Telecom Service Delivery Design Patterns

Atul Jain
135, Rishabh Vihar Delhi 110092 India
+91-11-98119 84678
jain.atul@wipro.com

ABSTRACT
The term service delivery platform refers to an architectural style applied to telecommunication infrastructure problems, intended to enable rapid development and deployment of new converged multimedia services such as video conferencing, multi-party gaming, and triple play services requiring combination of voice, data and video. This paper takes a top-down approach in terms of identifying the key challenges for service delivery at network level and then moves onto the challenges at service node level. In this approach, the paper contributes by identifying a few patterns that address these challenges in a given context. The paper is intended for designers involved in designing telecom service networks as well as telecom applications.

Categories and Subject Descriptors
C.2.1 [**Computer Communication Network**]: Network Architecture and Design – *Network Topology, Wireless Communication.*

General Terms
Management, Design.

Keywords
Service Delivery.

1. INTRODUCTION
In today's rapidly expanding and highly competitive telecom market, the goal of every service provider is to create and bring to market new, highly adaptive and compelling services which will increase revenue and differentiate them from the competition. The role that telecommunications play in the lives of users is expanding "beyond voice" to new multimedia services that allow people to do more than just speak to each other; to utilize sound, text and video in their interactions. Users also want to get access to services such as news, sport, games and music from any place and at any time, on any device, paving way for content and media providers to use telecom networks as an additional distribution channel. As a result, today's telecom networks are fast evolving to deliver multimedia services, which is putting lot of pressure on the transport or delivery network. Service Layer is getting decoupled from the underlying network infrastructure delivering those services leading to a true service oriented architecture approach to service delivery

While networks are evolving to deliver services in a more efficient way, the service creation and deployment environment is also fast changing in order to launch new services rapidly and cost effectively. As telecom operators are expanding their offerings to include content and application providers outside the traditional operator domain, they need service and content delivery infrastructures that support evolving business models as well as interfaces that support the needs of "non telecoms" IT-oriented developers and application providers.

This paper attempts to bring few patterns that are fundamental to the design of evolving service networks.

2. LANGUAGE MAP
Figure 1 show how various patterns work together to define telecom service delivery in a service network.

ACCESS AGNOSTIC SERVICE DELIVERY (1) and SEAMLESS SERVICE DELIVERY WHILE ROAMING (2) suggest how services are delivered in network. SERVICE DELIVERY PLATFORM (3) suggests how services are developed and deployed in the network.

Preliminary versions of these papers were workshopped at Pattern Languages of Programming (PLoP) '07 September 5-8, 2007, Monticello, IL, USA. ISBN:978-1-60558-411-9.

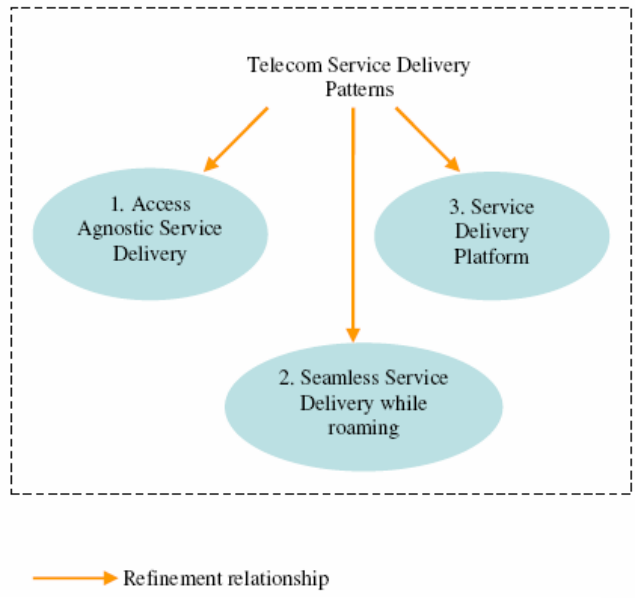

Figure 1. Pattern Language Map

3. GLOSSARY

IMS	IP Multimedia System
P-CSCF	Proxy - Call Session Control Function
S-CSCF	Serving – Call Session Control Function
WLAN	Wireless Local Area Network
MGW	Media Gateway

4. ACCESS AGNOSTIC SERVICE DELIVERY

4.1 Context

Networks that provides services to end user

4.2 Problem

An end user would like to use a service anytime, anywhere while on the move, at home or office and from any device. He should be able to access the same service through the "best" access mode available.

