Annexure 1: Technology Guidelines

1.0 **Reusing e-District Pilot Applications**

Briefly guidelines related to Information Technology, communication and reusing applications of pilot states are described hereunder.

1.1 **Gap Infrastructure including Connectivity**

The states are required to perform study of gap infrastructure at various department offices (DHQ, Tehsil and Block) and different locations within the State. It includes:

a. Computing infrastructure – desktop, laptop computer, printer, web cam, scanner and UPS.

b. Connectivity infrastructure which will connect the horizontal field offices where applications are processed. Note - The bandwidth from the telecom service provider would be made available by State as per existing provisions of SWAN.

c. The details of number of offices, the requirement of units of gap infrastructure per office taking in to considerations of the same either provided or provisioned under any e-governance mission mode project will be provided by the State IT department..

d. Maintenance of the computing and connectivity infrastructure for 3 years and user training support to be imparted to the end user.

At state level, it includes server hardware and system software for running e-district application

1.2 Using e-District Pilot Applications for Pilot State Wide Rollout

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2   Application software currently is being developed in Pilot states. The current applications after completing mandated STQC tests and compliance need to be evaluated by the Project Consultant for scaling up as well as for improvement in the system usability, design, maintainability and ensuring the system is closer to users' need. While achieving these objectives, if it stems out that application needs design tuning and IT infrastructure up gradation in respect of Servers etc , the same should be ensured by the State before deploying it for the state wide rollout. For example, response time requirements of the application should be assessed on the basis of the entire transaction load of all the concurrent users of all the districts of a State.

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5 **2. Reusing e-District Pilot Applications for Non Pilot State Wide Rollout**

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a. The key challenge in implementing e-district is to bring agility and acceleration so that citizens can reap the benefits of government services. The solution to this problem lies in building *common applications* and reusing and sharing it so that the speed can be maximized and cost can be minimized.

b. In e-district project, the aim is to reuse the current applications which are developed as pilot and subsequently planned to be rolled out as full-fledged applications in both pilot and non pilot states. Further, IT infrastructure already provided in State Data Centre(SDC) such as storage, security, SLA management tools, etc. should also be used for e-district applications. Facilities provided for Disaster Recovery under State Data Centre scheme may also be utilized, wherever infrastructure exists. The IT infrastructure in SDC should preferably be enabled in Virtualization mode..

c. Non pilot states will have to select and use one of the existing e-district applications developed in pilot states. However, manpower efforts to tune the pilot application for Sate wide rollout and development of any alternative optional service have been provisioned in the scheme.

2.1 Application Selection Process.

a. On completion of STQC/3rd Party testing of the Pilot Application, NIC and/or System Integrator(SI) developing Pilot Application Software need to create a page on the Web Site of DIT providing hyperlink to all the family of applications running on test database of pilot states so that the non pilot states can take deep dive view into the application functionality (instead of relying on just power point presentations), evaluate and see for themselves which application is closer to their requirements.

b. NIC and/or System Integrator need(s) also to put relevant information about pilot software regarding IT infrastructure like servers as well as system software licenses, their cost, number and configuration on the website so that non pilot states could expedite the process of procurement.

c. After assessing the applications in above manner, the project consultant of non pilot states shall determine the amount of customization required in existing services of an application which closely meets their requirements for national rollout and prepare the RFP accordingly for bringing System Integrator on board for State Wide roll out.

3.0 Offline Service Capabilities:

a. Centralized architecture is suggested for states so in case the central servers or storage or link or due to any reason go down despite building redundancy/high availability capabilities at SDC, the services may get hampered for the entire state. It is suggested that offline server capabilities on one Counter at each Block/Tehsil should be built and used judiciously so that during failures, the services can be provided to citizens from here. When the services at SDC get resumed, the work done at offline server machine should be synchronized with central servers immediately and the offline server machines start functioning under the control of central server. As long as the services are running from state data centre, the offline server machine will not function independently; these will run under control of state servers like any other browser based client.

b. Number of locations having the off line capabilities shall be decided at the project inception stage by the State and also funded by State only. Further, State may also examine the application of e-Forms as offline backup for certain services at CSC/ Front End Delivery points.

