various processes that will constitute the operations of the entire Computer Based Testing software. Each process shall have a defined input, the type of processing to be done on the inputs, and the defined output. Also documented with the process would be any process that precedes this process.

## Client Onboarding Process (COP)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Name and Contact Details  Contract Documents & Conditions  CMS Resources from Client  List of System Users and Rules | New Tenant Created in System  New System Users Created |
| **Processing** | |
| * Client Data Input into System * Create New Tenant in System * Add System Users * Assign Roles to System Users | |
| **Preceding Process** | |
| None | |



## Candidate Application Design (CAD)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Necessary Candidate Attributes  Defined Validation Rules  Optional Candidate Attributes  Payment Gateway Information  Other Payment Information (Offline) | Candidate Application Layout |
| **Processing** | |
| * Accepting Necessary and Optional Candidate Attributes from Client * Accepting Validation Rules from Client * Accepting Payment Gateway Information * Accepting Other Payment Information | |
| **Preceding Process** | |
| * Client Onboarding Process | |



## Admit Card and Score Card Design (ACSCD)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Predefined Templates  Client Inputs on Information to be Included | Preview with Sample Data  Data Encoded as QR Code |
| **Processing** | |
| * To fill information in Selected Template * Create New Template (Optional) | |
| **Preceding Process** | |
| * Test Design | |



## Candidate Application (CA)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Candidate Attribute Data (text)  Image Data (photo)  Document Attachments (annexures)  Payment Information  Choice of Test Centers  Choice of Exam Papers  Choice of Time Slots  Choice of Language | Application/Roll Number  Payment Transaction Number |
| **Processing** | |
| * Validation of Mandatory Fields * Validation of data w.r.t. Expected format * Rules-based Validation * Photo Validation * Aadhar Validation * Document Validation (w.r.t. Size and Format) * Duplicate Flagging | |
| **Preceding Process** | |
| * Candidate Information Registration * Candidate Application Design | |



## Test Design Process (TDP)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Roll Number Generation Pattern  Languages  Application Time Window  The date for Generation of Admit Card  Payment Gateway Choice  Test Time Window  Show Instant Raw Scores  Result Date  Escalation Process Definition | Configuration for Test |
| **Processing** | |
| * Take Inputs | |
| **Preceding Process** | |
| * Client Onboarding | |



## Question Paper Design (QPD)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Design Responsibility   * EDUTEST * Client   Account Details   * Authors * Proof-Readers * Publishers   Define Rules of Exam  Upload Answer Keys  Approval Process  Languages | Pair of Laptops with Offline Authoring Tools  Rule Definitions in System Recognized Format  Question Paper Template |
| **Processing** | |
| * Creation of Paper Format * Creation of Offline Authoring Tool for Client * Creation System User Account and Role Assignment | |
| **Preceding Process** | |
| * Test Design | |



## Question Paper Authoring (QPA)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Question Bank  Questions from Authors  Encryption PIN of Publisher | Candidate Console Preview  Encrypted Question Paper Sets |
| **Processing** | |
| * Proofreading * Language Translations * Creation of Question Paper Sets * Validation of Question Paper Sets * Approval of Question Paper Sets by Client | |
| **Preceding Process** | |
| * Question Paper Design | |



## Center Onboarding Process (CEOP)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Name and Contact Details  Contract Terms  Infrastructure (Network Topology Machines)  Availability of Center  Staffing | Center Master (Machine Details) |
| **Processing** | |
| * Auditing / Landscaping | |
| **Preceding Process** | |
| * None | |



## Center Allocation Process (CEAP)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Candidate Data  Center Master  Allocation Rules | Candidate - Center Mapping  Admit Card |
| **Processing** | |
| * Reassessment Audit of Center * Auto-Allocation based on Allocation Rules * Manual Assignment | |
| **Preceding Process** | |
| * Center Onboarding * Candidate Application | |



## Center Preparation Process (CEPP)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Center Master  Monitoring Agent (MOTA)  Center Servers  Candidate List  Mock Test Paper | Center Preparedness Report  Mock Test Raw Result  Updated Center Master |
| **Processing** | |
| * MOTA Installation * MOTA Execution * Conducting Mock Test * Mock Test Result Analysis | |
| **Preceding Process** | |
| * Center Allocation | |



## Candidate Registration at Center (CR)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Candidate Center Mapping  Admit Card Details (QR Code Reading)  Registration Sheet  Attendance Sheet  Candidate Photo  Candidate Biometric (Fingerprint) | Seat Allocation Slip to Candidate |
| **Processing** | |
| * Read Admit Card QR Code and Verify * Capture Photo and Biometric * Capture Signature * Validation of Photo | |
| **Preceding Process** | |
| * Center Allocation | |



## Exam Conduct (EC)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Candidate Login  Instructions  Test Paper  Attendance Sheet | Test Responses  Updated Attendance Sheet  Candidate Feedback  Fraud Report  Candidate Console Audit Report  Candidate Response Sheet (in Duplicate) |
| **Processing** | |
| * Sign On * Reading & Accepting Instructions * Attendance Sheet * Take Test * Candidate Console Responses * Fraud Detection | |
| **Preceding Process** | |
| * Candidate Registration | |



## Post Exam Reporting (PER)

|  |  |
| --- | --- |
| **Input** | **Output** |
| Candidate Data  Exam Data  Center Data  Attendance Data  Registration Data | Audit Log [PDF]  Candidate Raw Scores  Normalization of Scores  Feedback Report  Question Item Analysis Report  Candidate Profile Timeline [Registration to Result]  Center Performance Report |
| **Processing** | |
| * Generate Candidate Raw Score Report * Generate Center Incident Report * Matching of Attendance and Registration * Consolidate Feedback * Analyse Audit Log | |
| **Preceding Process** | |
| * Exam Conduct | |

# Functional Requirements

This section will give the details of the functions that will performed by the different components of the Computer Based Testing Software. Each one of these functions will be derived from one or more Business Requirements that have been described in the section above.

## Priority

The functional specifications in this document are prioritized as follows:

|  |  |  |
| --- | --- | --- |
| **Value** | **Rating** | **Description** |
| 1 | Critical | This requirement is critical to the success of the project. The project will not be possible without this requirement. |
| 2 | High | This requirement is high priority, but the project can be implemented at a bare minimum without this requirement. |
| 3 | Medium | This requirement is somewhat important, as it provides some value but the project can proceed without it. |
| 4 | Low | This is a low priority requirement, or a “nice to have” feature, if time and cost allow it. |
| 5 | Future | This requirement is out of scope for this project, and has been included here for a possible future release. |

## Authentication (AUTH)

The entire System shall be divided into two top level zones:

1. Public Zone – Accessed by general public can access the System over Internet to browse through and gather general information.
2. Protected Zone – Secured Accessed by only those who are authenticated and authorised by EDUTEST. This zone would form the bulk of the System.