For example while he is at home or office, he would like to use Fixed Line Broadband connection or WLAN to access the service on his laptop, however while he is on the move he would like to use his mobile phone to use the same service.

Different services have different requirements. Some services demand high bandwidths, while some would demand low latency. How should we deliver the same service to the end user irrespective of the characteristics of the access technology or mode of transport chosen by the end user?

4.3 Solution

Built the Service Network using architectures that treat all forms of access technologies such as Mobile access, Fixed line access, Wireless LAN access etc as equals. This can be ensured by having a layered architecture for the core network, comprising of transport/connectivity layer, control layer and service layers. The Service layer should be an independent layer, decoupled from the underlying network layers that support all forms of access technologies whether fixed, mobile or other wireless technologies.

The layered architecture is comprised of following layers

1. The Connectivity Layer or Transport Layer consists of switches and routers that transports voice, data and multimedia information.
2. The Control Layer consists of network control servers for managing call or session set-up, modification and release.
3. The Service Layer consists of application and content servers to execute value-added services for the user.

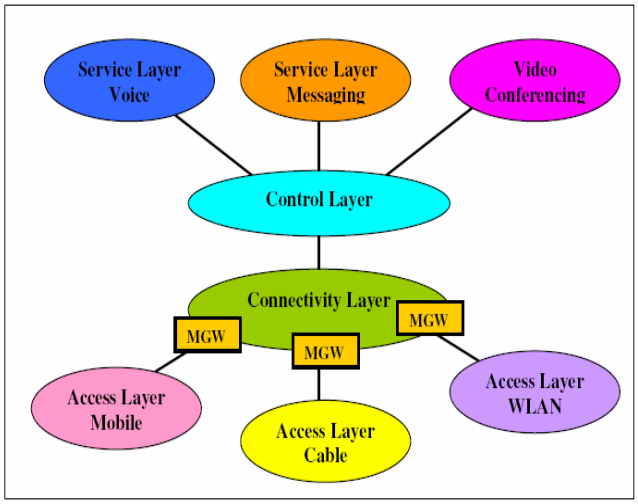

Figure 2. Layered Architecture

The decoupling of the service layer from the access/connectivity layer ensures that the service applications remain totally transparent to the complexity of how the service is getting accessed through the connectivity layer.

A common connectivity and control layer for all access types and service applications ensures that the services can be delivered irrespective of the access type. Additionally, the control and connectivity layers should be access technology aware in order to ensure that the delivered service is adapted to the characteristsic and capabilities of the end users currently selected device as well as access network. For example Access networks such as mobile, cable, WLAN may require a core network adaptation, due to transport or protocol incompatibilities, in the form of elements called media gateways (MGW).

5. SEAMLESS SERVICE DELIVERY WHILE ROAMING

5.1 Context

Networks that provide seamless services to end users, while they are roaming outside their home network

5.2 Problem

The networks can be classified as Home or Visited. From an end user perspective, the network of an operator with whom the end user is registered for his personalized end user does not have any registration relationship and where the end user is temporarily roaming, is referred to as Visited network.

A roaming end user connected to a visited network uses the services provided by the visited network operator, who may not provide the same set of services as offered by home operator. Therefore the end user can't use his personalized services while roaming in other networks.

5.3 Solution

All personalized services of an end user should reside in one network, the home network. The visited network should only provide access and connectivity to the home network for accessing the service. The visited network should provide a proxy function which would serve as a contact point for the end user for accessing his personalized services. The proxy function contacts the serving function residing in end user's home network for accessing the actual service. Proxy function should be capable of identifying the end-user's home network in order to connect to the serving function to setup the service session.