4.0 Role of System Integrators in Software Development and Deployment for National Rollout

a. Using common core of one of the existing state selected applications the System Integrator will customize it and accordingly update all the documents containing specifications, design and user manuals as well as code. The aim is enablement of reusing one of the Pilot applications in other states so all the **System Integrators** working currently in Pilot States as well as the those going to work under national rollout build the architecture of the applications in such a way that their applications can be used as a product.

b. If the application developed in pilot state, meets requirements of another state; and functionality is unchanged, then the System Integrator must deploy the application using any flavor of OS or RDBMS. However it is informed that under Pilot implementation, 14 Versions of the e-District application are being developed for different platforms with two types of flavours: 1) Open Source including Linux Operating System (OS), JBoss Application Server, open source database and 2) proprietary product including Window OS, .Net, MS SQL Server 2008.

c. Different versions of pilot applications are designed to handle particular operating environment, language interface and peripheral devices. In this case, the System Integrator need to change their user interface language and if they want to capture input and send output to other devices say mobile, handheld, etc., the applications should be amenable to reflect the functionality of the service delivery channels without affecting the other components of the application architecture.

d. Different versions of the applications address specific requirements of 5 mandatory services and 5 optional services. If the State wants to extend the functionality or modify it, then the System Integrator should modify it without disturbing the other components or layers of the architecture. A function is a collection of steps (processes), either some of its steps (processes) or all its steps (processes) can undergo changes/modifications or enhancements so the architecture should support it both at deployment time and design time.

e. System Integrator need to customize, test, port, make the application operational in State data Centre and maintain it. The SI is expected to perform two roles, firstly the role of software development and later the role of maintaining application and IT infrastructure.

f. During maintenance phase SI will post its engineers for application support, bug fixing, enhancements, Database administration, system administration so that application runs smoothly and evolves to respond to the new changes and emerging requirements.

g. SI will procure the hardware, system software licenses to develop and port the application and appropriate testing and configuration (e.g. HA, RAID configuration, etc.) will be done by them along with OEM.

h. SI will procure the IT infrastructure for districts, and offices connected with districts at block levels. The system integrator will port application and operationalize it at each district, sub-district office and CSC and also post deployment maintain the application.

i. As the architecture of the application will be central so high availability and redundancy need to be ensured by System Integrators at all layers of IT infrastructure including RDBMS, Application Servers and Web Services so that services to citizens can be delivered without any disruptions. Therefore, responsibility of ensuring business continuity will lie with the System Integrators. Further, SDC will only make provision for IT infrastructure, the responsibility of formulating policy and solution which ensure disaster recovery, resumption of services and data archival will lie with the System Integrators.

j. Citizen Relationship Module needs to be designed that allows:
    a. single sign to citizens through a CitizenID and password,
    b. e-authentication of citizens through UID and
    c. storing useful additional details of citizens not covered in UID but required in delivering e-district services, history of past transactions, documents submitted or to be submitted by the citizens to avail e-district services, etc.
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k. The services of Citizen Relationship Module and other services delivered through e-District project should be described and published in National Service Directory (NSD) of SSDG so that these can be discovered and used by other MMPs for delivering joined up services through SSDG.

l. States should identify and select the services which can be delivered over mobile phones from among the e-district services..

5 STQC Testing

a. STQC/3rd party testing is already being suggested for pilot applications before assessing the capability of the pilot application for State Wide Deployment and same shall also be mandatory for the applications adopted/developed for non pilot states

b. All States including pilot as well as non pilot should contact one of the regional centers of STQC (details at web site **http://www.stqc.nic.in/**) to get conducted the acceptance testing which is expected to include but not limited to the following:

- Functionality testing of Application
- Performance testing
- Usability testing
- Security testing and
- Conformance to e-Governance standards.