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| AUTH 1 | The Protected Zone of the System should be accessible only after Authentication. | 1 | EC |
| AUTH 2 | Login:  A User shall be Authenticated either by a combination of unique user id and password, i.e. Single Factor Authentication, or by additionally submitting a One Time Password (OTP), i.e. Two Factor Authentication. CAPTCHA shall be used where machine-based attacks are possible. | 1 | EC |
| AUTH 2.1 | Username shall be unique throughout the System, i.e. there shall be no two Users who can have the same username. | 2 | EC |
| AUTH 2.2 | A phone number, an email id or normal text can be used as a username | 2 | EC |
| AUTH 2.3 | For those users whose new account gets created by an Admin:   * Users with only phone access shall receive an OTP for first time login. Upon login, the user shall be taken to a new screen to let them create a new password. * Users with email address shall receive a link on their registered email, which upon clicking shall take them to create new password. | 3 | EC |
| AUTH 2.4 | Forgot Password:  There shall be a link on the User Interface to reset the current password, which when clicked shall send an SMS or email-based OTP to the User’s registered phone number or email id. | 3 | EC |

## Authorization – Role Based Access Control (RBAC)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| RBAC 1 | A Role is be defined as a collection of pre-defined System Level Atomic Permissions. | 1 | EC |
| RBAC 2 | Upon successful login, the screens, data accessible and tasks that can be performed by a User shall be dependent on the Role(s) assigned to the User. | 1 | EC |
| RBAC 3 | One or more number of Roles can be assigned to a User. | 1 | EC |
| RBAC 4 | An appropriate System Admin Role account should be able to add and remove Role(s) to/from one or more Users at a time. | 1 | EC |

## Audit Logging (AUDL)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| AUDL 1 | There shall be a list of activities, as defined with inputs from EDUTEST, for which the System shall track:   * Who – Which User did the operation? * What – What changed due to the operation * When – The timestamp of the operation | 1 | EC |
| AUDL 2 | It should be difficult for anybody to make any unauthorized change to the Audit Log | 1 | EC |
| AUDL 3 | The System should be able to detect any unauthorized change | 2 | EC |

## IT Asset Management (ITM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| ITM 1 | This component of the System shall maintain records of all the IT Assets, i.e. Computers, Laptops, Printers, Mobile/Handheld Devices etc., owned or leased by EDUTEST. | 4 | CEOP |
| ITM 2 | The IT Team shall be able to add and remove assets from time to time. | 4 | CEOP |
| ITM 3 | The IT Team shall be able to update the current status of enlisted assets from time to time. | 4 | CEOP |
| ITM 4 | The IT Team shall be able to reserve and assign assets for different CBTs from time to time. | 4 | CEOP |

## Test Center Management (TCM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| TCM 1 | This component of the System shall maintain records of all the Test Center Partners where CBT may be held. | 1 | CEOP |
| TCM 2 | The Attributes shall include, but not limited to the below list (complete list to be defined with help from EDUTEST):   * Name * Address * Contact Details * Contract Details, including Validity Period * Cost Associated for conducting CBT * Network Topology * Number of Available Computers (addressed under building name, room name and computer number) * Capability of each Computer * Last Used Status of each Computer | 1 | CEOP |
| TCM 3 | The IT Team shall be able to add and archive Centers from time to time. | 1 | CEOP |
| TCM 4 | The IT Team shall be able to update the current status of enlisted Centers from time to time, including the report from periodic audits & landscaping, and the overall performance of the Center during any CBT. | 1 | CEOP |
| TCM 5 | The Operations Team shall be able to reserve and assign Centers for different CBTs from time to time. | 3 | CEOP |
| TCM 6 | The System should be able to list Centers based on their past performance and pricing, to help the Operations Team shortlist and reserve the Centers | 3 | CEOP |

## Center Onboarding (CTOB)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CTOB 1 | The Operations Team shall complete the cooperation agreement and create an entry in the Center Management System. | 1 | CEOP |
| CTOB 2 | The IT Team shall visit the Center premise and work alongside the Center IT Team to identify the Computers available for running CBTs. | 1 | CEOP |
| CTOB 3 | The IT Team shall install a small application on each of the available computers, this application (called MOTA) shall have the ability to capture vital statistics of the computer and upload them to another ‘Collector’ Application running on IT Team’s Laptop (being carried to the Test Center). | 1 | CEOP |
| CTOB 4 | The below attributes shall be captured during the evaluation process:   * CPU, including 32-bit or 64-bit * RAM * HDD/SSD maximum and available space (good to have bad sector data if possible) * Network Interfaces * OS details   + Flavour     - Windows – 7, 10 or other     - Linux – Fedora, Ubuntu, Debian     - Mac   + Instruction Set     - 32-bit     - 64-bit * High Level Yes or No for consideration based upon predefined limits | 2 | CEOP |
| CTOB 5 | The Collector Application shall process the raw data from MOTA and upload the consolidated report to the CCS based Center Management System. | 2 | CEOP |
| CTOB 6 | Internet Upload and Download Bandwidth availability shall also be recorded during this process and shall be used later for filtering out the Test Centers. | 4 | CEOP |

## Temporary Human Resource Management (THRM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| THRM 1 | This component of the System shall maintain records of all the Human Resources that are temporarily hired during a CBT, i.e. IT Managers, Invigilators, Center Heads etc., by EDUTEST. | 4 | CEOP |
| THRM 2 | The Operations Team shall be able to add and remove these HR from time to time. | 4 | CEOP |
| THRM 3 | The Operations Team shall be able to update the status of enlisted HR from time to time – last performance, last payment, availability etc. | 4 | CEOP |
| THRM 4 | The Operations Team shall be able to filter based on overall performance & availability and reserve and (re-)assign these HR for different CBTs from time to time. | 4 | CEOP |

## Payment Gateway Management (PGM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| PGM 1 | In order to make the Candidate Application Process for CBT truly ‘online’, the System needs to accept the CBT Fee online, without any direct requirement to collect fee at counter. | 1 | TDP |
| PGM 2 | To facilitate ‘online’ fee collection, the candidates should be able to make payments using standard means like Credit Card, Debit Card, Direct debit from their accounts in popular banks, popular Wallets and Universal Payment Interface (UPI). | 1 | TDP |
| PGM 3 | There are standard third-party services called ‘Payment Gateway’ to achieve this. These provide interfaces with the above required methods of accepting payment so that the System need not interface with all the providers separately. | 1 | TDP |
| PGM 4 | At commission time, the System shall have working integrations with few popular Payment Gateways like Bill Desk, Razor Pay and SBI Collect (for realizing Challan payments) | 1 | TDP |
| PGM 5 | Upon on-boarding of a new Customer, EDUTEST shall take input from them about their preferred Payment Gateway (PG). | 1 | TDP |
| PGM 6 | Upon creation of a new CBT for a Customer, EDUTEST shall enable one or more pre-configured PGs from above step and make them available to candidates at the time of making payment during Application process. | 1 | TDP |
| PGM 7 | The System shall provide a means to upload payment status input from banks / payment gateways and reconcile the same against payments recorded within the System. | 3 | TDP |
| PGM 8 | Transaction Logs shall be maintained for all payments made through the payment gateways so as to enable manual reconciliation and tracing of disputed payments. | 1 | TDP |

## Customer Management (CUM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CUM 1 | This component shall be used by EDUTEST Admin to add, update and remove Customers to/from the System | 1 | COP |
| CUM 2 | All Customer related configuration attributes shall be input:   * Name and Description * Contact details * Theme details and Logos * … | 3 | COP |
| CUM 3 | Users shall be added to the System as per the list shared by Customer with EDUTEST | 1 | COP |
| CUM 4 | Users shall be assigned System Roles as per the information shared by Customer with EDUTEST | 1 | COP |
| CUM 5 | The User assigned with Customer Admin Role shall be able to perform all the above activities for subsequent list of users | 3 | COP |
| CUM 4 | Upon on-boarding of a new Customer, EDUTEST shall take input from them about their preferred Payment Gateway (PG). These attributes may include, but not limited to:   * Merchant Id * Merchant Secret | 1 | COP |

## Multi-Tenancy (MT)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| MT 1 | The System shall cater to more than one Customer at the same time, i.e. one System is deployed on a collection of Cloud and remote Servers to conduct CBTs for multiple Customers; separate instances of System, one for each Customer, is not required. | 1 | COP |
| MT 2 | Each Customer, while using the System would be able to access and modify their own data only, as if the System were built for their purpose only. | 1 | COP |
| MT 3 | The number of parallel hardware servers may increase or decrease from time to time so as to maintain optimum performance of the System. | 1 | COP |
| MT 4 | Only a small section of System may have different Software (in form of custom configuration, rules and/or code) to cater to the niche requirements of each Customer. | 1 | COP |
| MT 5 | Username for all users shall be unique across all Customers | 2 | COP |
| MT 6 | One Center shall conduct a CBT belonging to one Customer only | 1 | COP |
| MT 7 | One Center shall conduct only one CBT for a Customer, however, different exams papers may be conducted at the same time. | 1 | COP |
| MT 8 | Customer Users to be created and added for each Customer all over again for a new CBT? |  | COP |
| MT 9 | What about Temp HR User Accounts, tied to a CBT? |  | COP |

