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Title: Draft Recommendation ITU-T Y.NGN-SIDE-Req, Requirements and capabilities for NGN service integration and delivery environment (output of Q.3/13 27 Oct-05 Nov 2010 e-meeting)

Abstract

This document contains the output version of draft Recommendation ITU-T Y.NGN-SIDE-Req, “Requirements and capabilities for NGN service integration and delivery environment”, as agreed at the Q3 e-meeting held on 27 Oct-05 Nov 2010.

Editors and drafting team updated this document via offline drafting, reflecting the agreements reached in the e-meeting sessions of contributions review, and according to the final meeting review.

Attachment 1 provides a table of the currently open issues in this draft Recommendation (essentially based on the editor’s notes contained in this version of the document), in order to facilitate future contributions and resolution of the open issues themselves. Contributors are invited to consider this list in preparing their future contributions. NOTE: this table will be updated by the Editors after this e-meeting.

Attachment 2 provides a living list of NGN-SIDE topics which are considered of interest for future version of this Recommendation or new NGN-SIDE related Recommendations.

Editor’s note:

The **highlighted text** in the document needs to be carefully reviewed from a technical and/or editorial point of view. Contributors are invited to check it and, possibly, provide their views on it.

The following contributions addressing Y.NGN-SIDE-Req were reviewed in this meeting with the indicated results:

No.	Source	Title	Meeting Results
C1	ZTE Corporation	Y.NGN-SIDE-comments and amendments-to-TD569	This contribution was agreed by the meeting with some modifications.
C2	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify definitions	This contribution was agreed by the meeting with some modifications.
C3	ZTE Corporation	Y.NGN-SIDE-Proposal to resolve EN related to NGN-SIDE business model	This contribution was agreed by the meeting with some modifications.
C4	ZTE Corporation	Y.NGN-SIDE-Proposal to resolve ENs related to framework	This contribution was agreed by the meeting with some modifications.
C5	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify role of IDM and other management functions	This contribution was agreed by the meeting with some modifications.
C6	ZTE Corporation	Y.NGN-SIDE-Proposal to align capabilities description with framework	This contribution was agreed by the meeting with some modifications.
C7	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify context and resource manager capability-v2	This contribution was agreed by the meeting with some modifications.
C8	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify service registry capability-v2	This contribution was agreed by the meeting with some modifications.
C9	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify the application availability in NGN-SIDE	This contribution was agreed by the meeting with some modifications.
C10	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify adaptation to NGN and Non-NGN	This contribution was agreed by the meeting with some modifications.
C11	ZTE Corporation	Y.NGN-SIDE-Proposal to improve Appendix V-v2	This contribution was agreed by the meeting with some modifications.
C12	ZTE Corporation	Y.NGN-SIDE-Proposal to resolve ENs in Appendix II-v2	This contribution was agreed by the meeting with some modifications.
C13	ZTE Corporation	Y.NGN-SIDE-Proposal to clarify relationship of SDKs and other SDPs with SIDE-v2	This contribution was agreed by the meeting with some modifications.
C14	ZTE Corporation	Y.NGN-SIDE-Proposal to handle Appendix IV.1 IV.2 IV.3	This contribution was agreed by the meeting.
C15	ZTE Corporation	Y.NGN-SIDE-Proposal to categorize the requirements in clause 7-v2	It was agreed to implement the restructuring of clause 8 according to the requirement groups proposed by C15. The implementation of this restructuring will be realized at next meeting (the editor will propose its implementation as contribution into next meeting).
C22	France Telecom Orange	Comments and proposals regarding draft Y.NGN-SIDE-req	This contribution was agreed by the meeting with some modifications.

Information on drafting activity in this e-meeting:

Revision V4 includes agreements from contributions: C1, C2, C3, C10, and C22. Some of the points are still open and yet to be concluded.

Revision V6 which is based on Nov 2nd Tuesday meeting revision V5 and further implements:

- Remaining agreed contributions (C4, C5, C6, C7, C8, C9) except C11, C12, C13, C14, and C15;
- Agreements about Clause 9 (as per Nov 2nd Tuesday discussion);
Partially FT comments of the review of the V4 (before Clause 7.2.1); It doesn't cover other comments about V4.1 from the e-meeting discussion.

Revision V7 which is based on revision V6 and further implements:

- Nov 4th agreed C11, C12, C13, and C14
- Changes captured in PDF 16h & 17h with Appendix VI (excluded 7.2.1)
- Remaining part of V4.1 comments from e-meeting discussion, i.e. 7.2.1 and onward.

Revision V8 which is based on revision of V7 with the following clarifications:

- implements the online changes agreed in Friday Nov 5th session
- aligns the section numbering

Revision 9.5 implements all changes agreed in the various e-meeting sessions.

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

Requirements and capabilities for NGN service integration and delivery environment

Summary

This Recommendation provides requirements and capabilities for a service integration and delivery environment in NGN (NGN-SIDE) in order to support the following main functionalities in the NGN-SIDE ecosystem:

- integration of resources from different domains (e.g. telecom domain (fixed and mobile networks), broadcast domain, internet domain, content provider domain etc.) over NGN;
- adaptation, including abstraction and virtualization, of resources from different domains
- resource brokering for mediation among applications and resources;
- support of application development environment for application developers;
- support of different service interfaces across ANI, UNI, SNI and NNI for exposure of NGN-SIDE capabilities and access to resources in different domains;
- provision of mechanisms for the support of diverse applications including cloud services, machine to machine, and ubiquitous sensor network applications;
- provision of mechanisms for the support of applications making usage of context based information;
- provision of mechanisms for content management.

Keywords

NGN, NGN-SIDE, SDP, service integration, service delivery, resource adaptation, adaptation, resources, API, service enablers, brokering, service execution, service creation, service delivery management

Introduction

NGN-SIDE main objectives, characteristics and features are as follows:

- NGN-SIDE supports a multi-fold telecom business model and is paving the way for comprehensive eco-system for all the stakeholders in the NGN value chain;
- NGN-SIDE puts NGN providers in the centre to control the whole NGN value chain and provides numerous opportunities for NGN providers to enhance NGN end-users access to applications;
- NGN-SIDE provides an environment that enables the development of applications that fully leverage underlying NGN and non-NGN resources such as:
 - enabling developers to create compelling applications that take full advantage of a variety of resources such as service enablers, network capabilities, device enablers, content, other applications;
 - providing access to a wide range of tools and technologies that can be used to develop rich applications.

TABLE OF CONTENTS

1	Scope.....	10
2	References.....	10
3	Definitions	11
	3.1 Terms defined elsewhere	11
	3.2 Terms defined in this Recommendation.....	12
4	Abbreviations and Acronyms	13
5	Conventions	15
6	NGN-SIDE ecosystem.....	15
	6.1 NGN-SIDE users	17
	6.2 NGN-SIDE provider.....	17
	6.3 NGN-SIDE resource providers.....	17
7	NGN-SIDE functional framework.....	17
	7.1 NGN-SIDE layered view	17
	7.2 NGN-SIDE functional view	18
	7.2.1 NGN-SIDE integration layer	20
	7.2.2 NGN-SIDE adaptation layer.....	22
	7.3 NGN-SIDE positioning within the NGN reference architecture.....	22
8	NGN-SIDE general requirements.....	24
9	NGN-SIDE capabilities	29
	9.1 NGN-SIDE capabilities related to the integration layer.....	30
	9.1.1 Resource registry	30
	9.1.2 Service orchestration	30
	9.1.3 Content management.....	30
	9.1.4 Access control	31
	9.1.5 Developer portal	31
	9.1.6 Design tools	32
	9.1.7 Resource repository	32
	9.1.8 Testing environment.....	32
	9.1.9 Service dispatcher.....	32
	9.1.10 Policy enforcement.....	33
	9.1.11 Policy management	33

9.1.12	Charging	33
9.1.13	Management of role related information	34
9.1.14	Application provisioning	34
9.1.15	Context management	34
9.1.16	Resource manager	35
9.2	NGN-SIDE capabilities related to the adaptation layer	35
9.2.1	Resource brokering	35
9.2.2	Adaptors	35
10	NGN-SIDE interfaces requirements	41
10.1	NGN-SIDE resource interfaces	41
10.2	NGN-SIDE service interfaces	42
10.2.1	General requirements of NGN-SIDE service interfaces	43
10.2.2	Service interface requirements across ANI	43
10.2.3	Service interface requirements across UNI	44
10.2.4	Service interface requirements across NNI	44
10.2.5	Service interface requirements across SNI	45
	Appendix I - Application scenarios	48
I.1	3 rd party application scenario “Book a trip”	48
I.2	In-house application scenario “Enhanced Conference”	51
I.3	M2M/USN application scenarios	53
	Appendix II-Survey of API related standardization efforts	56
II.2	Open Mobile Alliance (OMA)	56
II.2.1	OMA NGSI	56
II. 2.2	OMA Parlay REST	56
II. 2.3	OMA CSEA	57
II.2.3	OMA PSA	57
II.3	GSM Association(GSMA)	58
II. 3.1	Version 1.0 APIs/ OMA PXPROF	59
II.3.2	Version 0.91 beta APIs	59
II.3.3	Phase 2 APIs	59
II.3.4	Phase 3 APIs	60
II.4	Java Community Process	60
II.5	Wholesale Applications Community (WAC)	60
II.6	World Wide Web Consortium (W3C)	61
II.6.1	W3C Web Applications	61
II.6.2	W3C DAP	63
II.6.3	W3C UWA	64
II.6.4	HTML5 and XHTML5	65

II.7	Organization for the Advancement of Structured Information Standards (OASIS).....	66	
II. 8	Open Grid Forum (OGF).....	67	
II. 8.1	OGF OCCI.....	67	
II. 9	Distributed Management Task Force (DMTF).....	68	
II. 9.1	DMTF VMAN	68	
II. 10	Storage Networking Industry Association (SNIA).....	68	
II. 10.1	SNIA CDMI.....	68	
Appendix III - Additional information on relevant Service Delivery Platforms (SDPs) initiatives..... 69			
III.1	Introduction	69	
III.2	SDP Alliance	69	
Appendix V - Overview of cloud computing characteristics and models in relationship with NGN-SIDE			73
V.1	Scenarios of XaaS service provisioning models and supporting role played by NGN-SIDE	73	
V.1.1	Software as a Service (SaaS).....	73	
V.1.2	Platform as a service (PaaS).....	74	
V.1.3	Infrastructure as a Service (IaaS)	74	
V.1.4	Communications as a service (CaaS)	75	
V.1.5	Network as a service (NaaS)	75	
Appendix VI - Business deployment scenarios in the NGN-SIDE ecosystem.....			76
VI.1	Actors mapping to business roles	76	
VI.2	Business deployment scenarios	77	

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

Requirements and capabilities for NGN service integration and delivery environment

1 Scope

The objective of this Recommendation is to provide requirements and capabilities for a service integration and delivery environment in NGN (NGN-SIDE) in order to support the following main functionalities in the NGN-SIDE ecosystem:

- integration of resources from different domains (e.g. telecom domain (fixed and mobile networks), broadcast domain, internet domain, content provider domain etc.) over NGN;
- adaptation, including abstraction and virtualization, of resources from different domains
- resource brokering for mediation among applications and resources;
- support of application development environment for application developers;
- support of different service interfaces across ANI, UNI, SNI and NNI for exposure of NGN-SIDE capabilities and access to resources in different domains;
- provision of mechanisms for the support of diverse applications including cloud services, machine to machine, and ubiquitous sensor network applications;
- provision of mechanisms for the support of applications making usage of context based information;
- provision of mechanisms for content management.

NOTE: NGN-SIDE can be viewed as the next generation Service Delivery Platform (SDP), which is, in the context of this Recommendation, targeted for NGN, but whose framework can conceptually be applicable to other telecommunication environments (e.g. mobile networks).

In this Recommendation, clause 6 provides an overview of NGN-SIDE ecosystem, clause 7 describes the NGN-SIDE functional framework, clause 8 identifies NGN-SIDE general requirements, clause 9 describes NGN-SIDE capabilities and clause 10 provides NGN-SIDE interface requirements.

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.

[ETSI TS 102 689] ETSI TS 102 689 V1.1.1 (2010-08), *M2M service requirements*

[ITU-T Y.2012] Recommendation ITU-T Y.2012 (2010), *Functional requirements and architecture of the NGN*

[ITU-T Y.2201] Recommendation ITU-T Y.2201 (2009), *Requirements and capabilities for ITU-T NGN*

- [ITU-T Y.2221] Recommendation ITU-T Y.2221 (2010), *Requirements for support of ubiquitous sensor network (USN) applications and services in the NGN environment*
- [ITU-T Y.2233] Recommendation ITU-T Y.2233 (2010), *Requirements and framework allowing accounting and charging capabilities in NGN*
- [ITU-T Y.2234] Recommendation ITU-T Y.2234 (2008), *Open service environment capabilities for NGN*
- [ITU-T Y.2091] Recommendation ITU-T Y.2091 (2008), *Terms and Definitions for Next Generation Networks*
- [ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN*
- [ITU-T Y.2702] Recommendation ITU-T Y.2702 (2008), *Authentication and authorization requirements for NGN release 1*
- [ITU-T Y.2704] Recommendation ITU-T Y.2704 (2010), *Security mechanisms and procedures for NGN*
- [ITU-T Y.2720] Recommendation ITU-T Y.2720 (2009), *NGN identity management framework*
- [ITU-T Y.2721] Recommendation ITU-T Y.2721 (2010), *NGN identity management requirements and use cases*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application [ITU-T Y.101]: A structured set of capabilities, which provide value-added functionality supported by one or more services.

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: need to check other definitions from the ITU database.*

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.

3.1.9 Ubiquitous Sensor Network [ITU-T Y.2221]

A conceptual network built over existing physical networks which make use of sensed data and provide knowledge services to anyone, anywhere and at anytime, and where the information is generated by using context awareness.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 Machine to Machine (M2M) applications

Applications enabled by machine oriented communications between two or more entities that do not necessarily need any direct human intervention.

NOTE: This definition is inspired by [ETSI TS 102 689].

3.2.2 NGN Service Integration and Delivery Environment (NGN-SIDE)

An open environment in NGN integrating resources from different domains and delivering integrated services to applications over NGN.

NOTE: these domains include, but are not limited to, Telecom domain (e.g. Fixed and Mobile Networks), Internet domain, Broadcasting domain and Content Provider domain.

Editor's note: the definition of "service enabler" is for consideration. The following text provides some considerations about it as well as two possible candidates based on existing ATIS and OMA definitions:

Definition of service enabler should be general enough to cover cases where supported within SIDE or when used an abstracted resource by SIDE (e.g. underlying NGN service enabler). In the context of NGN-SIDE, a NGN-SIDE service enabler can be characterized by that it is made available over well defined interfaces to be consumed/used by NGN-SIDE users (e.g. applications). The definition should contain a note which positions this definition with respect to the specific usage of "service enabler" in NGN (Y.2201).

***Service Enabler (based on ATIS but modified):** a function or closely related set of functions made available over one or more well-defined interfaces to other consuming software applications. A service enablers may support end-user services, provide operations functionality, or be used directly by other service enablers. Service enablers generally utilize underlying resources to perform their tasks and have operations interfaces for their own lifecycle management.*

NOTE - An example of functionality that a may provide would be a location service or a fault management service.

Service Enabler (based on OMA):

Enabler is defined as - A technology intended for use in the development, deployment or operation of a Service; defined in a specification, or group of specifications, published as a package by OMA. **Enabler implementations** are defined as an element in the OSE and it literally represents an implementation of an enabler, e.g. either in a Service Provider domain or in a terminal domain. An enabler implementation can be viewed as a template that represents an implementation of any enabler (e.g. MMS) as defined by OMA. The enabler implementations process the messages as defined by the enabler specification. The binding elements provide the specific syntax to express these messages in the selected format such as web services, Java or .Net.

4 Abbreviations and Acronyms

Editor's note: To be checked with respect to the final version of this document and be rearranged alphabetically.

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
M2M	Machine-to-Machine
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
SDK	Software Development Kit
SDP	Service Delivery Platform
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
USN	Ubiquitous Sensor Network
XaaS	Everything as a Service
XML	Extensible Markup Language
6lowpan	IPv6 over Low power WPAN
B2B	Business to Business
BCAST	Broadcasting
CAMEL	Customized Applications for Mobile Enhanced Logic
CDMA	Code Division Multiple Access
CDN	Content Delivery Network
CRBT	Customized Ring Back Tone
CP	Content Provider
CPU	Central Processing Unit
DM	Device management
DRM	Digital Right Management
DS	Data synchronization
DVB	Digital Video Broadcasting
ETSI	European Telecommunications Standards Institute
FTP	File Transfer Protocol
GM	Group management
ID	Identifier
IdM	Identity Management
INAP	Intelligent Network Application Part
LSC	Location Service Center
MBMS	Multimedia Broadcast and Multicast Services
MLP	Mobile Location Protocol
MM7	MMS Relay/Server – MMS VAS Applications
MMS	Multimedia Messaging Service
MMSC	Multimedia Messaging Service Center

NIST	National Institute of Standards and Technology
PAP	Push Access Protocol
PAN	Personal Area Network
PIM	Personal information management
RFID	Radio Frequency Identification
ROLL	Routing over Low power and Lossy networks
RSS	Really Simple Syndication
SMPP	Short Message Peer-to-Peer
SMS	Short Message Service
SMSC	Short Message Service Center
SP	Service Provider
UE	User Equipment
WAP	Wireless Application Protocol
WCDMA	Wideband Code Division Multiple Access
WIN	Wireless Intelligent Network

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.

The keywords “application(s)”, “service(s)”, “service enabler(s)”, “computing”, “storage”, “connectivity”, “network capability(ies)”, and “content” refer to specific types of resource as described in clause 7.1.

Editor’s note: the use of the term “service” needs to be understood. Relationship with “service enablers”, “service logic”, “applications”, “resources” should be understood.

6 NGN-SIDE ecosystem

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

Figure 6-1 shows the key business roles involved in the NGN-SIDE ecosystem and the business relationships among them.

NOTE: Some business deployment scenarios of the NGN-SIDE ecosystem, including description of relevant actors, are described in Appendix VI.

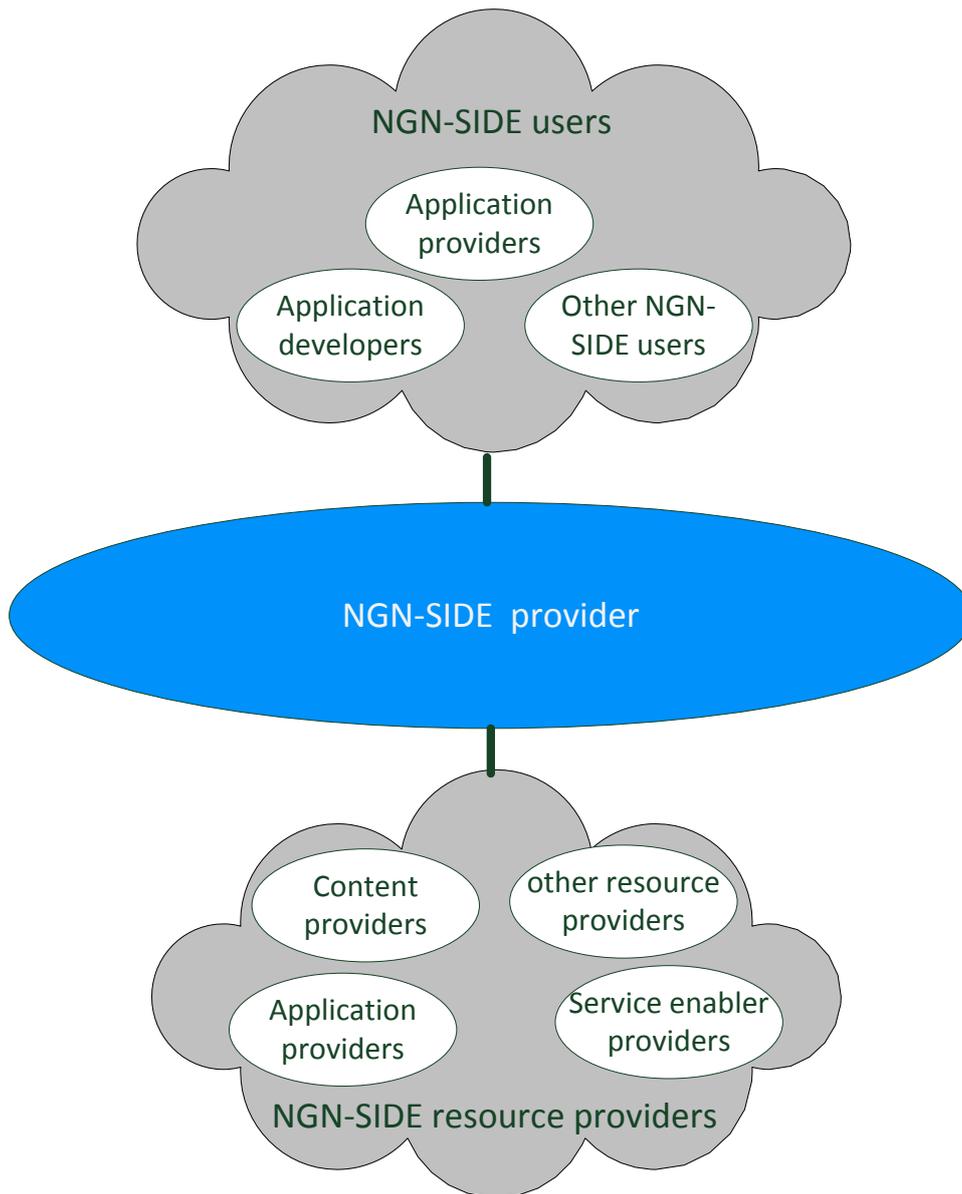


Figure 6-1 - Business role relationships in the NGN-SIDE ecosystem

NOTE: Although NGN-SIDE resource providers and NGN-SIDE users are part of the NGN-SIDE ecosystem, they are external to NGN-SIDE itself.

