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Understanding SOA Perspective of e-Governance in Indian Context: Case Based Study

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1. Introduction

Role of information and communication technologies (ICT) in managing business processes has been phenomenal. Today, ICT is aggressively used for development process and results are showing positively in this direction. E-governance projects are no exception. In today's context, e-governance projects have become a part of national policies across the world. Globally, e-governance projects have remained restricted to delivering government interfaces digitally with the focus to optimize transaction latency, improving transparency and extending on-line services. However, e-governance projects have fallen short of citizen expectations in developing countries (Mehdi, 2005). Most of the developing countries around the world have adopted e-governance systems strategically to provide better, transparent and value added services to its citizens with the help of ICT. Millennium development goals (MDG) have also included ICT as means of development (WSIS, (2004)). In India there is rapid progress in implementing e-governance strategy keeping pace with the global scenario. With the national e-governance plan (NeGP), the pace of progress in setting up information technology (IT) infrastructure has been accelerated (Ramaraao et al. (2004)). NeGP has identified various projects on "Mission Mode" for scale up nationally and have allocated funds for "Common Service Centres" (CSC) for deployment of ICT enabled services including e-governance services at the door steps of citizens (Chandrashekhar, (2006); NeGP, (2005)). Besides, there are many mission mode projects like Gramin Gyan Abhiyan (GGA) as per agenda set through Mission 2007, National Rural Employment Guaranty Act (NREGA) and Ministry of Company Affairs (MCA-21) have been taken up. However, alike the experiences worldwide (Heeks, (2006)), the scale up exercise for e-governance has not been yielding results as expected in India (Janssen, (2005); Mishra, (2007)). Various reasons including inadequate local level planning with least participation of citizens and challenging situations to spread effective infrastructure contribute to this poor adoption of e-governance services. Despite improved ICT infrastructure, penetration of telephony and internet, Indian e-governance applications and services are below expected levels of delivery standards.

In this paper, it is posited that e-governance projects in India need to follow SOA principles in order to make them successful in terms of sustainability, providing appropriate services to citizens. It is argued that Indian e-governance initiatives to be termed successful should

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pay special attention to rural areas. Rural areas in India are largely challenged by digital divides (social, educational, health etc.) and rural development largely influences overall development of Indian economy which is related to citizen services, especially value added rural services (Riley, (2003)). It is considered important that e-governance services should be available to rural citizens on demand and through proper orchestration of inputs received from various service provisioning agencies involved in the initiative. Essentially, SOA principles provide such ambience and in this paper its contributions are discussed to extend desired support to e-governance initiatives in India.

The organization of the paper is as follows. In section two, e-governance scenario in global context is discussed with specific reference to development perspectives in India. It aims at providing an appreciation of what is happening in India vis-à-vis global efforts in this direction. In section three architectural issues are discussed with specific reference to e-governance systems. A framework is presented in this section to understand the feasibility of Indian e-governance systems with development perspective. Rationale for deployment of SOA principles and their relevance in e-governance systems in Indian context are discussed in this section. In section four, SOA based architectural framework is presented. It includes a scenario built through SOA architecture to showcase the possible effect of SOA principles in order to appreciate citizen centric services taking scale-up issues into consideration. Unified Modelling Language (UML) is used for presenting the architecture and its possible use. Through this language, the scenario is presented to explain the path to reflect the underpinnings of orchestration of services on demand and service provisioning through e-governance initiatives for effective implementation SOA principles. In section five, two popular e-governance models implemented in India are taken for discussion based the SOA principles and an evaluation is done to understand the scope for further value addition in rendering citizen centric services. While concluding in section six, future direction of the work is described.

2. Indian E-Governance systems: development perspective

Conceptualization and implementation of E-governance projects have gradually gained momentum in recent years and many pilot projects have been taken up by governments worldwide. Most of the governments have transformed their pilot activities to real projects with scale up strategies (ADB,(2008)). European Union has strategies to collaborate and unify e-governance services across all its member states (Benamou, N. (2006)). Interoperability has been a critical evaluation criterion for enabling interstate transactions, managing information flow seamlessly and overseeing the backend process for effective delivery of citizen services. According to the European Commission (European Commission, 2004,2006) survey an average of 84% of all public services was available online in the EU member states much have been done for effective citizen transactions (Capgemini, (2007)). Despite such good efforts, EU countries largely acknowledge that though supply of e-governance services is rather not a problem, meeting the demands is actually a challenge before the strategic implementers. Globally, contemporary e-governance strategies therefore, profess for e-inclusion, e-participation and citizen centric services. E-Governance applications expect integrated efforts to improve citizen interfaces and citizen centric services while scaling up to make the government's withdrawal strategy feasible. These withdrawal strategies include involvement of private-public partnership, citizen inclusiveness and a proper revenue model among other critical parameters.

In India, e-governance system is still evolving and is not free from challenges as experienced in global terms. Mixed results of e-governance projects are experienced due to poor participation of important stakeholders - the rural citizens. In Indian sub-continent, one of the major concerns is ensuring “rural citizen interface through inclusion” and role of ICT in addressing this concern is challenging. This is because of the fact that rural India constitutes 72 percent per cent of India's population who live in villages; 55 per cent villages don't have electricity in homes and 85 percent have no sanitation facilities. The per capita income of Indian villagers is INR 12,000, while the national average is INR 25,000 [rural poverty]. Thus appreciating the role of e-governance services as “central” to their livelihoods is a difficult proposition. However, e-governance services have the desired potential to transform this centrality through demonstration of its orchestrating capabilities through which services related to the rural citizen’s demand could be rendered. This orchestration has remained a challenge because of ambiguous relationships among various stakeholders including government agencies who need to coordinate the information management imperatives (ADB, (2008)). There are many successful ICT initiatives in India oriented towards rural development with a focus to address some specific issues of rural citizens, thus forming “islands”. These initiatives are mostly led by the government administration, non-governmental organizations (NGOs) and some are even in private sectors. National e-Governance Plan (NeGP) recognizes the vitality of some critical, but successful ICT initiatives for their inclusion as mission-mode projects for scaling up at national level. The aim is to provide a portfolio of services to the citizens integrated with e-governance backbone to install a good e-governance system without getting affected during scale up phase.

