

## **Draft Recommendation ITU-T Y.NGN-SIDE-Req**

### **Requirements for NGN service integration and delivery environment**

#### **Summary**

TBD

#### **Keywords**

TBD

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## Draft Recommendation ITU-T Y.NGN-SIDE-Req

### Requirements for NGN service integration and delivery environment

#### 1 Scope

The objective of this Recommendation is to study requirements and capabilities for a service integration and delivery environment in NGN (NGN-SIDE) in order to support the integration of capabilities from different domains (e.g. telecom (fixed and mobile networks), broadcasting, Internet, etc.) over NGN.

This Recommendation defines requirements, capabilities and service interfaces of NGN-SIDE.

#### 2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- |                |  |
|----------------|--|
| [ITU-T Y.2012] | Recommendation ITU-T Y.2012 (2010), <i>Functional requirements and architecture of the NGN</i> |
| [ITU-T Y.2201] | Recommendation ITU-T Y.2201 (2009), <i>Requirements and capabilities for ITU-T NGN</i>         |
| [ITU-T Y.2234] | Recommendation ITU-T Y.2234 (2008), <i>Open service environment capabilities for NGN</i>       |
| [ITU-T Y.2091] | Recommendation ITU-T Y.2091 (2008), <i>Terms and Definitions for Next Generation Networks</i>  |

#### 3 Definitions

##### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1 application [ITU-T Y.2261]:** A structured set of capabilities, which provide value-added functionality supported by one or more services, which may be supported by an API interface.

*Editor's Note: This definition needs further review.*

**3.1.2 application programming interface [ITU-T I.312]:** An API provides a set of interfaces from an application environment to an execution environment. The execution environment provides services to the application environment.

*Editor's Note: This definition needs further review.*

**3.1.3 application network interface [ITU-T Y.2012]:** Interface which provides a channel for interactions and exchanges between applications and NGN elements. The ANI offers capabilities and resources needed for the realization of applications.

**3.1.4 functional architecture [ITU-T Y.2012]:** A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

**3.1.5 Functional entity [ITU-T Y.2012]:** An entity that comprises an indivisible set of specific functions. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

**3.1.6 next generation network (NGN) [ITU-T Y.2001]:** A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

**3.1.7 NGN service stratum [ITU-T Y.2011]:** That part of the NGN which provides the user functions that transfer service-related data and the functions that control and manage service resources and network services to enable user services and applications.

**3.1.8 NGN transport stratum [ITU-T Y.2011]:** That part of the NGN which provides the user functions that transfer data and the functions that control and manage transport resources to carry such data between terminating entities.

## **3.2 Terms defined in this Recommendation**

This Recommendation defines the following terms:

### **3.2.1 NGN service integration and delivery environment (NGN-SIDE)**

The NGN Service integration and delivery environment provides an open environment in NGN, which offers support for a diverse group of application developers and service providers. The environment supports the integration of capabilities from different domains (e.g. Telecom (Fixed and Mobile Networks), Internet, Broadcasting etc.) over NGN. Key features of this environment include service creation, service execution, service provision, service management, resource management, content management, and data management.

*Editor's note: this definition needs further elaboration, including alignment with the content of the document.*

### **3.2.2 Service brokering**

Service brokering manages the interaction among all available service enablers, simple or composed applications over NGN and services offered by Non-NGN. Service brokering identifies the appropriate capabilities and applications based on user's request and mediates among them.

*Editor's note: this definition needs further elaboration.*

### **3.2.3 Capability**

*Editor's note: the need of this definition as well as its content is not agreed and requires further discussion.*

Capability is any encapsulated resource to be reused by applications.

NOTE: The capabilities offered by NGN can be physical and soft resources. The physical resources offered by NGN include connection resources, storage resources and computing resources. The soft

resources offered by NGN include the service enablers specified in [ITU-T Y.2201]. The capabilities offered by Non-NGN include services and contents.

#### **4 Abbreviations and Acronyms**

*To be completed.*

This Recommendation uses the following abbreviations and acronyms:

3GPP	3rd Generation Partnership Project
ANI	Application Network Interface
API	Application Programming Interface
CaaS	Communications as a Service
GSMA	GSM (Global System for Mobile communications) Association
IaaS	Infrastructure as a Service
IMS	IP Multimedia Subsystem
IN	Intelligent Network
ISDN	Integrated Services Digital Network
IT	Information Technology
IP	Internet Protocol
IPTV	IP Television
NGN	Next Generation Network
NGN-SIDE	NGN Service Integration & Delivery Environment
NGSI	Next Generation Service Interface
NNI	Network Network Interface
OMA	Open Mobile Alliance
OSA	Open Service Access
OSE	Open Service Environment
PaaS	Platform as a Service
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
QoS	Quality of Service
QoE	Quality of Experience
REST	Representational State Transfer
SaaS	Software as a Service
SLA	Service Level Agreement
SNI	Service Network Interface
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
UI	User Interface
UNI	User Network Interface
URL	Uniform Resource Locator

XaaS	Everything as a Service
XML	Extensible Markup Language

## **5 Conventions**

In this Recommendation:

The keywords “is required to” indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords “is recommended” indicate a requirement which is recommended but which is not absolutely required. Thus this requirement needs not be present to claim conformance.

The keywords “can optionally” indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor’s implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

## **6 Overview of NGN-SIDE**

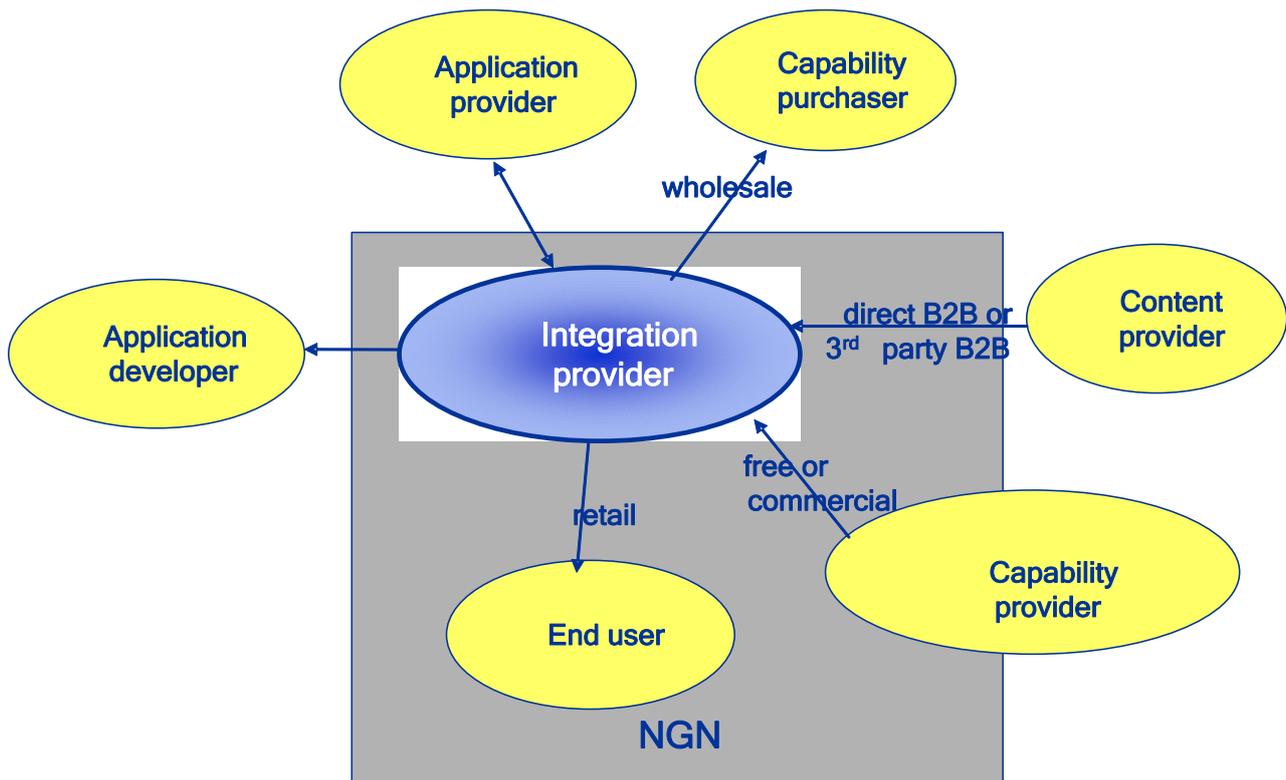
### **6.1 NGN-SIDE business model overview**

*Editor’s note: Other material for further consideration for this clause is contained in Appendix IV.1.*

The NGN Service Integration and Delivery Environment aims to support an ecosystem for all the stakeholders in the NGN value chain.

Figure 1 shows the key roles involved in the NGN-SIDE ecosystem and the business relationships among them.

*Editor’s note: figure 1 needs detailed review (completeness of information, alignment with the following text on roles).*



**Figure 1 - Business role relationships in the NGN-SIDE ecosystem**

*Editor's note: the following text on business roles needs detailed review as well as its alignment with the details of figure 1.*

For service integration and delivery environment, the following roles are considered:

- Application provider: the role that is responsible for providing application(s) to consumers associated with a subscription as a result of commercial agreements.
- Capability provider: the role that is responsible for providing exposed capabilities to facilitate the creation of new applications.
- Capability purchaser: the role whom the Integration provider wholesales capabilities to and which is linked with a commercial agreement to the Integration provider.
- End user: the end user of application(s).
- *Editor's note: It is needed to discuss further if this document addresses only end users of NGN or also end users of other network domains (e.g. Internet). Current figure 1 intends to depict only the case of end users of NGN.*
- Content provider: the role that is responsible for providing content to the principals whom it is contracted with in order to provide access to content and subscribed users.
- Application developer: the role who uses the exposed capabilities provided by NGN-SIDE to create new applications.
- Integration provider: the role who provides the service integration and delivery infrastructure to all the stakeholders in NGN-SIDE ecosystem.

*Editor's note: the text below related to NGN-SIDE actors needs to be revisited and a figure could help to discuss that. It is also to consider if it is appropriate to have content on NGN-SIDE actors in this document.*

The following identifies the different actors in the NGN-SIDE ecosystem:

- An NGN provider can act as application provider (for in-house applications) and/or capability provider and/or integration provider.
- The NGN-SIDE provider acts as integration provider.
- A 3<sup>rd</sup> party application provider acts as application provider (for third party applications) distinct from NGN provider and application developer.
- A 3<sup>rd</sup> party capability provider acts as capability provider distinct from NGN provider and content provider.
- A 3<sup>rd</sup> party capability purchaser acts as capability purchaser and purchase capabilities from NGN-SIDE provider.
- A content provider acts as content provider and provides content in various formats. It is expected the 3<sup>rd</sup> party application provider or 3<sup>rd</sup> party capability purchaser have a commercial agreement with the content provider in order to have access to its content.
- A consumer acts as end user or application developer (for user generated applications).

## 6.2 NGN-SIDE functional framework

Figure 2 shows a functional framework for NGN-SIDE

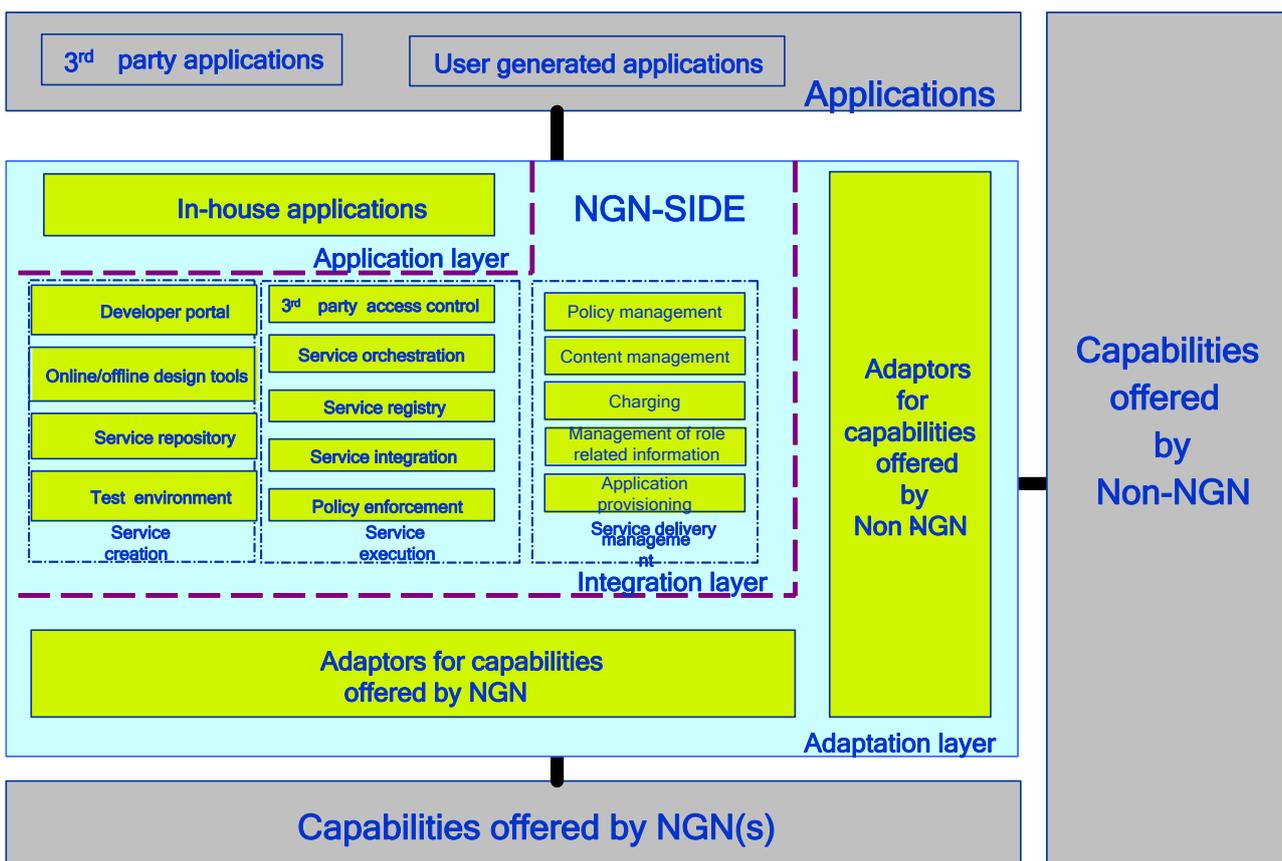


Figure 2 - NGN-SIDE functional framework

*Editor's notes: need of distinction between 3rd party applications and user generated applications requires further discussion;*

NGN-SIDE provides access to capabilities offered by NGN provider and 3rd party provider. NGN-SIDE can be viewed as composed by three layers as follows:

- Application layer,
- Integration layer,
- Adaptation layer.