The following sub-clauses describe the different key business roles involved in the NGN-SIDE ecosystem, i.e. NGN-SIDE users, NGN-SIDE provider, and NGN-SIDE resource providers.

6.1 NGN-SIDE users

The NGN-SIDE users use the services offered by the NGN-SIDE provider, including resource exposure. Resources exposed by the NGN-SIDE provider to a NGN-SIDE user include NGN-SIDE provider's and NGN-SIDE resource providers' exposed resources.

NGN-SIDE users include the following specific roles:

- Application provider: in the perspective of NGN-SIDE user, the role who uses capabilities and resources exposed by the NGN-SIDE provider for offering application(s) to customers.
- Application developer: the role who uses capabilities and resources exposed by the NGN-SIDE provider for developing applications.
- Other NGN-SIDE users: Other roles (e.g. other service providers) who use capabilities and resources exposed by the NGN-SIDE provider for other various purposes.

NOTE – A NGN-SIDE user can also be a NGN-SIDE resource provider. For example, this can be the case for an application provider (see clause 6.3).

6.2 NGN-SIDE provider

The NGN-SIDE provider manages the NGN-SIDE ecosystem. In particular, the NGN-SIDE provider performs the following main functions:

- access and integration of resources provided by NGN-SIDE resource providers;
- support and control of the service integration and delivery infrastructure;
- offering of **services**, including resource exposure, to NGN-SIDE users.

6.3 NGN-SIDE resource providers

The NGN-SIDE resource providers provide resources to the NGN-SIDE provider.

NGN-SIDE resource providers include the following specific roles:

- Content provider: the role that is responsible for providing content to the NGN-SIDE provider according to commercial agreements.
- Application provider: the role that is responsible for providing application(s) as resource(s) to the NGN-SIDE provider.
- Service enabler provider: the role that is responsible for providing service enabler(s) to the NGN-SIDE provider.
- Other NGN-SIDE resource providers: Other roles that provide resources to the NGN-SIDE provider (e.g. providers of network capabilities, providers of computing, connectivity, storage resources).

NOTE – A NGN-SIDE resource provider can also be a NGN-SIDE user. For example, this can be the case for an application provider (see clause 6.1).

7 NGN-SIDE functional framework

Editor's note: terminology alignment and text duplications need to be verified between clause 6, 7, 8, 9, and 10.

7.1 NGN-SIDE layered view

Figure 7-1 shows the layered view of NGN-SIDE.

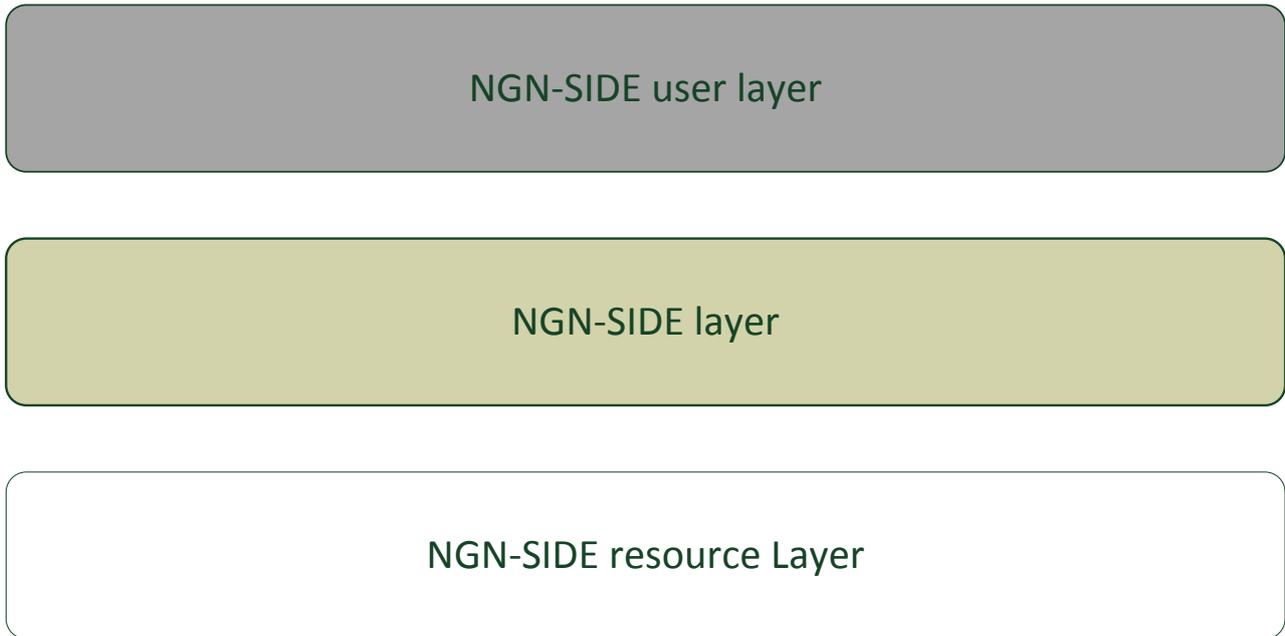


Figure 7-1 - NGN-SIDE layered view

The layered view of NGN-SIDE includes the following layers:

- The NGN-SIDE user layer, which uses the **services** offered by the NGN-SIDE layer, including resource exposure. It includes users accessing the NGN-SIDE, such as applications and other users. *Editor's note: examples of other users are for consideration.*
- The NGN Service Integration and Delivery Environment layer (NGN-SIDE), which corresponds to NGN-SIDE.
- The NGN-SIDE resource layer, which includes resources accessible by NGN-SIDE, such as **services**, applications, service enablers, network capabilities, connectivity, computing, storage, and content.

7.2 NGN-SIDE functional view

Figure 7-2 shows a functional view of NGN-SIDE according to the layers in Figure 7-1.

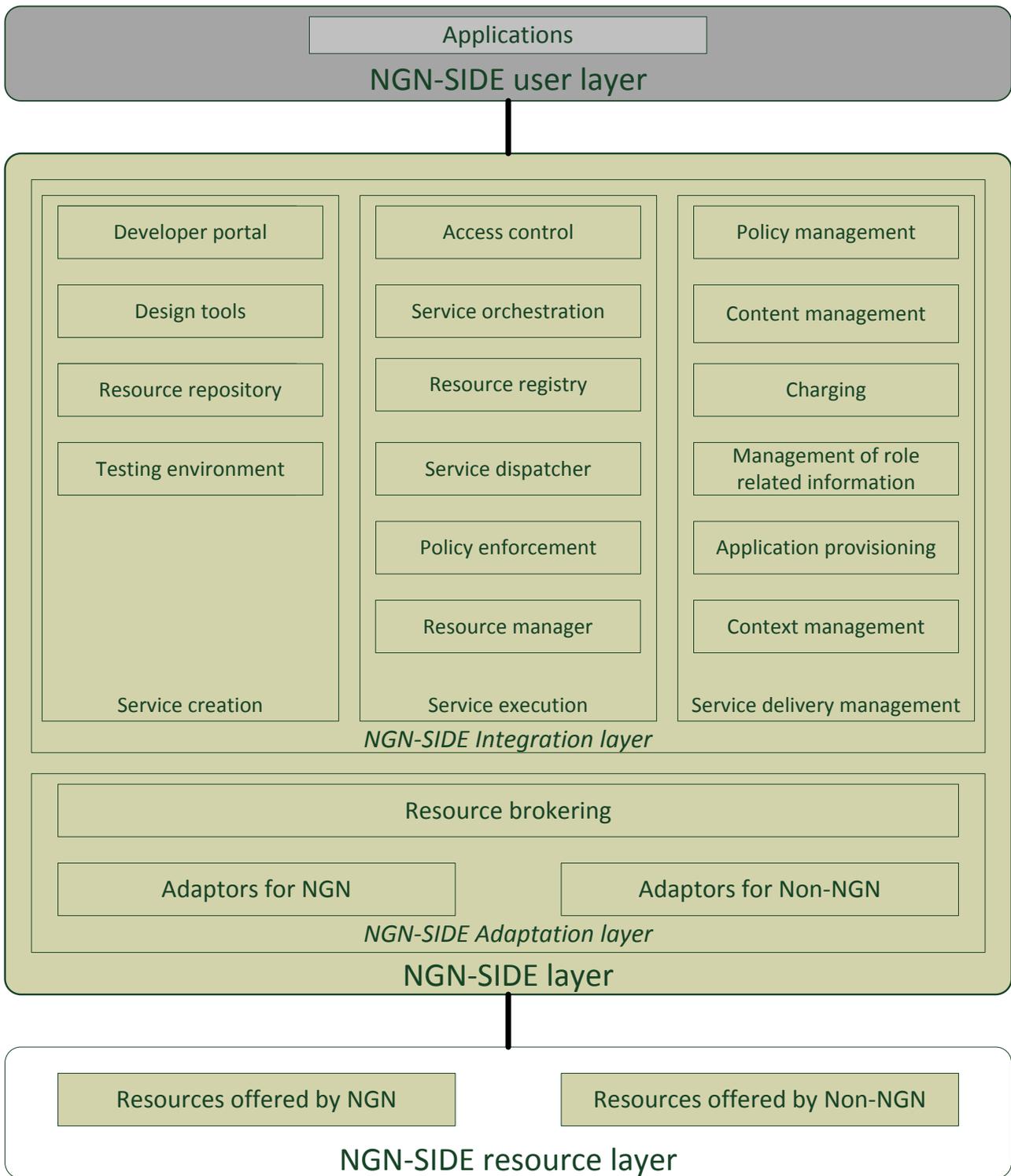


Figure 7-2 - NGN-SIDE functional view

Editor's note: it is for consideration if other users should be introduced in the user layer (e.g. for user accessing NGN-SIDE for application development).

As shown in Figure 7-2 the NGN-SIDE layer is itself further decomposed in the following layers:

- NGN-SIDE integration layer;
- NGN-SIDE adaptation layer.

Editor's note: Add pre-fix "NGN-SIDE" to Integration layer and Adaptation layer wherever applicable.

7.2.1 NGN-SIDE integration layer

In order to reduce the complexity of integrating resources, the NGN-SIDE integration layer provides a unified way for the NGN-SIDE users to access the resources offered by NGN and Non-NGN.

As shown in Figure 7-2, the NGN-SIDE service integration layer supports the following functional groups:

- service creation functional group;
- service execution functional group;
- service delivery management functional group.

The service creation functional group provides an application development environment to application developers.

The service execution functional group processes **service** requests received from the NGN-SIDE user layer and as a result, sends back responses to the NGN-SIDE user layer. While processing the **service** requests, service execution invokes the NGN-SIDE adaptation layer for requested resources.

The service delivery management functional group provides management support for ensuring proper functioning of the service creation and service execution functional groups and providing associated delivery functionalities.

The following sub-clauses provide a description of the functional groups supported by the NGN-SIDE integration layer.

7.2.1.1 Service creation functional group

The service creation functional group provides capabilities to realize an application development environment. This functional group includes the following capabilities:

- The developer portal which is responsible for providing secure access to NGN-SIDE capabilities and resources (exposed) from NGN-SIDE resource providers, secure storage of developers' applications, access to the testing environment and various application developer's support functions and mechanisms such as development management tools, API definitions etc.;
- The design tools which are responsible for service creation according to the application logic; **content aggregation; and user interface (UI)**;
- The resource repository which is responsible for providing resource information reusable to develop new applications;
- The testing environment which is responsible for providing an application simulation environment to verify if a new application can work correctly.

7.2.1.2 Service execution functional group

The service execution functional group provides capabilities to support the service execution environment. This functional group includes the following capabilities:

- The access control which provides functions related to control and manage access to NGN-SIDE by applications and translates standardized or proprietary APIs and protocols across different NGN-SIDE service interfaces. NOTE: NGN-SIDE service interfaces are described in clause 10.2. .

NOTE: access control is only applicable during application execution.

- The service dispatcher which provides the following functionalities:
 - API/protocol transformation from applications to common message structure;
 - business event handling;
 - message routing and exchange from/to NGN-SIDE users;
 - coordination with policy enforcement for service level monitoring such as QoS control.
- The service orchestration which is responsible for:
 - composing service logic in static and dynamic mode;
 - executing the service logic.
- The policy enforcement which provides policy execution, policy-based access control, resource consumption, application schedule and traffic control functions according to the Service Level Agreements (SLAs) between consumer and provider of the resources. *Editor's note: clarification is required on the policy enforcement functions (are these functions more policy decision related and actual enforcement is realized by other functions to be clarified).*
- The resource registry which provides mechanisms to register and discover resources, and to ensure resource governance. Resources are registered **and published** at this registry, which maintains a catalogue of the resources available, including all the relevant information for execution. At run-time, the resource registry is accessed to locate the resources. *Editor's note: "resource governance" needs to be described.*
- The resource manager which performs the centralized controlling function for all distributed resources offered by NGN (including NGN-SIDE) and non-NGN. The resource manager also assigns the required resources to NGN-SIDE in-house applications.
NOTE: The resource manager handles the pool of resources hosted by the NGN-SIDE provider for applications provided by the NGN-SIDE provider when playing the role of application provider. The role of the resource manager in managing third party resources is for further study.

7.2.1.3 Service delivery management functional group

The service delivery management functional group provides capabilities to realize the management of different aspects, provisioning of applications and charging. This functional group includes the following capabilities:

- The policy management which provides support for reliable, consistent, deterministic **policy decisions** according to **agreed policies, including SLAs** between NGN-SIDE users and NGN-SIDE resource providers.

Editor's note: clarification is required on the policy management functions (role with respect to policy decisions needs clarifications).

Editor's note: it is needed to expand the above text concerning policy rules (SLAs etc.). Final text needs alignment with corresponding in clause 9.

- The management of role related information which provides centralized access and management of information related to the different NGN-SIDE roles.
- The content management which provides mechanisms to handle content for its appropriate access by NGN-SIDE users.
- The charging capability which coordinates charging for NGN-SIDE, including performs triggering (online and offline) of all charging events during service delivery, interacting as appropriate with the NGN accounting and charging capabilities [ITU-T Y.2201]...
Editor's note: It is for consideration if any specific role of NGN-SIDE for charging exists (e.g. management of charging information specific to roles) with respect to general NGN charging functionalities.
- The application provisioning which provides mechanisms for application deployment in a secure way.
- The context management which collects context information and exposes context information to other entities in a secure way.

7.2.2 NGN-SIDE adaptation layer

Resource adaptation layer includes resource brokering and resource adaptors.

Upon requests received from the NGN-SIDE integration layer, the resource brokering identifies the appropriate resources from the NGN-SIDE resource layer and applications in the NGN-SIDE user layer based on user's request, and mediates among resources and applications.

The resource brokering also coordinates with the NGN-SIDE integration layer (e.g. policy enforcement) to implement the resource related policies such as scheduling of resources.

The resource adaptors include adaptors for NGN and adaptors for Non-NGN.

The resource adaptors perform adaptation of resources from the NGN-SIDE resource layer i.e. resources from NGN and Non-NGN, based on integration layer's outcome to fulfill the service requests. The resource adaptors perform adaptation of control plane and media plane related resources.

7.3 NGN-SIDE positioning within the NGN reference architecture

Figure 4 shows the NGN-SIDE positioning within the NGN reference architecture [ITU-T Y.2012].

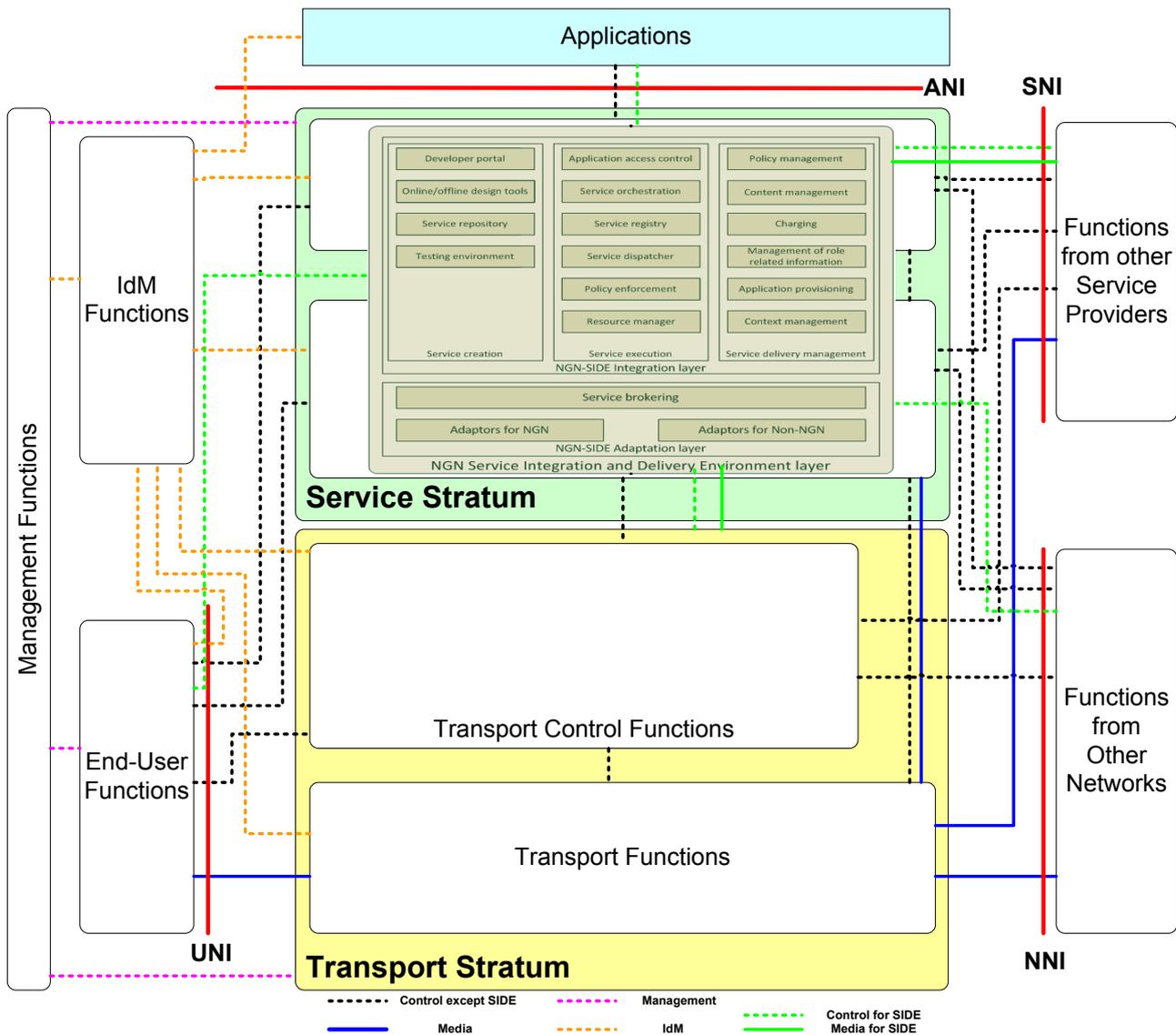


Figure 4 - NGN-SIDE positioning within the NGN reference architecture

The NGN-SIDE functional components are positioned inside the NGN service stratum. The NGN-SIDE resource adaptation layer enables the abstraction of resources, including the resources of the NGN transport stratum (e.g. transport control functions and transport functions related resources) and the NGN service stratum (e.g. service control functions and content delivery functions related resources).

NOTE: This Recommendation assumes one single NGN-SIDE per NGN domain.

“Control for SIDE” in Figure 4 represents the control level interfaces between NGN-SIDE and relevant entities outside the NGN service stratum. In particular:

- “Control for SIDE” at the ANI between applications and NGN-SIDE represents the interface to 3rd party applications.
- “Control for SIDE” at the NNI between other networks and NGN-SIDE represents the interface to other networks (e.g. to access NGN-SIDE in another NGN, resources in other networks etc.).

- “Control for SIDE” at the UNI between end user functions and NGN-SIDE represents the interface to end user functions (e.g. to access resources located in the end user side, to expose NGN-SIDE capabilities to applications in the end user side).
- “Control for SIDE” at the SNI between other service providers and NGN-SIDE represents the interface to other service providers (e.g. content providers).