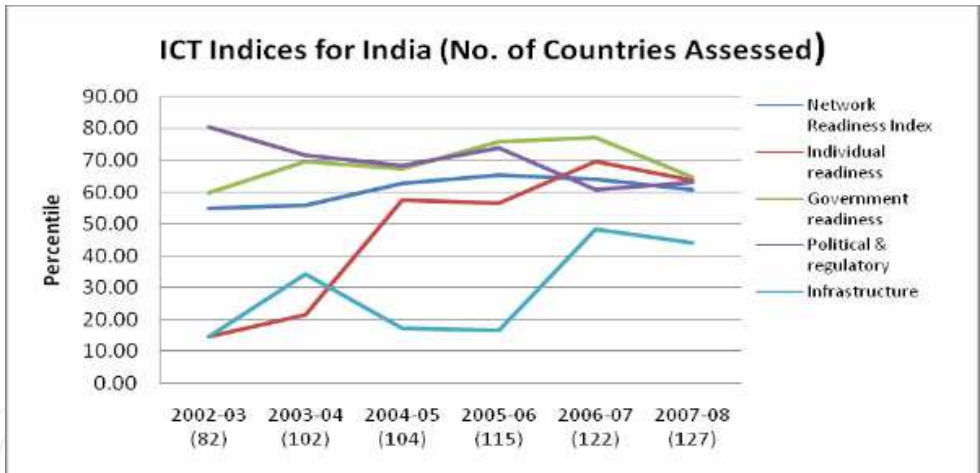


Fig. 1. ICT Indices for India (Dutta et al., (2008); Kaul, (2008)).

Good e-governance efforts need useful ICT infrastructure, individual readiness, government readiness, support of political and regulatory systems and network readiness. Individual readiness in Indian context, is quite critical because of the rural citizens are oblivious of the e-governance initiatives which are yet to bring desired impact in the lives of these rural citizens. Global “e-readiness” exercises to assess the ICT enabled capacities of countries and the usage the infrastructure indicate this readiness as an important contributor. In India, this readiness is gradually increasing. In Figure 1 other ICT indices which predominantly influence Indian e-governance efforts are presented in global context. It reveals that ICT infrastructure and individual’s orientation towards IT need more attention in order to hasten the process of implementing e-governance systems in the country (Chan, (2005);

Converged services with local contents are critical contributors to a successful e-governance initiative. In India, this is much more important since rural citizens need these services under local conditions and on demand. This demands a suitable infrastructure with adequate rural penetration (infrastructure readiness), government's presence in the villages in digital form with adequate reengineering (government readiness), decentralized governance systems with adequate ICT support (political and regulatory readiness) and networking of agencies (network readiness) to facilitate converge services. In all these areas India needs improvement as per global standards.

3. Understanding Indian e-governance architecture

Choosing a good ICT driven architecture, identifying scalable components and managing a sustainable relationship are basic tenets of ICT infrastructure set up and for understanding its readiness. Successful architecture advocates for addressing "views", "relationships" and "growth" among various components (Mishra, (2009)); Garlan & Shaw, (1994)) to meaningfully contribute to ICT enabled services without compromising desired services. E-governance architectures are no exceptions since these are aimed at national level encompassing a diverse pool of stakeholders. In India national e-governance architecture is being planned with these objectives to formulate standards for e-governance initiatives (Mishra & Hiremath, (2006)). "Common Service Centres" under the auspices of NeGP and "Telecentres" with mandate of "Mission 2007" are critical attempts of government of India to scale up e-governance project implementation strategy. Such national scale up strategy bears relevance of an architectural treatment (Prabhu, (2004)).

In order to understand the rural e-governance architecture in India, two approaches are considered important in this paper. The first one is the Architecture itself which is essentially useful for understanding the services to be rendered to the stakeholders and the second, the service grid that may be made available through 'back end' that can provide the services 'on demand'. These two approaches aim to discuss the underpinnings of the architectural issues for generating desired rural citizen centric services.

Most of the Indian e-governance services are now in the phases of consolidation and gradually coming out of the 'incubation' period. 'Integration' of 'information and services silos' are being networked through NeGP nationally. State data centres, national data centres and other related backbone for 'back end' network and grid are being installed. Diverse platforms are extensively used for development of applications, services with focus on local, regional and national languages. State level efforts are contributing to such situations. Open standards along with web 2.0 technologies and grid computing environment are being considered for implementation to enhance 'user services' (Prabhu, (2007)). However, provisioning of user independence, usability of services and even demanding the services are few challenges which have considerable impact on Indian e-governance efforts. In the 'development' parlance, this is more critical due to the fact that most of the 'users' belong to 'rural areas' and they lack basic infrastructure and facilities. SOA based services therefore, are quite relevant in Indian context.

Service orientation is an essential component for Indian e-governance systems since 'desired services' need to be provided to the citizens. As per NeGP, 'service grids' are being developed through 'data centres' with an organised backbone. At this point of time, aggregation of service requirements is more critical for the e-governance to generate a broad-based pool. In Figure 2 a scenario of service orientation is presented. It is posited that