c. Performance tests to be done by STQC need to ensure that the system can process its intended load and it should be done in such a way that load is increased steadily until the system performance becomes unacceptable. An operational profile has to be constructed in such a way that it contains actual mix of work, i.e., if 80% of transactions are of Service A, 10% of Service B and 5% each of Service C and D then the majority of test cases should be of Service A. By doing so, it will be possible to test the operational performance of application

d. On receipt of communication from one of the STQC centers, States are expected to provide the following documents/information/access to enable STQC to get conducted the acceptance testing and also to complete it within the time limits of the implementation of the project. State Designated Agency (SDA) shall be fully responsible to get conducted the STQC testing

  i. RFP for selection of the System Integrator of eDistrict, including scope of work of development of application software.
  ii. FRS for application of eDistrict
  iii. Software Requirement Specification (SRS) addressing functional and nonfunctional requirements including business functions and applicable regulations, standards and policies.
  iv. User manual (including installation and operational instructions of application software).
  v. Software application related information such as –Work flows/ Navigations, Business logics/Rules, Validation Rules, Screen shots
  vi. Software Design Document (optional)
  vii. In addition, STQC teams also need to be provided with access:

- To software application/ test site with sample data (preferably field data) along with the availability of various platforms hardware & system software including Operating System, Web Server, Application Server Middleware and Database for portability testing
- To hardware, software, network & IT Infrastructure with permission to connect test tools on to the system wherever required

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6 Architecture Specifications and Standards

6.1 Configuration:

The architecture of the application is expected to follow application product line software approach so that it is amenable to reconfiguration at two points in the development process: **Deployment time Configuration** and **Design time configuration**.

6.2 Deployment time Configuration:

A generic system needs to be designed for configuration by software development agency. The knowledge of states' specific requirements and system's operating environment needs to be built into a set of configuration files which the generic system uses. If some functionality or processes need to be masked or hidden or added the same will get disabled or enabled in the configuration file through a configuration interface without affecting the code.

6.2.1 Architecture Standards for Application Development for state wide rollout:

Following architecture standard needs to be ensured by all the States as regards with application software including the application being developing/developed in the pilot states to ensure scaling up application software for State Wide Rollout.

a. Ensure the architecture is scale able and capable to take the load of all districts without affecting the response time.
b. Architecture is flexible, i.e., its database schema design and User Interface design can accept the changes with minimum impact on other components.

c. Use layered approach so that it is possible to focus only on one layer if some changes are to be made. Security layer, User Interface layer, Business Layer, Database layer, Data Consolidation and Reporting layer, and Management and Monitoring layer are some of the layers envisaged for the architecture.

d. Size of Sub Systems or layers should be large enough so that there is minimum interaction between layers as this will improve performance.

e. **Centralized architecture** needs to be designed for better management and administration of application, platform and security.

6.3 Design time Configuration:

a. All the Application Developers including the current System Integrator/NIC who are developing the application are expected to deliver and use the *application framework approach* containing collection of abstract and concrete classes and interfaces linking them so that the System Integrator can implement the state specific processes and functionality through abstract classes provided in the application framework without disturbing the core of the application.

b. In the framework different design patterns can be used, e.g., *strategy design pattern* to extend the business architecture, *factory design pattern* to compose business processes and activities for delivering *workflow* of a given business functionality in a configurable file thereby giving the capabilities to extend, enhance, customize or hide business workflow (e.g. number of approvals) State wise without disturbing the core application. The *user interface*, preferably, needs to be controlled through *table-driven* entities whenever any attribute is added or deleted on the form.

7 Standards

7.1 **e-governance Standards:** There is a quality assurance framework developed by STQC and published for adoption for e-governance standards which lists various International/ISO standards to be followed in SDLC (Software Development Life Cycle) for quality assurance. Additionally, Metadata Standards and Data Standards for Person Identification and Land Region Codification, the Standards for Unicode and the Open Font Format should also be adhered. Details of the quality assurance standards are available at   **http://www.stqc.nic.in/index3b35f.html** and e-Governance Standards are available at **http://egovstandards.gov.in**

7.2 Other Standards: e-governance standards need to be refereed for the implementation of eDistrict project   However, if needed some of the international standards on the subject as indicated below may also be used for further reference. IEEE standards are indicated below for software requirement specifications, software design description, testing and project management. Besides these standards, industry specific standards which are required for information security, photographs and IT infrastructure services are also given below. However the lists given under both the headings are just for reference and are not to be treated as exhaustive. and need always to be aligned with e-governance technical standards for interoperability

