Chapter 6
Towards Connected Government Services:
A Cloud Software Engineering Framework

Muthu Ramachandran
https://orcid.org/0000-0002-5303-3100
Leeds Beckett University, Leeds, UK

Pethuru Raj Chelliah
https://orcid.org/0000-0001-5220-0408
Reliance Jio Platforms Ltd, Bangalore, India

P. Beaulah Soundarabai
Christ University (Deemed), Bangalore, India

ABSTRACT

Cloud computing technologies are being used highly successfully in large-scale businesses. Therefore, it is useful for governments to adopt cloud-driven multi-channel, and multiple devices to offer their services such as e-tax, e-vote, e-health, etc. Since these applications require open, flexible, interoperable, collaborative, and integrated architecture, service-oriented architecture approach can be usefully adopted to achieve flexibility and multi-platform and multi-channel integration. However, its adoption needs to be systematic, secure, and privacy-driven. In this context, micro services architecture (MSA), a direct offshoot of SOA, is also a highly attractive mechanism for building and deploying enterprise-scale applications. This chapter proposes a systematic framework for cloud e-government services based on the cloud software engineering approach and suggests a cloud adoption model for e-government, leveraging the benefits of MSA patterns. The proposed model is based on a set of evaluated application characteristics that, in turn, support emerging IT-based technologies.

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INTRODUCTION

Cloud Computing has emerged to address the need for delivering software-as-a-Service (SaaS). The economic benefits of Cloud Computing are enormous e.g. reduced IT costs by moving to the Cloud environment, and reduced costs of managing, securing, and maintaining IT systems. It also provides other technical benefits of scalability, elasticity, business continuity, efficient collaboration, multi-devices. Also, services can easily be rendered via multi-channels over various online applications such as Facebook, AI chatbots, AI agents, etc. In this context, Cloud Computing offers three types of services such as the following:

- SaaS (Software as a Service) at the highest application level to offer application services
- PaaS (Platform-as-a-Service) at the middle layer which offers platform level services
- IaaS (Infrastructure-as-a-Service) at the lowest layer that provide entire IT services base.

All these services provide a number of major resources viz: storage, compute power, databases, OS, virtualised hardware, management, and networks.

The Cloud technology also supports four types of deployment models, often referred to as: private, public, hybrid, and community clouds. In case of provision of e-government applications, these four models are useful to host services such as e-tax and e-community (for connecting to general public through multi-channels), e-businesses (for connecting businesses both large scale and small scale), e-education (for connecting educational establishments to communicate government plans and assessments directly to people and employers). All this is highly useful however, the Cloud Computing technology also poses considerable risks in terms of security, lack of required awareness amongst people, and energy efficiency. Therefore, it is of paramount importance that, for e-government, the Cloud services take this into account and have mechanisms to resolve these, by using established best practices, techniques, and processes to build and adopt Cloud-based e-government applications.

Electronic Government or E-Gov has emerged to support interaction between the Government and people (including busineses), with the use of emerging technologies such as social media, Cloud Computing, big data analytics to make decision, to learn from existing experiences, and to provide access using multiple smart devices with mobile communication technologies such as 4/5G. Improving public services delivery and tackling natural disasters requires even more efficient use of existing and emerging technologies, and hence the need for improving e-government technologies accordingly.

Service-Oriented Architecture (SOA) has been successful in providing such a framework for delivering software applications *as a service* with flexibility, using multi-platforms and through multi-channel integration, that is necessarily required for E-Gov citizen-oriented applications. To this end, this chapter develops a Cloud software engineering framework supporting a systematic approach to developing e-Gov Cloud-based services and a service-oriented reference architecture for E-Gov based on a set of evaluated application characteristics that support emerging technologies. This chapter also proposes a number of service component models that provide the required customisation, reuse, flexibility, and extensibility. The overall service-oriented architecture has been developed and a large-scale sub-system known as *e-Tax service* has been used as a case study with service design which has been validated against a set of key service quality attributes.