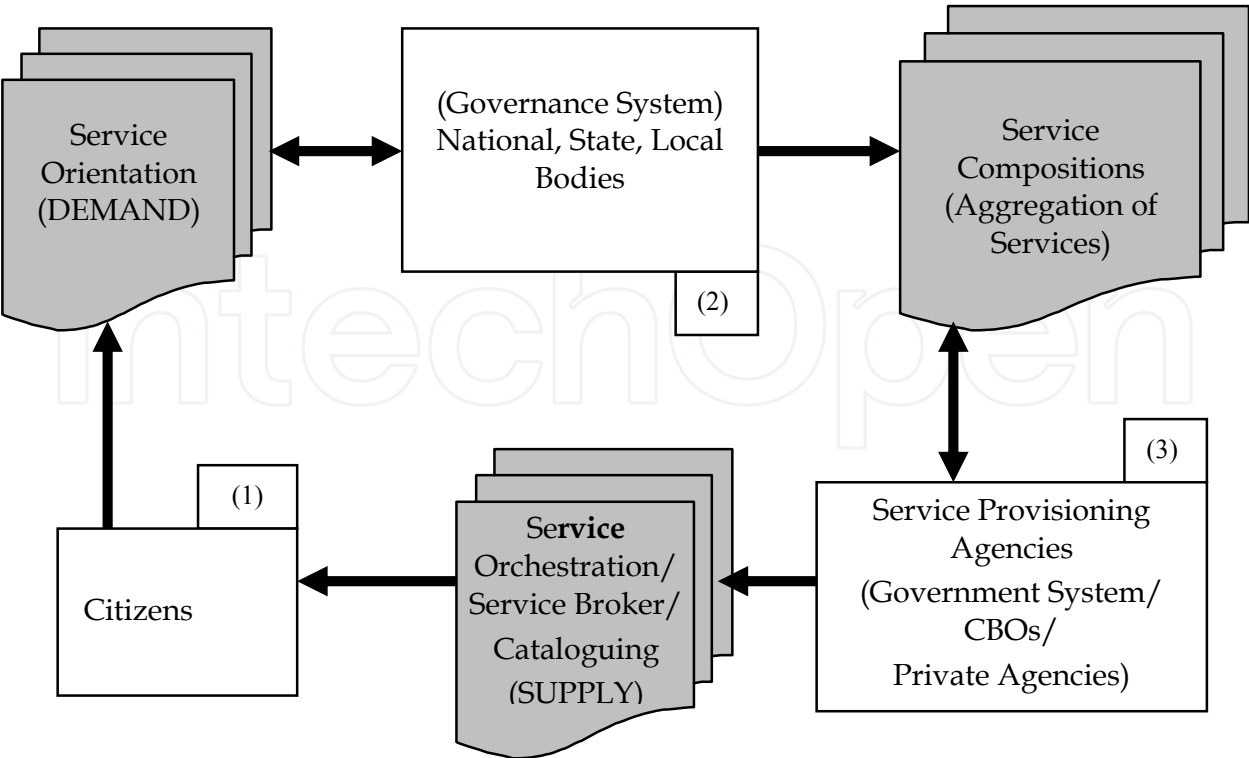


Fig. 2. Service Orientation Framework of Indian E-Governance System

citizens form the most critical element who are target recipients of services. In India, rural citizens form a major stakeholder in the e-governance system and their acceptance of the e-governance enable services would render the effort successful. As shown in (1) rural citizens are vulnerably placed to project their demand on services and receive them. Therefore, the architecture needs to capture their requirement appropriately. This is possible either through individual citizen collaboration or through collectively held institutions as legally framed through Indian governance systems. The later is quite strongly visible in the rural areas who interface with citizen as representatives with government administration. These bodies at local (panchayats, self help groups, micro finance institutions etc.), district (district level PRI bodies, municipalities, corporations etc.), state (assembly) and central (parliament) levels as shown in (2) are empowered to aggregate the demand and facilitate provisioning of desired services. Even at individual level, right to information act (RTI Act) has been a powerful instrument to raise demand on e-governance systems being developed. As shown in (3), it is the government system who is the service provider to uphold governance system, to implement the desired interface with citizens and provide services on demand. Therefore, it is the responsibility of district, state and national government administration to orchestrate the services and provide them to the citizens. This is possible through a SOA based model which would enable service orientation through citizen demands. Governance systems in India are organised at the grass root level to capture these citizen service orientation. However, this is most difficult task since most of the citizens reside in rural areas where 'digital divides' are quite strong (Heeks, 2003). Aggregated service demanded are the inputs for the 'service provisioning agencies' in the national network engaged for establishing the orchestrated link to manage the 'service brokering' facility and supply the services. This provides a scope for the citizens to receive the desired service through SOA based service model.

3.1 SOA principles and E-governance strategy

SOA principles draw strength from the benefits of well practiced architectures in software engineering discipline like client-server, distributed (including component object (COM)/distributed component object (DCOM) and Object-Oriented) architecture. SOA principles work closely with applications and enterprise with 'service-orientation', 'services' and 'service-oriented solution logics' (Erl, 2008). SOA promotes loosely coupled services which could be independent from each other, but are related in certain way to accomplish common tasks. SOA also encourages process orientation and includes organization and technology seamlessly. Analogous to business paradigm, where SOA principles have provided the intended impetus to reusability and productivity (Ravichandra et al., (2007)) e-governance oriented information systems demand intensive deployment and use of information technology (IT). Thus e-governance systems need agility, innovation and adaptable service oriented architectures which SOA could provide. SOA however, represents a paradigm shift at the architectural level to tackle integration requirements. E-governance services require such treatment at all levels of deployment of infrastructure and other resources.

E-governance services are mostly regarded as 'enterprise' level services since it includes various 'stakeholders' in the process. Major stakeholders are 'citizens', 'government agencies', 'communities' and 'service provisioning agencies'. SOA based models help revolutionalise enterprise environment by leveraging web services technologies. 'IT-enabled service-orientation' provides the right impetus for a good architecture which can be possible through the SOA. Web-services driven SOA is fast gaining its status against traditional 'distributed architecture' environment. SOA builds on the strengths of 'application architecture' and 'enterprise architecture' and therefore, has potential to manage e-governance projects. Application architectures have evolved in Indian states disjointly and there are a number of mission mode projects evolving for scale up. This scale up exercise entails federating the application architectures and their 'reuse'. Enterprise driven solutions are part of the mission mode projects which aim at having 'national reach' and providing distributed environment for the services to reach the citizens. Indian citizens have varied demands with strong rural-urban disparities and yet having a huge potential to have converged and unified services across the nation. This leads to an 'environment' conducive for encouraging individual 'service orientation' while providing 'standardised services' nationally. Indian villages cover large population to ignore and demands of this population vary depending on local, household and individual priorities, market conditions and national policies. In enterprise driven IT solutions like enterprise resource planning (ERP), SOA principles have helped in provided service orientation through which IT and organizations are finely blended. Despite rising complexities due to SOA applications, benefits are quite substantial in terms of integration, reusability and user orientation and SOA oriented solutions have provided effective support for business-process driven alignment. E-governance systems look for these strengths since the back end services need all these properties for an effective e-government service orientation. Besides, studies show that principles of "transaction cost theory" and "agency theory" which are well supported by conventional ERP based information systems have derived better results through SOA orientation in terms of their characteristics related to "specificity", "uncertainty", "strategic importance" and "frequency" (Bocke et al., 2009). All these attributes and principles of economic theories discussed above are foundations of e-governance information systems and therefore, there is a scope to induct SOA principles in those systems.