IEEE standards for software development

- Software Requirements Specification IEEE 830

- Software Design Description IEEE 1016

- Software Validation & Verification Plan IEEE 1012

- Software Test Documentation IEEE 829

- Software Project Management Plan IEEE 1058

- Software Quality Assurance Plan IEEE 730

- Software Configuration Management Plan IEEE 828

Industry standards

1.	Portal development	Guidelines for Indian Government website (GIGW)
2.	Information access/transfer protocols	SOAP, HTTP/HTTPS
3.	Interoperability	Web Services, Open standards
4.	Photograph	PNG for capture and the transmission can also be in JPEG 2000
5.	Scanned documents	Pdf (ISO 32000
6.	Digital signature	PKCS#7 (As per the IT Act 2000)
7.	Document encryption	PKCS specifications
8.	Information Security	system to be ISO 27001 certified
9.	IT Infrastructure management	ITIL / EITM specifications
10.	Service Management	ISO 20000 specifications

8.0 IT Infrastructure Sharing through Virtualization:

a. State Data Centers are being established to provide integrated, secured & well managed hosting environment for e-Gov applications in the State. Creation of the virtualization layer around hardware servers, storage boxes and Security infrastructure is needed so that the IT infrastructure can be shared among different applications. It may be only then possible to run both open source and proprietary products like for Web Servers, Application Servers, Databases and Tools.

b. This concept in the context of e-district application is relevant as at least two common resource pools, one, for reporting, monitoring and management servers and another between different types e.g., Web servers and Database servers of production and testing servers can be created by bringing in proper security in place so that during peak time the load of application can be handled. Inside the test environment two virtual environments, one for testing and another for sharing the load of production can be created.

c. On the other hand, **Multi tenancy Architecture** can be followed that is **State having adequate** infrastructure can host the e-district application of another state after due customization, provided the two states agree. Figure 1 depicts the sharing of the application. Consultants need to study and examine this aspect while finalizing the need for State Hardware resources.
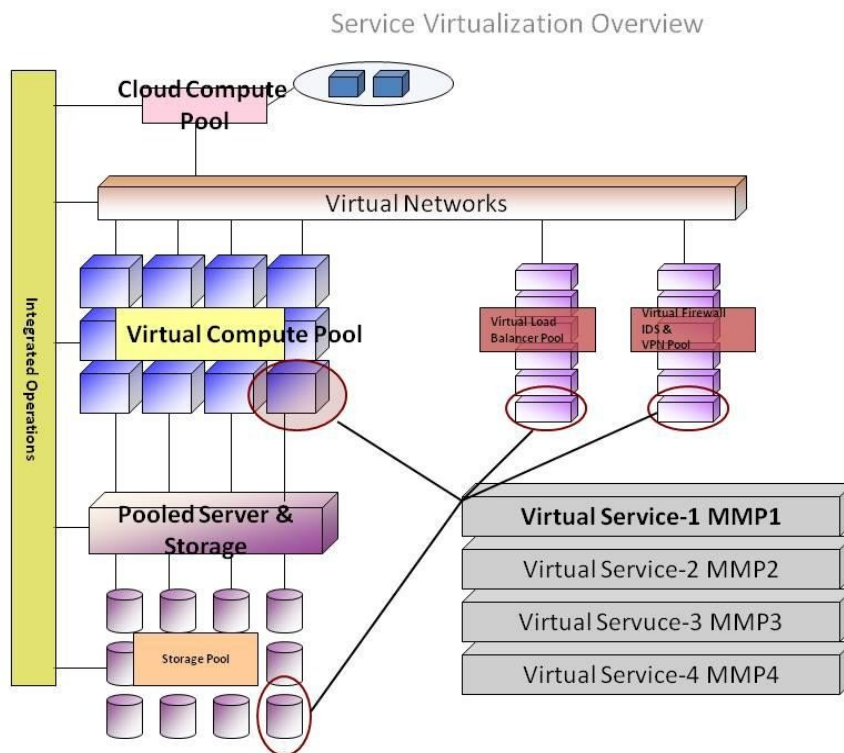
. Figure 1: Virtualization of Compute and Storage Resources