## CBT Management (CBTM)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CBTM 1 | This component shall be used by EDUTEST Admin to add, update and archive CBT for Customers to the System | 1 | TDP |
| CBTM 2 | A number of top-level attributes for CBT, including but not limited to, the below list shall be input:   * Minimum Qualification of the Candidate * Languages the CBT shall be available in * Application Time Window * Choices of Payment Gateways * Date of generation of Admit-Card * CBT Time Window * Result Date | 1 | TDP |
| CBTM 3 | System level configuration parameters shall also be defined:   * Roll Number generation pattern * Should the Raw-Score be shown immediately after the CBT is submitted? * … TBD | 1 | TDP |

## CBT Micro-Site (CMS)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CMS 1 | A micro-site shall be automatically generated based on a pre-defined template, there shall be one or more templates to choose from. | 4 | TDP |
| CMS 2 | This micro-site shall be themed based on the inputs received from Customer during their on-boarding process. | 4 | TDP |
| CMS 3 | The key data, like CBT dates etc. shall be auto-populated within the micro-site. | 4 | TDP |
| CMS 4 | There shall be place-holders pre-defined within the template layout, for which the Customer shall be able to provide custom content. | 4 | TDP |
| CMS 5 | This micro-site shall act as the entry-point for Candidates to Register themselves on the CBT System and subsequently access their CBT Dashboard from where they shall be able to track their end-to-end CBT. | 4 | TDP |
| CMS 6 | The entire micro-site, once generated and approved by Customer, shall be made available as a static downloadable folder of files that may be deployed with a suitable web-site hosting service by the Customer | 4 | TDP |
| CMS 7 | Customer shall have an option to let EDUTEST manage the deployment of the micro-site on its own cloud infrastructure with appropriate web URL | 4 | TDP |

## CBT Candidate Dashboard (CBTCD)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CBTCD 1 | Candidate Dashboard shall enable them to access: | 1 | CAD |
| CBTCD 2 | Application Form, including drafts | 1 | CAD |
| CBTCD 3 | Payment History | 1 | CAD |
| CBTCD 4 | Online Test Booking System | 4 | CAD |
| CBTCD 5 | Admit-Card | 1 | CAD |
| CBTCD 6 | CBT Raw-Score and Response Audit Trail | 1 | CAD |
| CBTCD 7 | Score-Card | 3 | CAD |
| CBTCD 8 | Counselling | 5 | CAD |
| CBTCD 9 | Help Desk | 3 | CAD |

## CBT Application Form Design (CBTAD)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CBTAD 1 | System shall have an exhaustive list of all possible Attributes that any customer may want to include in the Candidate Application | 1 | CAD |
| CBTAD 2 | The System shall have the ability to let EDUTEST select a sub-set of Attributes as required by the Customer | 1 | CAD |
| CBTAD 3 | The Attributes shall have one of the below mentioned types of input expected from the Candidate:   * Text * Number * Alpha-Numeric * Photo/Image Upload * Single Choice Selection * Multiple Selections * Document Upload (PDF and Images) | 1 | CAD |
| CBTAD 4 | The System shall have an ability to define the rules to validate the Application Form input, and also enable or disable few of the Attributes that depend on the Candidate’s input value in previous Attributes. These rules are over and above standard static validation for format of data input, e.g. number, email, phone number etc. These shall include:   * Photo validation (for flagging of bad photos like landscapes, cartoons, eminent personalities etc. and poor image quality) * Aadhaar based validation of Name, DOB and Phone Number * Duplicate Candidate flagging (based upon Name, DOB, Parent Name, Phone Number, Email etc.) * Altered validations based on Caste, Physically Challenged etc. | 1 | CAD |

## CBT Roll Number Design (CBRND)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CBRND 1 | The Roll Number of any CBT shall be formatted as per Customer’s preference. | 2 | TDP |
| CBRND 2 | There shall be scope for using static alpha-numeric section(s) within the Roll Number. | 2 | TDP |
| CBRND 3 | Remaining section of Roll Number shall be generated as a series of numbers with pre-determined initial value. | 2 | TDP |
| CBRND 4 | Part of the alpha-numeric section may derive from the input value given to specific Attribute(s) within the Application Form. | 2 | TDP  How do we generate Roll Numbers for Forms in Draft state without these attribute values being filled |

## Admit Card Design (ACD)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| ACD 1 | The System shall provide Multi-Lingual Template based Layout designs (in printable A4 size PDF Format) for the Customer to choose from. | 1 | ACSCD |
| ACD 2 | The System shall have a provision to add a newly designed Template from the backend. | 1 | ACSCD |
| ACD 3 | The System shall have an ability to assign available data to different place-holders within the Admit-Card template. | 1 | ACSCD |
| ACD 4 | The System shall have an ability to include one or more exam papers within the Admit-Card. | 1 | ACSCD |
| ACD 5 | The System shall include a Bar Code or QR code to deter tampering and fraud of Admit-Card. | 2 | ACSCD |
| ACD 6 | All Admit-Cards shall be timestamped at generation time (True for all PDFs). | 1 | ACSCD |

## Score Card Design (SCD)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| SCD 1 | The System shall provide Multi-Lingual Template based Layout designs (in printable A4 size PDF Format) for the Customer to choose from. | 1 | ACSCD |
| SCD 2 | The System shall have a provision to add a newly designed Template from the backend. | 1 | ACSCD |
| SCD 3 | The System shall have an ability to assign available data to different place-holders within the Score-Card template. | 1 | ACSCD |
| SCD 4 | The System shall have an ability to include one or more exam paper results within the Score-Card. | 1 | ACSCD |
| SCD 5 | All Score-Cards shall be timestamped at generation time. | 1 | ACSCD |

## CBT Question Paper Design (QPD)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| QPD 1 | The Question Paper (QP) design responsibility shall either rest completely with the Customer or completely with EDUTEST as per the agreement between these two parties. | 1 | QPD |
| QPD 2 | The System shall make a provision for the following input to be taken:   * User Account details that need to be assigned different Roles during QP Authoring * Languages the QP needs to be available in * Configuration Rules against which the QP shall be validated | 1 | QPD |
| QPD 3 | QP Configuration Rules:   * Exam Duration for both normal and physically challenged candidates; generally, the latter shall be given 20 minutes of extra time for every hour of an exam * Whether all the sections with a QP have questions belonging to the same subject (e.g. physics) or different subjects (e.g. same paper consists of physics, chemistry and math sections) * Type of Questions~~:~~   + Multiple Choice: The participant selects one response option from those available (two or more).   + Multiple Response: The participant selects one or more response options, from those available (two or more).   + True/False: The participant selects if they believe the question to be true or false.   + Yes/No: The participant selects if they believe the answer to the question is either yes or no.   + Text Match: To answer a question, the participant enters text in a text entry field.   + Essay: Gives the participant the opportunity to provide an essay type answer to a question.   + Explanation: Provides authors with the ability to add descriptive or informative text in an assessment.   + Pull-down: To answer a question, the participants selects the appropriate option from a pull-down list for each choice.   + Likert: A Likert question includes 'survey-type' response options in a 'I agree / I am neutral / I disagree' format (there can be between 3 and 10 response options). Participants select a response according to whether they agree or disagree with a statement. These questions are typically used in questionnaires.   + Numeric: In a Numeric question, the participant answers by typing in either a whole number or a real number. Answers can be defined within a specified range, with scores being assigned for accuracy.   + Matching: A Matching question presents two series of statements/words, and the participant must match items from one list to items within the other list. In other words, Matching question offers the participant a drop-down list of possible responses to a question.   + Hotspot: In a Hotspot question, participants place a single marker on an image to indicate their answer.   + Drag and Drop: Drag and Drop questions are similar to Hotspot questions but with up to 10 "hot" areas on an image that can be identified by participants. Participants place markers on an image to indicate their answers.   + Job Task Analysis: In a Job Task Analysis question, the participant ranks items on a Likert scale for multiple dimensions. When you create a Job Task Analysis question, four dimensions pre-populated with dimension choices are automatically added to the question.   + Knowledge Matrix: In a Knowledge Matrix question, participants are presented several Multiple-Choice questions together and selects one choice for each question presented.   + Survey Matrix: In a Survey Matrix question, participants are presented several Multiple-Choice questions together and selects one choice for each question presented. * Maximum Score * Number of Sections * Maximum Time Limit per Section or whole of Exam * Marks for each correct answer for each question * Marks for each wrong answer for each question * Number of sets | 1 | QPD |