In order to formulate a strategy to have SOA oriented e-governance services, it is essential to study the concept of SOA. SOA is expected to provide 'universal service identifier' in the system so that desired service can be identified 'on demand' with least transaction time, transaction cost and independent of spatial constraints. Universal service identifier is expected to coordinate with service broker with service descriptions so as to mine the desired service from the warehouse. A typical architecture is presented in Figure 3.

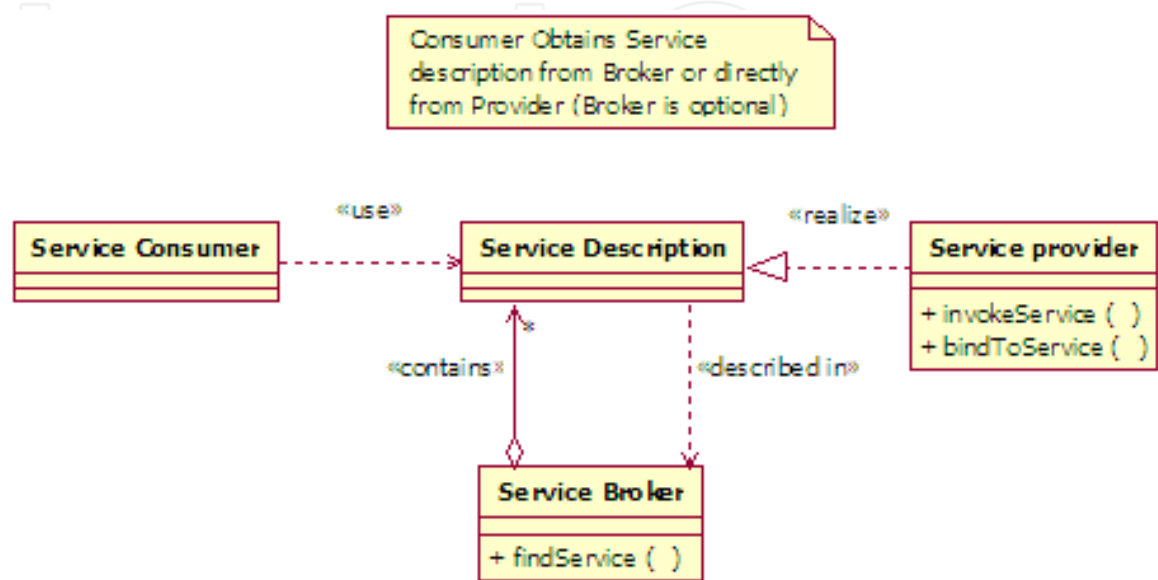


Fig. 3. Conceptual Model of SOA (Arsanjani, 2004)

In Figure 3 the concept behind SOA describes the service orientation and relationship of various stakeholders who collaborate, orchestrate and provide services as desired. But an enterprise level SOA needs an elaborate treatment for collating all possible services with best practices, interaction among components and relationships. In order to capture the underpinnings of SOA architecture for detailed abstraction seven layers are presented and discussed in Figure 4 below.

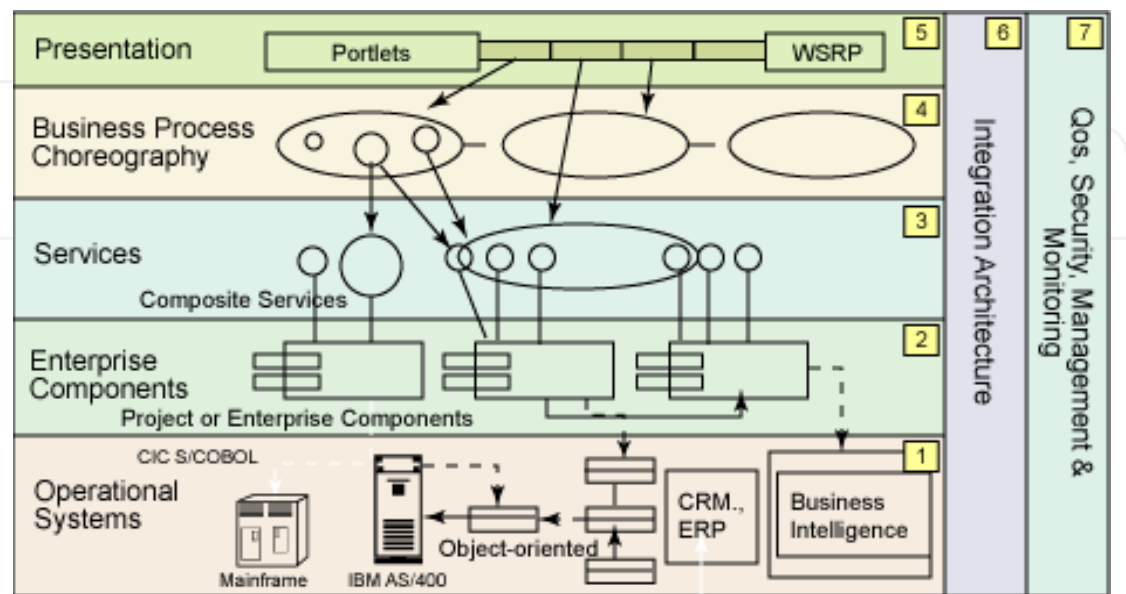


Fig. 4. Abstracted SOA (Arsanjani, 2004)

Each of the seven layers is numbered and discussed with reference to Indian e-Governance SOA model. In Figure 3, it is suggested that each layer in SOA model, specific tasks are to be carried out with clear delivery mechanisms. Each layer should also relate to the other as per the demand of the enterprise in order to meet the overall objectives of the services rendered (Erl, 2008). In this model quality of service, monitoring of services and establishing security standards for citizen transactions are the most important contributors to maintain trust, transparency and inter-operability which major deliverables of Indian e-governance systems (Stayanaryana, 2004) .

4. Proposed architecture

As explained in section three, various service components of SOA can contribute to the Indian e-governance system in order to provided desired services. The components are 'citizen demand on services', 'service on demand aggregation', 'service-on-supply aggregation', 'service orchestrators' and 'service providers'. A seamless integration of all the services and service provisioning components need to collaborate effectively to focus on citizen centric services. Besides, capabilities of SOA can also be harnessed for garnering all the benefits that e-government systems could provide through effective integration of backend services networked nationally in a unified way.