9.0 Selection, Sizing and Location of Servers

a. All types of servers such as Web Servers, Application Servers, Database Servers, Reporting Servers, SLA Management servers, Testing and Training Servers will be located in State Data Centre using storage, security servers and tools provided as part of SDC. Storage, Security, Management, monitoring, reporting and back up including archive tools will be provided by the composite team of State Data Centre where the application will be hosted and deployed. State Data Centre will also support Disaster Recovery as well as data archival.

b. It is estimated that 2 Web Servers, 2 App Servers and 2 Data Base Servers, 1 Server for Reporting, Backup and Management services, 2 offline servers for testing, development and training will be required for national rollout. These have been worked out on the basis of averaging the requirements of servers in large and small sized states. However there shall be variations in requirement of exact number of servers for each state which Consultant need to work out on the basis of estimated total /peak load of transactions, concurrent number of users, population of the state, etc. and specified in RFP floated for selecting system integrator of state. However, the flexibility needs to be given to system integrator to modify/add the number and type of servers.

c. System Software includes RDBMS, 3 Licenses (2 for Production Environment and 1 for Offline server) and License cost for matching number of licenses for OS. State specific hardware including System Software will be procured with 3 years OEM support.

d. State level support need to be provided by the System Integrator for e-District application by placing one System Administrator, one Network Administrator and Application Maintenance engineers in SDC. A State level help desk to provide support on issues like downtime of IT infrastructure, Operational issues and also for coordination with Third Party Software suppliers need also be set up by the System Integrator. The resources of composite team of State data centre may be utilized to the extent possible for e-District.

10.0   Digital Signatures

a. Digital Signature is an essential part of the authentication process of verifying the delivery of eservices. Digital Signatures are to be used for ensuring authenticity, integrity, confidentiality and non repudiation. All Government officials involved in processing the request need to be provided with the digital signature. The office of Controller   of   Certifying   Authorities   (CCA)   web   site   at **http://www.mit.gov.in/content/cca** has licensed few Certifying Authorities (CA) in the country to issue Digital Signature Certificates (DSC). State needs to put in place mechanism that ensures the process of verification of all certificates and notification issued from time to time by CCA on State portal.

b. States can procure DSC for all the officers nominated for providing eservices under eDistrict and include all such costs with proper justification in the State DPR.

c. Guidelines including technical details of digital signature are available on web site **http://egovstandards.gov.in/**

11.0   Integration with SSDG , e form and other MPP

One of the goals of the State Government is to cooperate, collaborate and integrate information across different departments in the State. To simplify the above task, the concept of e-Governance *Service Delivery Gateways has been conceptualized and State Service Delivery Gateway is rolled out in all states. It must be used as standards-based messaging switch between State Portal and backend departments to exchange data across the departments.*

12.0 Architecture of the eDistrict Delivery System

a. The functionality of the State Level gateway is similar to the NSDG at the Centre and shall work peer to peer with the Central NSDG and other Gateways. It shall use the National Level NSD to carry out address resolution of the services listed on other gateways across the country. All the State services shall be listed in this directory. Figure 2 given below depicts the positioning of the gateway in the SDC and the external entities interacting with the gateway for exchange of data using IIS/IIP message formats and protocols.
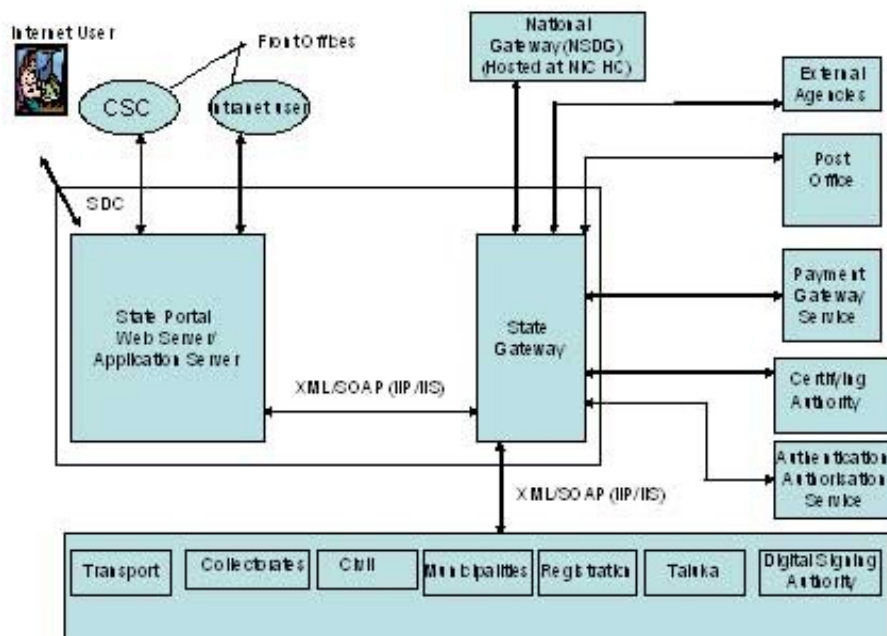