## CBT Question Paper Authoring by Customer (QPAC)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| QPAC 1 | To enable Customer to design and author the QP, EDUTEST shall provide an Offline Tool, i.e. once handed over to the customer, EDUTEST shall not have access to this tool for data synchronization until explicitly allowed by the Customer. | 1 | QPD |
| QPAC 2 | The Offline Tool shall be installed on a laptop computer and Authoring Team of the Customer shall be able to access the Tool using standard web-browser. | 1 | QPD, QPA |
| QPAC 3 | The Tool shall be installed on at least one more computer so that this computer acts as a backup for data redundancy and disaster recovery in case the first computer were to go down. | 1 | QPD, QPA |
| QPAC 4 | There shall be four Roles associated with QP Authoring process:   * Author: User responsible for creating the individual questions * Translator: User responsible for translating QP in multiple languages * Proof Reader: User responsible for validating the QP for quality and quantity, and creating multiple QP Sets from scratch. * Publisher: User responsible to generate the encryption PIN and officially allow EDUTEST to upload the QP to its Central Cloud Server (CCS) | 1 | QPD, QPA |
| QPAC 5 | Must to change login password upon first login for each user. | 1 | QPA |
| QPAC 6 | Each Author shall create Questions in his/her own sandboxed access, i.e. one author shall not be able to view the questions created by other authors on the System. | 1 | QPA |
| QPAC 7 | Each Author shall have an ability to upload the Answer Key for his/her specific QP. | 1 | QPA |
| QPAC 8 | Candidate Console Preview shall be made available for the Proof Reader to ensure that the questions are rendered properly on screen. | 1 | QPA |
| QPAC 9 | Once a QP is deemed completed by an Author, validation of designed QPs shall be done:   * Automatic validation shall be done on total sections, questions, question type, scores etc. * Manual validation shall be done by Proof Reader as described above, i.e. Candidate Console Layout, Question to Image mapping etc. | 1 | QPA |
| QPAC 10 | QP shall be translated into desired languages by the Translator(s). | 1 | QPA |
| QPAC 11 | The Proof Reader shall review and give final approval to QPs. | 1 | QPA |
| QPAC 12 | The System shall have a provision for the Customer User with Publisher role, ‘X’ hours before CBT, to set a Security PIN for the encrypted QP and upload to Central Cloud Server (CCS) over VPN with help of EDUTEST personnel | 1 | QPD, QPA |
| QPAC 13 | QP content integrity to be validated upon uploading to CCS | 1 | QPA |
| QPAC 14 | QP PIN (Up to 6 digit/alphanumeric) to be revealed ‘Y’ minutes before start of CBT, to be communicated downstream from the Publisher to Candidates (through multiple channels like call and/or SMS to Center IT Manager) to enable them decrypt and open the QP. | 1 | QPA |
| QPAC 15 | There shall be an EDUTEST Admin User account be created on the Question Paper Authoring Tool that shall have the ability to reset the password of any of the user accounts on the System. The password of this account may be shared with appropriate personnel of Customer should a User forget his/her password and needs a reset in case of an emergency. | 1 | QPA |

## CBT Question Paper Authoring by EDUTEST (QPAE)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| QPAE 1 | The internal EDUTEST designated Authoring Team shall be able to perform all activities that may be performed by the Customer QP Authoring Team. In addition, the Internal Team shall be able to perform few other activities. | 1 | QPD, QPA |
| QPAE 2 | All Questions may be added to Internal Question Bank upon Authoring. | 1 | QPD, QPA |
| QPAE 3 | Proof Reader shall also be able to pick the Questions directly from existing Question Bank without the need for Authors to create new Questions. | 1 | QPA |
| QPAE 4 | The Proof Reader shall be able to feed the number of Questions per QP and the number of QP Sets, and the System shall respond by creating those many QP (Sets) with specified number of Questions; the Questions shall be picked by a Randomization Algorithm as suggested by EDUTEST. | 1 | QPA |
| QPAE 5 | This Authoring Tool shall not be deployed offline, but shall be deployed as a component of CCS. | 1 | QPD, QPA |

## Candidate Online Registration (COREG)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| COREG 1 | Candidates shall be able to click on the ‘Candidate Dashboard’ link within the CBT Micro-Site to reach the Registration section. | 1 | CA |
| COREG 2 | The Candidate shall be asked to enter either a phone number or email address (should be unique in the System) and their name. They shall be required to fill a CAPTCHA to help avoid scripted attacks. | 1 | CA |
| COREG 3 | The Candidate shall receive an OTP which shall be required to be input to complete the Registration process, including setting up of password. In few cases, the Candidate may need to validate both phone number AND email though OTPs. | 2 | CA |
| COREG 4 | Upon successful registration, the Candidate shall be taken to the Candidate Dashboard where they shall be able to edit/complete their profile and further able to apply for the relevant opening by filling up the Application Form. | 1 | CA |

## Candidate Application (CAA)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CAA 1 | The Candidate shall fill up the Application Form to ensure eligibility for taking up the CBT. | 1 | CA, CAD |
| CAA 2 | The Candidate shall fill all the mandatory fields marked in the Application, including Aadhaar Number if applicable, missing which the Candidate shall not be able to submit the form successfully for further consideration. | 1 | CA, CAD |
| CAA 3 | The Candidate shall make the best effort to fill all the optional fields to ensure higher probability of selection. | 3 | CA, CAD |
| CAA 4 | The Candidate shall upload all the required documents, including photograph, scanned copies of certificates and filled up Annexure Forms. | 1 | CA, CAD |
| CAA 5 | The Candidate shall fill in the choice for Exam Papers as required. | 1 | CA, CAD |
| CAA 6 | The Candidate shall fill in the preferred language to take up the CBT. | 3 | CA, CAD |
| CAA 7 | The Candidate shall provide a list of Test Center Cities in an order of preference. | 1 | CA, CAD |
| CAA 8 | The Candidate shall be able to save the Application in draft state in case he/she wants to complete the process later. In this case, the form shall be saved with partially filled data and may remain invalidated. | 1 | CA, CAD |
| CAA 9 | The Candidate Application shall be checked for being a duplicate entry based on attributes like Name, DOB, Parent Name, Phone Number, Email etc., and shall be flagged for manual scrutiny if the matching confidence is above a pre-configured threshold. | 2 | CA, CAD |
| CAA 10 | Once all data is filled and validated, including Aadhaar Number if applicable and profile photo for not being an obvious fake (e.g. landscape, cartoons, eminent personalities), the Candidate shall be required to make the payment of fee by using one of the Payment Gateways and subsequently choosing a mode of payment (Credit Card, Debit Card, UPI etc.) | 2 | CA, CAD |
| CAA 11 | Upon successful payment, a receipt would be generated for the fee paid (PDF), and available for download from the Dashboard at any later point of time. | 1 | CA, CAD |
| CAA 12 | If the CBT were configured to allow the Candidate to choose a time-slot and center manually, the System shall make a provision for the same at this stage. | 3 | CA, CAD |