In Table 1 below, the proposed deliveries of SOA based e-governance systems are discussed based on its layers. These layers are 'operational systems', 'enterprise component', 'services', 'business process composition', 'access', 'integration' and 'quality of services' as explained in Figure 3 in section three. Operating system is a major layer in governance architecture which provides the base for establishment of systems, procedures and interaction principles among all the stakeholders to derive the desired services targeted for overall development of the society. This layer therefore, demands IT orientation for better ambience for orchestration among all the stakeholders, and establishment of service brokerage. In layer two, enterprise component is established to extend support to the service provisioning. This is a critical layer which accounts for establishment of 'on demand' service portfolios, provisioning of infrastructure and their maintenance. SOA principles look for loosely coupled components in this layer so as to make them convenient for creation, deployment and use. Layer three is focussed on identification of services, their points of generation and aggregation of these services through layer two. Layer four calls for an integrated environment in which all service provisioning agencies collaborate to capture services demanded, analyze them and provide value added services through continued innovation. Layer five is the access layer in which citizens are expected to gain access to the desired services. This establishes user component based on user centred design principles and calls for greater usability of the user driven application interfaces. In layer six, integration services, components and user interfaces is managed for converged services which is reflected in layer seven through management of quality principles.

In Table 1 below, a SOA model is presented with specific contribution to e-governance scenario which could be mapped to Indian context. In the proposed model four layers of SOA architecture are presented with a view to contribute to a good SOA architecture as discussed in Figure 3. In Table 2 these layers are discussed. This simplification is done in order to apply the e-governance framework presented in Figure 2 which is represented in Figure 3 through UML.

The first layer (SOA-I) stage considers elicitation of 'citizen demand'. It is an independent activity in the SOA since citizens may any type of services and these services may be specific

Layer	Layer Description	Rationale	E-Governance (Indian Context)	SOA Component Proposed
1	Operational Systems	Legacy Systems, Business Intelligence of enterprise	Legacy systems have evolved for e-government systems as backend services. E-governance pilot projects are emerging in isolation and there is effort to identify, design and implement National Mission mode Projects.	Service Provisioning (Service Brokerage and Service Orchestration)
2	Enterprise Component	Maintain Quality of Services; Organize Service Level Agreements	State Data Centres, National Data Centres, Identification of Service Providers are in the agenda	Services Composition, Loosely Coupled
3	Services	Business Processes, Interfaces and Orchestration	State level Grids, Connectivity to Citizen services and Interfaces with Citizens	Service Providers (Service Composition, Aggregation, Orchestration)
4	Business Process Composition	Choreography, Business Integration	Government services and business services to converge; Government and Business process Re-engineering	Service Orchestration (Supply)
5	Access	User Interfaces	Citizen Interfaces	Services (Demand)
6	Integration	Intelligent interfaces, protocol mediation	Location specific contents	Services Composition, Services Composition and Choreopgraphy
7	Quality of Services	Monitor, Manage and maintain quality of service	e-governance standards at national government level, interoperability protocols	Service orchestration

Table 1. Probable SOA based Deliveries

Layer Description	SOA Component Proposed
SOA-I	Service Demand
SOA-II	Service Aggregation, Orientation
SOA-III	Service Orchestration
SOA-IV	Service Agency Collaboration

Table 2. layers Proposed

to local conditions. In second layer (SOA-II), demands are aggregated, composed and service-orientation is done through an agency at the local level. This layer in turn is expected to 'orchestrate' with layer-III (SOA-III) which carries all the 'services' available through service providers. Layer-III, all the 'service providers' and 'services' are orchestrated. In layer IV (SOA-IV), 'service agencies' are collaborated and in Indian context these are 'national government', 'state government' and 'NGO'. There are other service providers like corporate agencies and social trusts engaged and can be added to the process of aggregation. The proposed model is sequenced and presented in Figure 5 through UML principles. UML provides a scope to generate solutions through business process modelling. E-governance processes provide such opportunities since these services are mostly component based and can be brokered through component objects. The UML generated model depicts the