### **Application layer**

The application layer supports in-house applications. In-house applications may directly interact with the capabilities of NGN or 3rd parties.

### **Integration layer**

*Editor's notes: The functionalities related to virtualization of network resources are FFS (e.g. resource management, etc).*

For 3rd party applications and user generated applications, in order to reduce the complexity of service provision, the NGN-SIDE integration layer provides a unified way to access the capabilities offered by NGN and Non-NGN.

The integration layer's basic functionalities include 3rd party access control, service orchestration, service integration, service registry and service delivery support *Editor's note: previous sentence needs to be reviewed*. These functionalities can be viewed according to the following functional groups: service creation functional group, service execution functional group and service delivery management functional group.

Service creation functional modules include:

- The application developer portal which is responsible for providing application developers' access to discover the capabilities, get technical support and publish their applications.
- The online/offline design tools which are responsible for service composition according to the application logic, content aggregation, and user interface (UI) design.
- The service repository which is responsible for providing all capability information, reusable to develop new applications.
- The test environment which is responsible for providing an application simulation and testing environment to verify if a new application can work correctly.

Service execution functional modules include:

- The third party access control which provides third party applications and user generated applications with controlled and managed access, via exposure of a standard interface, to the capabilities offered by NGN and non-NGN.
- The service integration which provides routing of service requests/responses from/to applications based on service registry information. It also performs integration and interoperability of the different capabilities from NGN and non-NGN via appropriate media and protocol transformations. It also performs integration in terms of load balancing, QoS etc.
- The service orchestration which is responsible for service composition according to the application logic.
- The policy enforcement which provides policy-based access, capability consumption and traffic control functions according to the Service Level Agreements (SLAs) between

consumer and provider of the capabilities. *Editor's note: this text is identical to "policy management" related text below.*

- The service registry which provides the mechanisms to register and discover services, and to ensure service governance. Services are registered and published at this registry, which maintains a catalogue of the services available, including all the relevant information for service execution like data element definitions, message and service definitions, routing information, etc. At run-time, the service registry is accessed by applications to locate and bind the services. *Editor's note: "service governance" needs to be described.*

The service delivery management is the infrastructure for application provisioning and deployment, and provides the following fundamental capabilities to in-house applications, 3rd party applications and user generated applications.

Service delivery management functional modules include:

*Editor's notes: All following bullets should be further reviewed in detail.*

- The policy management which provides policy-based access, capability consumption and traffic control functions according to the policy contract between consumer and capability/service provider. *Editor's note: this text is identical to the above "Policy enforcement" related text.*
- The management of role related information which provides centralized and harmonized access, and management (i.e. add, modify, delete operations) of information (e.g. preference profiles, user-application provider subscription relationship, capability purchaser-capability provider relationship etc.) related to the different NGN-SIDE roles. The management of role related information can optionally store some specific role related information.
- The content management which provides the mechanisms to manage content to be accessed by users.
- The charging functional module which provides control and charging (online and offline) of all charging events for all *subscribers and customers (third parties, partners, etc.)*.
- The application provisioning which provides application life-cycle management, application version management and application monitoring functions.

### **Adaptation layer**

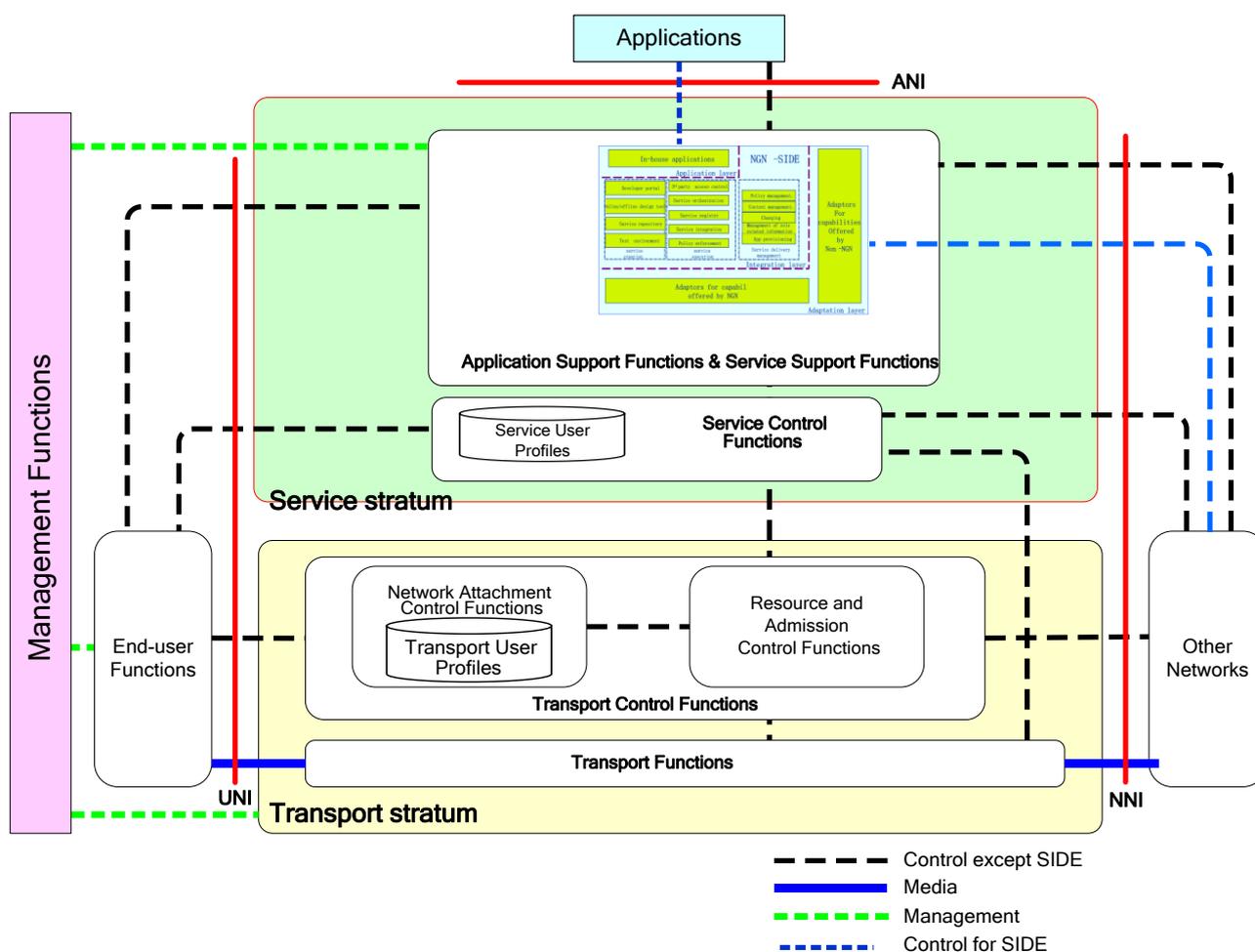
The adaptation layer performs adaptation, including control protocol and media format adaptation, to access capabilities from NGN and Non-NGN. These capabilities can be specific network functions, enablers or external service delivery platforms. *Editor's note: previous sentence should be reviewed.*

The adaption layer also performs the brokering among the multiple capabilities from NGN and Non-NGN. *Editor's note: what is "brokering" should be clarified (some initial input for further consideration is given in C359 from Sept 09 SG13 meeting). Also, clause 3 provides an initial text for brokering definition.*

### **6.3 NGN-SIDE positioning within the NGN reference architecture**

*Editor's note: repositioning of this clause should be considered (to follow clause 7?)*

Figure 3 is an extension of Figure 1 in [ITU-T Y.2012]. It shows an extended NGN architecture enabling support of service integration and delivery environment capabilities.



**Figure 3 - NGN-SIDE positioning within the NGN reference architecture**

*Editor's note: above figure will have to be updated according to the updated figure in Y.2012 Rev.1*

The functional group identified as “NGN-SIDE” in Figure 3 provides a service integration and delivery environment for NGN and enables NGN applications to implement enhanced services that make use of NGN and 3rd party capabilities across different domains. The NGN-SIDE also provides a uniform way for 3rd parties and end users to make use of capabilities exposed by SIDE. The NGN-SIDE functional components are positioned inside the application support functions and service support functions of the NGN service stratum.

“Control for SIDE” in Figure 3 represents the control level interfaces between NGN-SIDE and relevant entities.

The “control for SIDE” interface between applications and NGN-SIDE represents the interface exposed by NGN-SIDE to 3rd parties and end users. The “control for SIDE” interface between NGN-SIDE and other networks represents the interface for NGN-SIDE to access 3rd party capabilities. *Editor's note: it's for further discussion where is positioned the (single?, new ?) control for SIDE interface between NGN-SIDE and NGN capabilities.*

NOTE: This document assumes one single NGN-SIDE per each NGN deployment.

*Editor's note: the differences (and correspondences) between NGN-SIDE and NGN OSE, and NGN-SIDE versus NGN OSE positioning, are for further discussion (E.g. NGN-SIDE service orchestration versus NGN OSE service composition, etc.). Material for further consideration about these aspects is contained in Appendix IV.3.*

*Editor's note: The relationship between NGN IDM capabilities and NGN-SIDE IDM capabilities should be clarified.*

## **7 NGN-SIDE general requirements**

This clause describes the NGN-SIDE general requirements.

The following is a basic principle which NGN-SIDE is required to follow:

NGN-SIDE is required to allow the storage of acquired specialized knowledge on different domains (e.g. telecommunications, Internet, Broadcast, cable systems, etc), related to development, operation and maintenance aspects, as well as be a development environment based on information sharing, to ensure that those facilities, systems and/or services created can be improved according to best practice. *Editor's note: text of previous paragraph requires further clarification in terms of terminology and objectives.*

The general requirements for the NGN service integration and delivery environment are:

- Support the exposure of underlying capabilities:

*Editor's note: the following two requirements need further discussion (in particular on "which" NGN service enablers and "which" NGN capabilities are actually required to be exposed, and on the strength (required, recommended, optional) of these requirements)).*

- NGN-SIDE is required to support exposure of NGN service enablers as specified in [Y.2201]. NOTE: NGN service enablers as specified in [Y.2201] include group management, personal information management, message handling, presence, location management, push, device management, session handling, context awareness etc.
- NGN-SIDE is required to support exposure of *part of* NGN capabilities as specified in [Y.2201]. NOTE: NGN capabilities as specified in [Y.2201] include identification and security, profile (user profile and device profile) management, media handling, accounting and charging, etc.

NOTE: As an example, 3<sup>rd</sup> party CPs/SPs or individual developers may use the NGN capabilities (including service enablers) exposed by NGN-SIDE instead of deploying these capabilities themselves. *Editor's note: "3<sup>rd</sup> party CPs/SPs" needs clarification, including acronyms.*

- NGN-SIDE is required to support exposure of virtualized network resources of NGN including connections, storages and computing.

*Editor's note: The strength of the "exposure of virtualized network resources of NGN" requirement is FFS.*

- NGN-SIDE is recommended to support exposure of simple or composed applications and services (including legacy services) over NGN.

*Editor's note: above requirement is, in the intention of the authors, related to the adaptation layer for 3rd parties. It needs clarification based on agreements for the functional framework.*

*Editor's note: "legacy" services may be legacy to different communities; legacy services may be also provided by the NGN (e.g. PSTN/ISDN emulation) or via gateways accessing other environments (such as IN services).*

- NGN-SIDE is recommended to support exposure of services (including legacy services) offered by Non-NGN.

- NGN-SIDE is recommended to support exposure of contents offered by content providers.
- Support accessing the NGN capabilities and simple or composed applications and services (including legacy services) in a secure and controllable way;
- Support brokering the NGN capabilities, and simple or composed applications and services (including legacy services) in a secure and controllable way:
  - The service brokering is required to manage interactions among all available service enablers, simple or composed applications over NGN and services offered by Non-NGN.
  - The service brokering is required to be flexible enough to support the potential interaction requirements of new applications.
  - The service brokering is required to be efficient enough to avoid unnecessary interactions.
  - The service brokering is required to allow end users to personalize and control how applications work together when there are multiple available choices of service integration.

*Editor's note: "brokering" definition needs to be finalized (including relationship with NGN capabilities, 3<sup>rd</sup> party capabilities, applications and services) and brokering aspects need to be positioned in the functional framework.*

*Editor's note: above requirement is, in the intention of the authors, related to both adaptation layer and integration layer. It needs clarification based on agreements for the functional framework.*

- Provide an open environment for the integration of capabilities from different domains (e.g. NGN, Fixed Networks (e.g. PSTN/ISDN), Mobile Networks (e.g. PLMN), Internet, Broadcast Networks (e.g. Cable Networks), etc.):
  - NGN-SIDE is required to support integration of capabilities from the same operation domain.
  - NGN-SIDE is recommended to support integration of capabilities from different operation domains.