## Candidate Application Payments & Reconciliation (CAPR)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CAPR 1 | In case of payment failure and amount not deduction from Candidate, the Candidate shall be able to retry making a payment. All payment attempts shall be listed in the ‘Payment History’ showing the details for each Transaction. | 1 | CA, CAD |
| CAPR 2 | In case the payment status is returned as failed but the amount gets deducted from Candidate, the Candidate shall be able to raise a ticket/dispute in the ‘Help Desk’ section of the Candidate Dashboard for further tracking and closure. | 1 | CA, CAD |
| CAPR 3 | Auto-reconciliation shall be attempted by the System upon receiving data from bank through batch jobs run once or more times per day | 3 | CA, CAD |
| CAPR 4 | The Payment Dispute Ticket shall be assigned to the Accounts Team within EDUTEST. They shall be able to view the Reconciliation History fetched from the payment gateway and be able to map payments that are traceable against payments recorded within the System. | 3 | CA, CAD |
| CAPR 5 | Unmapped payments shall be tried for manual reconciliation by scanning through the Transaction Logs | 1 | CA, CAD |

## Candidate Center Allocation (aka Assessment Planning) (CCA)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CCA 1 | The Operations Team short lists the Centres based on projected total number of candidates. | 1 | CEAP |
| CCA 2 | After cut-off date for Application, the exact set of seats required for conducting the CBT is available. | 1 | CEAP |
| CCA 3 | The System shall allocate each candidate in a random order to a centre as per the below rules:   * Preference given to Physically Challenged Candidates, followed by Female Candidates and then lastly to Male and Transgender Candidates for their first choice of preference. * If any candidate remains unallocated after the first-choice round, all further choices (i.e. second choice onwards) for candidates are tried for allocation in the above preference order. * A list of all unallocated candidates, i.e. those who could not be automatically allocated a Center, shall be prepared by the System. * The System shall initiate another cycle of automatic seat allocation (in case of unallocated candidates remain) such that the first-choice allocation of few Candidates are revoked, and allocation given to their second or third choice city, so as to ensure that the previously unallocated candidates get allocated to the vacated cities from one of their given choices. * There could be an additional level of preference given as per the state (e.g. Madhya Pradesh, Gujarat etc.) * Schedule for all exam papers for any given candidate shall be allocated to the same Centre | 1 | CEAP |
| CCA 4 | In case of last-minute change in Centre allocation, offline measures shall be taken to transport candidates to the new Centre; new physical Centre carries the previously assigned Centre’s details in the System, i.e. Centre change remains transparent to the System. | 1 | CEAP |

## Center Team Preparation (CTPRP)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CTPRP 1 | Upon finalization of a Center for being selected to conduct the CBT, the Team of temporarily hired HR shall be hired and trained. | 4 | CEPP, CEAP |
| CTPRP 2 | Each hire shall be handed over training material to go through so that he/she is made aware of all key processes and made equipped to handle different situations that may emerge during the conduct of CBT. | 4 | CEPP |
| CTPRP 3 | An Online-Test shall be conducted to evaluate the preparedness of these HR. | 4 | CEPP |
| CTPRP 4 | Based on the results of the Online-Test, an HR may need to take the same again if satisfactory result does not come out of first attempt. | 4 | CEPP |
| CTPRP 5 | There shall not be any restriction on where and exactly when the Online-Test should be completed by the HR barring that it should be completed at least ‘X’ number of days before the start of the Center Preparation process. | 4 | CEPP |

## Center Preparation (CPREP)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CPREP 1 | Upon finalization of a Center for being selected to conduct the CBT, the Center shall need to be re-audited and sanitized if deemed so by the IT Team. | 1 | CEPP, CEAP |
| CPREP 2 | The IT Team shall visit the Center and ensure that the MOTA is installed/available on the Candidate Computers | 1 | CEPP |
| CPREP 3 | Re-scan of the Computers shall be performed on need basis. | 1 | CEPP |
| CPREP 4 | A Mock-Test shall be conducted to ensure the CBT can be conducted flawlessly during the actual schedule. | 1 | CEPP |
| CPREP 5 | Mapping of Computer Number and password (to come out of Kiosk Mode). | 1 | CEPP |
| CPREP 6 | The System shall generate pseudo username and passwords for the pre-allocated list of Candidates. | 1 | CEPP, CEAP |
| CPREP 7 | The System shall perform the Mapping of Candidate details (name, photo and roll number) | 3 | CEPP, CEAP |
| CPREP 8 | Quick Sanity Check shall be done just before starting the Exam. | 1 | CEPP |
| CPREP 9 | The Mock-Test shall be kicked-off by the IT Team manually and random inputs shall be given to each of the Candidate Computer to ensure that the clicks are getting recorded as expected. | 1 | CEPP |
| CPREP 10 | The System shall have a provision to automate the mock test responses, i.e. random clicks shall be simulated on Candidate Console with random interval similar to a live test. This shall help the IT Team to complete the mock test with lesser manual effort. | 3 | CEPP |
| CPREP 11 | Once the Mock-Test is submitted, end to end System validation is done to ensure the responses are captured properly and subsequently the test results are generated to satisfaction. | 1 | CEPP |
| CPREP 12 | Once the Mock-Test validation is complete, the Candidate Computers and the Local Center Server (LCS) are cleansed to remove the Mock-Test data and make it ready to accept real CBT data. | 1 | CEPP |

## Candidate Registration at Center (CREGC)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CREGC 1 | Each Candidate upon reaching the Test Center shall visit the Registration Desk for completing the Registration process. | 1 | CR |
| CREGC 2 | The Registration Desk In-Charge shall collect the below information from the Candidate:   * Admit-Card – QR Code scanning to be done to detect and deter fraud * Photo (taken at the spot) – This shall be used to validate/lookup the Candidate Identity as per the photo submitted during Application Process. * Biometric (Fingerprints) * Signature (Candidate listing shall be made available on System generated sheets of paper, indexed by Roll Number) | 1 | CR, CA |
| CREGC 3 | Upon successful collection of above data, the Candidate information shall be looked up based on given Roll Number of the Candidate (read while scanning the QR Code earlier) and Last Mile details shall be shared with the Candidate:   * Building Name/Number * Room Name/Number * Computer Number   This information shall be printed on a slip of paper to make it convenient for the Candidate to locate the Test Computer. | 1 | CR, CEAP |
| CREGC 4 | The Registration Desk Kiosk shall be connected with the CCS online and directly submitting all Registration Data directly to CCS at real-time. This data shall be synced with Local Center Server (LCS) at near-real-time at best effort basis. | 1 | CR |
| CREGC 5 | A hand-held device shall be a good fit to implement the Registration Desk Kiosk. | 4 | CR |

## Candidate Attendance at Center (CATTC)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CATTC 1 | Candidate Attendance shall be taken within the CBT Room in which Candidates sit on Computers. | 1 | CR, EC |
| CATTC 2 | Attendance process shall typically begin 30 minutes into the exam. | 1 | CR, EC |
| CATTC 3 | A System generated Candidate List shall be made available to the invigilator to take signatures and thumb impressions of the Candidates present; this list shall be indexed (sorted) based on the Computer Number, on which a Candidate is sitting while taking the CBT. | 1 | CR, EC |