“Media for SIDE” in Figure 4 represents the media level interfaces between NGN-SIDE and relevant entities outside the NGN service stratum.

NOTE: “control for SIDE” and “media for SIDE” interfaces between NGN-SIDE and NGN service stratum are implicit but not shown in Figure 4.

In line with [ITU-T Y.2012], it is possible for IdM functions to reside in different planes (e.g., user, control and management) and different strata of the architecture (e.g., service stratum and transport stratum). Although IdM functions are shown in the above figure as a standalone group of functions, this is not intended to impose any implementation design and restrictions for IdM functions. In particular, NGN-SIDE may provide support for IdM (e.g. IdM related to NGN-SIDE users, NGN-SIDE resource providers and NGN-SIDE provider). In addition, NGN-SIDE may also provide adaptation of IdM resources (via appropriate adaptors), including NGN IdM resources, and may also expose IdM resources to NGN-SIDE users.

Editor’s note: specific IdM functions in NGN-SIDE need consideration (see ATIS liaison).

It is possible for management functions to reside in different strata of the architecture (e.g., service stratum and transport stratum). Although management functions are shown in the above figure as a standalone group of functions, this is not intended to impose any implementation design and restrictions for management functions. In particular, management functions **may reside within NGN-SIDE** (e.g. those in support to the service delivery management functional group).

8 NGN-SIDE general requirements

Editor’s note: the e-meeting has agreed to re-structure this clause in alignment with the requirements groups proposed by contribution C15 to this e-meeting: 1) application related requirements, 2) integration related requirements, 3) adaptation related requirements, 4) other general requirements. The implementation of this restructuring will be realized at next meeting (the editor will propose its implementation as contribution into next meeting).

Editor’s note: a final check should be made concerning correspondence between requirements in clause 8 and capabilities in clause 9.

This clause describes the NGN-SIDE general requirements.

Editor’s note: some requirements in this clause are specific to NGN, but it is in various cases unclear or not justified why they have to be only for NGN and not also for non-NGN. They need to be revisited.

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

- NGN-SIDE is required to provide application access control:
 - NGN-SIDE is required to support access from applications to NGN-SIDE functionalities and to exposed resources in a secure and controlled way;
- NGN-SIDE is required to support exposure of resources, including virtualized resources (virtualized connectivity, virtualized computing and virtualized storage) from different domains. *Editor's note: duplication of this requirement with others in clause 8 needs to be checked. In particular:*
 - NGN-SIDE is required to support mechanisms to expose Telecom domain resources. This includes mechanisms to expose NGN capabilities, including NGN service enablers, as specified in [ITU-T Y.2201].
NOTE: NGN service enablers are a subset of the NGN capabilities specified in [ITU-T Y.2201].
 - NGN-SIDE is required to support mechanisms to expose Internet domain resources.
 - NGN-SIDE is required to support mechanisms to expose Broadcasting domain resources.
 - NGN-SIDE is **recommended** to support exposure of **composite** resources, such as composite applications and services, supplied by a given NGN-SIDE resource provider .
 - NGN-SIDE is **recommended** to support exposure of **legacy services**; *Editor's note: this requirement needs clarification.*
- NGN-SIDE is recommended to support exposure of contents offered by NGN-SIDE resource providers;
- NGN-SIDE is recommended to support mechanisms for content storage, content caching, content processing and content control to be used for real-time and non-real time communications.
- NGN-SIDE is required to support brokering of resources supplied by different NGN SIDE resource providers in a secure and controlled way:

The resource brokering is required to manage interactions among all available resources, including cloud resources, offered by different NGN-SIDE resource providers.
- The resource brokering is required to take into account context information (including user's context information) when selecting a resource to fulfill a request from the NGN-SIDE integration layer.
- NGN-SIDE is required to provide an open environment for the integration of resources from different domains:
 - NGN-SIDE is required to support integration of resources supplied by the same NGN-SIDE resource provider. and from different NGN-SIDE resource providers.
 - NGN-SIDE is recommended to support **orchestration** of resources supplied by the NGN-SIDE provider and resources supplied by different NGN-SIDE resource providers. *Editor's note: it needs to be clarified if the usage of the word*

“orchestration” here is related to “service orchestration” (in this case it should be considered in the related bullets) or is for different meaning.

- NGN-SIDE is required to provide standardized mechanisms to access the resources located in different NGN-SIDE resource providers.
- NGN-SIDE is recommended to provide an abstract standardized description of resources located in different NGN-SIDE resource providers.
- NGN-SIDE is required to support an agile service creation environment:
 - NGN-SIDE is required to use standardized description of resources within NGN-SIDE uniformly.
 - NGN-SIDE is required to support at least one standardized description language for service logic (i.e. the logic of the services to be provided by NGN-SIDE)..
 - NGN-SIDE is required to support mechanisms to notify application developers about availability of new or updated resources.
 - NGN-SIDE is required to support application testing environment for application developers.
 - NGN-SIDE is required to support online and offline design tools for application developers.
 - NGN-SIDE is required to provide NGN-SIDE users with a physical location independent resource identification scheme for accessing the resources exposed by NGN-SIDE (e.g. independent of their physical addresses).NGN-SIDE is required to support mechanisms for personalization based on end user’s context information including language, location, presence and other customized information;
 - NGN-SIDE is required to support protection of property rights.
Editor’s note: it is FFS whether property right: a) is the right of use or right of protection; b) needs consideration of both ways (NGN-SIDE to developer and vice versa).
- NGN-SIDE is required to support service orchestration features as follows:
 - NGN-SIDE is required to support static service orchestration according to the pre-defined service logic.
 - NGN-SIDE is required to support a mechanism to select the appropriate resource responding to dynamic context information changes such as those of end user context, device context, network context.
 - NGN-SIDE is required to support a mechanism to generate a service logic meeting the NGN-SIDE user’s demand (e.g. cost and execution requirements).
 - NGN-SIDE is required to support a mechanism for adaptive composition to ensure application’s reliability when it occurs that some resources are not available.
- NGN-SIDE is required to support features for a configurable, manageable, scalable, reliable and virtualizable service execution environment:
 - NGN-SIDE is required to support traffic control related functions based on applications’ SLAs for the invocation of resources offered by NGN-SIDE resource providers. *Editor’s note: it should be clarified if this requirement is for all applications or only for a subset (in-house applications).*

- NGN-SIDE is required to support monitoring functions (e.g. monitoring of resources' availability, devices' overload, network congestion level etc.) for resources offered by NGN-SIDE resource providers.
- NGN-SIDE is required to provide functions for application execution's scalability and reliability.
- NGN-SIDE is required to support virtualization mechanisms to share connectivity, computing and storage resources **at execution time**.
- NGN-SIDE is required to support mechanisms for application provisioning, addressing and routing: *Editor's note: it should be clarified to which applications this requirement applies, and why this requirement is distinct from that below on "resources" (applications can be resources).*
 - NGN-SIDE is required to provide mechanisms to publish an application supported by NGN-SIDE so that it can be accessible from various domains NOTE: this may include publishing a domain name for internet domain, assigning a special access number (e.g. an E.164 number) for 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**. *Editor's note: clarification is required on the parties involved.*
- NGN-SIDE is required to support mechanisms for resource registration, discovery and routing:
 - NGN-SIDE is required to provide mechanisms for resource registration, including a standard language to describe the resources, a unique identification of the resources, a resource addressing mechanism. *Editor's note: standard description language is also mentioned in a previous requirement.*
 - NGN-SIDE is required to provide a routing mechanism to locate the required resources and establish a path to access the resources.
 - NGN-SIDE is required to provide a mechanism of SLA control of resources, including authentication, authorization and traffic control for routing.
- NGN-SIDE is required to provide content storage, caching, processing, delivery and control mechanisms: *Editor's note: this sentence is duplicated in (part of) a previous bullet. It needs to be reviewed with the previous bullet and with the content management bullet.*
 - NGN-SIDE is required to provide real-time content recording, processing (**e.g.** transcoding, encryption, decryption, content protection (Digital Right Management (DRM))).
 - NGN-SIDE is required to provide real-time and static content 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 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).

- Provide mechanisms to support M2M applications [ETSI TS 102 689] and USN applications [ITU-T Y.2221]
- Support application developer's requirements:
 - NGN-SIDE is required to support application developer's management including developer's registration, auditing, authentication and authorization.
 - NGN-SIDE is required to support various charging modes for application developers, e.g. revenue sharing, quota limitation etc. *Editor's note: text needs further elaboration.*
NOTE: This charging mode is only between application developer and application provider. Additionally this charging mode is not applicable to resource consumption in run-time environment.
- NGN-SIDE is required to support the following security requirements:
 - NGN-SIDE is required to support security mechanisms according to [ITU-T Y.2201], [ITU-T Y.2701], [ITU-T Y.2702], [ITU-T Y.2704], **OASIS [OASIS WSS 1.1]** for the following dimensions: access control, authentication, authorization, non-repudiation, data confidentiality, communication security, data integrity, availability and privacy.
 - NGN-SIDE is required to provide a security environment for the NGN-SIDE user, so that the NGN-SIDE user can set up a trust domain for context aware applications.
 - NGN-SIDE is required to provide a privacy schema to enable the NGN-SIDE user's protection for access and selection of NGN-SIDE user related context information. NGN-SIDE is required to have mechanisms to manage, control and distribute context related information, according to the NGN-SIDE provider's privacy policies and related agreements with NGN-SIDE users and the NGN-SIDE resource providers supplying context information.
 - NGN-SIDE can optionally provide Identity Management support to NGN-SIDE users via integration of NGN Identity Management network based capabilities according to [ITU-T Y.2201] [ITU-T Y.2720] [ITU-T Y.2721] with Identity Management capabilities provided by Applications and/or other resources.
Editor's note: consideration should be given 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.
- NGN-SIDE is required to support mechanisms for context management as follows:
Editor's note: it should be considered if the text should mention that different types of context information may be used by NGN-SIDE (not restricted to NGN context).
 - NGN-SIDE is recommended to support standardized data format and semantics of context information following [ITU-T Y.2201] ;
 - NGN-SIDE is recommended to support context management for managing context information about context entities and context access (etc. register, query, subscribe, notify, update, discover availability);
 - NGN-SIDE is recommended to support security and reliability for context information following [ITU-T Y.2201];
 - NGN-SIDE is recommended to support charging function based on context information following [ITU-T Y.2201].
- NGN-SIDE is required to support mechanisms for management of role related information as follows:

Editor's note: the related text in clause 6.3 needs review and alignment with the following agreed text.

- NGN-SIDE is required to support the management (i.e. add, modify, delete, operations) of role related information by the NGN-SIDE provider.
- NGN-SIDE is required to support the management (i.e. add, modify, delete operations) of subscription related information **between different roles** by the NGN-SIDE provider.
- NGN-SIDE is recommended to support policy based access of NGN-SIDE role related information;
- NGN-SIDE is recommended to support policy based access of application end users' subscription related information.
- NGN-SIDE is required to support mechanisms for content management as follows:
 - NGN-SIDE is required to support content profiling to handle content according to content usage in different NGN-SIDE users' environments;
 - NGN-SIDE is required to support extraction of appropriate information (e.g. size, type, publisher, etc) from content;
 - NGN-SIDE is required to support content dispatching to content storage resources.
- NGN-SIDE is **required** to provide mechanisms to support the following cloud service categories:
 - Application Services (SaaS);
 - Platform Services (PaaS);
 - Communication Services (CaaS);
 - Resource Services (IaaS);
 - Network Services (NaaS).
- NGN-SIDE is recommended to provide the following functionalities to support cloud services:
 - intermediation, monitoring, security, screening, transformation, provisioning and integration of cloud services;
 - negotiation (e.g. for SLA, QoS) between cloud service users (as NGN-SIDE users) and cloud service providers (as NGN-SIDE resource providers).
- NGN-SIDE can optionally be deployed, as internal resources and functionalities, in a distributed fashion using cloud computing mechanisms (e.g. virtualization, distributed file system, distributed cache, distributed database). NOTE: this deployment can provide IaaS support by the NGN-SIDE infrastructure itself.

NOTE: Details about cloud service categories can be found in [b-ITU-T FG-Cloud-Ecosystem]. An overview of characteristics and models of cloud computing technology and the relationship of these models with NGN-SIDE are described in Appendix V.

9 NGN-SIDE capabilities

Editor's note: it is required to clearly explicit the various requirements supported by each capability. And the capabilities should be ordered in similar way than in clause 7.

This clause describes the capabilities of NGN-SIDE according to the NGN-SIDE layered view.

9.1 NGN-SIDE capabilities related to the integration layer

9.1.1 Resource registry

This capability provides the functionalities related to the registration, deregistration, discovery, and governance of resources offered by NGN-SIDE resource providers.

This capability defines a mechanism for a resource of a NGN-SIDE resource provider to be registered within NGN-SIDE, so that this resource can be used by the application developers to create applications.

All resources have to be registered to the resource registry with their relevant information. The resource registry can also support resource update as well as resource deregistration.

When there is a resource deregistration request (e.g. if a resource is not needed anymore), the resource registry capability is required to ensure the application running instances' reliability.

The resource registry capability implements a resource discovery mechanism which allows NGN-SIDE users (e.g. applications) to choose an appropriate resource. Resources are discovered based on static configuration and dynamic information. NOTE: the static information used for selection may include user identity information (e.g. user name, binding address, etc) which is generally invariable; the dynamic information used for selection may include other user information, such as user's presence and location, user's access network bandwidth, which is subject to change.

The resource registry capability provides resource governance in terms of management of all registered resources, including resource life cycle management, resource portfolio management, resource performance monitoring. For example when a resource is updated, the resource registry capability is responsible for informing all the application developers and the application running instances about this update.

9.1.2 Service orchestration

This capability provides mechanisms for:

- composing resources (resources provided by the NGN-SIDE provider as well as registered resources from other domains) to create new composite resources;
- executing composite resources;

Composing resources is the process of generation of the service logic (i.e. the logic of the service to be provided by NGN-SIDE) taking into account requirements from the end user (user of the application), including consideration of context information, and dynamic changes of resources.

Executing composite resources includes parsing and running the service logic. NOTE: the execution process also includes ensuring reliability and continuity of the service to be provided by NGN-SIDE, when a resource to be composed is not available (e.g. the resource hosting device is powered off or its connection to NGN-SIDE is broken).

9.1.3 Content management

Content can be provided as resources to NGN-SIDE by different NGN-SIDE resource providers (e.g. content providers, end users and Internet sourced content providers).

This capability provides the following functionalities:

- extraction of appropriate information (including size, type, publisher, location, etc.) from content, enabling the NGN-SIDE provider to ensure the integrity of the content itself.

- profiling of content as appropriate to enable its delivery to different NGN-SIDE users' environments, such as content for specific applications (e.g. WAP, CRBT, Web), content for specific end user equipment, content for specific end user locations, etc.;
- dispatching of content to content storage resources in order to expose content to applications. NOTE: content storage resources can be supported within NGN-SIDE or external NGN or Non-NGN environments.

9.1.4 Access control

The access control capability provides translation of APIs/protocols across different NGN-SIDE service interfaces as well as access from applications to functionalities and/or resources exposed by NGN-SIDE.

The access control capability supports the following functionalities:

- API/protocol translation between different service interfaces and NGN-SIDE;
- authentication of NGN-SIDE users requesting usage of exposed functionalities and/or resources;
- authorization of NGN-SIDE users requesting usage of exposed functionalities and/or resources according to the policies;
- handling and relaying of service requests and/or events from applications and/or resources towards NGN-SIDE;
- handling and relaying of responses from applications and/or resources;
- triggering of charging events for applications accessing functionalities and/or resources exposed by NGN-SIDE.

9.1.5 Developer portal

This capability enables application developers to develop applications using resources exposed by NGN-SIDE.

An application developer can develop applications using online and/or offline tools.

In the online application development mode, the application developer connects to the developer portal and develops applications using online tools accessible via the developer portal.

In the offline application development mode, the application developer downloads offline tools (e.g. SDKs or plugins) from the developer portal and develops applications.

Developer portal supports the following functionalities:

- provides an easy and secure access to resource repository;
- provides developers' applications with customer and contextual data to deliver an enhanced user experience;
- supports easy-to-use development management tools and multiple easy-to-use development platforms;
- supports access to the testing environment;
- supports purchasing and payment mechanisms as well as revenue sharing models;
- provides support functionality for secure storage of developers' applications; provides rules, guidelines, sample applications and API definitions for rapid application development;
- supports collection and exposure of customer feedback and rankings about applications;
- supports security mechanisms to assure protection of intellectual property.

9.1.6 Design tools

Editor's note: it needed further consideration about design tools as distinct capability.

Design tools facilitate the rapid development of applications by application developers.

Editor's note: the following text is redundant with the text included in the developer portal capability.

Using the online applications development mode, the application developer directly connects to the developer portal which includes integrated development management tools, testing environment, access to the developers' community.

Using the offline application development mode, the application developer downloads SDKs or plugins locally for application development support in accessing resources exposed by NGN-SIDE.

9.1.7 Resource repository

The resource repository capability is required to provide functionalities for the storage of information related to the registered resources. *Editor's note: the following function seems appropriate for the design tool capability, however it is not clear if these tools may be also used by resource providers.*

The resource repository capability is required to provide various suitable packaging tools for the registered resources to application developers **and resource providers**, including Java SDK, .NET SDK and Eclipse.

The resource repository capability is recommended to:

- provide a version management mechanism to allow registered resource automatic upgrade;
- provide a **standard** mechanism to interact with the resource registry capability for cooperation on resource related information retrieval and storage.

9.1.8 Testing environment

This capability provides a testing environment to application developers to allow testing of application operation (e.g. support of application tracing, debugging, **single-step implementation**).

The testing environment can optionally support tools and capabilities for simulation of NGN-SIDE capabilities as appropriate for testing..

The testing environment is recommended to not impact the operations of NGN-SIDE.

It is recommended that NGN-SIDE itself be able to simulate resources within the testing environment.

9.1.9 Service dispatcher

This capability provides unified message routing and message exchange mechanisms within NGN-SIDE:

- The message routing mechanisms provide for route calculation for requests and responses between NGN-SIDE users and NGN-SIDE resource providers. Message routing can be based on various criteria e.g. context, policies etc..
- The message exchange mechanisms control the message flow between NGN-SIDE users and NGN-SIDE resource providers.

The service dispatcher coordinates with policy enforcement for service level monitoring such as QoS control.

The service dispatcher also provides API/protocol transformation from applications to common message structure and business event handling.

- The service dispatcher capability is required to support exchange and routing of messages between NGN-SIDE users and NGN-SIDE resource providers. This includes support of message flows involving multiple application providers.
- The service dispatcher is required to coordinate with policy enforcement for service level monitoring such as QoS control.
- The service dispatcher capability is required to support API/protocol transformation from applications to common message structure, and handling of business events.

9.1.10 Policy enforcement

Editor's note: introduction text is needed.

The policy enforcement capability is required to:

Editor's note: clarification is required on the policy enforcement functions (see clause 7).

- synchronize policy related information with the policy management capability;
- interpret and execute policy rules provided by the policy management capability;
- coordinate with the service dispatcher for policy decisions, according to policy related information, concerning usage and routing of resources when an application is running.

Editor's note: text of above bullet should be considered for alignment with the service dispatcher text (which currently mentions coordination for service level monitoring),

9.1.11 Policy management

The policy management capability provides management of policies, used for access, provisioning, logging and management of resources [ITU-T Y.2201].

The policy management capability is required to support:

- storage of policy related information, including SLAs, for interaction between applications and NGN-SIDE;
- storage of policy related information, including SLAs, for interaction between NGN-SIDE and resources;
- storage of end user's preferences provided by end users at subscription time.

9.1.12 Charging

This capability coordinates charging for NGN-SIDE, interacting as appropriate with the NGN accounting and charging capabilities [ITU-T Y.2201].

The charging capability is required to support charging modes and mechanisms as specified in [ITU-T Y.2233], including:

- support of revenue sharing among the various actors involved in the NGN-SIDE ecosystem (e.g. support of individual application developers);
- support of event-based online/offline charging in the NGN-SIDE ecosystem.

9.1.13 Management of role related information

The management of role related information capability makes role related information available to other NGN-SIDE capabilities (e.g. to access control for role authentication and authorization).

This capability is required to provide access and centralized management (i.e. add, modify, delete operations) of role related information, including information on role inter-relationship, concerning the different roles involved in the NGN-SIDE ecosystems.

NOTE: role related information includes basic information for all roles (e.g. NGN-SIDE user - resource provider relationship), role specific information (e.g. preference profiles), subscription related information (e.g. end user-application provider subscription relationship information for in-house applications), and **SLA information**.

The management of role related information can optionally support storage of role related information.

9.1.14 Application provisioning

The application provisioning capability is used for deployment of applications in a secure way by the NGN-SIDE provider when they are available for deployment. NOTE: this capability is used for applications hosted by the NGN-SIDE provider.

This capability provides application packaging, publishing, deployment, lifecycle management and monitoring functions.

This capability only deals with applications of the NGN-SIDE integration provider when playing also the role of application provider.