Figure 2.0: Positioning of the Gateway in the SDC

b. The gateway thus enables interaction between various departments /external entities using standard interfaces/connectors. The gateway acts as the single point of access to backend departments for all external entities. The state level gateway also interacts with the NSDG at the central level for exchange of data with central MMPs. The various Central and State Mission Mode Projects (MMPs) under the NeGP are under different phases of project conceptualization, design and implementation stage. The idea is to

develop a framework for speedy realization of benefits under NeGP, and in a way such that the various other MMPs can utilize this framework as and when they are in operational phase.

c. The State Portals will host all the forms and link to application of State MMPs for various Government Services accessible to citizens in the state. A citizen will be able to download the forms and submit his/her application electronically. This submitted form will be routed intelligently by the SSDG to the respective field office in the state responsible for providing that particular service. The Gateway will guarantee assured delivery of the request from the citizen to the government department and the acknowledgement of successful submission from department to the citizen. A citizen will be able to query the status of his/her application at a later point in time. This request/ response again will be routed through the SSDG. The basic functionalities envisaged through SSDG are as follows:

i. Act as hub for all the interactions between service seekers (the citizen and businesses) and various service providers (Government Departments) and even among Govt Departments (refer Figure 3).

ii. Audit Management & Time Stamping - Results in better tracking (auditing) and security of each transaction.
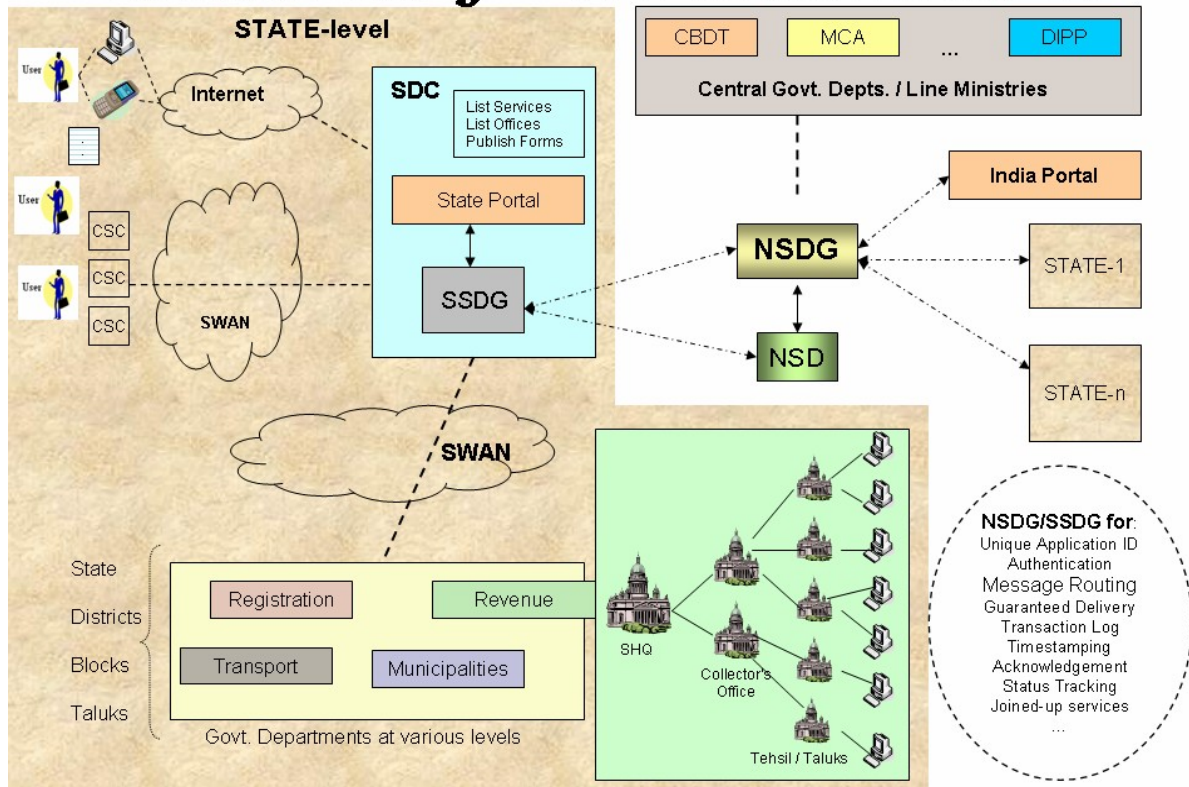
Figure 3: Service Delivery Architecture