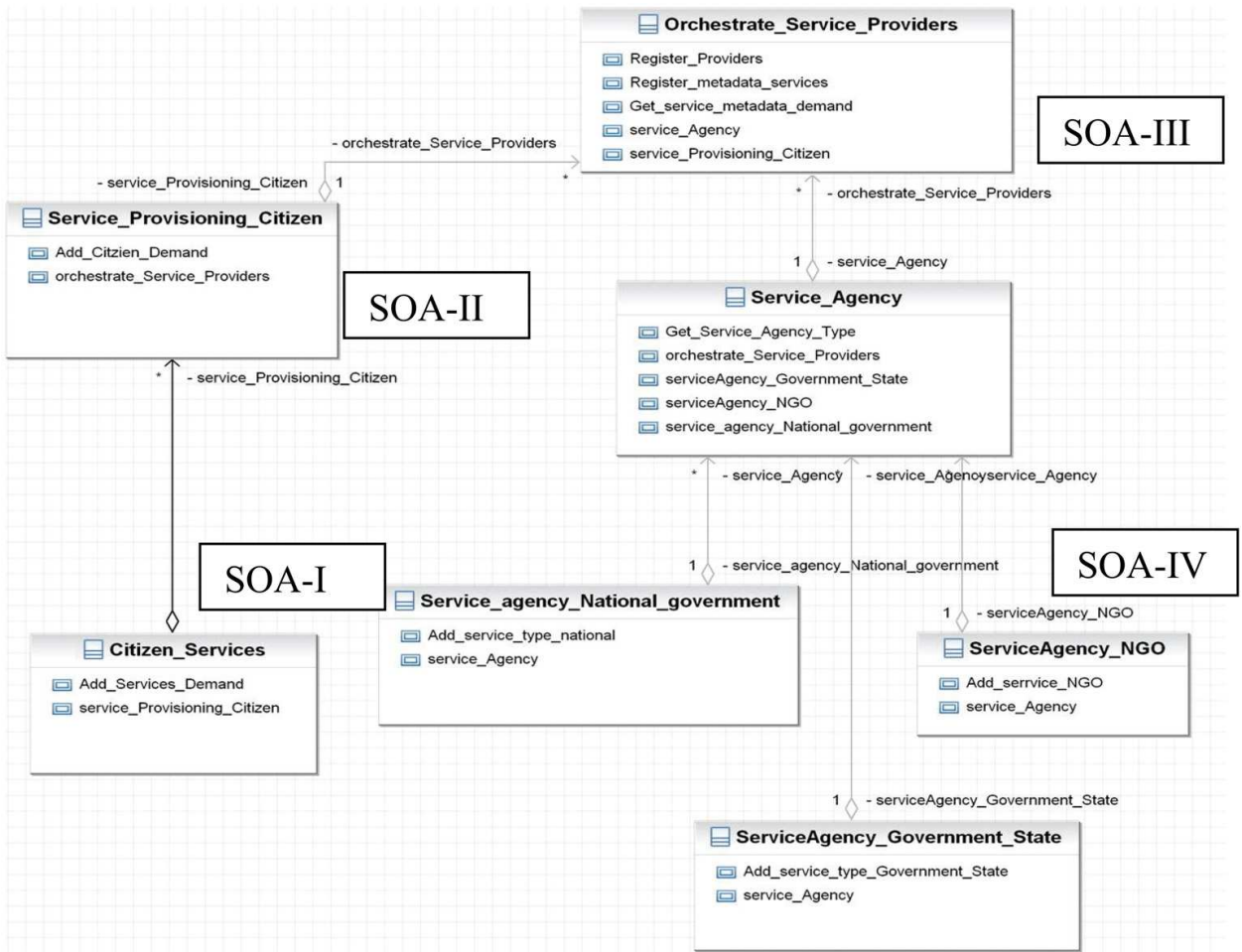


Fig. 5. Proposed SOA e-Governance Model (UML Based)

explanations made in section three through Figure 2. This model posits that SOA-I would capture demand of services raised either individually or collectively. It would take care of the point of raising demand on services, the latency and appropriateness. This “point of service (POS)” will generally be backed by appropriate technology to manage mode, medium and frequency, service components to be pulled by appropriate component technologies. In SOA-II, these services are collated for better management of information systems. This layer also manages the service provisioning agencies which could be called for active collaboration on demand. It provides the facility to add citizen demand as well. SOA-III generates the platform for addition of service providers and their services for orchestration. It relates to maintenance of databases for services, service providers related to government and non-government systems, business houses and entrepreneurs. This is mainly related to ‘orchestration’. SOA-IV establishes the need for backend ‘service-oriented bus’ which would ensure detailed mapping of agencies their profiling, establishment of adequate infrastructure, computing grids and application layers for providing services as desired. Unified service provisioning facilities are created through this layer. This model attempts to provide cyclic treatment to “service demands” and “service supplies” which would provide the right input to the intermediary agencies to collaborate, orchestrate and add value to the services being generated.

It may be noted here that Indian democracy provides limited autonomy to states which take part in the governance systems with relation to the state boundaries. State legislations are part of the state administration whereas the national level governance looks after central governance issues. Therefore, e-governance projects reflect traces of such dual administrative structure. In other words, there are concurrent attempts to provision citizen centric services taken by central and state authorities. Of late, central administration has deployed mission mode projects with states collaborating as part of NeGP (Chandrashekhar, 2006). NeGP also mandates for public-private-participation (PPP) based services for the citizens. Therefore, convergence of services is of prime importance so as to provide commercial approach to the services and establish sustainable and remunerative information service provisioning.

5. Discussion of two cases

In this section two cases from India are presented and assessed through the model discussed in section three in Figure 4. This assessment provides insights to the SOA based approach to e-governance systems and their prospects to serve the citizens.

5.1 Case of national E-governance plan

National e-Governance Plan (NeGP) is getting implemented through 100,000 common service centres (CSC) in India (Misra, 2009). The entire project is being based on “Entrepreneurship Model” in which six villages would be covered by one CSC.

It is envisaged that the information backbone would extend services to these CSCs. The vision states “Make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realize the basic needs of the common man” (Misra, 2009). It considers “state level and national level mission mode projects” as critical success factors for the plan. In Figure 6 the approach of NeGP suggests an integrated environment and therefore, calls for a robust architecture.

NeGP infrastructure includes state level data centres, state wide area networks, and considers integration among various ICT enabled services. The Status of NeGP implementation

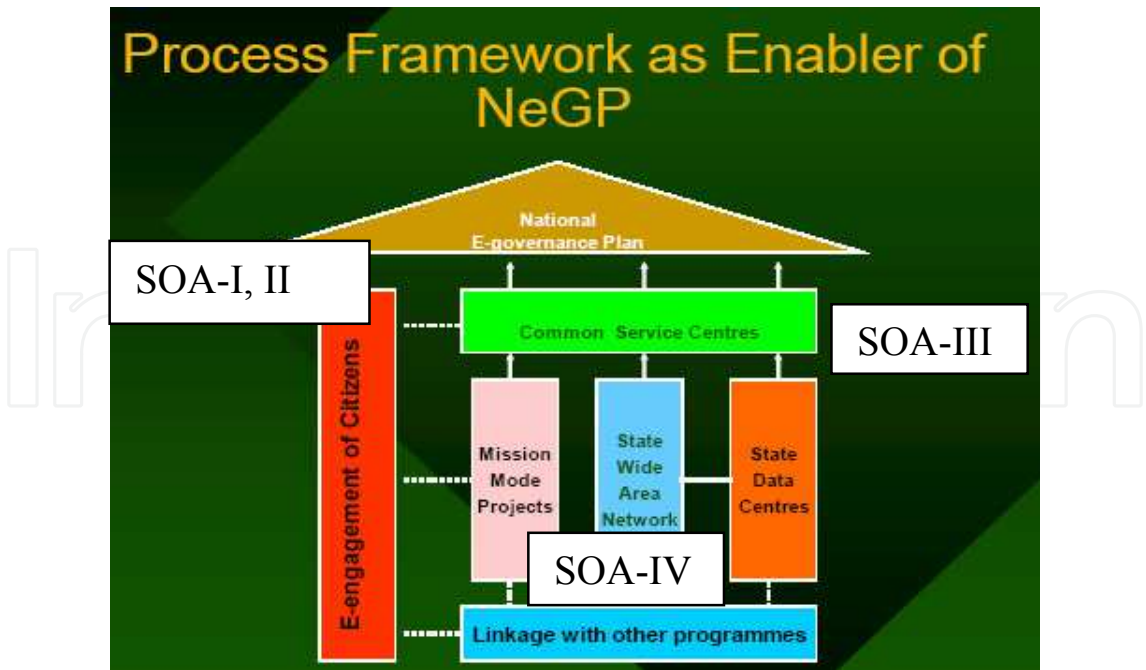


Fig. 6. CSC Implementation Approach (Mishra, 2007; EGovOnline, 2009)