The capability is required to provide:

- a standard format for application packaging, including directory structure, compression format, configuration format;
- a standard schema for application provisioning;
- a publishing mechanism **which makes** an application **accessible** by different domains, e.g. assigning a domain name to the application for Internet user access, assigning a SMS access code for PLMN user access;
- a deployment mechanism which allows to assign an application server in the NGN-SIDE provider domain for application hosting;
- access means for control of application lifecycle, including application **load, unload, transfer**, version management and tracing log.

9.1.15 Context management

The context management capability collects, aggregates and manages context information related to different context sources, exposing context information, including to other NGN-SIDE capabilities, according to the NGN-SIDE provider's policies.

Context information includes different types of context related information such as **service**, end user, device and network context:

- the **service** context may include service availability, service QoS, service performance;
- the end user context may include the end user's identity, end user's presence, end user's end location, end user's preferences and end user's **social situation**;
- the device context may include device status (device's presence, device's capabilities), device's runtime parameters (CPU, memory, load, performance, etc);

- the network context may include network conditions (e.g., bandwidth, traffic, topology, etc.) and network performance.

The context management capability is required to:

- collect and aggregate context information related to different context sources;
- expose context information, including to other NGN-SIDE capabilities, according to the NGN-SIDE provider's policies.

9.1.16 Resource manager

The resource manager performs the centralized controlling functions for all resources in order to satisfy the application's requirements.

During the deployment of applications provided by the NGN-SIDE provider when playing the role of application provider, the application provisioning capability communicates with the resource manager which assigns the resources internal to the NGN-SIDE according to the application's requirements (SLAs) and the NGN-SIDE provider's policies.

9.2 NGN-SIDE capabilities related to the adaptation layer

9.2.1 Resource brokering

Editor's note: Text of this clause has to align with related text in clauses 6 and 7.

This capability provides the interaction between applications and resources for the downward invocation of resources and the upward triggering of applications. It also coordinates with the NGN-SIDE integration layer capabilities (e.g. policy enforcement) to implement the resource related policies such as scheduling of resources.

For the downward request from the application side, the resource brokering is required to coordinate with policy enforcement in order to decide which resources should be invoked among the candidate resources and to mediate among the resources according to the context information (e.g. end user's preferences, resource conditions, device status). For the upward request from the resource side, the resource brokering is required to control the application's trigger sequence and mediate among the applications and resources according to policies (including the NGN-SIDE provider's policies, context information, and application provider's policies).

The resource brokering is recommended to provide brokering of cloud resources from a single or multiple domains, and interfacing with such domains in a proxy manner. NOTE: details about requirements for support by the resource brokering of cloud resources are out of scope of this document.

9.2.2 Adaptors

The resources offered by NGN-SIDE resource providers may vary based on the underlying resource technology used by the NGN-SIDE resource providers. This makes difficult for application developers to develop new applications based on direct usage of such diverse and complex underlying resources.

The NGN-SIDE adaptation layer is required to adapt resources offered by NGN-SIDE resource providers such as their own service logic and service control, and related protocols, in order to

provide uniformly adapted resources (e.g. control and media format) for interaction with the NGN-SIDE integration layer.

The NGN-SIDE adaptation layer provides adaptation capabilities, called adaptors, shielding the details of the resources in the NGN-SIDE resource layer as shown in Figure 9-1.

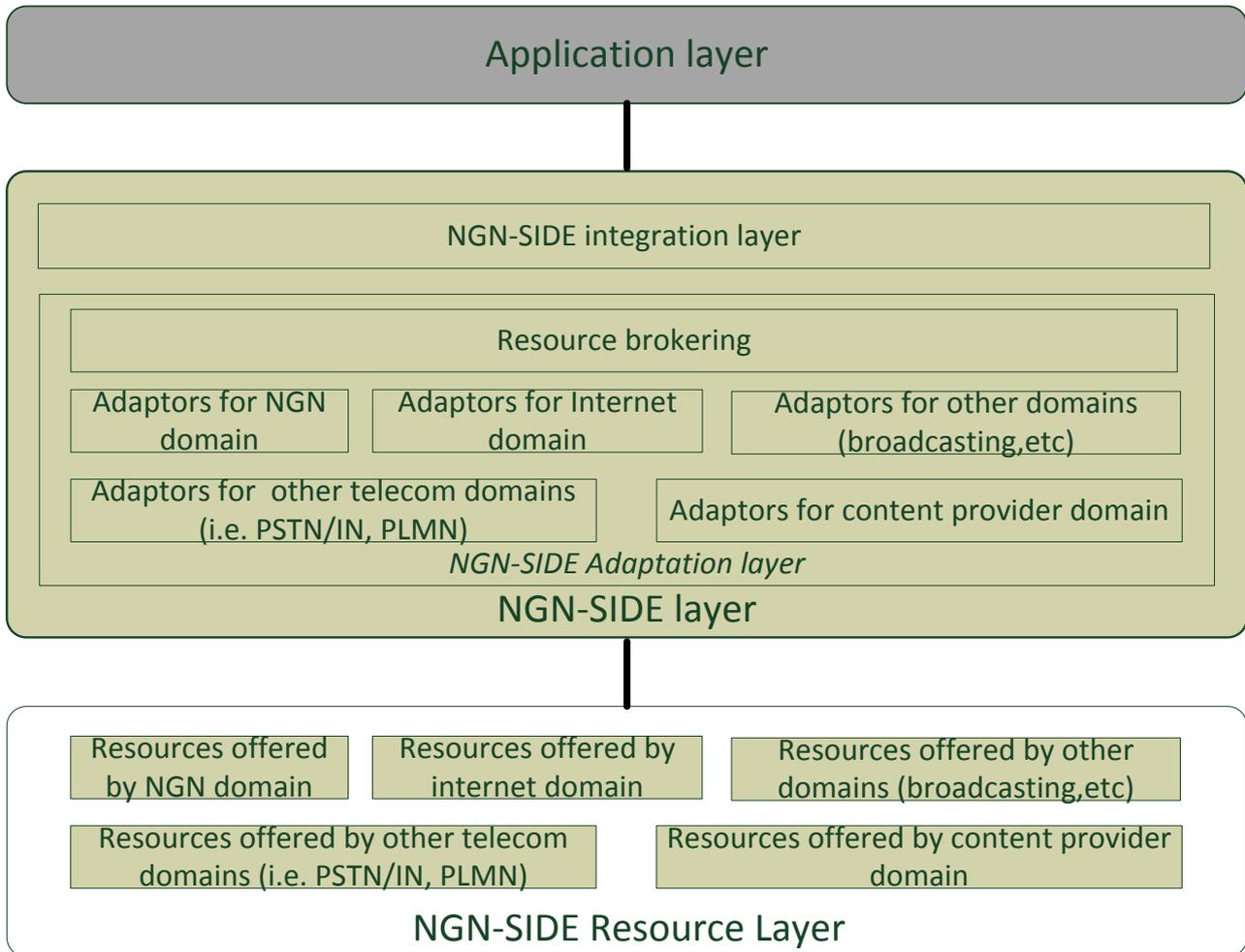


Figure 9-1 – Adaptation of resources in NGN-SIDE

Editor's Note: Need further consideration of content adaptors (currently) versus CDN adaptors; similarly, content versus CDN as external domain, as well as relationship between CDN and broadcast networks as external domain (domains).

The NGN-SIDE adaptation layer includes adaptors for resources available in the NGN-SIDE resource layer. The adaptors perform adaptation at both control plane and media plane level.

Figure 9-2 shows the approach for adaptation of resources offered by the NGN-SIDE resource layer.

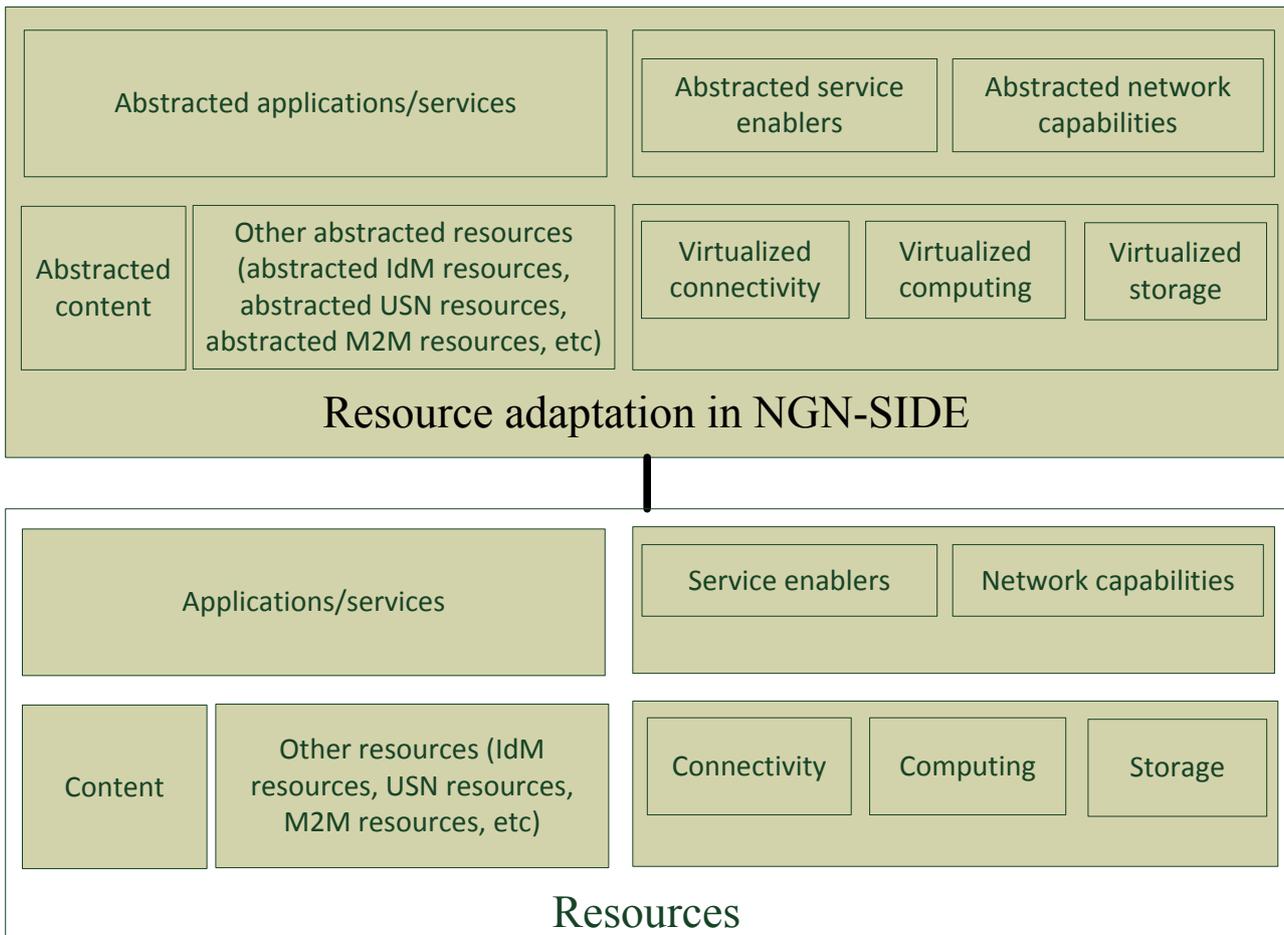


Figure 9-2 – Resource adaptation in NGN-SIDE

Resources shown in Figure 9-2 such as service enablers, network capabilities, applications, **services**, connectivity, computing, storage, content and other resources (including USN resources and M2M resources), can be offered by NGN and/or Non-NGN.

Editor's note: to consider if figure 9.2 requires modification for "applications/services".

NGN-SIDE is required to abstract connectivity, computing and storage resources by using virtualization mechanisms **to support privacy/security, scalability and reliability cost-effectively.**

NGN-SIDE is required to abstract network capabilities, service enablers, applications, **services**, content and other resources by using a standardized description mechanism, i.e. common message structure, common media format, unique mapping scheme between resources and common message structure.

NGN-SIDE is recommended to support adaptation of resources to support M2M applications, including:

- Support of M2M adaptors for accessing M2M devices (e.g. directly or via M2M gateways). NOTE: NGN-SIDE acts in this approach as **M2M middleware** (resources for support of M2M applications are abstracted in NGN-SIDE).
- Support of M2M adaptors **for accessing** M2M related resources. NOTE: NGN-SIDE acts in this approach as a mediator between M2M applications and M2M middleware.

NGN-SIDE is recommended to support adaptation of resources to support USN applications [ITU-T Y.2221], including:

- Support of USN adaptors for accessing sensor networks (e.g. directly or via USN gateways). NOTE: NGN-SIDE acts in this approach as USN middleware (NGN capabilities for support of USN applications [ITU-T Y.2221] are abstracted in NGN-SIDE);
- Support of USN adaptors to USN middleware as described in [ITU-T Y.2221]. NOTE: NGN-SIDE acts in this approach as a mediator between USN applications and USN middleware.

NGN-SIDE is recommended to support adaptation of resources to support the various cloud service categories, including support of adaptors for accessing cloud resources (including connectivity, computing, storage).

The following sub-clauses provide details about adaptors offered by NGN and Non-NGN.

9.2.2.1 Adaptors for resources offered by NGN

Figure 9-3 shows the approach for adaptation of resources specifically offered by NGN.

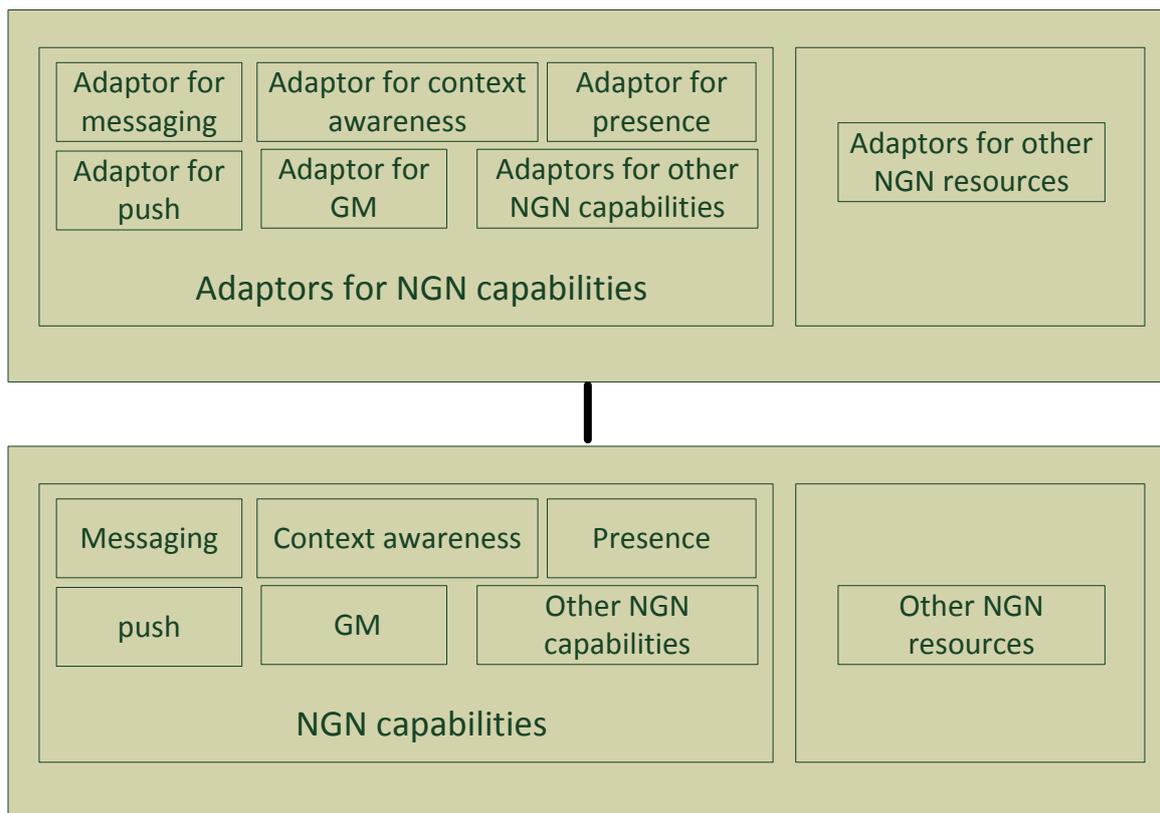


Figure 9-3 - Adaptation examples of resources offered by NGN

NOTE: NGN resources include NGN capabilities, as described in [ITU-T Y.2201], and other NGN resources.

The figure 9-3 shows only some examples of NGN capability adaptors, the actual scope of adaptation depending on the NGN-SIDE provider's policies and, in case the NGN-SIDE provider and the NGN provider are distinct, on the agreements with the NGN provider.

NGN-SIDE is recommended to provide adaptors for at least the following service enablers [ITU-T Y.2201]:

- Message handling;
- Presence;
- Location management;
- Session handling;
- Accounting and charging

9.2.2.2 Adaptors for resources offered by non-NGN

Figure 9-4 shows the approach for adaptation of resources specifically offered by Non-NGN.

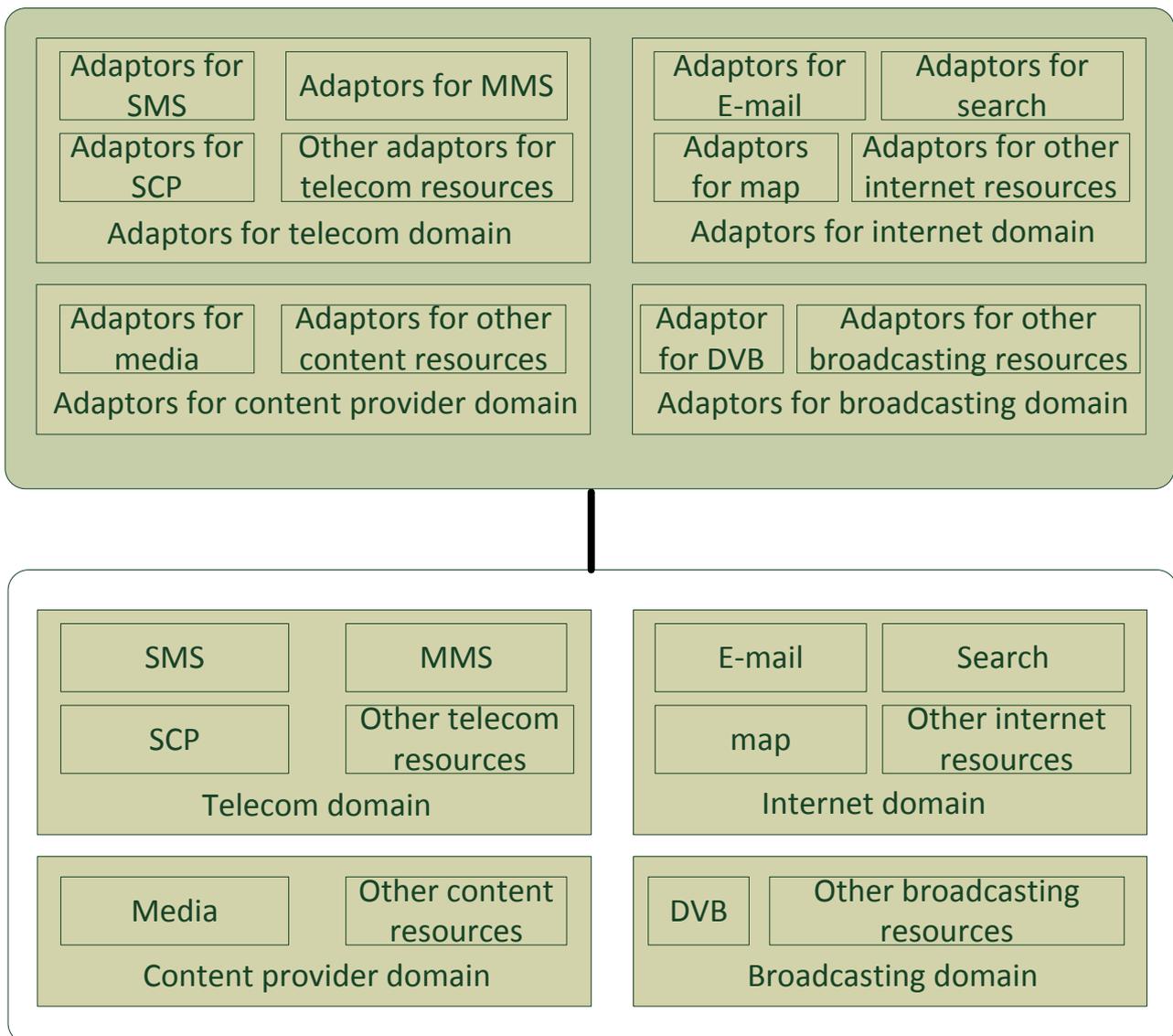


Figure 9-4 – Adaptation examples of resources offered by Non-NGN

NGN-SIDE supports adaptation of telecom resources, internet resources, broadcasting resources and content resources. *Editor's note: protocol references are required in the various bullets below.*

- In order to access resources from the telecom domain, NGN-SIDE **is required** to provide , at least the following adaptors for the corresponding standard interfaces:

Editor's note: the support of OMA enablers needs further consideration.