13.0 Site Preparation

The site preparation would involve, but not limited to, all civil, electrical, mechanical and other general works or modifications before the installation of the required hardware under the e-district project. The Implementation partner should start the site preparation work well in advance to avoid delays in installation and commissioning of IT infrastructure for e-District project. The following needs to be considered for preparation of site for eDistrict project:

a. *The State/ District e-Governance Society (DeGS) would identify the locations of the sites at District, Tehsil and Block offices and shall provide the necessary rooms /space for site preparation under e-District project.*

b. *The State/ District e-Governance Society (DeGS) should ensure that the project funds are optimally utilized to facilitate the rollout of e-District project with minimal civil works.*

c. *The selected Implementation Partner should conduct site survey and needs to submit design lay-out and site preparation plan for all the sites. The implementation plan should clearly define the site-wise milestones to be achieved across the state.*

d. *SDA/DeGS shall arrange for necessary clearances which shall enable the vendor to undertake civil, electrical and mechanical works including false ceiling, partitioning, installation of electrical equipment, cable laying etc. at the respective sites.*

e. *The entry and exit to the site for the equipment and personnel for the System Integrator shall be in accordance with security rules and regulations, which may apply to the Government campus, where the sites are located*

f. *The System Integrator would be appropriately penalized for delays in preparation of project sites to avoid delays in rollout of the project*

g. *The System Integrator would not only be responsible for preparation of project sites rather the maintenance of these sites would also be part of scope of engagement*

h. *The System Integrator should ensure that day-to-day functioning of official work and existing electrical setup should not get disrupted during the process of site preparation. Any damage to the interiors during process of installation would have to be made good at no extra cost to the department.*

i. *All wiring shall be carried out with single core, PVC insulated cables with copper conductors.*

j. *The system of wiring shall be that separate phase and neutral wire shall be taken for each circuit from the main control board/distribution fuse board.*

k. *Power circuits if any shall be kept separate and distinct from the light and fan circuits. The wiring shall be done in such a way to facilitate easy inspection.*

l. *No joints shall be permitted in the wiring.*

m. *Necessary earth continuity connection shall be provided keeping in mind the maintenance requirements, safety etc. In addition to the above earth connection, the contractor is required to have a separate earth pit and earth connection*

n. *The vendor shall supply cabling materials which are load tested in accordance with specifications and manufacturers instructions*

o. *The Implementation vendor shall ensure earthing shall be in conformity with Indian Electricity rules 1956 and as per IS-3843-1986*

p. *The Fire Protection and other safety measures should be adequately planned for all the project sites.*

q. *The entry of Rodents and other unwanted pests shall be controlled using non-chemical, non-toxic devices.*

r. *All the Operational Manuals and similar accessories made available by equipment manufacturers would be handed over by the vendor to the department after the installation work is over.*

s. *The installation of equipments shall be accepted only after installation tests are completed successfully.*

t. *The project consultant shall prepare a check list for Site completion and assist the State in ensuring the necessary work done.*

u. *The System Integrator shall be awarded a Site completion certificate for all the project sites prepared as per terms & conditions of the engagement.*