## Candidate Console Layout for CBT (CCLC)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| CCLC 1 | The Candidate Console shall be the interface that a Candidate sees after login and start of a CBT. | 1 | EC |
| CCLC 2 | The Candidate Console Layout shall be optimized for a minimum screen resolution of 1024x768. However, the Console shall run and utilize screens with higher resolution to best possible efficiency. | 1 | EC |
| CCLC 3 | There shall be different sections within the Candidate Console, each responsible for different functionality. | 1 | EC |
| CCLC 3.1 | Information:   * CBT details including subject name, Candidate’s Identity – Roll Number, Name, Photo. May be shown shrunken with ability to be enlarged upon Invigilator’s request * Actual Time (taken sync’d from LCS) * Time remaining/elapsed – normal number in minutes or in clock (00:00:00) format * Extra-Time format to be shown based on Exam Configuration – separately (2:00 + 0:20) or general (2:20) * All Questions and their current Status (read-only and scrollable) | 1 | EC |
| CCLC 3.2 | Navigation Action Buttons:   * Language selection * Left-Handed or Right-Handed selection * Question Answer Status Pane – should be ‘Colour Blind’ friendly   + Questions yet to be seen   + Questions seen but not yet answered   + Questions answered   + Questions answered but Marked for Review   + Questions answered but Saved and Marked for Review * Go to Next Question, Previous Question, Submit Exam * Clear Answer: to reset an answer already given – text, radio or checkboxes (on Question Pane) | 1 | EC |
| CCLC 3.3 | Question Pane shall be based on NTA standards:   * Question display order shall be randomized * Answer Options display order randomized * Options may be numbered – a, b, c, d or 1, 2, 3, 4 OR un-numbered * Ability to zoom-in or zoom-out any question | 1 | EC |
| CCLC 3.4 | The Console shall show Normal or Scientific Calculator based on Exam Config. | 1 | EC |

## Test Conduct – Candidate View (TCCV)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| TCCV 1 | The System shall run the CBT software, MOTA, in Kiosk mode on the Candidate Computer, i.e.:   * Run in full screen mode * Lock the keyboard at the candidate console to prevent its usage   Lock the Center and Right clicks on mouse (for case of right-handed candidates) or Center and Left Click (for left-handed candidates) | 1 | EC, CR |
| TCCV 2 | The System shall display the candidate details like Roll Number, Name, Test Name on the candidate console for reference to the candidate when the Candidate first approaches the Computer. | 1 | EC |
| TCCV 3 | The System shall allow the candidate to login to the candidate console with the username and password after at any time ‘X’ minutes before the actual start of Test. However, the CBT shall not start before the actual time, i.e. Candidate shall not be able to either view the questions or answer them. | 1 | EC |
| TCCV 4 | Upon login, the System shall display the following:   * Instructions from EDUTEST for candidates taking the test in the language of choice of the candidate * Instructions from the client for candidates taking the test in the language of choice of the candidate. * Selection Button to choose Language of choice. * Mouse button orientation (i.e. whether the candidate is a left-hander or a right-hander) * Total time available for the candidate to take the test. | 1 | EC |
| TCCV 5 | During the test the System shall display one question followed by the options for the choice of the candidate. There could be a few exceptions when there is a cross-reference between preceding and succeeding questions. | 1 | EC |
| TCCV 6 | The System shall display the time taken by the candidate for the test and the time remaining for the test to complete. | 1 | EC |
| TCCV 7 | The System shall display the status of each question in the question paper as an easy reference to the candidate  Questions shall have the following status:   * Yet to be seen * Seen but Yet to be answered * Answered * Marked for Review * Saved and Marked for Review | 1 | EC |
| TCCV 8 | The System shall provide the candidate with the option to:   * Go to Next question * Go to previous question * Clear an answer that was incorrectly selected * Submit the responses at the end of the test * Go to a specific question by number | 1 | EC |
| TCCV 9 | Based on the client specification the System shall:   * Enable the Submit button just before the completion of time for the test * Auto submit the responses marked by the candidate at the time of completion of time for the test | 1 | EC |
| TCCV 10 | Based on the client specification the System shall:   * Show the candidate the number of questions attempted and correct * Show the candidate the number of questions attempted and incorrect * Show the candidate the number of questions not attempted | 1 | EC |
| TCCV 11 | The System shall display the raw score of the test to the candidate if configured | 1 | EC |
| TCCV 12 | The System shall solicit a feedback about the Test from the Candidate. The questions shall be pre-defined and put in consultation with the Customer. | 2 | EC |
| TCCV 13 | The System shall generate a Candidate Test Response Sheet in hard copy format. | 2 | EC |
| TCCV 14 | The System shall logout the candidate after a pre-set time of completion of the test. | 1 | EC |

## Test Conduct – EDUTEST View (TCEV)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| TCEV 1 | The System shall alert the Invigilator, the IT Manager in Centre and the CCC whenever the connection with a candidate console is lost. | 1 | EC |
| TCEV 2 | The System shall alert the Invigilator and the IT Manager in Centre whenever the candidate console is detected in “idle” state continuously for ‘X’ minutes during the conduct of the test. | 3 | EC |
| TCEV 3 | The System shall alert the Invigilator and the IT Manager in Centre whenever the test is paused on a candidate console due to various factors like computer seizure. | 1 | EC |
| TCEV 4 | The System shall alert the Invigilator and/or the IT Manager in Centre whenever a candidate console attempts to:   * Access internet * Open an external communication port * Open an external peripheral (USB) * Open an application that has not been Whitelisted by EDUTEST   Based on predefined configuration settings, the CBT may be paused automatically by the System in such cases | 1 | EC |
| TCEV 5 | The System shall allow a candidate to resume a “Paused” test only after approval by the IT Manager in the Centre and in some cases, by the CCC Team. | 1 | EC |
| TCEV 6 | The System shall alert the IT Manager and CCC about a candidate attempting to login to the CBT without completing the Registration process. | 1 | EC |
| TCEV 7 | The System shall permit the CCC and IT Manager to allow candidate(s) to proceed with the login to the CBT without completing the Registration process after exception approval. | 1 | EC |
| TCEV 8 | The System shall permit the IT Manager and CCC to view the audit log of a Centre at any time during the conduct of the test. | 1 | EC |
| TCEV 9 | The System shall permit the IT Manager to enter the Attendance Data of the candidates at the centre. | 1 | EC |

## Test Conduct – Customer View (TCUV)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| TCUV 1 | The System shall produce a detailed report on the Attendance of Candidates at the centre. | 1 | EC |
| TCUV 2 | The System shall produce an alert on each instance of external intrusion attempted. | 1 | EC |
| TCUV 3 | The System shall produce an alert on each instance of external access attempted from any of the candidate consoles in a centre. | 2 | EC |
| TCUV 4 | The System shall allow a read-only access to majority of the dashboards that the CCC Team would have access to. The list of dashboards includes, but not limited to:   * Test Progress * Real-Time Incident Reports * CCTV Footage (to be made available in future) | 1 | EC |

## Post Test Center Reports (PTCR)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| PTCR 1 | The System shall produce the Raw Score of each and every candidate and the same shall be displayed on the candidate console. | 1 | PER |
| PTCR 2 | The System shall produce a detailed report on the Raw Scores of the candidates at the centre for the record of the customer/EDUTEST for keeping hard-copy records. | 1 | PER |
| PTCR 3 | The System shall produce a detailed report on the exception incidents reported in the Centre. The report shall include, but not limited to:   * Incidents of intrusion into the System * Incidents of attempts to access external systems from within the network * Abnormal Computer seizures | 1 | PER |
| PTCR 4 | The System shall produce a report that will match the Attendance of Candidates at the centre with the Registration of Candidates at the centre. The report shall highlight   * The mismatches (to enable identification of Candidates who have not completed Registration prior to CBT and should complete it before leaving the Center) * The Absentees | 1 | PER |
| PTCR 5 | The System shall produce a report on the feedback collected from the Candidates at the centre. The report shall highlight the exceptions   * Extremely high ratings * Extremely low ratings | 3 | PER |
| PTCR 6 | The System shall create a series of reports on the Audit Logs that are maintained for every activity at the centre. | 1 | PER |