Editor's note: to confirm all needed adaptors and which strength

- SMPP adaptor in order to access SMS resources;
 - MM7 adaptor in order to access MMS resources;
 - MLP adaptor in order to access LCS resources;
 - PAP adaptor in order to access WAP gateway resources;
 - INAP adaptor in order to access SCP resources;
 - WIN adaptor in order to access CDMA based network resources;
 - CAMEL adaptor in order to access WCDMA based network resources;
 - SIP-ISC adaptor in order to access IMS based network resources
-
- In order to access resources from internet, NGN-SIDE **is recommended** to provide at least the following adaptors for the corresponding standard interfaces:
 - Mail adaptor in order to access Internet e-mail resources; *Editor's note: this adaptor is not protocol specific*
 - FTP **engine** adaptor in order to access file transfer resources; *Editor's note: this adaptor is not protocol specific*
 - Streaming **service** adaptor in order to access streaming resources; *Editor's note: this adaptor is not protocol specific*
 - Search **proxy** adaptor in order to access search resources; *Editor's note: this adaptor is not protocol specific*
 - RSS adaptor in order to access RSS resources; *Editor's note: this adaptor is not protocol specific*
 - Map service adaptor in order to access map resources; *Editor's note: this adaptor is not protocol specific*
 - Web service **gateway** adaptor in order to access web service resources *Editor's note: this adaptor is not protocol specific.*
-
- In order to access content resources, NGN-SIDE **is recommended** to provide content adaptation for different content types, and support of format adaptation, codec adaptation, and code and packaging adaptation according to the corresponding standards:
 - 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.).

Editor's note: it should be clarified how content is managed internally and why NGN-SIDE provides different conversion (translation, file and packaging) combinations.

- In order to access broadcasting resources, NGN-SIDE **is recommended** to provide adaptors for the corresponding **standard network protocols**, including adaptation for at least DVB, OMA BCAST enabler, 3GPP MBMS.

Editor's note: This text needs further elaboration and discussion.

- In order to access cloud resources, NGN-SIDE **is recommended** to provide adaptors for at least the **standardized** cloud APIs specified in **[b-OGF-OCCI]**, **[b-DMTF-OVF]**, **[b-SNIA-CDMI]**.

10 NGN-SIDE interfaces requirements

Editor's note: linkage with the functional framework is required here. It is for consideration to move clause 7.3 into clause 10 since very much related.

Editor's note: linkage should be made between adaptors in clause 9 and this clause (adaptors being used to adapt resources – from resource providers).

The NGN-SIDE interfaces extend the NGN [ITU-T Y.2012] interfaces, i.e. ANI, UNI, SNI, and NNI, for its interaction with NGN-SIDE users and NGN-SIDE resource providers. The NGN-SIDE interfaces can be categorized as follows:

- NGN-SIDE resource interfaces;
- NGN-SIDE service interfaces.

As far as the interfaces among NGN-SIDE internal capabilities, this document doesn't identify reference points among NGN-SIDE internal capabilities.

However, it is not precluded that NGN-SIDE uses **standard interfaces** among NGN-SIDE internal capabilities, in order to **ensure** NGN-SIDE internal capabilities' reusability, portability, accessibility.

10.1 NGN-SIDE resource interfaces

Figure 10-1 shows interaction between NGN-SIDE and resources from NGN-SIDE resource providers. In this perspective, NGN-SIDE consumes resources offered by NGN-SIDE resource providers.

NGN-SIDE resource interfaces refer to the standardized or proprietary interfaces exposed by NGN-SIDE resource providers. NGN-SIDE adapts these interfaces to access resources as described in clause 9.2.

NOTE: This Recommendation assumes that NGN-SIDE accesses these resources **via NGN**. [ITU-T Y.2012] does not identify or provide resource interface mapping **such as which NGN-SIDE resource is adapted by which NGN interface**. *Editor's note: the text of this NOTE needs review.*



Figure 10-1 - Interaction between NGN-SIDE and resources

Editor's note: figure to be modified as "resource interfaces". To consider if the larger box should be removed.

10.2 NGN-SIDE service interfaces

This section identifies the NGN-SIDE service interface requirements in terms of APIs, related protocols and technologies across NGN ANI, UNI, SNI, and NNI. Figures 10-2 show a high level view of the relationship of NGN-SIDE with NGN ANI, UNI, SNI, and NNI.

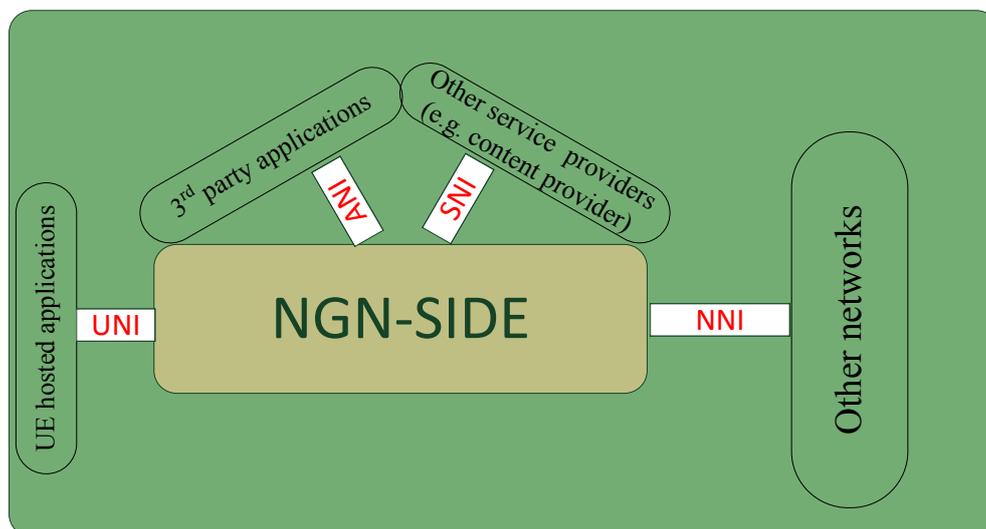


Figure 10-2 – Service interfaces supported by NGN-SIDE

Editor's note: to consider if all the NGN-SIDE user boxes should be on top of NGN-SIDE; to resize the other networks box like the other ones; to consider inclusion of other roles (e.g. resource providers).

NGN-SIDE is recommended to implement standardized APIs, protocols, and technologies to realize the **service** exposure towards applications.

NOTE: Appendix II.2 provides an overview of API related efforts in the standardization arena.

Editor's note: the positioning of the paragraph below earlier in the document is agreed (see usage of this classification in figure 10.2), the exact location is still to be determined. The following types of applications are considered:

- NGN UE hosted applications hosted in the NGN end user domain and accessing NGN-SIDE via UNI [ITU-T Y.2012]; For drafting consideration: does it make sense the scenario of a smart terminal located in another network (connected to NGN via NNI)? If so, is the current classification covering that scenario?
- 3rd party applications hosted by NGN-SIDE users (e.g. Application providers) and accessing NGN-SIDE via ANI [ITU-T Y.2012].
- In-house applications hosted by the NGN-SIDE provider. In-house applications may access NGN-SIDE via ANI [ITU-T Y.2012], but access via proprietary interfaces is not precluded.
Editor's note: to consider a possible different name than "in-house" because this is already used in Y.2012.

10.2.1 General requirements of NGN-SIDE service interfaces

Editor's note: the following paragraph needs further clarification.

NGN-SIDE is required to provide access by NGN-SIDE users to **NGN-SIDE resources and functions** via the NGN-SIDE service interfaces (i.e. ANI, UNI, NNI, SNI).

The NGN-SIDE integration layer processes the **service** request received from the **service** invoked interface according to the **service** request's communication needs, invokes the NGN-SIDE adaptation layer according to the **service** request's processing results and finally sends the response to the requesting service interface.

Editor's note: positioning of the requirement below should be confirmed (is it possible to identify whether it applies to UNI, ANI, NNI, ...?)

NGN-SIDE is recommended to expose standardized APIs to enable support of the different cloud service categories, including:

- Application Services (SaaS);
- Platform Services (PaaS);
- Communication Services (CaaS);
- Resource Services (IaaS);
- Network Services (NaaS).

10.2.2 Service interface requirements across ANI

NGN-SIDE ANI service interface is required to provide the interaction between applications and NGN-SIDE. The service requests initiated by applications are sent to the NGN-SIDE integration layer via ANI.

NGN-SIDE is recommended to support standardized APIs at the ANI for exposing **NGN-SIDE resources and functions** to applications.

NOTE – NGN-SIDE can support, but is not limited to, the following APIs across ANI:

- Parlay Service Access (PSA) APIs [b-OMA-PSA] [b-OSA-Parlay-X];

- Parlay APIs [b-OSA-Parlay];
- Next Generation Service Interfaces (NGSI) APIs [b-OMA-NGSI];
- RESTful bindings for Parlay X Web Services (ParlayREST) APIs [b-OMA-ParlayREST1.0] [b-OMA-ParlayREST2.0];
- GSMA One APIs [b-GSMA-OneAPI] [b-OMA-PXPROF];
- J2SE APIs, J2EE APIs, JAIN APIs, JTAPI, JDBC APIs, JMS APIs, IMS Services APIs, IMS Communication Enablers (ICE)) [b-JCP-JSR]; *Editor's note: references to be confirmed for all services in this bullet.*

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

10.2.3 Service interface requirements across UNI

NGN-SIDE is recommended to support standardized APIs at the UNI for exposing NGN-SIDE resources and functions to applications whose application logic is located in the NGN End User functions (e.g. NGN UE hosted applications).

NOTE - NGN-SIDE can support, but is not limited to, the following APIs across UNI:

- OMTP (Open Mobile Terminal Platform)'s BONDI APIs [b-OMTP- BONDI];
- JIL (the Joint Innovation Lab) Widget System Handset APIs [b-JIL-API];
- W3C's WebApps (Web Applications) APIs and Widgets [b-W3C-WebApps];
- W3C's DAP (Device API and Policy) [b-W3C-DAP];
- W3C's UWA (Ubiquitous Web Applications) [b-W3C-UWA];
- OMA CSEA(Client-Side Enabler API) [b-OMA-CSEA];
- HTML5 and Xhtml5 [b-W3C-HTML5];
- Java Micro Edition JSRs [b-Java ME-JSR].

10.2.4 Service interface requirements across NNI

NGN-SIDE NNI service interface is used to provide interaction with other NGN-SIDEs, NGNs and non-NGNs.

The following service interfaces are relevant for the interaction of NGN-SIDE with other domains at NNI level:

- Service interface between two distinct NGN-SIDEs (that is, located in two distinct NGN domains);
- Service interface between NGN-SIDE and other NGNs which have no NGN-SIDE support;
- Service interface between NGN-SIDE and Non-NGNs.

NGN-SIDE is recommended to support standardized protocols and APIs at the NNI for exposing NGN-SIDE resources and functions to other networks.

NOTE - NGN-SIDE can support, but is not limited to, the following protocols and technologies across NNI:

Editor's note: To be completed (any API/protocol requirements for interworking with IMS and with other NGN-SIDE ?).

NOTE - NNI Interworking with other (non-NGN) Telecom domain networks (PSTN, PLMN) follows the existing NGN related NNI specifications (NGN-SIDE is not directly involved in this interworking scenario).

10.2.5 Service interface requirements across SNI

NGN-SIDE is recommended to support standardized protocols and APIs at the SNI for exposing NGN-SIDE **resources and functions** to other service partners (e.g. such as content providers, data information providers and application service providers).

NOTE - NGN-SIDE can support, but is not limited to, the following protocols, APIs and technologies across SNI:

Editor's note: Requirements for SNI need further consideration.

- some Parlay Service Access (PSA) APIs (for both control and media), including "Multimedia streaming control", "Multimedia multicast session management", "Content management" [b-OMA-PSA][b-OSA-Parlay-X];
- **Protocols and APIs for IPTV service support across SNI [b-ITU-T Y.1910].**

Annex A

Relationship between capabilities in ITU-T Y.NGN-SIDE-Req and capabilities in ITU-T Y.2234

Editor's note: a sentence is needed in the body to refer to this annex.

Table A-1 describes the mapping between the capabilities defined in [ITU-T Y.2234] and the capabilities defined in this Recommendation.

Table A-1 – Relationship between ITU-T Y.NGN-SIDE-Req and ITU-T Y.2234 capabilities

[ITU-T Y.NGN-SIDE-Req] capabilities	[ITU-T Y.2234] capabilities	Additional function(s)/capability(ies) in [ITU-T Y.NGN-SIDE-Req] not covered in [ITU-T Y.2234]
Access control	A function part of “service management”	Access control additionally provides access control for resources offered by Non-NGN.
Service orchestration	Service composition	Service orchestration additionally covers composition logic for resources offered by Non-NGN.
Resource registry	Service discovery, Service registration	- Resource registry additionally covers: registration of resources offered by Non-NGN.
Application provisioning	Service development support	Application provisioning additionally supports: <ul style="list-style-type: none"> – a standard format for application packaging; – a standard schema of application provisioning; – a publishing mechanism.
Resource brokering	Service coordination	Resource brokering additionally supports: <ul style="list-style-type: none"> – Brokering among Non-NGN resources; – Brokering among applications of events from underlying resources.
Policy enforcement	Policy enforcement	
Service dispatcher	-	-
Developer portal	-	-
Design tools	-	-
Resource repository	-	-
Testing environment	-	-
Policy management	-	-
Content management	-	-

[ITU-T Y.NGN-SIDE-Req] capabilities	[ITU-T Y.2234] capabilities	Additional function(s)/capability(ies) in [ITU-T Y.NGN-SIDE-Req] not covered in [ITU-T Y.2234]
Charging	-	-
Management of role related information	-	-
Context management	-	-
Resource manager	-	-
Adaptors for NGN	-	-
Adaptors for Non-NGN	-	-

Editor’s note: general review is required of all appendixes (consistency check including relevance of the content, terminology alignment with body and related referencing in the body, removal of duplications and conflict with the body) as well as reordering (with related renumbering).

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).

This appendix identifies application scenarios involving NGN-SIDE.

I.1 3rd party application scenario “Book a trip”

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

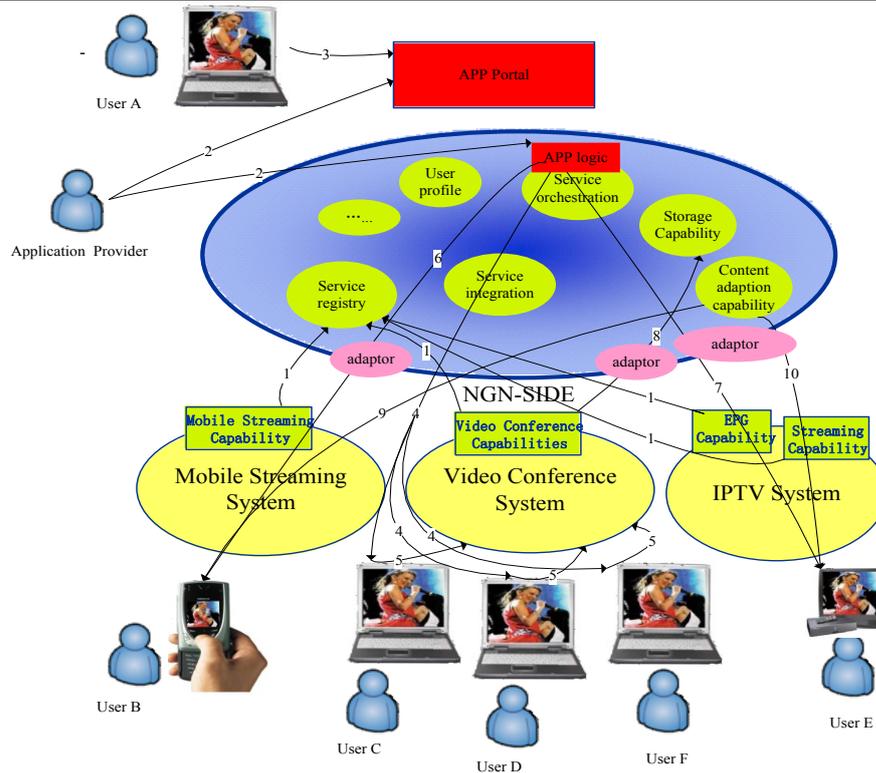
	<ol style="list-style-type: none"> 3) The user is reading a newspaper, which contains an advertisement from 'Travel Agency A' with some travel with a related <i>BIDI code</i>. The user decides to make a travel booking, so he/she uses his/her mobile phone to scan, decode and send the <i>BIDI code</i> via MMS. 4) When the MMS receives the message with BIDI code, there is always a configured identifier to forward this message to NGN-SIDE. 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. 6) The application "Book a trip" calls another service 'Booking & Info' provided by 'Ctrip' to book the flights, the hotels and to get the related tourist information. NGN-SIDE routes this request to "Ctrip". 7) If the result of the "Booking & 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. 8) The application composes a response message (MMS) and sends it via the MMS service. 9) The user A receives the MMS with the response on his/her mobile phone.
<p>Benefits analysis for relevant business stakeholders</p>	<ol style="list-style-type: none"> 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. 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. 3) NGN-SIDE benefits the NGN provider with a service integration environment in an efficient and economic way.
<p>NGN-SIDE requirements Analysis</p>	<ol style="list-style-type: none"> 1) NGN-SIDE is required to provide mechanisms for application provisioning, addressing and routing: <ol style="list-style-type: none"> 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.). b. NGN-SIDE is required to provide a standard way for application addressing (e.g. URL, E.164) by NGN-SIDE. c. NGN-SIDE is required to provide a mechanism to establish paths to route requests to applications 2) NGN-SIDE is required to provide mechanisms for capability registration, discovery and routing: <ol style="list-style-type: none"> 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. b. NGN-SIDE is required to provide a routing mechanism to locate the required capability and establish a path to access the capability.

	c. NGN-SIDE is required to provide a mechanism for SLA control of capabilities, including authentication, authorization and traffic control.
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I.2 In-house application scenario “Enhanced Conference”

Service entities	<ul style="list-style-type: none"> ● NGN—SIDE which provides the real-time media storage capability, real-time media adaption capability and real-time media transfer capability. ● 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. ● IPTV system which provides IPTV related capabilities including EPG capability, streaming capability etc. ● Mobile streaming system which provides mobile streaming related capabilities including streaming capability, management capability etc.
Roles	<ol style="list-style-type: none"> 1) User A (Customer pays to order a 4 persons’ video conference and invite his/her team to join the conference). 2) User B (Member of A’s team, and not conference participant) 3) User C (Member of A’s team, and also conference participant) 4) User D (Member of A’s team, and also conference participant) 5) User E (Member of A’s team, and not conference participant) 6) User F (Member of A’s team, and also conference participant)
Relevant business stake holders	Telecom operators, Application providers
Analysis of the Usage Model	
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



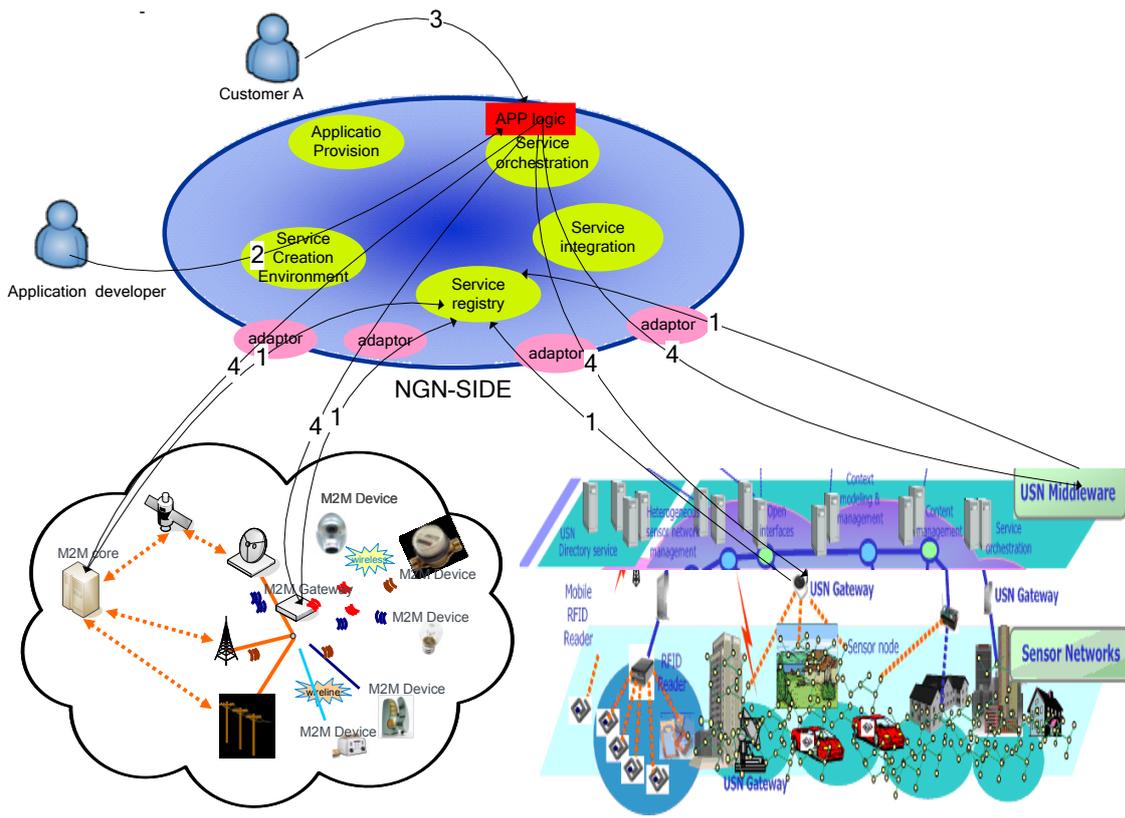
- 1) The capabilities (mobile streaming capability of mobile streaming system, video conference capability of video conference system, EPG and streaming capabilities of IPTV system) are registered to NGN-SIDE by NGN provider so that developers can find them and make use of them.
- 2) The Application 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>
Benefits analysis for relevant business stakeholders	<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>
NGN-SIDE requirements Analysis	<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"> a) NGN-SIDE is required to provide real-time media recording, processing (e.g. transcoding, encryption, decryption, DRM). b) NGN-SIDE is required to provide real-time media delivery within NGN-SIDE. c) NGN-SIDE is required to provide static content storage, caching, adaptation (e.g. codec conversion, format conversion). 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. e) NGN-SIDE is required to support media streaming mechanisms. <p>-</p>

I.3 M2M/USN application scenarios

Editor's note: this text has not been reviewed. It is also for consideration to combine as M2M/USN if no differences from a scenario point of view. Also Figure needs revision in term of capability names.