programme is presented in figure 7 and Figure 8. As regards service oriented contents, NeGP recognises the scope for large-scale implementation of application under mission mode projects (MMPs) with emphasis on integrated services. Under NeGP, national level MMPs and state level MMPs are identified for implementation on scale-up mode as presented in Figure 7. Every interested state government is now under a state wide area network (SWAN). Each state is now in the process of having state data centres under the NeGP policy. This endeavour is part of state readiness exercise which is adapted mostly from the global information technology report framework published annually by the World Economic Forum. This assessment commencing in 2003 has provided insight to the performance of states which are placed in six categories: Least Achievers (L1), Below Average Achievers (L2), Average Achievers (L3), Expectants (L4), Aspiring Leaders (L5), and Leaders (L6). The latest rankings of the participating states are given in Figure 8.

5.2 Case of E-Gram¹

E-Gram is a state level e-governance project initiated by state authorities in one of the states in India. The state has commissioned the project to provide services to citizens which include issuing of documents and certificates, application forms for various development and welfare schemes (like record of rights (land records), property registration, vehicle registration, driving license, health care, employment registration and passport). Commercial services include market rates, and distance learning opportunities. It has also helped 10,000 rural entrepreneurs in managing these e-gram centres on commission/incentive/salary basis. Gram Panchayats² are empowered to manage the infrastructure deployed. Gram Panchayat can further offer services like; VSAT communication technology based broadband

¹ 'Gram' is a word in Indian Language and english version is 'Village'

² 'Panchayat' is local body which administratively empowered by Government of India as per PRI Act