*Editor's note: "operation domain" needs to be clarified as well as the value of differentiating requirements for same and different operators or administrative boundaries (e.g. regulatory issues across countries). Use cases would be useful (in particular, on the level of integration among different operation domains).*
  - NGN-SIDE is recommended to support orchestration of internal capabilities supplied by the NGN-SIDE provider and external registered services from other domains.
  - NGN-SIDE is required to provide a standardized mechanism (e.g. common message structure, media format) to access the capabilities located in different domains.
  - NGN-SIDE is recommended to provide an abstract standardized description of capabilities.
  - NGN-SIDE is required to provide a mapping between common message structure and corresponding capabilities located in different domains for a particular service.

- Support customers' personalized services (e.g. customized configuration (such as language, location, presence etc.), service mashup customization);
- Support an agile service creation environment:
  - NGN-SIDE is required to use standardized description of capabilities within the NGN-SIDE environment in a unified way.
  - NGN-SIDE is required to support at least one standardized description language for service logic.
  - NGN-SIDE is required to support mechanisms to notify developers about availability of new or updated capabilities.
  - NGN-SIDE is required to support application testing capabilities for developers.  
*Editor's note: this requirement needs alignment with the test environment module capabilities inside NGN-SIDE service creation.*
  - NGN-SIDE is required to provide a single access point for accessing the capabilities exposed by NGN-SIDE despite of the capability location (e.g. their physical addresses).  
*Editor's note: this requirement needs further clarification (single access point).*
- Support service integration as follows: *Editor's note: more explanatory text for on-premise (and on-demand – see 8.1.2) service integration is needed.*
  - NGN-SIDE is required to support on-premise service integration according to the *pre-load* service logic.
  - NGN-SIDE is required to support a mechanism to select the appropriate capability responding to dynamic information changes such as user's context, network devices' load and topology.
  - NGN-SIDE is recommended to provide dynamic adaptation according to the change of terminal/application server/network environment. *Editor's note: Clarification of the terms used here should be further considered (adaptation (e.g. codec and media format adaptation, network environment etc.).*
  - NGN-SIDE is required to support a mechanism to generate a *composition sequence* to meet the user's demand (e.g. the lowest cost, the shortest execution duration).
  - NGN-SIDE is required to support a mechanism for adaptive composition to ensure the application's reliability when it occurs that some capabilities are not available (e.g. the capability hosting device is power off or its connection is broken).
- Support a configurable, manageable, scalable, reliable and virtualizable service execution environment:
  - For manageability and configurability aspects: NGN-SIDE is required to support traffic control related functions based on applications' SLAs to ensure the authorized invocation of capabilities offered by NGN or Non-NGN.
  - For manageability aspects: NGN-SIDE is required to support monitoring functions for network resources of NGN and NGN service enablers, e.g. monitoring of capabilities' availability, devices' overload, network congestion level etc. *Editor's note: "network resources of NGN" needs further elaboration (e.g. which are the different types of network resources).*
  - For scalability and reliability aspects: NGN-SIDE is required to provide functions for application execution's scalability and reliability.

- For virtualization aspects: NGN-SIDE is required to support virtualization mechanisms to share the network resources of NGN over NGN. *Editor's note: virtualization objectives and value need further discussion.*
- Provide mechanisms for application provisioning, addressing and routing:
  - NGN-SIDE is required to provide the capability to publish an application supported by NGN-SIDE in the various domains accessible by NGN-SIDE (e.g. publishing a domain name in internet, assigning a special access number (e.g. E.164) in telecom domain etc.).
  - NGN-SIDE is required to provide a standard way for application addressing (e.g. URL, E.164).
  - NGN-SIDE is required to provide a mechanism to establish paths to route requests to applications.
- Provide mechanisms for capability registration, discovery and routing:
  - NGN-SIDE is required to provide a mechanism for capability registration, including a standard language to describe the capabilities, a unique identification of the capabilities, a capability addressing mechanism.
  - NGN-SIDE is required to provide a routing mechanism to locate the required capabilities and establish a path to access the capabilities.
  - NGN-SIDE is required to provide a mechanism for SLA control of capabilities, including authentication, authorization and traffic control.
- Provide real-time media and static content storage, caching, processing and control mechanisms:
  - NGN-SIDE is required to provide real-time media recording, processing (e.g. transcoding, encryption, decryption, Digital Right Management (DRM), etc.).
  - NGN-SIDE is required to provide real-time media delivery within NGN-SIDE.
  - NGN-SIDE is required to provide static content storage, caching, adaptation (e.g. codec conversion, format conversion, etc.).
  - NGN-SIDE is required to provide static content delivery (e.g. set up a content transfer channel, content split and reorganization, etc.) within NGN-SIDE.
  - NGN-SIDE is required to support media streaming mechanisms.

*Editor's note: The above requirements in this bullet related to content storage, delivery, adaptation and media streaming need further discussion, e.g. whether they should be functionalities of NGN-SIDE or of underlying networks (e.g. NGN).*
- Support backward compatibility with existing systems and implementations: *Editor's note: the following text of this bullet needs further refinement.*
  - NGN-SIDE is required to ensure that the development of systems and functionalities related to accounting, network management, provisioning and customer management aspects are compatible with legacy systems. *Editor's note: "legacy systems" should be clarified.*
  - NGN-SIDE *must not* impose any restrictions to current development architectures and platforms.

*Editor's note: Possible repositioning of the following two requirements needs consideration.*

- NGN-SIDE is required to develop an open environment in such a way to provide incentive for the creation of new development platforms;
- NGN-SIDE is required to support the development of functionalities, services, and/or systems that are reliable, scalable and have standard and interoperable interfaces between different implementations;

NGN-SIDE is required to support the following security requirements: *To be completed*

*Editor's note: contributions are invited to provide requirements on the various security aspects, such as end user's security levels, service security levels, applications' security, service data trace back etc.*

*Editor's note: contributions are invited to consider caching requirements of NGN-SIDE.*

*Editor's note: The Sept 09 Q3 meeting agreed to remove the distinction between clause 7.1 and clause 7.2 being difficult to define the meaning of traditional (IT) SOA (as discussed in C360). The implementation of this agreement will be executed at the April 2010 meeting, and related requirements will be moved, as necessary, to the high level requirements clause.*

*With respect to the initial intention of distinguishing between requirements supported and not supported by traditional (IT) SOA, this should still be taken into consideration in further study.*

### **7.1 NGN-SIDE requirements supported by traditional (IT) SOA**

The NGN service integration and delivery environment is required to offer SOA-based service integration capabilities in order to provide a single access point to the NGN capabilities:

- NGN-SIDE is required to provide third party application access control to the NGN capabilities;
- NGN-SIDE is required to provide integration of capabilities providing integration and interoperability of the different elements in the SOA-based integration. Applications access the underlying capabilities exposed as SOA services through the NGN-SIDE integration layer. The NGN-SIDE integration layer is required to include transport and routing of messages between service consumers and service providers, message and protocol transformations, handling of business events, etc. *Editor's note: text in this bullet point has not been reviewed.*
- NGN-SIDE is required to provide adaptation capabilities to shield the details of underlying network and to expose uniform SOA service interface.

### **7.2 NGN-SIDE requirements not supported by traditional (IT) SOA**

The NGN service integration and delivery environment is required to offer non-SOA based service integration capabilities in order to provide an efficient access to the NGN capabilities:

- NGN-SIDE is required to provide mechanisms to support direct access of applications to the NGN capabilities using NGN protocols.

## **8 NGN-SIDE capabilities**

### **8.1 Generic set of NGN-SIDE capabilities**

#### **8.1.1 Service registry**

*Editor's note: The title needs further consideration as well as the splitting of the functionalities in this clause.*

This capability provides the functionalities related to the registration/deregistration, discovery, negotiation, reliable detection and governance of capabilities offered by NGN and Non-NGN. *Editor's note: This clause needs to contain the descriptions for all the functionalities.*

This capability defines a mechanism for a capability to register to NGN-SIDE, so that can be used by the developers to create applications.

When *the information* is changed, the service registry capability is responsible for informing all the developers and the application running instances.

When there is a capability deregistration request, the service registry capability is required to ensure the application running instances' reliability.

The service registry capability implements a selection mechanism to choose an appropriate capability based on the dynamic information, such as user's context, network devices load and topology. *Editor's note: it is needed clarification on QoS, static information, dynamic information in general. Need also to harmonize with the NOTE below and to consider a possible link with the "capability" definition in clause 3.*

The service registry capability is in charge of all capabilities' reliable detection and *status*.

NOTE: the information of a capability includes static and dynamic information, mainly, but not limited to, the address, identifier (ID), name, binding address, *state* and QoS. *Editor's note: need to consider a possible link of this NOTE with the "capability" definition in clause 3.*

### **8.1.2 Service orchestration**

*Editor's note: The title needs further consideration as well as the splitting of the functionalities in this clause.*

This capability is responsible for service composition according to the application logic.

It is required to support the on-premise and on-demand service integration. For the on-premise service integration, service orchestration is required to parse the application logic and execute according to the pre-load sequence to perform the application. For the on-demand service integration, this capability is required to use the user's requirement, calculate and generate a service execution sequence, and organize to accomplish the user's demand.

## **8.2 Application-specific NGN-SIDE capability sets**

### **8.3 NGN-SIDE capabilities specific to integration**

*Editor's note: following text requires further discussion. In particular, it is required to clarify why different applications impose different requirements on the NGN-SIDE supported models.*

NGN-SIDE is recommended to:

- use a SOAP-based model for the integration of 3<sup>rd</sup> party applications;
- use a REST-based model for the integration of user generated applications.

NGN-SIDE can optionally:

- use a SOAP-based model for the integration of user generated applications;
- use a REST-based model for the integration of 3<sup>rd</sup> party applications;
- use proprietary approaches for the integration of in-house applications.

## **8.4 Relationship of NGN-SIDE capabilities with [ITU-T Y.2201] capabilities**

## 8.5 Relationship of NGN-SIDE capabilities with NGN-SIDE framework

### 8.6 Capability adaptation in NGN-SIDE

*Editor's note: positioning of this clause (and sub-clauses) is for further discussion.*

NGN-SIDE requires interaction with NGN and Non-NGN capabilities to implement the diverse requirements from third parties, CPs, SPs, consumers etc.

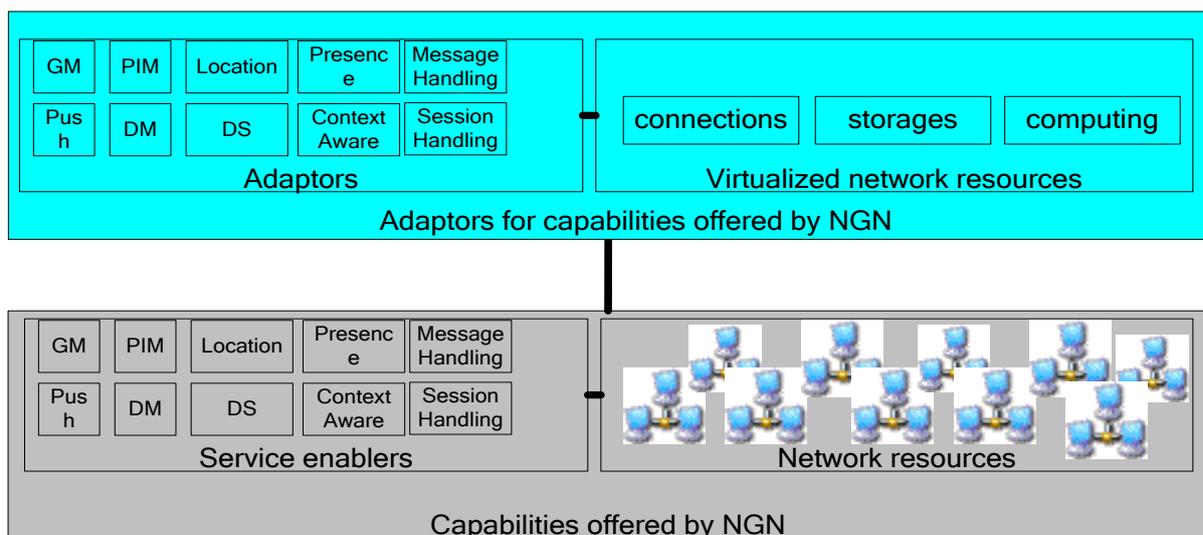
The service control protocols in NGN and non-NGN may vary based on the underlying technology and this makes difficult for the developers to create new services based on such a multiple and complex protocol underlying system.

The adaptation layer is required to adapt the service logic, service control and protocols used by NGN and Non-NGN, to provide a uniform control and data format to access to the NGN-SIDE integration layer.

#### 8.6.1 Adaptation of capabilities offered by NGN

Figure 4 shows the adaptation of capabilities offered by NGN.

*Editor's Note: The following figure doesn't show an exhaustive list of enablers, it is rather an example.*



**Figure 4 - Adaptation of capabilities offered by NGN**

The capabilities offered by NGN can be abstracted in two types: network resources, services enablers,

*Editor's note: Above classification (as well as figure 4) and clause 7 classification should match (clause 7 classifies capabilities as: a) service enablers, b) NGN capabilities, c) virtualized network resources).*

The network resources may be abstracted into connections, storages and computing. *Editor's note: the previous sentence needs further elaboration.*

The service enablers, as specified in [Y.2201], include:

- Group management
- Personal information management

- Message handling
- Presence
- Location Management
- Push
- Session Handling
- Data synchronization
- Context awareness
- Device management

The NGN-SIDE is recommended to support via abstraction all these service enablers.