Service entities	<p>1) NGN-SIDE.</p> <p>2) USN include USN gateways and USN middleware.</p> <p>3) M2M include M2M gateways and M2M core.</p>
Roles	<p>1) Customer A (end user of the Application)</p> <p>2) Operator A (NGN-SIDE provider)</p> <p>3) Application developer (develop the new B2B hosted application)</p> <p>4) M2M Provider</p> <p>5) USN Provider</p>
Relevant business stakeholders	Telecom operators, Capability providers
Analysis of the Usage Model	
Main	NGN-SIDE provide mechanisms to support M2M applications and USN applications

Intent/Objective of the scenario in terms of usage model	
NGN-SIDE key features	<p>NGN-SIDE is required to provide a set of capabilities to support different M2M and USN applications;</p> <p>NGN-SIDE is recommended to support adaptation of M2M capabilities.</p> <p>NGN-SIDE is recommended to support adaptation of USN capabilities.</p>
Scenario description	 <ol style="list-style-type: none"> 1) NGN-SIDE registers M2M capabilities and USN capabilities. 2) Application developer develops a new B2B application in NGN-SIDE supported service creation environment based on M2M capabilities, USN capabilities and other NGN-SIDE capabilities. 3) Customer A sign contract with NGN-SIDE provider to purchase this new B2B application and use it. 4) The application invoke M2M provider's capabilities through M2M gateways or M2M core, USN provider's capabilities through USN gateways or USN middleware.
Benefits analysis for relevant business stakeholders	<ol style="list-style-type: none"> 1) NGN-SIDE benefits provide a set of capabilities to support different M2M and USN applications.
NGN-SIDE requirements Analysis	<p>NGN-SIDE is required to provide a set of capabilities to support different M2M and USN applications;</p> <p>NGN-SIDE is recommended to support adaptation of M2M capabilities.</p>

	NGN-SIDE is recommended to support adaptation of USN capabilities.
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Appendix II-Survey of API related standardization efforts

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

Editor's note: text in this clause needs detailed review and coordination with other SDOs.
This Appendix provides a survey of API related standardization efforts.

NOTE: the content of this Appendix is derived from publicly available documents from relevant Standardization Development Organizations (SDO).

Editor's note: Appendix II sub-clauses need renumbering

II.2 Open Mobile Alliance (OMA)

This clause identifies the Open Mobile Alliance (OMA) initiatives in the area of APIs.

II.2.1 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 9 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. The NGSI V1_0 APIs include:

- NGSI-1 - Generic Data Management Interface
- NGSI-2 - Generic Data Change Notification Interface
- NGSI-3 - Address List Change Notification Interface
- NGSI-4 - Call Control Extension Interface
- NGSI-5 - Call Notification Extension Interface
- NGSI-6 - Call Handling Extension Interface
- NGSI-7 - Multimedia Conference Extension Interface
- NGSI-8 - Multimedia List Handling Interface
- NGSI-9 - Context Entity Discovery Interface
- NGSI-10 - Context Information Interface
- NGSI-11 - Service Registration Interface
- NGSI-12 - Service Discovery Interface
- NGSI-13 - Identity Resolution Interface
- NGSI-14 - Identity Management Interface

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

http://member.openmobilealliance.org/ftp/Public_documents/ARCH/Permanent_documents/

II. 2.2 OMA Parlay REST

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 [b-OMA- ParlayREST2.0]
- TerminalStatus [b-OMA- ParlayREST2.0]
- TerminalLocation [b-OMA- ParlayREST2.0]
- ShortMessaging [b-OMA- ParlayREST2.0]
- Payment [b-OMA- ParlayREST2.0]
- MultiMediaMessaging [b-OMA- ParlayREST2.0]

- CallNotification [b-OMA- ParlayREST2.0]
- AudioCall [b-OMA- ParlayREST2.0]
- DeviceCapabilities [b-OMA- ParlayREST2.0]
- Presence [b-OMA- ParlayREST2.0]
- AddressListManagement [b-OMA- ParlayREST2.0]

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

http://member.openmobilealliance.org/ftp/Public_documents/ARCH/Permanent_documents/

II. 2.3 OMA CSEA

OMA Client-Side Enabler API (CSEA) defines the enabler requirements for Javascript-callable API's for web applications to access a set of OMA enablers, addressed as the following two work areas:

- OMA enablers focused on access to content, as a typical web application need: initially limited to DCD (Dynamic Content Delivery), Push
- OMA enablers supplementing the web application experience with key capabilities enabling application personalization and contextualization: initially limited to DPE (Device Profile Evolution)

The scope of this work is being limited to requirements specification in order to allow OMA to define the requirements and determine a roadmap for realization of the requirements through specific API's.

For details, the latest OMA CSEA Candidates are available at:

http://member.openmobilealliance.org/ftp/Public_documents/CD/Permanent_documents/

II.2.3 OMA PSA

3GPP, 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, NOTE: specification withdrawn

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 (PSA 1.0, ex-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.3 GSM Association(GSMA)

The GSM Association (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. 3.1 Version 1.0 APIs/ OMA PXPROF

The following APIs are OMA candidate releases (PXPROF: OneAPI Profile of the Parlay X SOAP Web Services V1.0). GSMA will reuse the following OMA candidate release APIs for the GSMA version 1.0 APIs :

- SMS RESTful API - send and receive SMS via your application
- MMS RESTful API - send and receive MMS via your application
- Location RESTful API - get the location of one or more mobile network users
- Payment RESTful API - charge mobile network users for your services. NOTE: a minor change from the original OMA API is implemented in GSMA version 1.0.

II.3.2 Version 0.91 beta APIs

a) RESTful APIs:

- o SMS RESTful API v0.91
- o MMS RESTful API v0.91
- o Location RESTful API v0.91
- o Payment RESTful API v0.91

b) Web Services APIs:

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

II.3.3 Phase 2 APIs

OneAPI 2.0:

- APIs to make delivery of video content to user equipment. This includes functions for:
 - Data Connection profile to identify bearer and network
 - Remaining Credits Look-Up to see if the user can afford the stream
 - Determining the supported video codecs on the handset
- In-app billing;
- Click-to-call to set up calls between two or more people;
- Call notification where a Web application can be informed of events in a phone call (caller busy, diverts etc.).

II.3.4 Phase 3 APIs

OneAPI 3.0:

- SMS triggering via UDH and other triggering/provisioning technologies such as USSD
- QOS to ensure a good quality, jitter-free video stream between a Web server and handset

II.4 Java Community Process

The Java Community Process (JCPSM) is the mechanism for developing standard technical specifications for Java technology [b-JCP-JSR].

JSRs by Platform are JSRs relate to one or more of the Java platforms, include Java Enterprise Edition, Java Standard Edition and Java Micro Edition.

- The Java Enterprise Edition offers APIs and tools for developing multitier enterprise applications. The JSRs in this list are part of the Java EE platform as component or umbrella JSRs.
- The Java Standard Edition offers APIs and tools for developing desktop and server-side enterprise applications. The JSRs in this list are part of the Java SE platform as component or umbrella JSRs.
- Java ME technology, Java Micro Edition, specifically addresses the vast consumer space, which covers the range of extremely tiny commodities such as smart cards or a pager all the way up to the set-top box, an appliance almost as powerful as a computer.

JSRs by Technology:

- OSS/J, Operations Support System through Java, is providing a set of APIs focused on operations and business support systems for service provider networks.
- JAIN, Java APIs for Integrated Networks, is providing a set of APIs focused on emerging network protocols and architectures driven by convergence of traditional telecommunication and IP networks.
- XML, the Extensible Markup Language, is a universal syntax for describing and structuring data independent from the application logic. Several JSRs focus on developing Java technology APIs specifically targeted at building XML-based applications.

For details, the latest JSRs are available at:

<http://jcp.org/en/jsr/all>

II.5 Wholesale Applications Community (WAC)

II.5.1 OMTP/WAC

The OMTP (Open Mobile Terminal Platform)/WAC (Wholesale Applications Community) BONDI initiative is addressing the way in which the existing web 2.0 environment is moved onto mobile devices. Mobile devices offer new capabilities to web service developers which make them very desirable, but present new security issues. BONDI uses web technologies and builds upon them to provide new APIs to the key mobile phone functionality like Contacts, Calendar, Messaging & Location.

BONDI API Specification version 1.1 Approved Release defines the composite specifications to allow web applications (widget and web pages) to interoperate over BONDI defined execution environment (widget runtime and web user agent).

BONDI API Features v1.1:

1. The BONDI module
2. The Application Launcher module: applauncher
3. The Messaging module: messaging
4. The User Interaction module: ui
5. The File System module: filesystem
6. The Gallery module: gallery
7. The Device Status module: devicestatus
8. The Application Configuration module: appconfig
9. The Geolocation module: geolocation
10. The Camera module: camera
11. The Telephony module: telephony
12. The PIM module: pim
13. The Contact module: contact
14. The Calendar module: calendar
15. The Task module: task

For details, the latest APIs are available at:

<http://bondi.omtp.org/1.1/apis/index.html>

II.5.2 WAC/JIL

The JIL (Joint Innovation Lab) API provides a mechanism to access **services** available on the handset. Access to these services is via a semi-object-oriented paradigm in which functions and parameters are accessed via objects that correspond to the handset.

The JIL API provides access to handset services in the following categories:

- Telephony: for initiating phone calls and accessing call records
- PIM: for accessing contacts and calendar information
- Multimedia: for accessing multi-media capabilities such as the camera
- Device: for accessing information about the phone, including the file system
- Messaging: for sending sms, mms, and email messages and accessing messages on the phone

Access to these categorized services is via a JavaScript object-containment name spacing mechanism. In this mechanism, all services are accessed via a hierarchical identification scheme in which the Widget object is the top-level entry point.

For details, the latest APIs are available at:

<http://www.jil.org/web/jil/develop>

II.6 World Wide Web Consortium (W3C)

The World Wide Web Consortium [b-W3C] is the main international standards organization for the worldwide web (abbreviated WWW or W3).

II.6.1 W3C Web Applications

The mission of the Web Applications Working Group [b-W3C-WebApps], part of the Rich Web Client Activity, is to provide specifications that enable improved client-side application development on the Web, including specifications both for application programming interfaces (APIs) for client-side development and for markup vocabularies for describing and controlling client-side application behavior.

The target environments for the Web Applications Working Group's deliverables include desktop and mobile browsers as well as non-browser environments that make use of Web technologies. The group seeks to promote universal access to Web applications across a wide range of devices and among a diversity of users, including users with particular accessibility needs. The APIs must provide generic and consistent interoperability and integration among all target formats, such as HTML, XHTML, and SVG.

The working group will deliver at least the following:

- **Asynchronous DOM Mutation Notification (ADMN)**
A performance-sensitive asynchronous mechanism to provide script notifications of changes to the DOM, such as the addition, removal, or alteration of elements, attributes, and text content, to replace DOM Mutation Events.
- **Clipboard Operations for the Web 1.0: Copy, Paste, Drag and Drop (ClipOps)**
A detailed model for rich clipboard operations in User Agents, with consideration for different environments; this may be developed as part of the HTML5 specification
- **Database and Offline Application APIs**
A set of objects and interfaces for client-side database functionality. Currently, the following specifications comprise the WebApps Database APIs:
 - **Web Storage:** an API for persistent data storage of key-value pair data in Web clients
 - **Indexed Database API:** an API for a database of records holding simple values and hierarchical objects
 - **Programmable HTTP Caching and Serving:** an API for off-line serving of requests to HTTP resources using static and dynamic responses
 - **Web SQL Database:** an API for storing data in databases that can be queried using a variant of SQL
- **Document Object Model (DOM)**
A set of specifications defining objects and interfaces for interaction with a document's tree model. These deliverables include:
 - **DOM Level 3 Events:** A generic platform- and language-neutral event system which allows registration of event handlers, describes event flow through a tree structure, and provides basic contextual information for each event.
 - **DOM Level 4 Core:** A platform- and language-neutral interface that allows programs and scripts to dynamically access and update the content, structure, and style of documents, with specific considerations for the browser-based Web platform.
- **File API**
An API for representing file objects in web applications, as well as programmatically selecting them and accessing their data. This may include file writing and file system APIs. This replaces the File Upload specification.
- **Progress Events**
Event types used for monitoring the progress of uploads and downloads.
- **Selectors API, Level 1 and Level 2**
An interface for matching and retrieving Element nodes in a DOM according to flexible criteria.
- **Server-Sent Events**
An API for opening an HTTP connection for receiving push notifications from a server in the form of DOM events. The API is designed such that it can be extended to work with other push notification schemes such as Push SMS.
- **Secure Cross-Domain Resource Sharing**
Mechanisms for selective and secure cross-domain scripting. For more details, see the WebApps WG Comparison of CORS and UMP. Currently, there are two different specifications for defining proposed mechanisms:

- Cross-Origin Resource Sharing: extends the design of the Same Origin Policy.
- Uniform Messaging Policy: describes a mechanism upon which a variety of access-control mechanisms can be implemented.
- Web Interface Definition Language (Web IDL)
Language bindings and types for Web interface descriptions.
- Web Messaging
A secure messaging system to allow discovery of and communication between cross-domain documents, including postMessage and MessageChannel.
- Web Sockets API
An API that enables Web pages to use the Web Sockets protocol for two-way communication with a remote host.
- Web Workers
An API that allows Web application authors to spawn background workers running scripts in parallel to their main page, allowing for thread-like operation with message-passing as the coordination mechanism.
- Widgets
A set of specifications that describe various aspects of widgets, interactive single purpose applications for displaying and/or updating local data or data on the Web, packaged in a way to allow a single download and installation on a user's machine or mobile device.. Currently, the following specifications comprise Widgets:
 - Widgets Packaging and Configuration: a packaging format and configuration format for widgets.
 - The Widget Interface: APIs to store preferences and access widget package metadata.
 - Widgets Digital Signature: a means for widget packages to be digitally signed using a custom profile of the XML-Signature Syntax and Processing Specification.
 - Widgets Updates: a version control model that allows widgets to be kept up-to-date over [HTTP].
 - Widgets Access Request Policy: a means to request access to URI-identifiable resources (e.g. resources on the Web).
 - Widgets URI Scheme: a URI scheme for use inside widgets or other such applications of web technology that do not run on the Web.
 - Widgets View Mode: a media feature and API related to presentation mode.
 - Widgets Embedding: a mechanism to allow embedding of packaged applications within other Web content, such as referencing via the HTML object element.
- XML Binding Language (XBL2)
A language and set of APIs to allow for rich real-time transformations of documents
- XMLHttpRequest (XHR), Level 1 and Level 2
An API for client-server data transfer, both to specify what is currently implemented and to extend its capabilities

For details, the latest APIs are available at:
<http://www.w3.org/2008/webapps/wiki/PubStatus>

II.6.2 W3C DAP

The mission of the Device APIs and Policy Working Group [b-W3C-DAP] is to create client-side APIs that enable the development of Web Applications and Web Widgets that interact with device services such as Calendar, Contacts, Camera, etc. Additionally, the group will produce a framework for the expression of security policies that govern access to security-critical APIs.

The working group will deliver at least the following specifications:

- a set of Personal Information Management (PIM) APIs that includes:
 - Calendar API, an API to access a calendar service (e.g. to add an entry, to edit an entry, to delete an entry, etc.)
 - Tasks API, an API to access a personal task management / organizer service (e.g. to add, edit, delete a task, etc.)
 - Contacts API, an API to access a contacts or address book service (e.g. to add an entry, to edit an entry, to delete an entry, etc.)
- Camera API, an API to manage a device's camera e.g. to take a picture
- Messaging API, an API to access a message service (e.g. to create a message, to send a message, to delete a message, etc.). The API is agnostic to the underlying messaging service (e.g. e-mail, SMS, MMS, etc.).
- System Information and Events API, an API to access various system services e.g. battery level, network status, etc.
- FileSystem API, an API to access the file system and perform basic operations (Create, Read, Update, Delete) and more complex operations (e.g. mount, unmount) - this API should be developed in coordination with the Web Applications Working Group File Upload specification
- Application Launcher API, an API to discover, identify and launch the platform's native applications
- Application Configuration API, an API to manage application settings and user preferences
- User Interaction API, a set of APIs that gives a widget or website far better control of how it manifests itself on different platforms. This would include minimise/maximise functions, window size, alerting mechanisms etc.
- Communication Log API, an API to access information about past communication events, such as sent emails, SMS, MMS, call events.
- Gallery API, an API to manage the local media file storage
- Security Policy Framework, to express security policies that govern access of Web Applications and widgets to security-critical APIs, including work on
 - Identification of APIs
 - Identification of Web Applications and Widgets
 - Definition of a policy description language for security policies
 - Expression of security policies that govern access of Web Applications and Widgets to security-critical APIs

For details, the latest APIs are available at:

<http://www.w3.org/2009/dap/>

II.6.3 W3C UWA

The UWA Working Group [b-W3C-UWA] focuses on extending the Web to enable distributed applications of many kinds of devices including sensors and effectors. Application areas include home monitoring and control, home entertainment, office equipment, mobile and automotive.

The working group will deliver at least the following specifications:

- Recommendations
 - Composite Capability/Preference Profiles (CC/PP): Structure and Vocabularies 1.0
A CC/PP profile is a description of device capabilities and user preferences. This document describes the structure of a CC/PP profile and shows how vocabularies for these capabilities are used.
- Candidate Recommendations

- Delivery Context Client Interfaces (DCCI)
Defines a framework for client-side access to a hierarchy of device properties together with a means to set event handlers for notifications of changes to property values. W3C Candidate Recommendation published in December 2007
- Content Selection for Device Independence (DISelect) 1.0
This document defines a markup for selecting between versions of content. W3C Candidate Recommendation published in July 2007
- Delivery Context: XPath Access Functions 1.0
This document defines a suite of XPath functions for access the delivery context. W3C Candidate Recommendation published in July 2007
- Last Call Working Drafts
 - Composite Capability/Preference Profiles (CC/PP): Structure and Vocabularies 2.0 (CC/PP 2.0)
This working draft updates the CC/PP 1.0 Recommendation by making it in line with the latest revision of RDF, and ensures its interoperability with OMA's UAPProf2.
- Working Drafts
 - Delivery Context Ontology
It describes an OWL ontology for device properties as a basis for adaptation to the context in which an application is executed.
 - Device Independent Authoring Language (DIAL)
This working draft describes a markup language for the filtering and presentation of Web page content available across different delivery contexts.
 - Content Selection (DISelect) Primer 1.0
 - Core Presentation Characteristics: Requirements and Use Cases
This working draft describes the requirements for core presentation characteristics and covers a number of use cases.
- Working Group Notes
 - Authoring Techniques for Device Independence
This note provides a summary of several techniques and best practices that Web site authors and solution providers may employ when creating and delivering content to a diverse set of access mechanisms.
 - Device Independence Principles
This note discusses the general principles associated with device independence.
 - Authoring Challenges for Device Independence
This note discusses the challenges associated with authoring materials that can be accessed by a wide range of device with very different capabilities. It includes a set of high level requirements for systems that support device independence.

For details, the latest APIs are available at:

<http://www.w3.org/2007/uwa/docs/>

II.6.4 HTML5 and XHTML5

HTML5 is a standard for structuring and presenting content on the World Wide Web. The new standard incorporates features like video playback and drag-and-drop that have been previously dependent on third-party browser plug-ins such as Adobe Flash, Microsoft Silverlight, and Google Gears.