For example In case of IP Multimedia Networks, the service application as well as the session control for a service resides in the Home network. The Serving Call Session Control Function (S-CSCF) is located in the Home network and is responsible for performing the call session control for the specific service. Proxy CSCF (P-CSCF) function is located in the Visited network and is responsible for forwarding the session requests to the Serving CSCF in the Home network. By this means, the end user is able to enjoy all his services while roaming in a visited network.

Moreover, by focusing service execution in the home network, operators who want to deploy new services need not wait for roaming partners to add similar services.

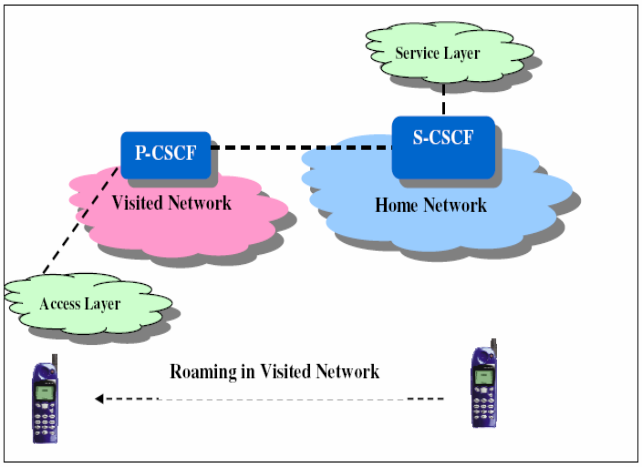

Figure 3. IP Multimedia Network

6. SERVICE DELIVERY PLATFORM

6.1 Context

Environments where service providers require rapid introduction of new services in order to gain competitive advantage and revenue.

6.2 Problem

Services needs to be developed and deployed rapidly as well as managed efficiently. For new service introduction, service providers are dependent on the content providers and application developers to bring new content and applications to its subscribers; however integration of the third party content and applications into service provider's business process as well as the network is complex and time consuming since it requires select set of skills and knowledge of telecom network equipment and telecom protocols. How do we deploy the new service in a simple and efficient manner for a faster time to market?

6.3 Solution

Service Providers should deploy "Service delivery platforms" that provide a more efficient way to create, launch, integrate and manage new services for their end users.

Service Delivery Platform is an open, standards-based framework that helps service providers to create, deploy and deliver new services and applications faster, simpler and at low cost. It provides a service creation environment, service execution environment and an abstraction layer where the complexity of underlying communication network is hidden from the application developers.

Traditionally, services are delivered as vertical 'stovepipe' implementations with each service having its own service specific functionality for charging, provisioning and management. Such deployments involving replicated structures of functionality across the network are very costly and complex to build and maintain.

With the introduction of Service Delivery Platforms, many Service Control functions can be reused for faster service creation and delivery, defining a horizontal architecture where service enablers and common functions can be reused by multiple applications.

A Service Delivery Platform helps to standardize all the service interfaces for a service provider, creating a horizontal platform from which they can provision, control and bill for all the value-added services they provide, whether the services are created by third-party application developers or by the service providers themselves. SDP links a service provider's back end business processes (e.g. provisioning, ordering, billing and customer care) with front-end applications and the underlying network service elements.

7. CONCLUSIONS

In today's highly competitive telecom market, where operators are fast losing revenue due to commoditizing of the traditional voice services, operators are turning to new revenue generating value added services in order to improve their competitiveness. As a result, the mentioned design approaches are being followed over and over again to address the identified challenges. This paper

has attempted to describe some of these approaches in the form of patterns.

While we understand that Service Delivery being a vast field there are many more challenges and concerns than what is stated in this paper, the author intends to address the same in future work.

8. ACKNOWLEDGMENTS

Many thanks to Michael Stal and Brian Foote for helping me through the shepherding process with some very valuable and insightful comments that have greatly helped in improving this paper.