## Post Test CCS Reports (PTCCR)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| PTCCR 1 | The System shall create a Question Item Analysis Report that will:   * Summarize the number of Candidates giving correct answers for each question * Summarize the number of Candidates giving incorrect answer for each question * Summarize the number of Candidates selecting a particular incorrect option in every question | 3 | PER |
| PTCCR 2 | The System shall create a consolidated report on the performance of all Centres. This report shall include:   * The number of Candidates Registered * The number of Candidates Attended * The number of Terminals with Issues * The number of Intrusion attempts * The number of external access attempts | 1 | PER |
| PTCCR 3 | The System shall produce a consolidated report on the exception incidents reported in all the Centres. The report shall include, but not limited to:   * Incidents of intrusion into the System * Incidents of attempts to access external systems from within the network * Abnormal Computer seizures | 1 | PER |
| PTCCR 4 | The System shall produce an Attendance Analysis Report to help CCC discover trends if any. | 4 | PER |
| PTCCR 5 | The System shall route the report on the feedback collected from the Candidates at the centre to appropriate System Users for further analysis. | 3 | PER |
| PTCCR 6 | The System shall produce an end-to-end Timeline for Candidates as requested by Customer. This shall enable the Customer to trace the action history of any candidate from registration on portal (to fill application) to their last recorded detail like exam score. | 2 | PER |
| PTCCR 7 | List of other Reports and Scanned Copies:   * Centre Supervisory Closure Report * CCTV Footage * Biometric Capture * Scanned copies of all receiving of documents:   + Admit cards   + Attendance sheets   + Verification sheets (if any)   + Centre In-Charge Closure reports | 4 | PER |

## Help Desk (HELP)

|  |  |  |  |
| --- | --- | --- | --- |
| **ID** | **Requirement** | **Priority** | **Business Process Reference** |
| HELP 1 | The System shall provide a Help Desk to enable external system users, like Candidates and Temp HR, report or escalate different types of issues. | 1 | CA, CEOP, CEPP, EC, PER |
| HELP 2 | The Help Desk shall also be accessible to the Contact-Center personnel (who make both in-bound and out-bound calls). | 1 | CA, CEOP, CEPP, EC, PER |
| HELP 3 | Typical use-cases from Candidate View:   * Accessible from their Dashboard * General queries like details about Exam * Failed Payment disputes * Admit Card related discrepancies * Score related disputes   The same may be created by Contact Center personnel upon receiving an in-bound call from the candidates. | 1 | CA |
| HELP 4 | Typical use-cases from Temp IT HR:   * Reporting or escalations for LCS going offline * Any other malfunction in the Center   The same may be created by Contact Center personnel upon receiving an in-bound call from the Temp IT Staff. | 1 | CEOP, CEPP, EC, PER |
| HELP 5 | Other Temp HR like City Heads, Center Heads and non-HR like Center Staff and Customer Reps may also create issues through calls to Contact Center. | 1 | CEOP, CEPP, EC, PER |
| HELP 6 | There shall be System generated issues as well, that may get created targeting out-bound Contact Center, where in there could be some information collection required from Candidates or other people for which making a manual call is the best way to reach out, e.g. when a Candidate does not download an updated Admit Card despite multiple automated SMS/email. | 3 | CA, CEOP, CEPP, EC, PER |
| HELP 7 | Issues shall be automatically triaged based on the type of issue being created. | 2 | CA, CEOP, CEPP, EC, PER |
| HELP 8 | Further triaging may be required for niche issues or escalations, that shall be handled either by a dedicated Triage Team or the currently assigned owner of the issue. | 1 | CA, CEOP, CEPP, EC, PER |
| HELP 9 | The Helpdesk shall allow an incoming email at a specified email id to trigger a new case creation. This may mandate a specific pattern to be used within subject line to help classify the case and for further tracking. | 2 | CA, CEOP, CEPP, EC, PER |

# Non-Functional Requirements

Non-functional requirements are those requirements that are used to judge the quality of the overall system. These will be used to determine the usability, effectiveness, speed, safety, etc. of the System. This section lists the Non-Functional requirements of for the System.

## High Availability of LCS and QPS (NFR1)

The Local Center Server and the Question Paper Server shall be hosted on a pair of computers. One computer shall be the primary computer to which all the users shall connect. The second computer shall be a backup computer. In the event the primary computer fails because of a hardware or software failure the secondary computer shall be configured as soon as possible to become the primary computer and the users shall be able to login to the System and continue their activities.

It is desirable that these computers shall be configured for high availability. If one computer is unavailable due to a hardware or software issue, the other computer shall take over seamlessly without any interruption to the Test Conduct and Question Paper Authoring Process and all the associated processes.

## Performance of Internet Facing Apps (NFR2)

Applications that are exposed to external parties through the internet shall be designed to give a quick response. Under normal conditions the applications shall generate a response to the user within maximum 2 seconds from receiving the request.

## Performance of Computer Based Testing Offline Application (NFR3)

The Computer Based Testing Software shall be designed to respond to give a quick response to the user. Under normal conditions, the application shall generate and communicate a response to the user within maximum 1 second.

## Performance of Information Dashboards in Central Command Center (NFR4)

The various reporting dashboards in the Central Command Center (CCC) shall be updated in near real-time with the data from the different Exam Centers. In all circumstances the data from the Exam Centers must be available at the CCC as soon as it is generated to ensure that the Controller of Examinations has an accurate picture of the progress of the tests.

This requirement may not be met when the network connectivity between CCS and LCS breaks or there is increase in network latency. In such a situation, the System shall synchronize the data in all dashboards as soon as the network connection is restored.

## Disaster Recovery of Data at LCS and CCS (NFR5)

The data collected in LCS and CCS shall be backed up in near-real-time on a server that is physically in a different location than the primary server. In case the location with the primary server has an outage or is afflicted by any disaster the data collected during the process shall still be safe and available to EDUTEST in the other server.

## Security between servers and endpoints (NFR6)

The System shall comply with ISO 27001. The communication between the servers and the endpoints (Candidate Console computers) shall be secured using 256-bit encryption for data on the move.

## Security of Data at rest (NFR7)

The database being used in LCS, QPS and CCC shall be secured and AES 256-bit encrypted such that only the authorized applications shall have access to them. The sensitive data shall not be human readable and shall be decrypted in real-time at the end point of usage, e.g. Question Paper shall be stored in encrypted format within database, and shall be decrypted on Candidate Console computer before being rendered on screen.

## Data Consistency within LCS, QPS and CCS (NFR8)

The databases in LCS and QPS computers shall be in sync at all times, i.e. the database in the primary computer shall be synced to backup computer in near-real-time.

## Fraud Detection (NFR9)

The System shall be designed and operated in a manner that it would be able to detect suspected cases of fraud by candidates attempting a Test. The System shall have consistent checks at every stage of the process – candidate registration at centre and during the test. In case a suspected fraudulent behaviour is detected by the System it shall flag the necessary alerts at different levels and prevent the subject candidate from proceeding further. This functionality may depend on the System having Administrator (root) privileges on the Candidate Console computer.

## Number of Candidates (NFR10)

The System shall cater up to 200 candidates to be allocated to one Center and take Test without noticeable degradation in performance.

## Number of Centers (NFR11)

The System shall be expected to cater up to 1000 Centers without any noticeable degradation in performance.