HTML5 specifies scripting application programming interfaces (APIs). There are also new APIs, such as:

- The canvas element for immediate mode 2D drawing. See Canvas 2D API Specification 1.0 specification <<http://dev.w3.org/html5/canvas-api/canvas-2d-api.html>>
- Timed media playback
- Offline storage database (offline web applications). See Web Storage <<http://dev.w3.org/html5/webstorage/>>
- Document editing
- Drag-and-drop
- Cross-document messaging. See HTML5 Web Messaging <<http://dev.w3.org/html5/postmsg/>>
- Browser history management
- MIME type and protocol handler registration.
- Microdata. See HTML Microdata <<http://dev.w3.org/html5/md/>>http://en.wikipedia.org/wiki/HTML5_-_cite_note-15#cite_note-15

HTML5 has both a regular text/html serialization and an XML serialization, which is known as XHTML5. In addition to the markup language, the specification includes a number of application programming interfaces. The Document Object Model is extended with APIs for editing, drag-and-drop, data storage and network communication.

For details, the latest HTML5 specifications are available at:
<http://www.w3.org/TR/html5/>

II.7 Organization for the Advancement of Structured Information Standards (OASIS)

NOTE: OASIS standards are mostly related to basic Service Oriented Architecture (SOA) and Web Services technologies. Although OASIS has no specific activities regarding the development of APIs, the text below is provided for general information.

Editor's note: the structure and content of this section should explain which OASIS elements can play a relevant role in NGN-SIDE. At least it should show relationship with the various internal layers of NGN-SIDE (for example at the beginning of this clause).

Organization for the Advancement of Structured Information Standards (OASIS) produces web services standards along with standards for security, e-business and standardization efforts in the public sector and for application-specific markets [b-OASIS].

OASIS continues to develop and enhance standards for some of the essential underpinnings of web services, such as managing distributed services, implementing service registry and security, and, at a higher level, for implementing business processes.

The Web Services Description Language (WSDL) developed in OASIS is typically used to express the web services descriptions and interface syntax. As well, some standard languages such as in particular Business Process Execution Language (BPEL) are developed by OASIS. BPEL can be used to compose web services although current BPEL specification [**current BPEL spec**] is not suitable for composing web services to be used in conjunction with telecom services, due to its poor

real time and asynchronous support as well as lack of support of some important features such as availability, reliability, security, etc.

OASIS is defining (within its Open Composite Services Architecture Member Section (Open CSA)) a collection of standards and related items to allow for pre-defined building of services from sub components, including “on-the-fly” runtime assembly. The Open CSA Member Section advances open standards that simplify SOA application development.

OASIS is defining (within its WS Discovery and WS Devices Profile (WS-DD) Technical Committee):

- A lightweight dynamic discovery protocol to locate web services that composes with other Web service specifications (for drafting: reference would be useful)
- A binding of SOAP to User Datagram Protocol (UDP), including message patterns, addressing requirements, and security considerations.
- A profile of Web Services (WS) protocols consisting of a minimal set of implementation constraints to enable secure WS messaging, discovery, description, and eventing on resource-constrained end-user domain.

OASIS is considering (within its IDtrust Technical Committee) to address the issue related to the exchange of common reputation data for social networking and trust establishment. The aim is to focus on common data format for social networking.

OASIS is trying to realize the full advantages of SOA to the telecommunications industry (within its Telecommunications Services Member Section (OASIS Telecom)). OASIS Telecom was chartered with a clear focus on telecoms services in a SOA framework. The specific telecommunications related issues that the OASIS Telecom is addressing include:

- Security (incremental security in a telecom environment)
- SLAs, including mechanisms to predict the composite SLA associated with an aggregate service that may include multiple SOA components.
- Service availability and reliability models for composed services, in particular for mission-critical telecommunication services.

II. 8 Open Grid Forum (OGF)

II. 8.1 OGF OCCI

The Open Grid Forum Open Cloud Computing Interface (OCCI) working group will deliver an API specification for remote management of cloud computing infrastructure, allowing for the development of interoperable tools for common tasks including deployment, autonomic scaling and monitoring. The scope of the specification will be all high level functionality required for the life-cycle management of virtual machines (or workloads) running on virtualization technologies (or containers) supporting service elasticity.

The new API for interfacing “IaaS” Cloud computing facilities will allow for:

- Consumers to interact with cloud computing infrastructure on an ad-hoc basis (e.g. deploy, start, stop, restart)
- Integrators to offer advanced management services
- Aggregators to offer a single common interface to multiple providers
- Providers to offer a standard interface that is compatible with available tools
- Vendors of grids/clouds to offer standard interfaces for dynamically scalable service delivery in their products
-

II. 9 Distributed Management Task Force (DMTF)

II. 9.1 DMTF VMAN

DMTF VMAN Initiative (Distributed Management Task Force, Virtualization Management Initiative) includes a set of specifications that address the management lifecycle of a virtual environment. VMAN's OVF (Open Virtualization Format) specification provides a standard format for packaging and describing virtual machines and applications for deployment across heterogeneous virtualization platforms. VMAN's profiles standardize many aspects of the operational management of a heterogeneous virtualized environment.

The key properties of the format are as follows:

- Optimized for distribution
- Optimized for a simple, automated user experience
- Supports both single VM and multiple
- Portable VM packaging
- Vendor and platform independent
- Extensible - OVF is immediately useful — and extensible.
- Localizable - OVF supports user-visible descriptions in multiple locales

DMTF's Open Cloud Standards Incubator will focus on standardizing interactions between cloud environments by developing cloud resource management protocols, packaging formats and security mechanisms to facilitate interoperability.

The Open Cloud Standards Incubator addresses the following aspects of the lifecycle of a cloud service:

- description of the cloud service in a template
- deployment of the cloud service into a cloud
- offering of the service to consumers
- consumer entrance into contracts for the offering
- provider operation and management of instances of the service
- removal of the service offering

II. 10 Storage Networking Industry Association (SNIA)

II. 10.1 SNIA CDMI

Storage Networking Industry Association (SNIA) leads the storage industry worldwide in developing and promoting standards, technologies, and educational services to empower organizations in the management of information. The Cloud Storage Initiative (CSI) is promoting the adoption of cloud storage as a new delivery model that provides elastic, on-demand storage billed only for what is used.

The Cloud Data Management Interface defines the functional interface that applications will use to create, retrieve, update and delete data elements from the Cloud. As part of this interface the client will be able to discover the capabilities of the cloud storage offering and use this interface to manage containers and the data that is placed in them. In addition, metadata can be set on containers and their contained data elements through this interface. This interface is also used by administrative and management applications to manage containers, accounts, security access and monitoring/billing information, even for storage that is accessible by other protocols. The capabilities of the underlying storage and data services are exposed so that clients can understand the offering.

Appendix III - Additional information on relevant Service Delivery Platforms (SDPs) initiatives

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

Editor's Note: need to develop relationship of this appendix with the body.

This appendix provides additional information related to relevant SDPs initiatives.

III.1 Introduction

The term Service Delivery Platform (SDP) refers to a system architecture or environment that enables the efficient creation, deployment, execution, orchestration and management of one or more classes of services. SDP is a key component in the telecommunication field.

Next generation SDPs are generally built around the Service Oriented Architecture (SOA) which enables efficient service integration, orchestration and lifecycle management.

An example of next generation SDP architecture is described by Moriana, and referred as SDP2.0 [b-Moriana-SDP]. This architecture consists of the following layers:

- Service Exposure Layer
- Service orchestration and management Layer
- Telecom Service and Service Enablers Layer
- Service creation and execution Layer
- Telecom Network Abstraction Layer

Editor's note: a concise sentence for each of the above layers would be useful, and maybe concluding with a note for each description such as: "NOTE: capabilities of this layer are covered in NGN-SIDE by".

Editor's note: Need to insert a reference to this appendix III.1 in the body (in design tools clause).

Software Development Kits (SDKs) are used in SDPs to facilitate the development of applications by application developers.

The following types of SDK can be considered:

- Device SDK, which provides a set of development tools for the creation of device side applications, i.e. applications which reside on the device;
- Network SDK, which provides a set of development tools for the creation of network side applications which may be hosted by 3rd parties or by the NGN-SIDE provider itself.

III.2 SDP Alliance

The SDP Alliance [b-SDP-Alliance] is a consortium involving the collaboration of **some** software product companies. The objectives of the SDP Alliance are to bring together elements of a Service

Delivery Platform (SDP) and to offer them either as a unified whole or in a subset of category-defining products.

One main purpose of this consortium is to pre-integrate consortium members' respective product based solutions into a cohesive, end-to-end, retail/wholesale focused, set of SDP enablers.

In this consortium, SDP is seen as a software framework for delivery and management of value added services and content *Editor's note: need to link the bullets in the sentence or just remove them. (does the bullet list item refer to what? Applications, roles?)*

- In-house
- Partners
- Other 3rd parties

Furthermore, SDP should support rapid development and deployment of **telecoms** services and leveraging **telecom** network capabilities. SDP should enable rapid development, deployment and discovery of new **converged** services.

Editor's note: need to confirm that classification comes from SDP Alliance and level of this classification (functional level, implementation level).

Concerning SDP enablers, the following so-called "Traditional SDP Enablers" are identified by the SDP Alliance:

- Service Provisioning: – for central provisioning of network & services
- Service Execution Environment: – for providing a carrier-grade execution environment
- Content Management : – for content acquisition, DRM, **repurposing**
- Service Delivery: – for **multi-channel** (voice, data, video)
- Device Management: – for OTA provisioning, device rendering
- Convergent Charging: – for pre & post paid, rating, revenue share settlement

In addition, the following "Mobile Web & Telco 2.0 Enablers "are described by the SDP Alliance:

- Partner Management - rapid partner sign-up and policy enforcement
- Capability Exposure - messaging, call control, location, presence, data
- Service Discovery – On Device Portals, Operator Portal, Off-Portal
- Service Promotion – intelligent recommendation, cross-sell & up-sell
- Personalisation - on portal, on device, in service
- Common Data Access – consolidated access to service & subscriber data
- Developer Environment – web-friendly interfaces, commodity app servers

Editor's note: some text for each capability is necessary (like above). It should be understood the link between the two above lists and this list below.

Regarding capabilities to support SDP Alliance's End-to-End Service Delivery, the following ones are described:

- Partner Management
- Capability Exposure
- Service Provisioning
- Service Execution Environment
- Service Promotion
- Service Discovery
- Service Delivery
- Content Management
- Device Management
- Convergent Charging
- Personalisation

- Common User Profile

Finally, the following API requirements are proposed by the SDP Alliance:

- A complete set of Service Oriented APIs exposed on a common technology framework (Telecoms Web Services Exposure like Parlay X):
 - Messaging
 - Charging
 - Location
 - Presence
 - Subscriber Profile
 - Terminal capability
 - Marketing preferences
- A single technology to provide a solution for all new external APIs
 - A single entry point for all application access and a single technology for all APIs
 - API capability
 - Security (login, authentication)
 - Policy control (e.g. throttling, load control)
 - Privacy control (e.g. Location Based, Presence privacy preferences)
 - One Common Business Process framework including e.g.
 - Partner (Sales House) Sign-up
 - Partner Management
 - Service/Campaign Provisioning

Appendix V - Overview of cloud computing characteristics and models in relationship with NGN-SIDE

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

Editor's note: it is required to consider final location of cloud related content in this document (currently there are some general requirements, some requirements specific to adaptation layer, one appendix and living list items).

An overview of cloud computing characteristics and models is contained in [b-ITU-T FG-Cloud-Ecosystem]

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

Everything as a Service (XaaS), broad term that embraces all the Cloud Computing based service provision models [b-itechthoughts DFN], is a concept of outsourcing of resources at different levels.

Editor's note: [b-itechthoughts DFN] to be added in bibliography.

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)
- Network as a Service (NaaS)

The above service provision models may be mapped to the following cloud service categories:

- Application Services (corresponding to SaaS);
- Platform Services (corresponding to PaaS);
- Communication Services (corresponding to CaaS);
- Resource Services (corresponding to IaaS);
- Network Services (corresponding to NaaS).

NGN-SIDE may play a supporting role to realize different XaaS service provision models.

V.1.1 Software as a Service (SaaS)

Editor's note: text below is proposed in alignment with current text in [b-ITU-T FG-Cloud-Ecosystem]. The final definition will be confirmed in January Q3 meeting based on FG Cloud December meeting's decisions.

Cloud Software as a Service (SaaS) [b-NIST DFN]: *The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.*

Alternative definition from [b-infoworldDFN]: The capability provided to the consumer is to use any application that is delivered over the platform Of the Web to a user, typically accessing the application through a browser. While many people associate application as a service with enterprise applications, office automation applications are indeed application-as-a-service as well.

The NGN-SIDE application provisioning capability allows publication of applications.

Applications can be offered by NGN-SIDE as SaaS, and NGN-SIDE users can invoke these applications through the NGN-SIDE platform.

V.1.2 Platform as a service (PaaS)

Editor's note: text below is proposed in alignment with current text in [b-ITU-T FG-Cloud-Ecosystem]. The final definition will be confirmed in January Q3 meeting based on FG Cloud December meeting's decisions.

Cloud Platform as a Service (PaaS) [b-NIST DFN]:*The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.*

Alternative definition from [b-infoworldDFN]: This is a complete platform – including application development, interface development, Database development, storage, and testing – delivered through a remotely hosted platform to subscribers. Based on the traditional time-sharing model, modern platform-as-a-service providers provide the ability to create enterprise-class applications for use locally or on-demand for a small subscription price or for free.

The NGN-SIDE integration layer's functionalities (e.g. service creation functional group, service execution functional group and service delivery management functional group) can be deployed as PaaS.

The PaaS service offered by NGN-SIDE allows developers to develop their applications and upload them via the NGN-SIDE developer portal capability to NGN-SIDE, which provides an execution environment for the applications.

V.1.3 Infrastructure as a Service (IaaS)

Editor's note: text below is proposed in alignment with current text in [b-ITU-T FG-Cloud-Ecosystem]. The final definition will be confirmed in January Q3 meeting based on FG Cloud December meeting's decisions.

Cloud Infrastructure as a Service (IaaS) [b-NIST DFN]:*The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls).*

Alternative definition from [b-infoworldDFN]: This is actually datacenter-as-a-service, or the ability to remotely access computing resources. In essence, you lease a physical server that's yours to do with as you will, and for all practical purposes it is your datacenter, or at least part of a datacenter. The difference with this approach versus more mainstream cloud computing is that instead of using an interface and a metered service, you're getting access to the entire machine and the software on that machine. In short, it's less packaged and more akin to hosting.

The IaaS service can be provided to NGN-SIDE users by usage of NGN-SIDE provider's resources and/or resources from NGN and other domains.

NOTE 1: a cloud computing compatible approach (e.g. virtualization, distributed file system, distributed dispatch, distributed cache, distributed database, search engine) can be used to manage NGN-SIDE provider's resources;

NOTE 2: the NGN-SIDE resource brokering capability can be used to manage NGN-SIDE resource providers' resources (e.g. connections, computing, storage) in a cloud computing compatible approach.

V.1.4 Communications as a service (CaaS)

Editor's note: text below is proposed in alignment with current text in [b-ITU-T FG-Cloud-Ecosystem]. The final definition will be confirmed in January Q3 meeting based on FG Cloud December meeting's decisions.

Communications as a Service (CaaS) [b-itechthoughts DFN]: *The capability of hardware and software is to provide support for communication and collaboration services. Such services include voice over IP, instant messaging, video conferencing, for both fixed and mobile devices.*

NGN-SIDE can provide CaaS based on SaaS, PaaS, IaaS capabilities as described above.

NOTE: NGN-SIDE resource brokering capability can be used to manage NGN-SIDE resource providers' resources (e.g. communication enablers) in a cloud computing compatible approach.

V.1.5 Network as a service (NaaS)

Editor's note: text below is proposed in alignment with current text in [b-ITU-T FG-Cloud-Ecosystem]. The final definition will be confirmed in January Q3 meeting based on FG Cloud December meeting's decisions.

Network as a Service(NaaS) [b-itechthoughts DFN]:*The capability provided to the consumer from telecommunication operators is to provide network communications, billing, and intelligent features as services to consumers.[From Cloud-I-0033] [Editor's Note] : the definition needs to be reviewed (e.g. there was no consensus on keeping "from telecommunication operators" and "to consumers" in the definition or amending/removing these words). Also, it is needed to have clear distinction and clear relationship between this definition and IaaS (SaaS, PaaS) definitions.*

To be completed.

Appendix VI - Business deployment scenarios in the NGN-SIDE ecosystem

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

Editor's note: to renumber appendixes, this appendix should become appendix I.

Editor's Note: need to review the text and check the alignment with the body (clause 6).

This appendix identifies business deployment scenarios in the NGN-SIDE eco-system. First, identification of the actors is provided based upon business roles identified in clause 6 of this Recommendation. Then business deployment scenarios are provided.

VI.1 Actors mapping to business roles

The following identifies different actors of the NGN-SIDE ecosystem and the business roles that they can play:

- The “NGN provider” actor. In the context of NGN-SIDE, the "NGN provider" actor plays the role of NGN-SIDE resource provider (e.g. for resources such as NGN capabilities, NGN service enablers). Depending on the business scenario, the "NGN provider" actor can also play the role of NGN-SIDE provider. . If playing the role of NGN-SIDE provider, the "NGN provider" actor can also play the roles of application developer (for **in-house applications**) as well as application developer.
- The “integration provider” actor. The "Integration provider" actor plays the role of NGN-SIDE provider; Depending on the business scenario, the "integration provider" can also play the role of application provider.
- The “3rd party application provider” actor. The "3rd party application provider" actor plays the role of application provider but is distinct from the NGN provider (although it may be a different NGN provider). Examples of 3rd party application providers include end users, Web based application providers. NOTE: the “3rd party application provider” actor can also play the role of application developer.
- The “3rd party resource provider” actor. The "3rd party resource provider" actor plays the role of NGN-SIDE resource provider but is distinct from the NGN provider (although it may be a different NGN provider). Examples of 3rd party resource providers include PLMN providers, PSTN/ISDN providers, application providers, **content providers**, other NGN providers, end users.
- The “content provider” actor. The "Content provider" actor plays the role of content provider, but is distinct from the NGN provider. Examples of such providers include IPTV content providers, end users.
- The “3rd party application developer” actor. The "3rd party application developer" actor plays the role of application developer, but is distinct from the NGN provider. Examples of 3rd party application developers include end users, etc. NOTE: the “3rd party application developer” actor can also play the role of application provider.

Note: end users may include NGN end users and end users from other domains.

Editor's note: need to confirm that above text is OK for an actor which, for example, can play both roles of app provider and resource provider.

Editor's note: it should be considered if there should be a distinction between two roles, the case of the "pure" application provider role whose role is to provide applications that are used by e.g. the end-user from the role of application resource provider whose role is to provide "applications" as resources to NGN-SIDE. May be Clause 6 should be revisited to cover these two distinct roles. Then an "application provider" actor can play the application provider role and optionally the "application resource provider" role.

VI.2 Business deployment scenarios

This clause identifies business deployment scenarios where the NGN-SIDE provider role is played by either the "NGN provider" actor or the "integration provider" actor as described in clause VI-1.

NOTE – In the following figures:

- actors are represented using yellow colored rounded boxes;
- the NGN-SIDE provider role is represented using blue colored ovals;
- roles other than the NGN-SIDE provider role are represented using grey colored ovals.

Figure VI-1 illustrates an example of business deployment scenario where the NGN provider plays the role of NGN-SIDE provider.