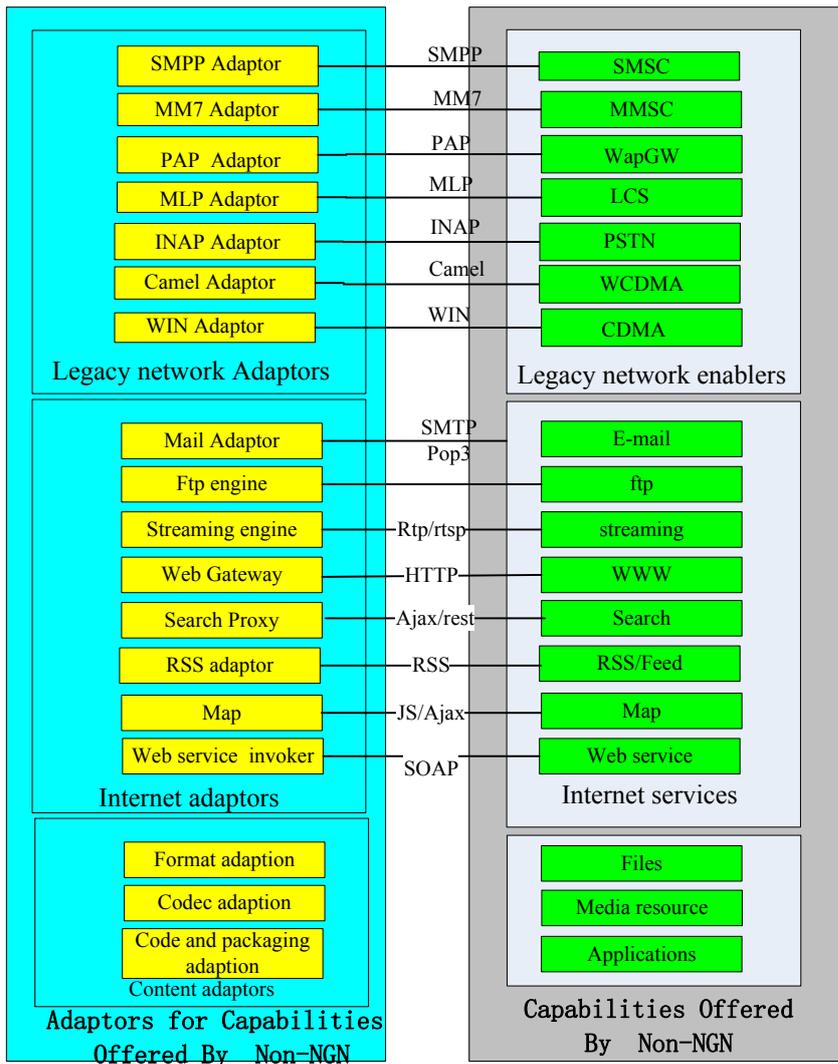
From the NGN-SIDE point of view, all these abstracted service enablers can optionally use the virtualized network resources.

The virtualized network resources can also be exposed to 3rd parties to host 3rd party services.

*Editor's note: positioning of the previous two sentences should be reviewed.*

### **8.6.2 Adaptation of capabilities offered by non-NGN**

Figure 5 shows the paradigm of realization and adaptation of capabilities offered by Non-NGN.



**Figure 5 - Adaptation of capabilities offered by Non-NGN**

*Editor's note: above figure requires further discussion (including its presentation) and alignment with the text below until the end of the clause. Also, all retained acronyms need to be included in clause 3.*

NGN-SIDE is required to support the adaptation with legacy network capabilities, internet capabilities and content.

a) To support capabilities from legacy networks, legacy network adaptors to be considered with respect to protocol translation *Editor's note: the word 'translation' needs further discussion* are as follows:

*Editor's note: As each protocol has different versions, to avoid complexity, it is for consideration to have adaptors per interface/protocol (e.g. a SMPP adaptor, a MM7 adaptor, etc.).*

*Editor's note: contributions are invited with respect to which legacy network adaptors are required for the NGN.*

*Editor's note: references of all acronyms need to be provided.*

- SMPP protocol translation to access to SMSC
- MM7 protocol translation to access to MMSC

- MLP protocol translation to access to LSC
  - PAP protocol translation to access to WAP Gateway
  - INAP protocol translation to access to PSTN
  - WIN protocol translation to access to CDMA based network
  - CAMEL protocol translation to access to WCDMA based network
- b) Capabilities from internet can be abstracted into the following adaptors:
- Mail adaptor
  - FTP engine adaptor
  - Streaming service adaptor
  - Web gateway adaptor
  - Search proxy adaptor
  - RSS adaptor
  - Map service adaptor
  - Web service gateway adaptor.
- c) Content adaptation can be realized via different adaptors, which include support of format adaptation, codec adaptation, and code and packaging adaptation:
- format adaptation provides data conversion from one coding format to another one as per context (e.g. binary coding to text coding etc.).
  - codec adaptation provides media translation from one codec format to another one (e.g. G.711 codec format to G.729 codec format).
  - code and packaging adaptation provides file and packaging format adaptation (e.g. bitmap to gif, rar to zip etc.).

### **8.7 Realization of XaaS service provision models in NGN-SIDE**

*Editor's note: It is for further study to provide text and link this clause with the XaaS related Appendix V.*

## **9 Requirements of NGN-SIDE capabilities**

*Editor's note: The service interface requirements to expose capabilities to a capability purchaser as wholesale are FFS.*

### **9.1 General requirements of NGN-SIDE capabilities**

#### **9.2 Service interface requirements across ANI (Telecom APIs)**

The NGN-SIDE is required to expose interfaces to 3<sup>rd</sup> party applications.

*Editor's note: Contributions are invited for description of these ANI requirements.*

*Editor's note: Consideration of the APIs listed in Appendix II is FFS.*

### **9.3 Service interface requirements within NGN-SIDE**

*Editor's note: this is related to open service interfaces among different components of NGN-SIDE.*

*Editor's note: Contributions are invited for description of these NGN-SIDE internal requirements.*

*Editor's note: Consideration of the APIs listed in Appendix II is FFS.*

### **9.4 Service interface requirements across UNI**

*Editor's note: These requirements deal with the User equipment-NGN-SIDE interface for applications whose service logic is (partially) located in User Functions (e.g. User generated Applications)*

*Editor's note: Contributions are invited for description of these UNI requirements.*

*Editor's note: Consideration of the APIs listed in Appendix II is FFS.*

### **9.5 Service interface requirements across NNI**

The NGN service integration and delivery environment is required to provide:

- Interface between different NGN-SIDEs located in different NGN domains (e.g. between NGN-SIDEs of two different NGN providers);
- Interface between NGN-SIDE and Non-NGNs (e.g. between NGN-SIDE and a Web service platform, NGN-SIDE and H.323 networks, etc.).

*Editor's note: Contributions are invited for description of these NNI requirements.*

*Editor's note: Consideration of the APIs listed in Appendix II is FFS.*

### **9.6 Service interface requirements across SNI**

*Editor's note: Contributions are invited for description of these SNI requirements.*

*Editor's note: Consideration of the APIs listed in Appendix II is FFS.*

## **10 Link with other related work**

*Editor's note: this clause should basically provide a pointer to (or a description about relationship with) work that has been developed (is developed/will be developed) in other documents.*

## Appendix I - Application scenarios

(This appendix does not form an integral part of this Recommendation)

*Editor's Note:*

*How they make usage of NGN-SIDE capabilities;*

*Categories of applications:*

- *Communication services*
- *IPTV applications*
- *USN/ N-ID applications*
- *User Generated Content applications*
- *Web-based applications*
- *Others (social networks, peer-to-peer, MCC, grids)*
- *3rd party provided applications (MDS, etc.)*
- *Composite applications*
- *Composition of NGN capabilities with capabilities from other environments/platforms*
  - *Different NGNs, Internet, Mobile networks, etc.*
  - *Across ANI, SNI, UNI, NNI*
- *Composition of NGN services with legacy services*

*Editor's note: this appendix (and related clause in the body) could be also linked to service use cases developed in other documents.*

*Editor's note: different business models could be considered (e.g. providers' cooperation via NGN-SIDE).*

*Editor's note: the text contained in the scenarios described in this appendix will have to be checked for full alignment with the rest of the document (especially from terminology and requirements analysis points of view).*

### I.1 3<sup>rd</sup> party application scenario "Book a trip"

Service entities	<ol style="list-style-type: none"> <li>1) NGN-SIDE</li> <li>2) MMS system (as specified in Y.2201 Message handling capability.) offered by telecom operator.</li> <li>3) Application called "Book a trip" provided by 3<sup>rd</sup> party Application provider named "Travel Agency A".</li> <li>4) Service called "Booking &amp; Info" provided by ctrip as 3<sup>rd</sup> party capability provider. This service returns the flight and the hotel reservation reference number, related tourist information etc.</li> <li>5) Service called "Weather Info" provided by Meteorological Institute as 3<sup>rd</sup> party capability. This service gets the weather report associated to a specific location.</li> <li>6) Service called "Map" provided by <i>Google</i> as 3<sup>rd</sup> party capability provider. This service returns the map data.</li> </ol> <p>NOTE: service" and "application" are used distinctively here</p>
Roles	<ol style="list-style-type: none"> <li>1) User A (end user of the Application called "Travel agency")</li> <li>2) Operator A (NGN provider who provides the SMS &amp; MMS service to User A)</li> <li>3) Ctrip (Capability provider who registers the exposed service "Booking &amp;</li> </ol>

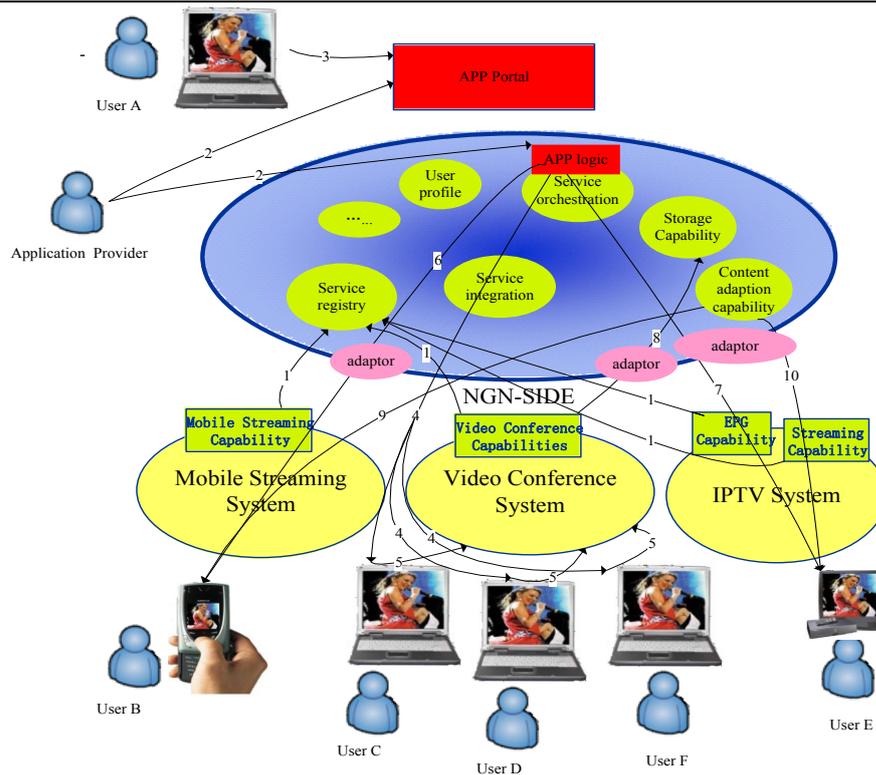
	<p>Info” to NGN-SIDE )</p> <ol style="list-style-type: none"> <li>4) Google (Capability provider who registers the exposed service “Map” to NGN-SIDE)</li> <li>5) Meteorological Institute (Capability provider who registers the exposed service “Weather Info” to NGN-SIDE)</li> <li>6) Travel Agency A (Application provider who provides the application named “Book a trip” )</li> </ol>
<p>Relevant business stake holders</p>	<p>Telecom operators, Capability providers, Application providers</p>
<p>Analysis of the Usage Model</p>	
<p>Main Intent/Objective of the scenario in terms of usage model</p>	<p>This scenario shows how NGN-SIDE can help 3<sup>rd</sup> party applications.</p>
<p>NGN-SIDE key features</p>	<ol style="list-style-type: none"> <li>1) 3<sup>rd</sup> party can publish an application to NGN via application provisioning capabilities of NGN-SIDE and using service enablers offered by NGN (MMS) to trigger an application.</li> <li>2) NGN-SIDE is required to provide a way for 3<sup>rd</sup> party applications to access the capabilities registered to NGN-SIDE.</li> </ol>
<p>Scenario description</p>	<div style="text-align: center;"> </div> <ol style="list-style-type: none"> <li>1) Existing configuration: <i>Google</i> registers the “Map” service to NGN-SIDE, Telecom Operator A registers the MMS service to NGN-SIDE, Ctrip registers the “Booking &amp; info” service to NGN-SIDE, Meteorological Institute registers the “Weather Info” service to NGN-SIDE.</li> <li>2) Existing configuration: The Application provider finds the exposed services and composes them into a new application called “Book a trip” and publishes it to NGN-SIDE via the application provisioning function provided by NGN-SIDE.</li> <li>3) The user is reading a newspaper, which contains an advertisement from 'Travel Agency A' with some travel with a related <i>BIDI code</i>. The user decides to make a travel booking, so he/she uses his/her mobile phone to</li> </ol>