## Hardware configuration for Candidate Console (NFR12)

The minimum hardware configuration of a computer to be eligible to be used as a Candidate Console computer is as follows:

* CPU 1.5 GHz 64-bit
* RAM 2 GB
* HDD 10 GB free space/partition
* Display Resolution 1024x768
* Keyboard
* Mouse

## Software configuration for Candidate Console (NFR13)

The minimum software configuration of a computer to be eligible to be used as a Candidate Console computer is as follows:

* OS:
  + Windows 7 64-bit
  + Ubuntu Linux 16.04 64-bit

## Hardware configuration for LCS (NFR14)

The minimum hardware configuration of a computer to be eligible to be used as an LCS is as follows:

* CPU i7 quad-core 64-bit
* RAM 8 GB
* HDD/SSD 80 GB

## Installation of Monitoring Test Agent (MOTA) (NFR15)

The System shall have a Monitoring & Test Agent that will be installed on all the Candidate Console computers. MOTA should be easy to install and configure in a Candidate Console computer. The time to install and configure MOTA should not exceed 5 minutes per Candidate Console computer under normal circumstances.

It is desirable that MOTA shall be installed as a thin-OS directly on an existing HDD partition on the Candidate Console computer for improved security.

## Installation ease for LCS (NFR16)

It should be easy to install and configure an LCS on any available server machine at the Center, should the EDUTEST provided computers go down.

It is desirable that the installation can be completed with few user-clicks and happens largely unattended. Once the installation is complete, appropriate personnel from CCC should be able to configure the LCS remotely over VPN.

## Data Synchronization between QPS and CCS (NFR17)

Data between QPS and CCS shall be synchronized up to 2 days before the CBT. Once the data transfer is completed, the database containing Question Papers on QCS and CCS shall be compared to ensure consistency, i.e. they are identical and none of the Questions is missing on the CCS database.

It would be desirable to have the sync being performed just 2 hours before the start of CBT.

## Data Synchronization between LCS and CCS (NFR18)

The database on LCS computer shall be synced with CCS in near-real-time. Additionally, once the Test is deemed completed, the database containing Candidate Test Response on LCS and CCS shall be compared to ensure consistency, i.e. they are identical and none of the Candidate Responses is missing on the CCS database.

## Data Synchronization between CCS and LCS (NFR19)

Data between CCS and LCS shall be synchronized on-demand, e.g. to push Candidate data or CBT Question Paper data. The time taken to synchronize the data between CCS and LCS shall not be more than 30 minutes.

## Whitelisting of CBT Applications (NFR20)

The computer-based testing software and its associated components like MOTA should be whitelisted by leading anti-virus software such that they are not blocked at the time of installation in Candidate Console computer and LCS.

## Crowd Management (NFR21)

The System response at the time of registration shall be such that the centre staff are able to manage the candidate registrations without a large pile up happening and delaying the commencement of the testing process.

It would be desirable for the System to alert the center staff whenever there is a possibility of a delay in registration at least 30 minutes in advance of the commencement of the testing process to enable them to rectify and speed up the process.

## Tracking of lapsed Exam time (NFR22)

The System shall track the time elapsed since the test commenced for each candidate accurate up to the last minute. This should not depend on the Candidate Console computer’s clock.

## CCS shall be cloud service provider agnostic (NFR23)

The CCS shall be designed such that it can be seamlessly deployed on any cloud service provider without any modifications to be done to it.

## Adequate logging of important System Events (NFR23)

The System shall follow the CERT-IN security guidelines. The System shall be designed such that it can collect all critical information in logs. This shall help during system monitoring, intrusion detection and post mortem analysis.

## Summary of Non-functional Requirements

|  |  |  |
| --- | --- | --- |
| **Sl. No** | **Type of Non-Functional Requirement** | **NFR Reference** |
| 1 | Availability | NFR1, NFR10, NFR11, NFR12, NFR13, NFR14, NFR16, NFR20, NFR23 |
| 2 | Security | NFR6, NFR7, NFR9, NFR15, NFR23 |
| 3 | Reliability | NFR12, NFR13, NFR14, NFR15 |
| 4 | Performance | NFR2, NFR3, NFR4, NFR21 |
| 5 | Disaster Recovery | NFR1, NFR5, NFR16 |
| 6 | Data Integrity and Consistency | NFR8, NFR17, NFR18, NFR19, NFR22 |

# Recommended Architecture

This section describes the recommended architecture for the System along with a bird’s eye view of the Software Technology and Frameworks suitable to build such a System.

## Deployment Architecture

The System shall be having an up to 3-tier deployment architecture with the below tiers:

1. Level – 1:
   1. Central Cloud Server (CCS)
2. Level – 2:
   1. Local Center Server (LCS), through VPN
   2. Question Paper Authoring Server (QPS), through VPN
   3. Candidate Dashboard, through Internet
   4. Registration Kiosk at Centers, through Internet
3. Level – 3:
   1. Candidate Console computer (through MOTA), LCS through LAN at Center



## System Building Blocks

The System shall comprise of multiple Software Blocks at different layers. A high-level representation has been put below for reference.

1. At the core of the System shall be an Event Bus, driving the entire System.
2. The entire System functionality shall be distributed across multiple Micro-Services, typically responsible for providing closely coupled or atomic features.
3. Logging data shall be collected from across the System to give insights to the Core Application, and Hardware & Software performance.
4. The System shall be pluggable to adapt hi-tech frameworks like Artificial-Intelligence (AI) and Machine Learning (ML) implementations.
5. The System shall integrate with multiple external Third-Party services through Application Programming Interfaces (APIs)



## Service Components

The Software System shall be implemented by breaking it down into multiple (re-usable) Services that map to specific System Functionality.





# Recommended Software Framework

This section explains all of the terms and abbreviations that were used in this document, for those who are unfamiliar with them. Not everybody who reads this document will understand all of the terms, so this section is helpful.

## Technology

1. CCS
   1. Multi-AZ Distributed Container based Cluster
   2. Data-Center Agnostic
   3. Polyglot Component Implementation
   4. Event Driven
2. LCS
   1. 2-node Primary-Backup
   2. Light-weight
   3. Linux based Distro with simple click-through install
3. Candidate Console Computer
   1. Light-weight, with optional Linux based Distro
   2. Cross-Platform – support Windows and Linux

## Software Stack

1. Languages
   1. Java
   2. JavaScript
   3. Python
   4. HTML
2. Frameworks
   1. Spring
   2. NodeJS
   3. ReactJS
3. Persistence
   1. MongoDB
   2. MySQL

# Glossary

This section explains all of the terms and abbreviations that were used in this document.

|  |  |
| --- | --- |
| **Term** | **Explanation** |
| CCS | Central Cloud Server – A cluster of applications running at a Cloud based Data Center that is composed of multiple Software Components but is perceived as a single logical entity by the Users. |
| LCS | Local Center Server – The Software running on EDUTEST provided computers, as a group of at-least 2 machines, responsible for smooth conduct of CBT. |
| MOTA | The **MO**nitoring and **T**est **A**gent that shall run on the Candidate Computer. |
| CCC | Central Command Center Team at EDUTEST Head Quarters |
| API | Application Programming Interface |
| AI/ML | Artificial-Intelligence and Machine Learning |
| CPU | Central Processing Unit – The Processor within a computer |
| RAM | Random Access Memory – The volatile memory available within computer |
| HDD | Hard Disk Drive within a computer |
| SSD | Solid State Drive within a computer |

# References

This section contains links to all other places that were referred to in this document.

|  |  |
| --- | --- |
| **Name** | **Link** |
| National Testing Agency | <https://nta.ac.in/> |
| Question Mark | <https://www.questionmark.com/> |

# Document History

This section details the history of the document at each version.

|  |  |  |  |
| --- | --- | --- | --- |
| **Version** | **Date** | **Changes** | **Author** |
| 0.1 | 28 Aug. 19 | Initial draft | Rishi Choudhary |
| 1.0 | 20 Sep. 19 | Release candidate | Rishi Choudhary |
| 1.1 | 25 Sep. 19 | Final Draft | Rishi Choudhary |
| 1.2 | 16 Jan. 21 | Incremental Changes | Rishi Choudhary |