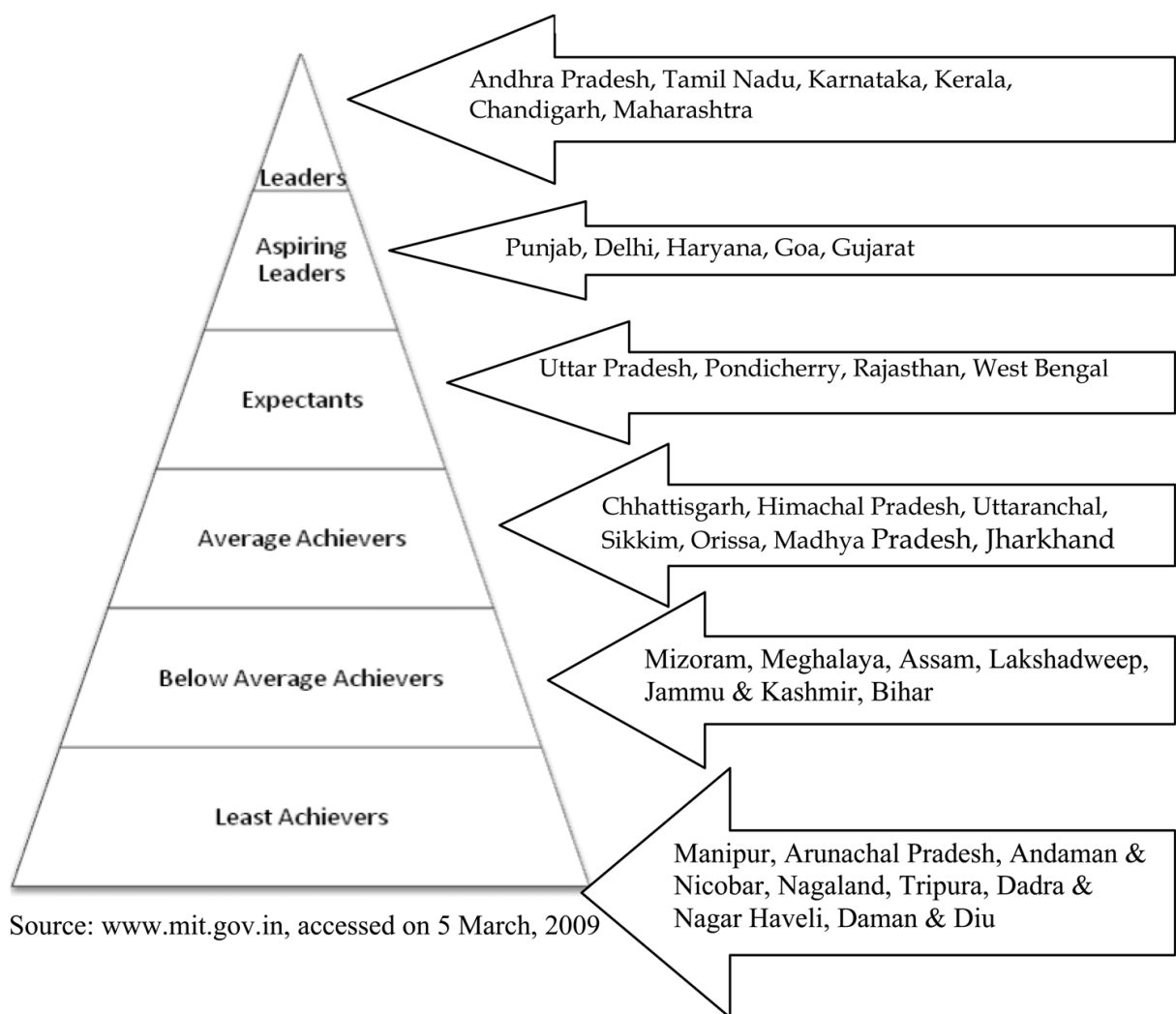


Fig. 7. Status of NeGP

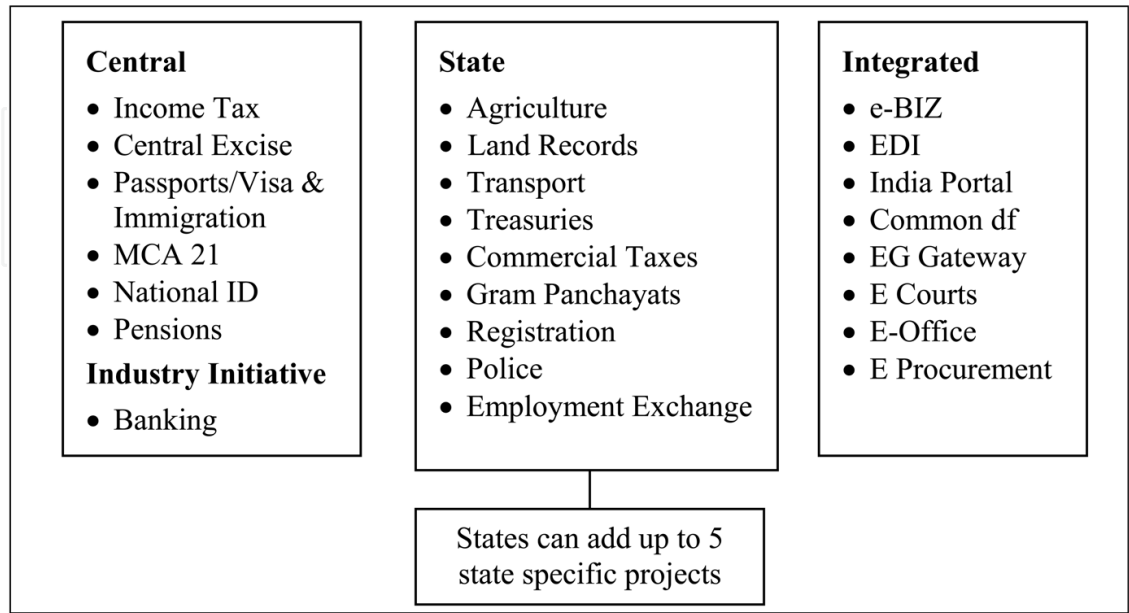


Fig. 8. Status of NeGP driven Projects. Source: www.mit.gov.in, accessed on 5 March, 2009

connectivity; free of cost communication between panchayats; common service centre facility for the villagers. Villagers can also take advantage of internet and cyber services through the establishment of these e-Gram services. This e- Gram would gradually also take other services under its ambit, like electricity and telephone bills, visa, e-Postal services. The technology partners involved in this e-Gram project are Airtel, Gilat, Cisco, IBM, Prodelin and Nokia Siemens Networks. E-Gram covers all 13,693 panchayats of the state (egovIndia, (2009)).

5.3 Case analysis

Two cases discussed in section 5.2 provide an insight to e-government scenarios in India. In the case of NeGP, a national level project covering all the willing states is driven by policy on e-governance. This project having a 'top-driven agenda' intends to deploy mission mode projects covering the entire nation. The next case on e-gram, a state sponsored project

Layer	Layer Description	SOA Component Proposed	Case (NeGP)	Case (E-Gram)
1	Operational Systems	II,III	Available through Mission Mode Application Software (strong for SOA)	Disjoint Application (Weak in SOA)
2	Enterprise Component	IV	Available through Mission Mode Application Software (Strong in SOA)	Service Composition is localised to state government (Weak in SOA)
3	Services	IV	Common Service Centres are on entrepreneurship model. So, multiple services are available (Strong in SOA)	E-Gram is state sponsored. Panchayat is empowered to take decisions on management, not services (Weak in SOA)
4	Business Process Composition	III	Citizens are not included in planning (Weak in SOA)	Citizens are not included in planning (Weak in SOA)
5	Access	I,II	Access point is near to village. (Strong in SOA)	E-Gram is in Local Language and in the panchayat. (Strong in SOA)
6	Integration	III	Services of State Agencies and National Network do not converge (Weak in SOA)	Services of State Agencies and National Network do not converge (Weak in SOA)
7	Quality of Services	I	Broad based Citizen Demand is not planned and captured. (Weak in SOA)	Broad based Citizen Demand is not planned and captured. (Weak in SOA)

Table 3. Case Analyses

provides similar services to the citizens through panchayats and in addition, it extends state services which are otherwise not under the purview of national network under NeGP. The backend services are mostly driven from the state data centres and a backbone network funded through a NeGP. As per SOA model described in section 4 a comparative analyses of both the cases are presented for appreciation. In Table 3 the analyses are discussed.

6. Conclusion

NeGP in India is policy driven project with an aim to spread ICT infrastructure in rural areas, provide converged services to rural citizens and establish the backend data centres to establish the linkage between governance systems. E-Gram initiative, in contrast, is a state sponsored service. SOA architecture based treatment to NeGP and e-Gram services reveal that there is a need to carefully conceptualize and to incorporate all the characteristics of SOA in order to provide citizen centric services. It is far more important that countries like India need to carefully articulate services with active collaboration of the citizens in order to provide good governance systems. In Table 2 it is discussed and noted that both the e-governance projects having sponsorship from national and state governments respectively, these projects lack effort in 'orchestrating', 'composing', 'choreographing', and making the services 'demand driven' from the view points of the citizens. SOA approaches provide a comprehensive view to such projects and provide the necessary tools and appropriate internet technologies to conceptualise, design, develop and implement e-governance services. This paper is carved out of an initial research work done in the areas of SOA for e-governance projects and there is a plan to take the research forward to implement SOA driven software engineering principles and evaluate e-governance efforts in India.

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User Interfaces

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Designing user interfaces nowadays is indispensably important. A well-designed user interface promotes users to complete their everyday tasks in a great extent, particularly users with special needs. Numerous guidelines have already been developed for designing user interfaces but because of the technical development, new challenges appear continuously, various ways of information seeking, publication and transmit evolve. Computers and mobile devices have roles in all walks of life such as in a simple search of the web, or using professional applications or in distance communication between hearing impaired people. It is important that users can apply the interface easily and the technical parts do not distract their attention from their work. Proper design of user interface can prevent users from several inconveniences, for which this book is a great help.

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