	<p>scan, decode and send the <i>BIDI code</i> via MMS.</p> <ol style="list-style-type: none"> <li>4) When the MMS receives the message with BIDI code, there is always a configured identifier to forward this message to NGN-SIDE.</li> <li>5) NGN-SIDE finds that the service is ‘Book a trip’ offered by ‘Travel Agency A’’, then routes the message with <i>BIDI code</i> to the related APP server.</li> <li>6) The application “Book a trip” calls another service ‘Booking &amp; Info’ provided by ‘Ctrip’ to book the flights, the hotels and to get the related tourist information. NGN-SIDE routes this request to “Ctrip”.</li> <li>7) If the result of the “Booking &amp; Info” request is successful, the application “Book a trip” calls other services, Map, Weather, and generates a <i>BIDI code</i> including the booking ID, etc.</li> <li>8) The application composes a response message (MMS) and sends it via the MMS service.</li> <li>9) The user A receives the MMS with the response on his/her mobile phone.</li> </ol>
<p>Benefits analysis for relevant business stakeholders</p>	<ol style="list-style-type: none"> <li>1) NGN-SIDE benefits the Capability providers with a controlled, managed and security way to provide access to their capabilities/services and generate revenues for them.</li> <li>2) NGN-SIDE benefits the Application providers with a facility and centralized way to discover capabilities that can be used and also provides a flexible and simple way to deploy an application through different domains.</li> <li>3) NGN-SIDE benefits the NGN provider with a service integration environment in an efficient and economic way.</li> </ol>
<p>NGN-SIDE requirements analysis</p>	<ol style="list-style-type: none"> <li>1) NGN-SIDE is required to provide mechanisms for application provisioning, addressing and routing:             <ol style="list-style-type: none"> <li>a. NGN-SIDE is required to provide the capability to publish an application supported by NGN-SIDE in the various domains accessible by NGN-SIDE (e.g. publishing a domain name in internet, assigning a special access number (e.g. E.164) in telecom domain etc.).</li> <li>b. NGN-SIDE is required to provide a standard way for application addressing (e.g. URL, E.164) by NGN-SIDE.</li> <li>c. NGN-SIDE is required to provide a mechanism to establish paths to route requests to applications</li> </ol> </li> <li>2) NGN-SIDE is required to provide mechanisms for capability registration, discovery and routing:             <ol style="list-style-type: none"> <li>a. NGN-SIDE is required to provide a mechanism for capability registration, including a standard language to describe the capability, a unique identification of the capability, a capability addressing mechanism.</li> <li>b. NGN-SIDE is required to provide a routing mechanism to locate the required capability and establish a path to access the capability.</li> <li>c. NGN-SIDE is required to provide a mechanism for SLA control of capabilities, including authentication, authorization and traffic control.</li> </ol> </li> </ol>

## I.2 In-house application scenario “Enhanced Conference”

Service entities	<ol style="list-style-type: none"> <li>1) NGN—SIDE which provides the real-time media storage capability, real-time media adaption capability and real-time media transfer capability.</li> <li>2) Video conference system which provides the video conference related capabilities including initiating a video conference, inviting a user to join a conference, recording the conference, etc.</li> <li>3) IPTV system which provides IPTV related capabilities including EPG capability, streaming capability etc.</li> <li>4) Mobile streaming system which provides mobile streaming related capabilities including streaming capability, management capability etc.</li> </ol>
Roles	<ol style="list-style-type: none"> <li>1) User A (Customer pays to order a 4 persons’ video conference and invite his/her team to join the conference).</li> <li>2) User B (Member of A’s team, and not conference participant)</li> <li>3) User C (Member of A’s team, and also conference participant)</li> <li>4) User D (Member of A’s team, and also conference participant)</li> <li>5) User E (Member of A’s team, and not conference participant)</li> <li>6) User F (Member of A’s team, and also conference participant)</li> </ol>
Relevant business stake holders	Telecom operators, Application providers
<b>Analysis of the Usage Model</b>	
Main Intent/Objective of the scenario in terms of usage model	Provide a convergence application which covers multiple service domains, such as IMS, IPTV, Mobile streaming.
NGN-SIDE key features	NGN—SIDE acts as a real-time media control and transfer bus.

Scenario description



- 1) The capabilities (mobile streaming capability of mobile streaming system, video conference capability of video conference system, EPG and streaming capabilities of IPTV system) are registered to NGN-SIDE by NGN provider so that developers can find them and make use of them.
- 2) The Application provider develops a new application using the capabilities offered by NGN and NGN-SIDE, e.g. mobile streaming capability, EPG capability, IPTV streaming capability, video conference capability, storage capability, content adaptation capability and user profile capability, and using the service creation tools offered by NGN-SIDE. The Application provider publishes the application to NGN-SIDE.
- 3) User A can order a video conference through the *App portal* facilities. User A invites his/her team including User B, User C, User D, User E and User F to join the conference.
- 4) When the conference has been successfully created, the application sends the conference notification to the participants and the NGN-SIDE selects the notification method (e.g. SMS, IM, E-mail or *the initiating a call*) according to the participants' presence and preference using the "management of role related information" capability offered by NGN-SIDE and the presence capability.
- 5) User C, User D and User F receive the invitation and join the conference, and the conference room becomes full.
- 6) User B, using a mobile phone, is notified that the conference room is full. The *App server* asks User B if he/she wants to watch the live meeting.
- 7) User E, using a Set Top Box (STB) to watch TV, is notified that the conference room is full. The *App server* asks User E if he/she wants to watch the live meeting.
- 8) When User B and User E select 'Yes', the *App server* uses the storage capability offered by NGN-SIDE to record the meeting's real-time media.

	<p>9) The App server asks NGN-SIDE to convert the real-time media from video conference format to mobile streaming format to User B. The Mobile streaming system lives the video meeting to User B.</p> <p>10) The App server asks NGN-SIDE to convert the real-time media from video conference format to IPTV streaming format to User E. User E receives a notification, and a new channel of the conference appears on his/her STB's service guide (EPG). User E selects the live meeting.</p>
<p>Benefits analysis for relevant business stakeholders</p>	<p>Without NGN-SIDE, the deployment of this application is very complex and the video conference has to connect to each system (e.g. mobile streaming system, IPTV system).</p> <p>1) NGN-SIDE acts as an access control and service integration entity.</p> <p>2) In this case NGN-SIDE also provides application specific capabilities, including media control, storage and content adaptation functions, to hide the complexity of physical devices' connections.</p>
<p>NGN-SIDE requirements analysis</p>	<p>1) NGN-SIDE is required to provide real-time media and static content storage, caching, processing and control mechanisms:</p> <ul style="list-style-type: none"> <li>a) NGN-SIDE is required to provide real-time media recording, processing (e.g. transcoding, encryption, decryption, DRM).</li> <li>b) NGN-SIDE is required to provide real-time media delivery within NGN-SIDE.</li> <li>c) NGN-SIDE is required to provide static content storage, caching, adaptation (e.g. codec conversion, format conversion).</li> <li>d) NGN-SIDE is required to provide static content delivery (e.g. set up a content transfer channel, content split and reorganization, etc.) within NGN-SIDE.</li> <li>e) NGN-SIDE is required to support media streaming mechanisms.</li> </ul> <p>-</p>

## Appendix II - Survey of API related standardization efforts

(This appendix does not form an integral part of this Recommendation)

*Editor's note:*

- including both WS and REST approaches;
- 3GPP
- OMA
- GSMA OneAPI
- Other relevant API efforts of other SDOs (e.g. OASIS, OGF - to be completed)

### II.1 Integration of Web Service models in NGN-SIDE

*Editor's note: an introduction about the various Web service models should be considered here.*

***Editor's note: text in this clause needs further review. Also, relationship of this text with NGN-SIDE and with object of this appendix should be provided.***

#### II.1.1 Mechanisms for SOAP-based model service implementations

SOAP (Simple Object Access Protocol)-based model service implementations rely on a mesh of software services. Services comprise unassociated, loosely coupled units of functionality that have no calls to each other embedded in them. Each service implements one action, such as filling out an online application for an account, or viewing an online bank-statement, or placing an online booking or airline ticket order. Instead of services embedding calls to each other in their source code, they use defined protocols that describe how services pass and parse messages, using description metadata.

Developers associate individual SOAP objects by using orchestration. In the process of orchestration the developer associates software functionality (the services) in a non-hierarchical arrangement using a software tool (i.e. service registry) that contains a complete list of all available services, their characteristics, and the means to build an application utilizing these sources.

Underlying and enabling all of this requires metadata in sufficient detail to describe not only the characteristics of these services, but also the data that drive them. Programmers have made extensive use of XML (Extensible Markup Language) to structure data that they wrap in a nearly exhaustive description-container. Similarly, Web Services Description Language (WSDL) typically describes the services themselves, while SOAP describes the communication exchanges.

#### II.1.2 Mechanisms for REST-based model service implementations

REST (Representational State Transfer)-based model service implementations typically make use of Asynchronous JavaScript and XML (AJAX), Adobe Flash, and JavaScript/Ajax frameworks technologies.

AJAX uses JavaScript to upload and download new data from a web server without undergoing a full page reload. The data fetched by an AJAX request is typically formatted in XML or JSON (JavaScript Object Notation) format. When this data is received via Ajax, the JavaScript program then uses the Document Object Model (DOM) to dynamically update the web page based on the new data, allowing for a rapid and interactive user experience.

Adobe Flash is often used in web applications: among the numerous Flash capabilities, the most commonly used in web applications is that enabling playing of audio and video files.

JavaScript/Ajax frameworks make use of AJAX/DOM technologies and provide offline/online design tools to facilitate developers in the development of web applications.

## **II.2 API related efforts from other SDOs**

*Editor's note: text in this clause needs detailed review and coordination with other SDOs.*

### **II.2.1 3GPP CT5**

3GPP CT5, jointly with the Parlay Group and ETSI, developed Application Programming Interfaces (APIs) for Open Service Access (OSA). 3GPP CT5 closed on June 2008 and the work was transferred to Open Mobile Alliance (OMA), ARC (Architecture) PSA (Parlay Service Access) group. The OMA ARC PSA group is now responsible for the completion of the Parlay/Parlay X Release 8 work.

The Parlay API specification (3GPP TS 29.198) is structured in the following Parts:

29.198-1	Part 1:	Overview
29.198-2	Part 2:	Common Data Definitions
29.198-3	Part 3:	Framework
29.198-4	Part 4:	Call Control SCF
29.198-5	Part 5:	User Interaction SCF
29.198-6	Part 6:	Mobility SCF
29.198-7	Part 7:	Terminal Capabilities SCF
29.198-8	Part 8:	Data Session Control SCF
29.198-9	Part 9:	Generic Messaging SCF
29.198-10	Part 10:	Connectivity Manager SCF
29.198-11	Part 11:	Account Management SCF
29.198-12	Part 12:	Charging SCF
29.198-13	Part 13:	Policy Management SCF
29.198-14	Part 14:	Presence & Availability Management SCF
29.198-15	Part 15:	Multi-media Messaging SCF
29.198-16	Part 16:	Service Broker SCF

The ParlayX API specification (3GPP TS 29.199) is structured in the following Parts:

29.199-1	Part 1:	"Common"
29.199-2	Part 2:	"Third party call"
29.199-3	Part 3:	"Call Notification"
29.199-4	Part 4:	"Short Messaging"
29.199-5	Part 5:	"Multimedia Messaging"
29.199-6	Part 6:	"Payment"
29.199-7	Part 7:	"Account management"

29.199-8	Part 8:	"Terminal Status"
29.199-9	Part 9:	"Terminal location"
29.199-10	Part 10:	"Call handling"
29.199-11	Part 11:	"Audio call"
29.199-12	Part 12:	"Multimedia conference"
29.199-13	Part 13:	"Address list management"
29.199-14	Part 14:	"Presence"
29.199-15	Part 15:	"Message Broadcast"
29.199-16	Part 16:	"Geocoding"
29.199-17	Part 17:	"Application driven Quality of Service (QoS)"
29.199-18	Part 18:	"Device Capabilities and Configuration"
29.199-19	Part 19:	"Multimedia streaming control"
29.199-20	Part 20:	"Multimedia multicast session management"
29.199-21	Part 21:	"Content management"
29.199-22	Part 22:	"Policy"

For details, specifications are available at: <http://www.3gpp.org/ftp/Specs/html-info/29-series.htm>

## II.2.2 OMA NGSI

The main objective of the OMA Next Generation Service Interface (NGSI) enabler is to define a set of new services for deployment across individual, corporate and general societal user communities. Building on extensions beyond today's Parlay X APIs (latest version: 3GPP Release 8 Parlay/Parlay X APIs), NGSI will stimulate the usage of various service enablers into new services and applications.

OMA NGSI key features include call enhancements, identity control, preferences, enhanced conference experience, multimedia list handling, access to service provider data, service recommendations, and context management.

For details, the latest OMA NGSI drafts are available at:  
[http://member.openmobilealliance.org/ftp/public\\_documents/REQ/REQ-NGSI/Permanent\\_documents/](http://member.openmobilealliance.org/ftp/public_documents/REQ/REQ-NGSI/Permanent_documents/)

## II.2.3 OMA REST APIs

The OMA Parlay REST API specifications under development are intended to define RESTful bindings for Parlay X Web Services. Until now, the work has progressed on the following APIs:

- ThirdPartyCall
- TerminalStatus
- TerminalLocation
- ShortMessaging
- Payment
- MultiMediaMessaging

- AccountManagement

For details, the latest OMA REST drafts are available at:

[http://member.openmobilealliance.org/ftp/public\\_documents/ARCH/ARC-REST/Permanent\\_documents/](http://member.openmobilealliance.org/ftp/public_documents/ARCH/ARC-REST/Permanent_documents/)

## **II.2.4 GSMA OneAPI**

The GSMA OneAPI is an initiative to define a commonly supported API to allow mobile (and other network) operators to expose useful network information and capabilities to Web application developers. It aims to reduce the effort and time needed to create applications and content that is portable across mobile operators. The project aims to reuse existing standards (or proper subset thereof) as well as advise standards bodies as to what Web developers expect from network operator APIs, so that such standards can evolve accordingly. The project is a work in progress.

For details, the latest drafts are available at:

<https://gsma.securespsite.com/access/Access%20API%20Wiki/Home.aspx>

### **II.2.4.1 Version 0.9 APIs:**

The following APIs are being specified via the OMA:

#### **a) RESTful APIs:**

- SMS RESTful API
- MMS RESTful API
- Location RESTful API
- Payment RESTful API
- OneAPI RESTful principles

#### **b) Web Services APIs:**

- SMS Web Service API
- MMS Web Service API
- Location Web Service API
- Payment Web Service API

### **II.2.4.2 Phase 2 APIs:**

These APIs are early drafts:

- Data Connection profile
- User Profile
- SMS triggering via UDH

## **II.2.5 Summary of API efforts in other SDOs**

*Editor's note: this sub-clause could contain a table showing, with respect to a list of identified APIs, the relevant specifications developed/under development in other SDOs (in line with the content provided in the previous sub-clauses of this appendix).*

### **Appendix III - Capabilities and APIs of relevant market SDPs**

(This appendix does not form an integral part of this Recommendation)

*Editor's note 1: One appendix per each relevant market SDP (SDP types)*

*Editor's note 2: This needs to be discussed further. It is just stressed here that, taking care to avoid mention of specific provider or manufacturer's platforms, general information on relevant market SDPs (SDP types), key characteristics would help harmonization and convergence of the sets of APIs currently developed in different (closed or not) ecosystems/platforms of the market. Relevant market SDPs (SDP types) need to be identified – e.g. network SDKs, handset SDKs, etc.*

TBD

## **Appendix IV - Material for possible further consideration**

(This appendix does not form an integral part of this Recommendation)

*Editor's note: The material contained in this Appendix is for possible further consideration.*

### **IV.1 (a) July 6-10 e-meeting - Discussion on WD04**

Consumer -> Application end user

NGN provider (it may provide only transport stratum capabilities or only service stratum capabilities or both). Note: for further discussion possible roles of NGN provider (distinction between provider of service stratum and provider of transport stratum capabilities).

NGN SIDE operator -> NGN SIDE provider

A NGN provider may be a NGN SIDE provider (the impact in terms of requirements and architecture of the two options will be evaluated separately).

Application provider

An application provider may be the NGN provider (e.g. in house applications) or the NGN SIDE provider or a 3<sup>rd</sup> party application provider.

Application developer

An application developer is an entity who develops applications on behalf of an application provider.

3<sup>rd</sup> party application provider is an application provider distinct from the NGN provider and NGN SIDE provider.

Capability provider

A capability provider may be the NGN provider or the NGN SIDE provider or a 3<sup>rd</sup> party capability provider. A capability provider may be a NGN provider or a content provider or an application provider or a network/service provider in another domain.

*Editor's note: need to clarify the relationship between applications and capabilities.*

3<sup>rd</sup> party capability provider is a capability provider distinct from the NGN provider and NGN SIDE provider.

Content provider: *Editor's note: see possible reuse of existing definitions (e.g. Y.1901). Need to consider linkage of this definition with other roles.*

*Editor's note: need to clarify the need to introduce the concepts of retail and wholesale and related roles, including their applicability to applications and capabilities, their relationship with the various other roles (end user, NGN provider, NGN SIDE provider, application provider, capability provider), the role of purchaser versus provider.*

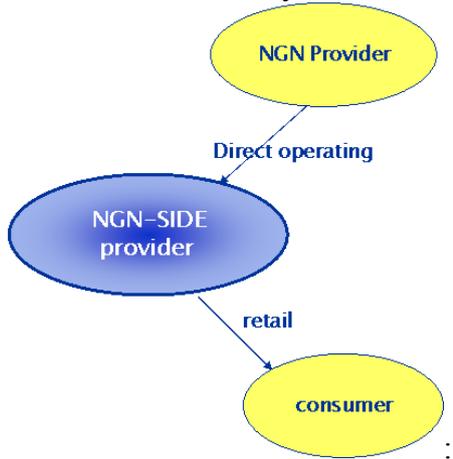
*Wholesale purchaser*

Wholesale provider  
Retail purchaser  
Retail provider

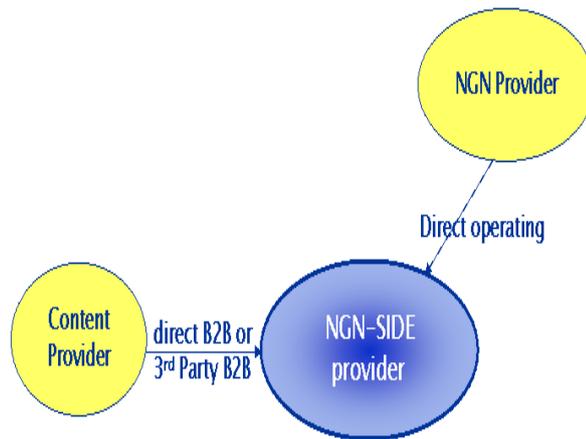
Domain: *Editor's note: a definition is needed.*

**IV.1 (b) 02-12 September Mar del Plata meeting - Discussion on C362 (Proposed description of service model in 6.2 of. Y.NGN-SIDE-Req)**

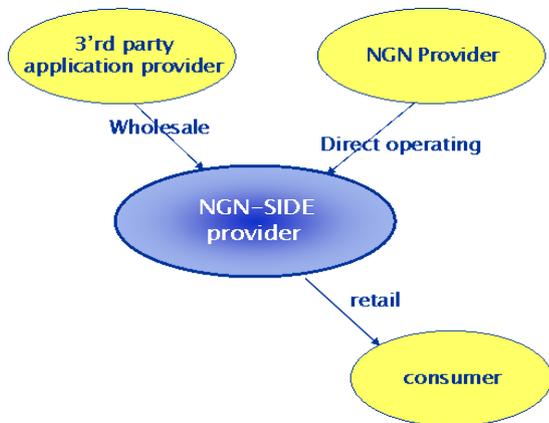
The NGN-SIDE ecosystem indicates the following business model:



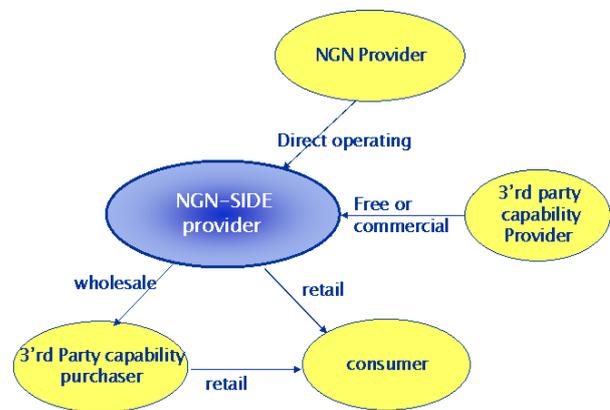
- In-house application model:



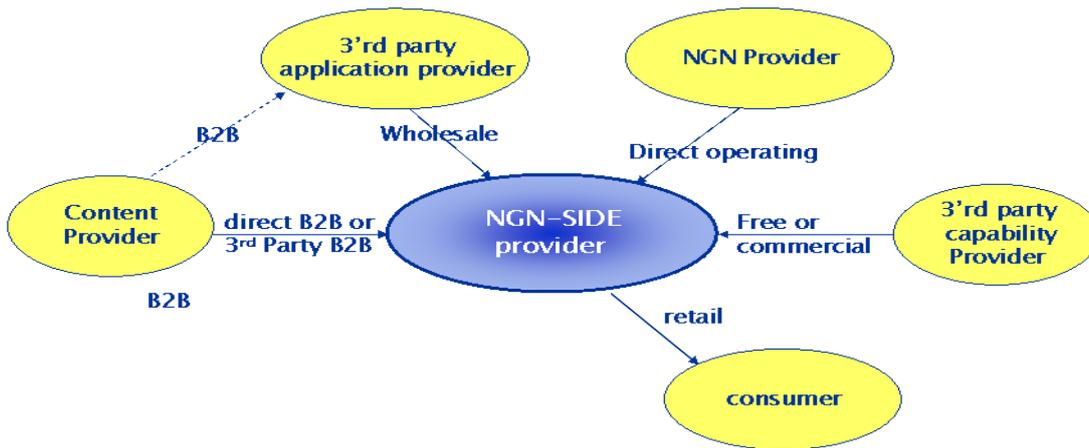
CP business model:



APP Store model



capability operating model



CP-SP model

- In-house application model includes 3 roles of NGN-SIDE ecosystem. The NGN provider act as an NGN capability provider. The NGN-SIDE is required to provide service creation related functions, service execution related functions, service management related functions.. The typical applications are PIM, MMTEL etc.
- The CP business model includes 4 roles of NGN-SIDE ecosystem. The NGN provider provides the content delivery capabilities such as SMS, MMS, WAP and so on. In this case NGN provider acts as the capability provider and application provider. The content provider provides content in various formats to the NGN-SIDE. The NGN-SIDE provider provides the content management functions including content audit, content uploading, content storage, content adaption, and so on. The typical applications include value-added SMS, music download, CRBT and so on.
- The APP store business model includes 4 roles of NGN-SIDE ecosystem. In this case, the NGN provider acts as the capability provider providing the application delivery capabilities such as download and so on. The 3rd party application provider publishes the applications to the NGN-SIDE The NGN-SIDE is required to support revenue sharing mechanism among the stakeholders. The applications provided by the 3rd party can be looked as a special content.
- The capability operating model includes 5 roles of NGN-SIDE ecosystem. In this case, the NGN provider acts as the capability provider. The 3rd party capability provider here mainly refers to the capabilities exposed by the broadcasting network operator , ISPs and so on. The NGN-SIDE provider is responsible of the capability related control and management functions including capability registration, SLA management and control function. Capability usage functions and so on.
- The CP-SP model includes 6 roles of NGN-SIDE ecosystem. In this case, the application is provided by the 3rd party application provider, the content provider provides content to the NGN-SIDE or directly to the 3rd party application provider through B2B mode. The NGN-SIDE is required to provide application provisioning functions, partnership management functions and identity management and single sign on functions, etc.

#### IV.2 July 6-10 e-meeting - Discussion on WD06R1– related to Figure 2

Agreed to not use SOA-based and non SOA-based differentiation at this stage

The word “domain” is used in the figure in a different sense than what we intended to use for (IT, Internet, Mobile, Broadcast etc.)

We should aim in this figure to a high level functional view including key SIDE functional components and functional components external to SIDE, with harmonized terminology.

All components shown in the figure should be described. (in the current figure, “Service delivery framework”, “BOSS”, “adaptor” (at least) are not described).

Relationship with OSE functional components should be considered and introduced, if and as appropriate, in the figure (and related text) – e.g. service registry and service orchestration are functional components of the OSE.

Comment A) 3rd party apps and user generated apps are out of SIDE.

Comment B) Agree to put 3rd party apps and user generated apps out of SIDE

Comment C) Is this a topological figure or functional hierarchy figure?

Comment D) There is some mix in current figure between roles (NGN provider, 3<sup>rd</sup> party provider, SIDE provider etc.) and functional components.

Third party framework: is the unique interface towards applications over the ANI (as described in NGN architecture documents)?

Comment E) There are two different interaction points between SIDE and 3<sup>rd</sup> party apps (via 3<sup>rd</sup> party framework and at the bottom towards the 3<sup>rd</sup> party provider domain): this needs to be clarified.

Some guidelines for drafting activity related to WD06R1:

- Redraw the figure with a functional component orientation, showing the minimum set of components (key SIDE functional components and functional components external to SIDE) needed to explain the key functions of SIDE. Detailed components can be described (and associated figures) later.
- Add a “minimum” description for “each” component of the figure, including the relationship with other SIDE-internal and external components.
- In a second phase, the relationship between this figure and figure of WD03 will have to be clarified.
- Use a harmonized terminology across the whole text of this document.
- In the first phase we should not differentiate between SOA and non-SOA aspects in the figure. Differentiation between SOA and non-SOA aspects might be introduced in a second phase (maybe using new figures).

### **IV.3 July 6-10 e-meeting - Discussion on WD07**

A)

Some key differences of NGN SIDE with NGN OSE:

- Integration of services from different domains
- Full controllability, manageability and chargeability

B)

- why this material should go only in appendix: at least from the reqts perspective, this should be used in the body to identify additional reqts and capabilities of NGN SIDE
  - o X) 8.4 was intended to identify differences with existing NGN capabilities/reqts (Y.2201 including NGN OSE (Y.2234))
- need figure with positioning also of NGN SIDE
- we should start from the already defined reqts of NGN OSE (Y.2234)

C)

- Need to identify which functions need to be introduced or extended in NGN

Meeting discussion on NGN SIDE differences with NGN OSE (based on text extracted from WD07):

- Objective of NGN-SIDE is to define an manageable, controllable and chargeable service environment across different domains. A's comment: although NGN OSE may have the same objective, its specifications do not seem to address fully, flexibly and in unified way issues of management, control and charging across different domains.
  - NGN-SIDE aims to an Internet characteristics service environment based on the NGN architecture (NGN-SIDE is a service integration and delivery environment with Internet characteristics)  
Comment: aiming to introduce Internet-like service concepts (mashup, etc.) in the NGN service environment, still keeping the added value of NGN such as QoS, security, accounting and charging, management support (even in composite application chains).
  - NGN SIDE: integration of services from different domains.  
Comment: NGN OSE doesn't address (at least in a satisfactory way) the reusability in NGN of capabilities residing in other domains (Internet, mobile networks, broadcast networks).
  - NGN SIDE aiming to manage and *converge* the service related data, media and capabilities in a unified way.
- a) New input from Mar del Plata meeting – Discussion on C334 the Relationship and key differences of NGN-SIDE with ITU-T Y.2234 (Y.ngn-openenv)

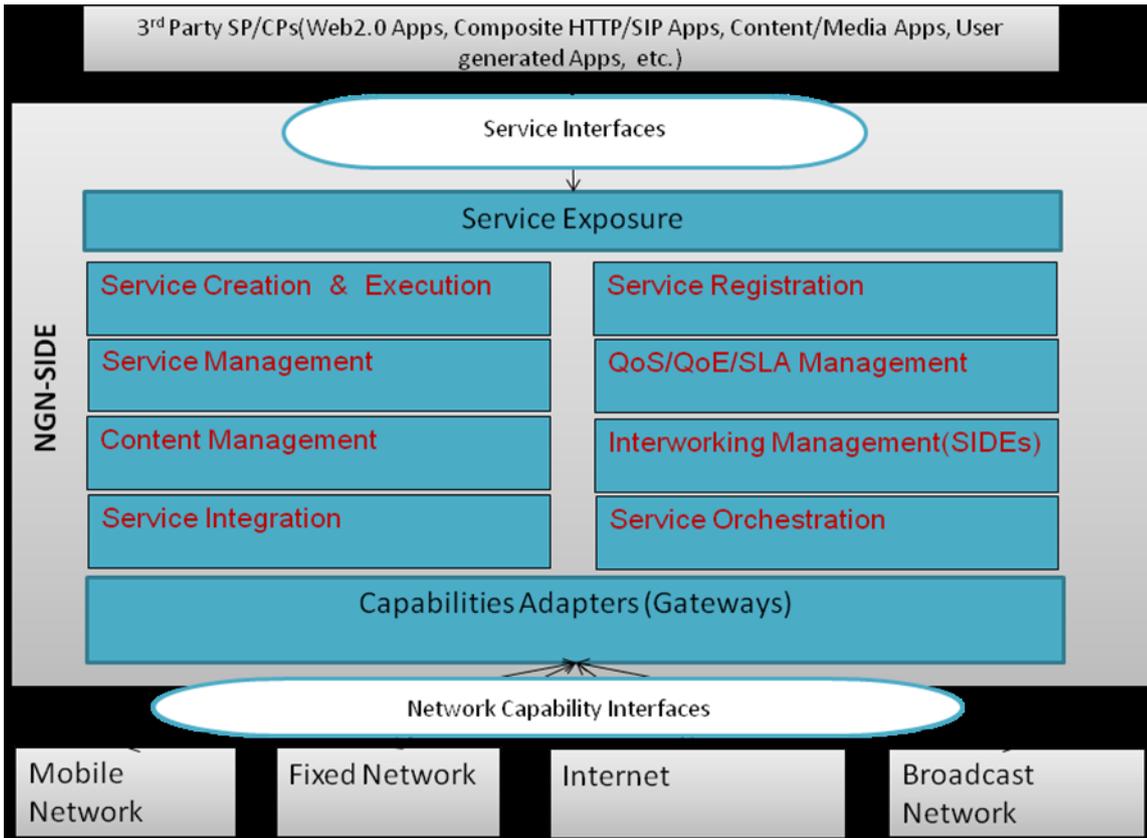
In conclusion, some key differences of NGN SIDE with NGN OSE are:

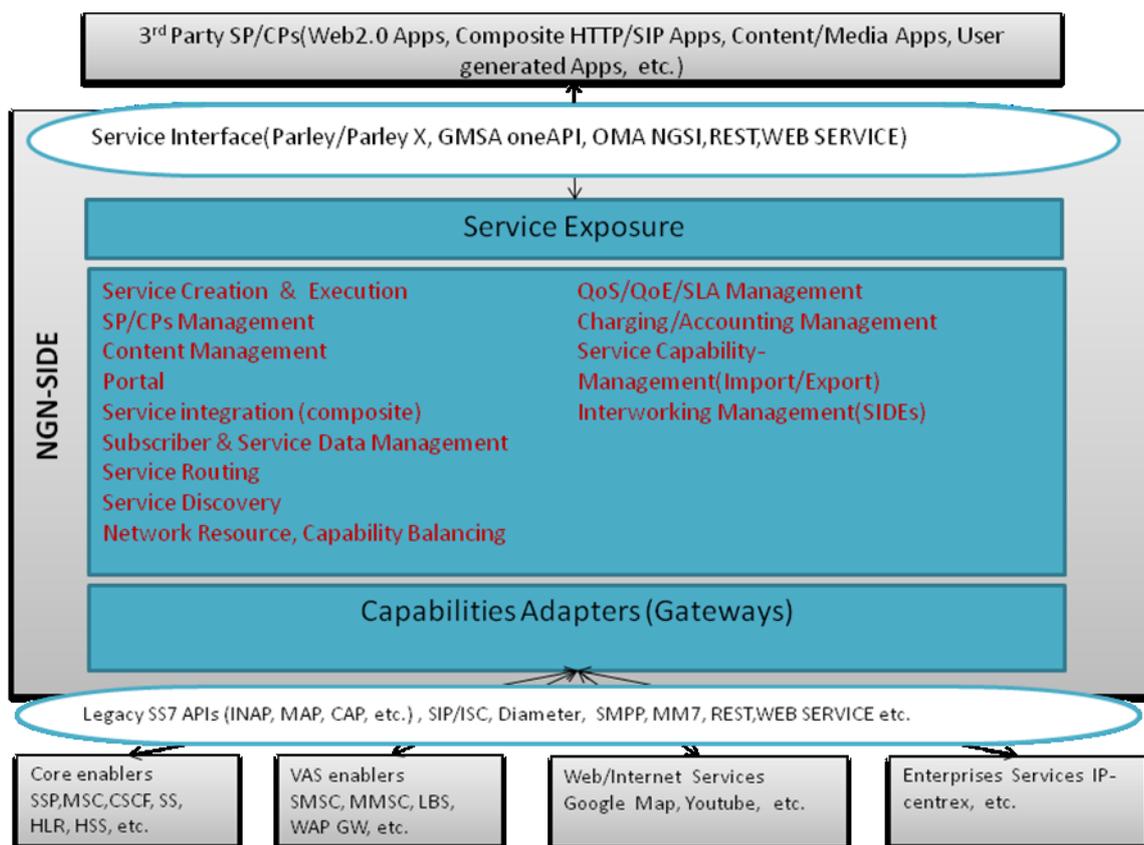
- objective of NGN-SIDE is to define an manageable, controllable and chargeable service environment across different domains. Although NGN OSE may have the same objective, its specifications do not seem to address fully, flexibly and in unified way issues of management, control and charging across different domains.
- NGN-SIDE aims to an Internet characteristics service environment based on the NGN architecture. NGN-SIDE is a service integration and delivery environment with Internet characteristics. NGN SIDE aiming to introduce Internet-like service concepts (mashup, etc.) in the NGN service environment, still keeping the added value of NGN such as QoS, security, accounting and charging, management support (even in composite application chains).
- NGN SIDE integrates services from different domains. NGN OSE doesn't address (at least in a satisfactory way) the reusability in NGN of capabilities residing in other domains (Internet, mobile networks, broadcast networks).
- NGN SIDE aiming to manage and integrate the service related data, media and capabilities in a unified way

#### IV.4 September 02-12 Mar del Plata meeting - Discussion on C359

*Editor's note: The following text is from C359. The contributor's intention is to give the detail description of functional components in clause 6.3. For reason of overlapping with clause 6.2, responding to China Telecom's contribution C282, it was agreed to not have it in clause 6.3, but it was agreed to put it in appendix for further consideration (e.g. contribution to clause 8).*

NGN-SIDE consists of a lot of functional components and logical functions depicted in Figure 3. The following figure shows an overview of NGN-SIDE functions.





**Figure 3 - Overview of NGN-SIDE functions**

NGN-SIDE has two kinds of interface. The first one is network capability interface which connects to the underlying network, and the second is service interface which exposes network capabilities to the 3rd party SP/CPs.

NGN-SIDE will review the existing APIs such as Parley/Parley X, GSMA oneAPI, OMA NGSI, REST and Web Service etc. If necessary, NGN-SIDE will define new interfaces as service interfaces.

NGN-SIDE functions are listed below:

### Service exposure

NGN-SIDE provides a mechanism to enable secure and managed 3<sup>rd</sup> party access to service enablers and underlying network capabilities. It has a management portal for 3<sup>rd</sup> party. It has also a service interface gateway which implemented a set of standardized APIs. An operator can decide what kind of APIs to expose.

### Capability Adapter

Capability adapters (Gateways) connect with underlying networks from different domains such as mobile networks, fixed networks, broadcast networks and internet using Network capability interfaces (e.g. legacy SS7 APIs, SIP/ISC, SMPP, MM7, REST and Web Service etc).

### Service Creation & Execution

Services are typically created using a service creation environment (SCE). These created services are then executed by a service execution environment after being deployed into a given network.

### Service Management

- Service providers and content providers management

- Service lifecycle management
- Subscriber & service data management
- Charging management

### **Service orchestration**

NGN-SIDE standards-based service orchestration helps to deliver the application integration and agility promised by Service-Oriented Architecture (SOA). It provides a means to automate and integrate multiple APIs that execute on heterogeneous platforms into a business process.

### **Content Management**

To manage work flow needed to collaboratively create, edit, review, index, search, publish and archive various kinds of digital media and electronic text.

### **Service integration**

- Service Routing  
NGN-SIDE provides routing of service requests/responses from/to applications based on service registry information.
- Service Addressing  
NGN-SIDE will provide a mechanism to address services in different domains.
- Multi-network service capability integration  
To input, output and balance network resources and capabilities.

### **Service Registration**

NGN-SIDE provides a mechanism to register and discover services.

### **QoS/QoE/SLA**

NGN-SIDE will focus on End to End QoS/QoE. It includes the service level QoS (i.e., SLA).

### **Interworking Management**

NGN-SIDE will provide a mechanism to interwork with other SIDs to reschedule the network capabilities.

## **IV.5 17-20 Sanya meeting - List of items, developed by the Rapporteur, for consideration concerning future contributions to the Y.NGN-SIDE-Req draft**

### **Rapporteur's note:**

the following input has been presented by the Rapporteur in Q3/13 Sanya meeting to stimulate discussion among parties on items and related priorities for the development of the Y.NGN-SIDE draft Recommendation. No decision was taken on this input in the Sanya meeting, but it was recognized the interest to have discussion on this topic.

Interested parties are invited to contribute to next Q3/13 meeting to progress this discussion towards the target objective (see below).

### **Input on items for consideration concerning next contributions to Y.NGN-SIDE Q3/13 Rapporteur, Sanya, Nov 20 2009**

#### **A) List of items**

1. Check the current table of contents (Telco APIs, etc.) and identify the high/medium priority items
2. SLA management in SIDE
3. Service enablers (description, security, liability) in SIDE
4. Integration of SIDE with Business Process Management
5. Identity aspects and IdM integration with SIDE
6. Brokering in/of SIDE: definition Service Broker and views from various SDOs' efforts (3GPP, service broker forum, others?) ( role for interaction between NGN and Internet, NGN and legacy networks; APIs brokering), brokering/interworking with other domains (Service Quality Mgt and Policy Mgt)
7. Virtualized networks resources in SIDE: objective of virtualization needs to be clarified, classification of network resources
8. Context awareness, data interaction, SIDE functions in User Networks
9. SIDE relationship with OSE capabilities (Y.2234) [extensions of OSE capabilities? (policy, creation and execution etc.)]  
\*\*\*\*\*
10. Service scenarios (e.g. of IMS, IPTV, USN ?) to show usage of SIDE (including interworking with Web 2.0) – see point 1 (current table of contents)
11. Scenarios of XaaS (Saas, PaaS, IaaS) and relationship with SIDE
12. Scenarios of user access to SIDE from other domains (Internet etc.) and access to SIDE by xSPs on the Internet
13. IMS platform as a SIDE platform, SIDE platform-IMS platform interworking
14. Role of a Web service platform for (Telco) SIDE, including Web 2.0 APIs
15. Interfaces (ANI, NNI, ?) to be used to provide Web APIs/enablers to (Telco) SIDE and vice-versa
16. Role of (Telco) SIDE for a Web service platform [for example, role of (Telco) SIDE as negotiator of enablers for other service environments]
17. Usage of (Telco) SIDE by other domains (Internet, legacy networks) [this topic may be also in relationship with service broker]
18. Scenarios concerning migration of some SIDE functions in the Web (Web 2.0 as support environment to the (Telco) SIDE platform)  
\*\*\*\*\*
19. Terminology: to reconsider a more visible terminology than “SIDE” for the outside world/other SDOs (what about “SDP”?)

**B) Target objective of related discussions among interested parties**

Among the items considered relevant for future developments, it is needed to assign a priority (high/medium(/low)) to provide guidance to future contributions.

As a result of related discussions among interested parties, it is expected to generate an item/priority table around the suggested following structure:

Item	Priority	Details

## **Appendix V - XaaS models and NGN-SIDE**

(This appendix does not form an integral part of this Recommendation)

*Editor's note: this appendix will have to be positioned before current appendix IV.*

### **V.1 Scenarios of XaaS service provision models and supporting role played by NGN-SIDE**

Everything as a Service (XaaS) is a concept of outsourcing of resources at different levels. NGN-SIDE may play a supporting role to realize different XaaS service provision models.

XaaS may be realized via the following major service provision models:

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)
- Communications as a Service (CaaS)

*Editor's note: text below for each service provision model should clarify who are the users and the providers of each service offer and the role played by NGN-SIDE in this model.*

#### **V.1.1 Software as a Service (SaaS)**

Software as a Service is a provision model in which a third party hosts an application which enables users to consume capabilities without any concern about where, how, by whom the computation is performed and storage is provided. The service being offered is a complete end-user application.

*Editor's note: the previous paragraph needs detailed review.*

From the NGN-SIDE perspective, all 3<sup>rd</sup> party applications can be outsourced as Software as a Service as shown in Figure V.1.

*Editor's note: it is for further discussion if other applications (e.g. in-house applications) can be offered as SaaS in addition to third-party applications.*

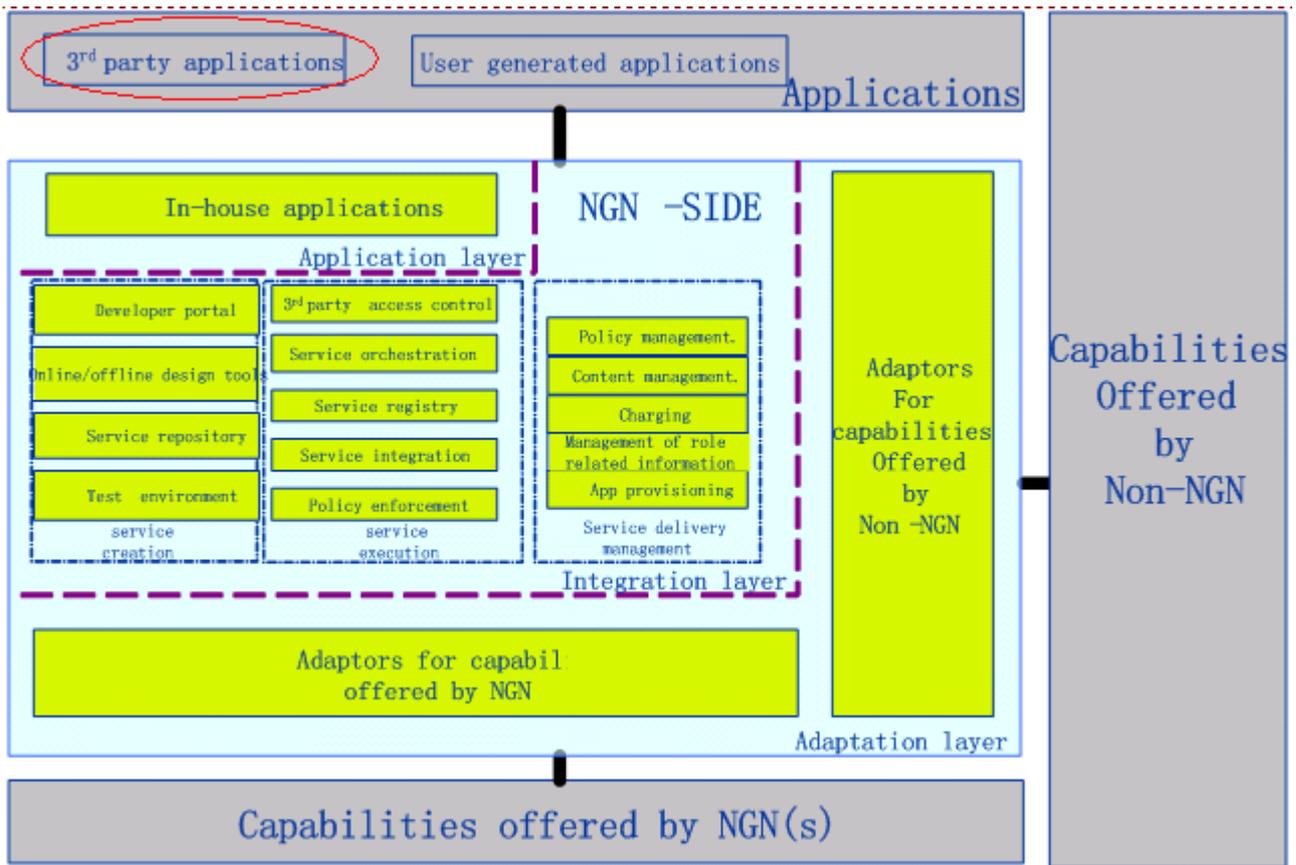


Figure V.1 – SaaS realization in NGN-SIDE

### V.1.2 Platform as a service (PaaS)

Platform as a Service is a provision model in which a platform is offered to developers to develop their applications and upload them via the NGN-SIDE developer portal functional module in NGN-SIDE, which provides the execution environment for the applications. The service being offered is the platform that allows the applications to run and processes users' application requests.

NGN-SIDE as a whole can be outsourced as Platform as a Service as shown in Figure V.2.

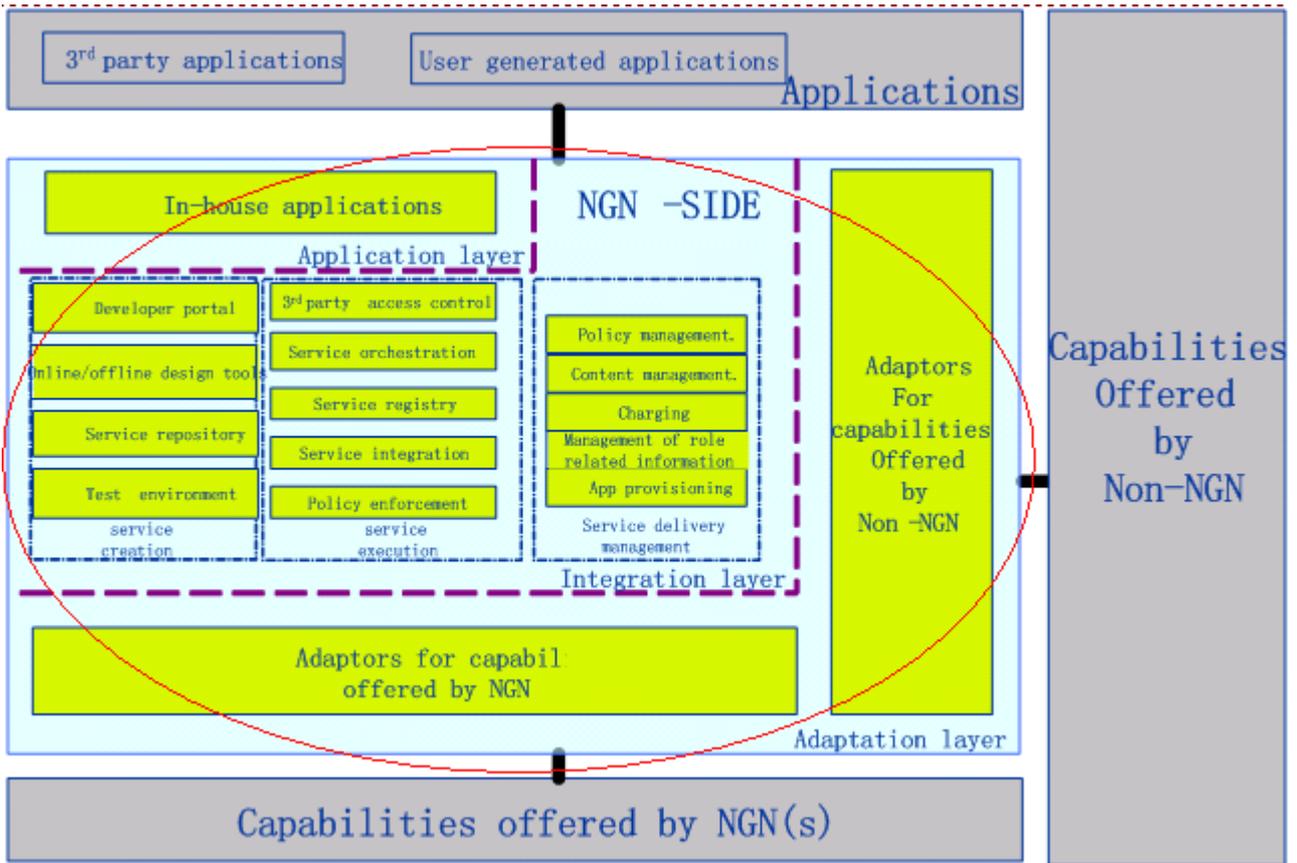


Figure V.2 – PaaS realization in NGN-SIDE

### V.1.3 Infrastructure as a Service (IaaS)

Infrastructure as a Service is a provision model in which resources/equipment used to support operations, including *storage, computation, hardware, servers and networking components* are outsourced. The service provider owns the resources/equipment and is responsible for housing, running and maintaining it. NOTE: Infrastructure as a Service is sometimes referred to as Hardware as a Service (HaaS). *Editor's note: the previous paragraph needs detailed review.*

From the NGN-SIDE perspective, resources (e.g. connections, computing, storage) available in NGN and other domains (e.g. Internet) can be outsourced as Infrastructure as a Service as shown in Figure V.3

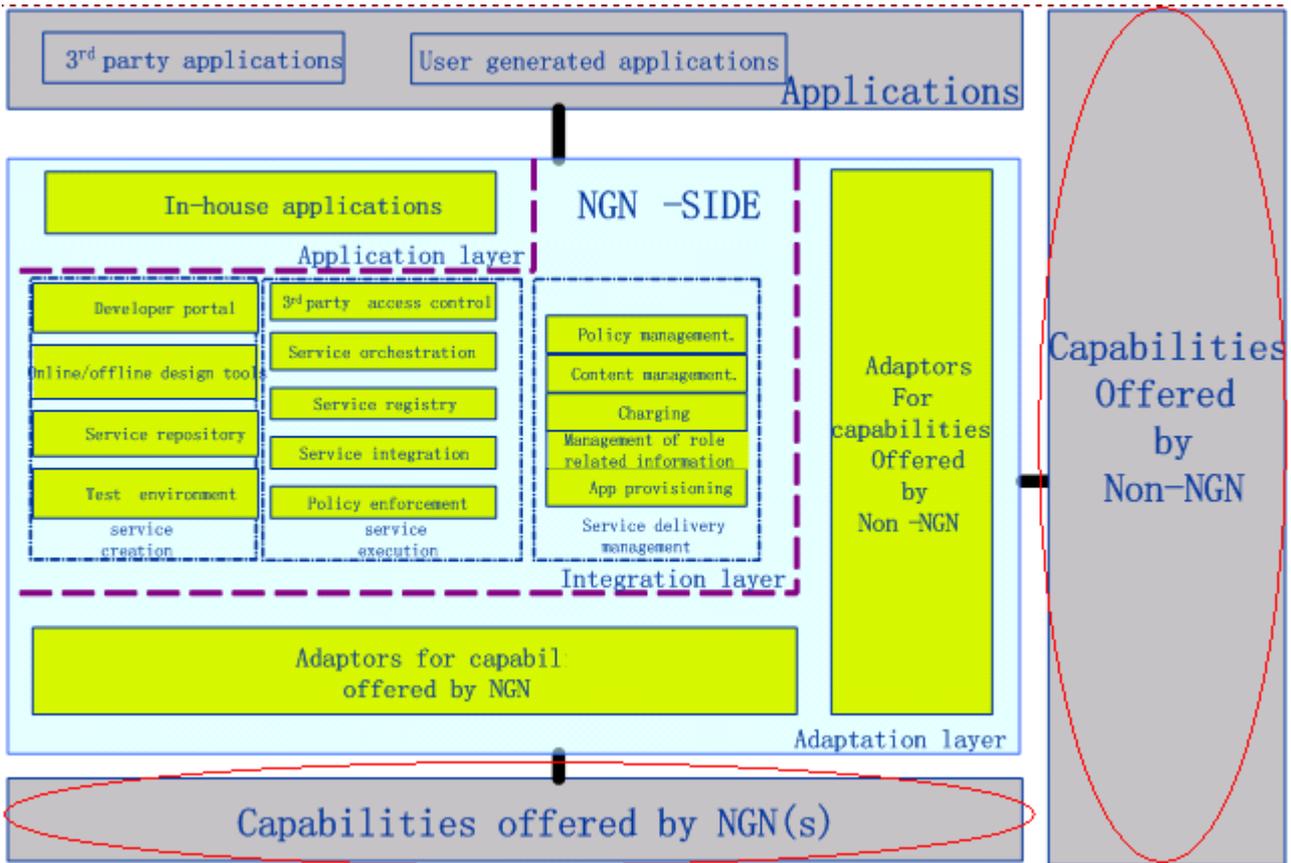


Figure V.3 – IaaS realization in NGN-SIDE

#### V.1.4 Communications as a service (CaaS)

*Editor's note: relationship between what is offered by IaaS and what is offered by CaaS needs clarification and consequently, text should be aligned with the agreed view. The following text is offered to invite contributions: "Communications as a Service is a provision model where the NGN provider or a Capability provider in non-NGN domains is responsible for the offer and management of hardware and software required for delivering different communication services such as Voice over IP, remote automated call distribution (ACD), hosted Private Branch Exchange (PBX), video conferencing, messaging and others."*

## **Bibliography**

TBD

## **ATTACHMENT - Rationale for the new study area of “NGN Service Integration & Delivery Environment”**

*Editor’s note: text of this attachment has been developed at the May 2009 NGN-GSI meeting.*

At the final session of the joint meeting between Q3, Q12, Q13 and Q14, the participants agreed on the following conclusions concerning the rationale for initiating work in this new study area. Contributions are invited to the next meeting to enhance this rationale in order to finalize the initial objectives of the SG13 work in this new study area.

### **1 What is the problem to solve**

A current trend of numerous NGN deployments (deployment plans) is the increasing support and network integration of communication enabled applications, and the evolution of the service layer infrastructure towards a service (delivery) platform, capable to use and integrate capabilities from different environments such as (Fixed and Mobile) Telecom, Broadcasting, Internet, etc., allowing advanced, flexible, quick, customized, and low-cost application developments and providing increased opportunities for NGN providers, third party application providers and end user communities.

### **2 What is missing in NGN today**

The followings are some developments already completed or in progress inside ITU-T (SG13) which have some relevance for the work in the new study area:

- Y.2232 (NGN convergence service model and scenario using web services) - only provides models and scenario for NGN based on web services.
- Y.2234 (Open service environment capabilities for NGN) - only defines some capabilities from the aspect of service creation and provisioning.
- Y.2212: Requirements of Managed Delivery Services (Jan 2008) - only focuses on third party scenarios using NGN capabilities through the ANI.
- Y.OSE-arch (OSE functional architecture for NGN) - just launched in Jan 09

However, currently in ITU-T, there is still lack of systemic study on service integration and delivery environment aspects. For example:

- Capabilities are required to accommodate service integration across different domains (e.g. Internet, Telecom etc) over NGN.
- There is not a complete flexible environment for application developers and service providers to create services in a quick way.

### **3 Definition and Scope**

#### **Definition:**

NGN-SIDE Service integration and delivery environment provides an open environment in NGN, which offers support for a diverse group of application developers and service providers. The environment supports the integration of capabilities from different domains (e.g. Telecom (Fixed and Mobile), Internet, Broadcasting etc) over NGN. Key features of this environment

include service creation, service execution, service provision, service management, resource management, content management and data management.

**Scope:**

The objective of NGN-SIDE is to study scenarios, requirements, functionalities and framework to specify an open service integration and delivery environment for NGN. These studies integrate telecom and internet capabilities to enable service integration and delivery environment across different domains (e.g. Telecom (Fixed and Mobile), Internet, Broadcasting, etc.) over NGN.

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