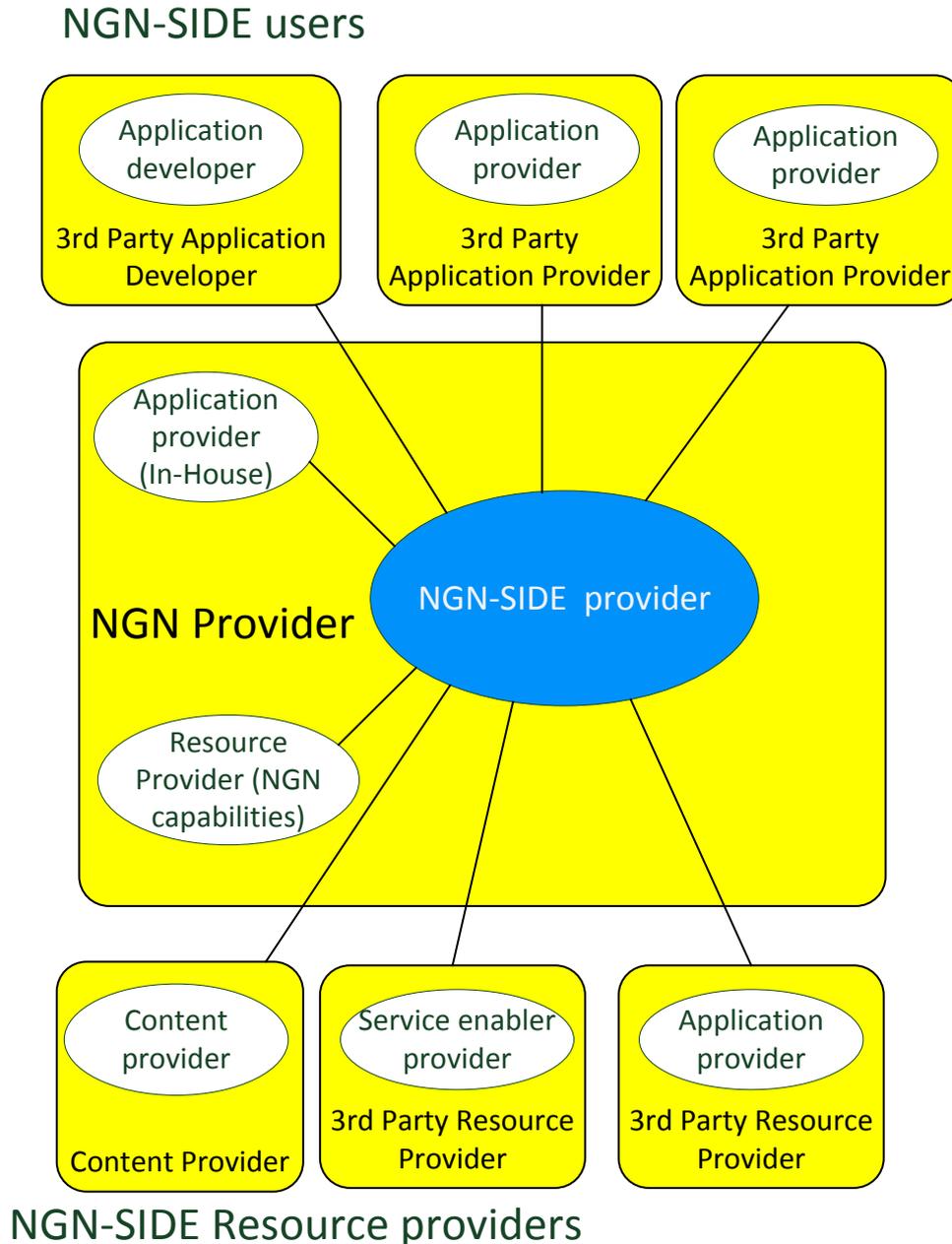


Figure VI-1 – NGN provider as NGN-SIDE provider

In the scenario shown in Figure VI-1, in addition to the NGN-SIDE provider role, the "NGN Provider" actor is also playing the role of NGN-SIDE resource provider for the resources it owns as well as the role of an application provider since providing so-called "**in-house applications**". In addition, since playing the role of NGN-SIDE provider, the "NGN provider" actor can:

- access and integrate resources of actors such as "content provider" and "3rd party resource provider";
- expose NGN-SIDE capabilities and resources to actors such as "3rd party application developer" and "3rd party application provider".

Editor's note: depending on definition of in-house application, need to confirm that in-house app is not already determining the specific role which provides these apps.

Figure VI-2 illustrates an example of business deployment scenario where an "Integration provider" actor (distinct from the "NGN provider") plays the role of NGN-SIDE provider.

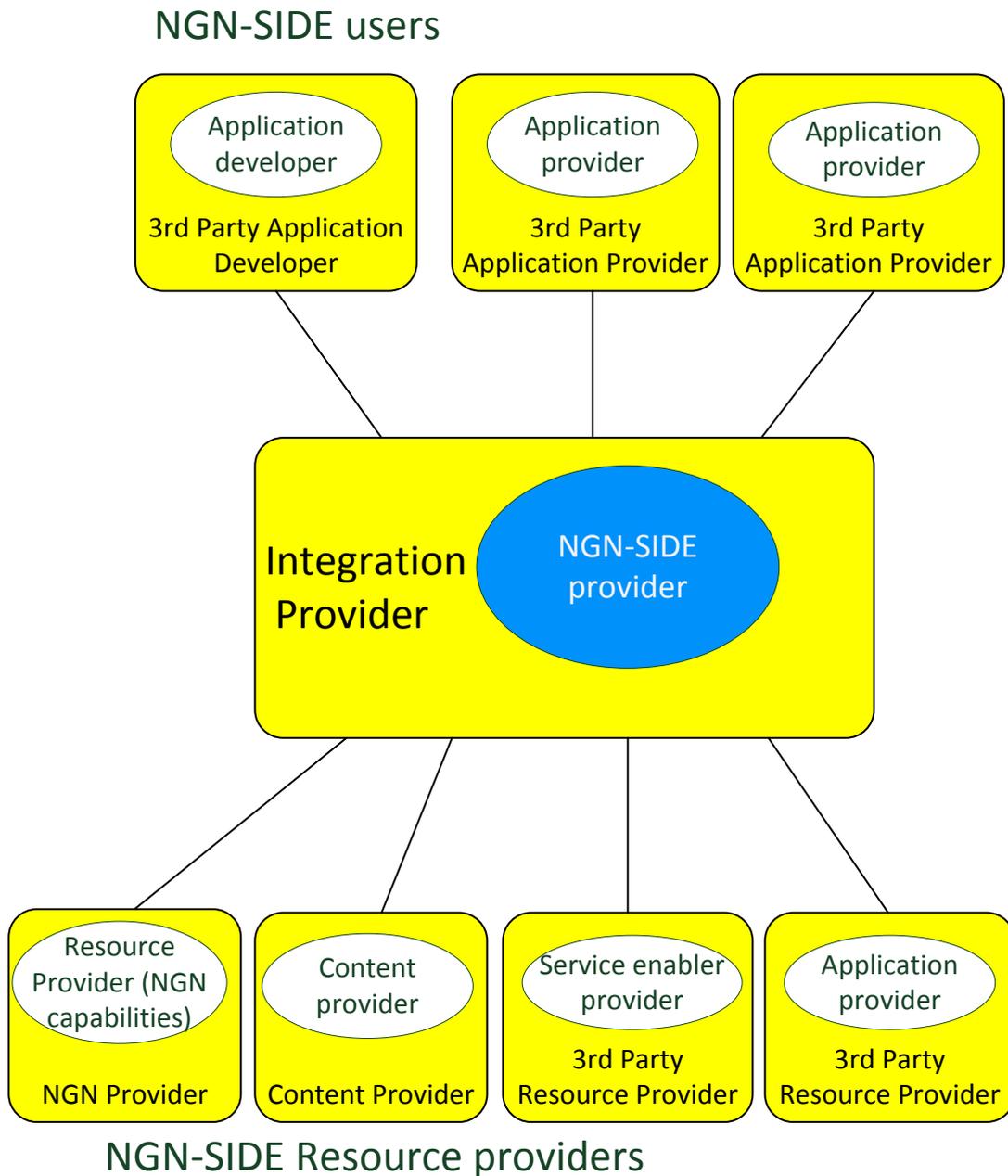


Figure VI-2 – NGN-SIDE provider as an integration provider (distinct from NGN provider)

Editor's note: consideration should be given to the use of "network capability provider" as role for the NGN provider in above figure.

In the scenario shown in Figure VI-2, since playing the role of NGN-SIDE provider, the "integration provider" actor can:

- access and integrate resources of actors such as "NGN provider", "content provider" and "3rd party resource provider";
- expose NGN-SIDE capabilities and resources to actors such as "3rd party application developer" and "3rd party application provider".

Figure VI-3 illustrates an example of business deployment scenario where the "Integration provider" actor also plays the role of application provider. This scenario is similar to the scenario shown in Figure VI-2 but allows the "integration provider" to be an application provider.

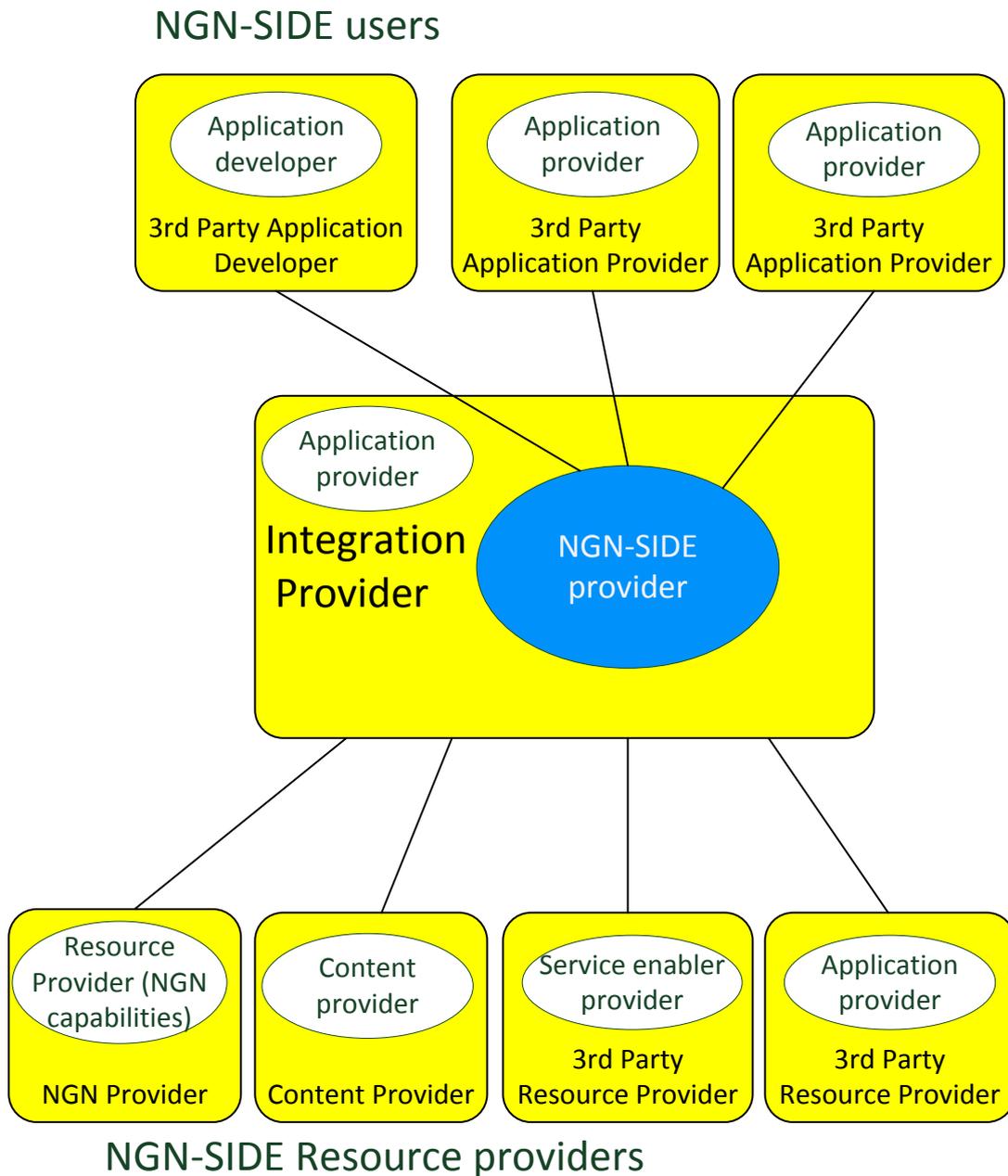


Figure VI-3 – NGN-SIDE provider as an integration provider and application provider

Editor's note: it should be considered if the "consumer" (from the deleted clause VI.2 below) is useful entity for clause VI.1 (e.g. it could be shown in previous figures as consumer of "application" provided by the "application provider" role as well as examples of applications and resources used (can be added to the above text itself if needed)).

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ATTACHMENT 1

List of identified issues in the current version of this document

Editor's note: the current version below needs to be updated based on Oct 27- Nov 5 Y.NGN-SIDE output version.

NOTE: the following table provides the currently open issues in this draft Recommendation (essentially based on the editor's notes and highlights contained in this version of the document), in order to facilitate future contributions and resolution of the open issues themselves. Contributors are invited to consider this list in preparing their future contributions.

Legend: Priority H: Serious problem, M+: significant medium level problem, M: Medium level problem, L: low level problem (mainly editorial issues)

Issue number	Priority	Document clause number	Context description	Issue description	Working groups (to be) involved in the issue resolution	Other documents which (may) have relation with the issue	Issue status (Open or Closed)	Q3/13 action proposal
1	H	Clause 7	Some requirements are hard to read like duplication, misplaced etc	Re-organization of requirements			Open	
2	H	Clause 6, 7, and 8	Functions identified in framework	Align of section 6, 7, and 8 in terms of framework, requirement and capability			Open	

			need to align with requirements and capabilities					
3	H	All clauses and appendices		Consistency review of the whole document regarding usage of the terminologies.			Open	
4	M	Clause 9	Currently NGN-SIDE adds requirements to ANI/UNI/SNI/ NNI but its not very clear that which scenarios need these requirements.	Provide use cases regarding role of ANI/UNI/NNI/SNI in NGN-SIDE and level of detail at this stage of the document.			Open	
5	M+	Appendix IV	Appendix contains a lot of material coming from several meetings	Review appendix IV and remove or merge the material for further considerations.			Open	
6	H	Clauses 8.1 and 8.2	Complete the missing topics in section 8.1	topics in section 8.1			Open	
7	H	All clauses and appendices	There are considerable ENs in the	Resolve editors notes throughout the document			Open	

			document which needs to be resolved via proper contributions.				
8		All clauses and appendices	A contribution is needed to provide acronyms for the terms being used in the document.	Provide acronyms for every term being referenced in the document			Open

ATTACHMENT 2

NGN-SIDE living list

No.	Item	Status
1	List of topics for consideration in future versions of this Recommendation	Under Study (Nov 2009, Sanya)
2	NGN-SIDE requirements for cloud services	Under Study (Sept 2010, Geneva)
3	Application scenario: NGN-SIDE built on cloud computing platform using virtualized resources in telecom domain	Under Study (Sept 2010, Geneva)
4	Application scenario: NGN-SIDE acting as cloud service broker for cloud services	Under Study (Sept 2010, Geneva)

Item No. 1] List of topics for consideration in future versions of this Recommendation

List of documents addressing the issue:

A working document from the Q3/13 Rapporteur at the Q3 November 2009 meeting (Sanya) (“Items for consideration concerning next contributions to Y.NGN-SIDE-Req”). The input was presented 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 (the original list was captured in Appendix IV.5 of this document)..

1. SLA management in SIDE
2. Service enablers (description, security, liability) in SIDE
3. Identity aspects and IdM integration with SIDE
4. 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)
5. Scenarios of XaaS (Saas, PaaS, IaaS) and relationship with SIDE
6. Scenarios of user access to SIDE from other domains (Internet etc.) and access to SIDE by xSPs on the Internet
7. IMS platform as a SIDE platform, SIDE platform-IMS platform interworking

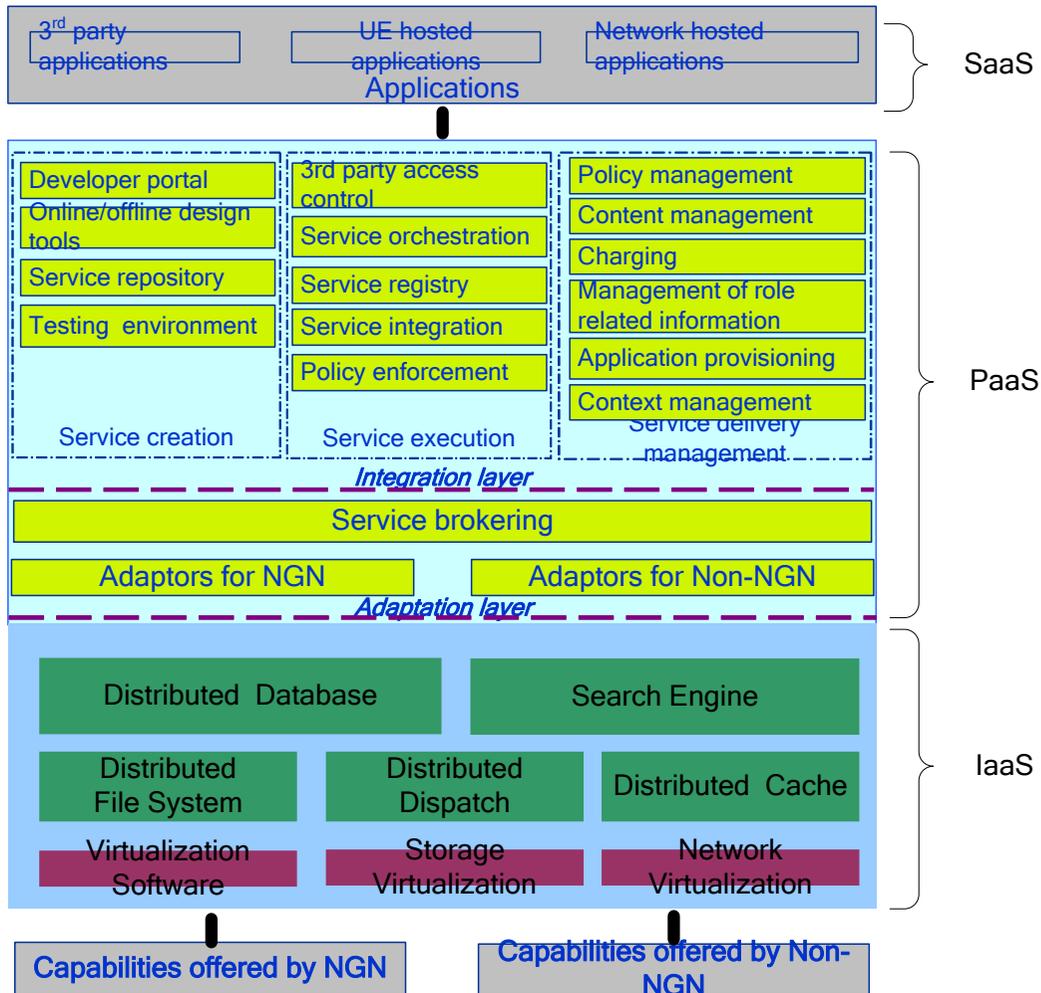
8. Role of a Web service platform for (Telco) SIDE, including Web 2.0 APIs
9. Interfaces (ANI, NNI, ?) to be used to provide Web APIs/enablers to (Telco) SIDE and vice-versa
10. Role of (Telco) SIDE for a Web service platform [for example, role of (Telco) SIDE as negotiator of enablers for other service environments]
11. Usage of (Telco) SIDE by other domains (Internet, legacy networks)
12. Scenarios concerning migration of some SIDE functions in the Web (Web 2.0 as support environment to the (Telco) SIDE platform)

Editor's Note: Above topics 1 to 3 need verification if they are already captured in this Recommendation.

Item No. 2] NGN-SIDE requirements for cloud services

List of documents addressing the issue

- C801, NGN-GSI, Sept 2010, Geneva



- NGN-SIDE is required to support exposure of virtualized resources of NGN including connections, storages and computing.
- NGN-SIDE is required to support exposure of cloud resources of non-NGN including SaaS, PaaS, IaaS.

- NGN-SIDE is required to support SaaS, applications include 3rd party applications, UE hosted applications, Network hosted applications can be as SaaS services which are deployed on NGN-SIDE cloud computing platform.
- NGN-SIDE is required to support PaaS, NGN-SIDE integration layer and adaptation layer's capabilities can be as PaaS to expose which are deployed on NGN-SIDE cloud computing platform.
- NGN-SIDE is required to support IaaS which provide entire cloud infrastructure resource stack from the facilities to the hardware platforms that reside in them.
 - NGN-SIDE is required to support virtualization technology which includes virtualization software, storage virtualization, network virtualization.
 - NGN-SIDE is required to support distributed file system which allows access to [files](#) from multiple hosts [sharing](#) via [computing network](#).
 - NGN-SIDE is required to support distributed dispatch which schedules cloud computing virtualization resource include network resource, storage resource, computing resource.
 - NGN-SIDE is required to support distributed cache.
 - NGN-SIDE is required to support distributed database which store data dispersedly over a [network](#) of interconnected computers or total NGN-SIDE environment.
 - NGN-SIDE is required to support search engine which provides searching for information on NGN-SIDE, the information may consist of data, files, capabilities, resources in NGN-SIDE.

- NGN-SIDE is required to support Cloud Service Brokering function which offers intermediation, monitoring, transformation/portability, governance, provisioning, and integration services and negotiate relationships between various cloud providers (which provide different cloud service, e.g SaaS, PaaS, IaaS etc.) and consumers. Cloud Service Brokering is one part function of service brokering.

Note: NGN-SIDE supports the integration of capabilities from different domains (e.g. telecom, broadcasting, Internet, etc.), and there are different clouds deployment in these domains. Cloud service broker will abstract the possibly incompatible capabilities and interfaces on behalf of consumers to provide proxy in advance of the arrival of common, open and standardized ways of solving the problem longer term with a semantic capability that allows fluidity and agility in a consumer being able to take advantage of the model that works best for their particular needs.

Item No. 3] Application scenario: NGN-SIDE built on cloud computing platform using virtualized resources in telecom domain

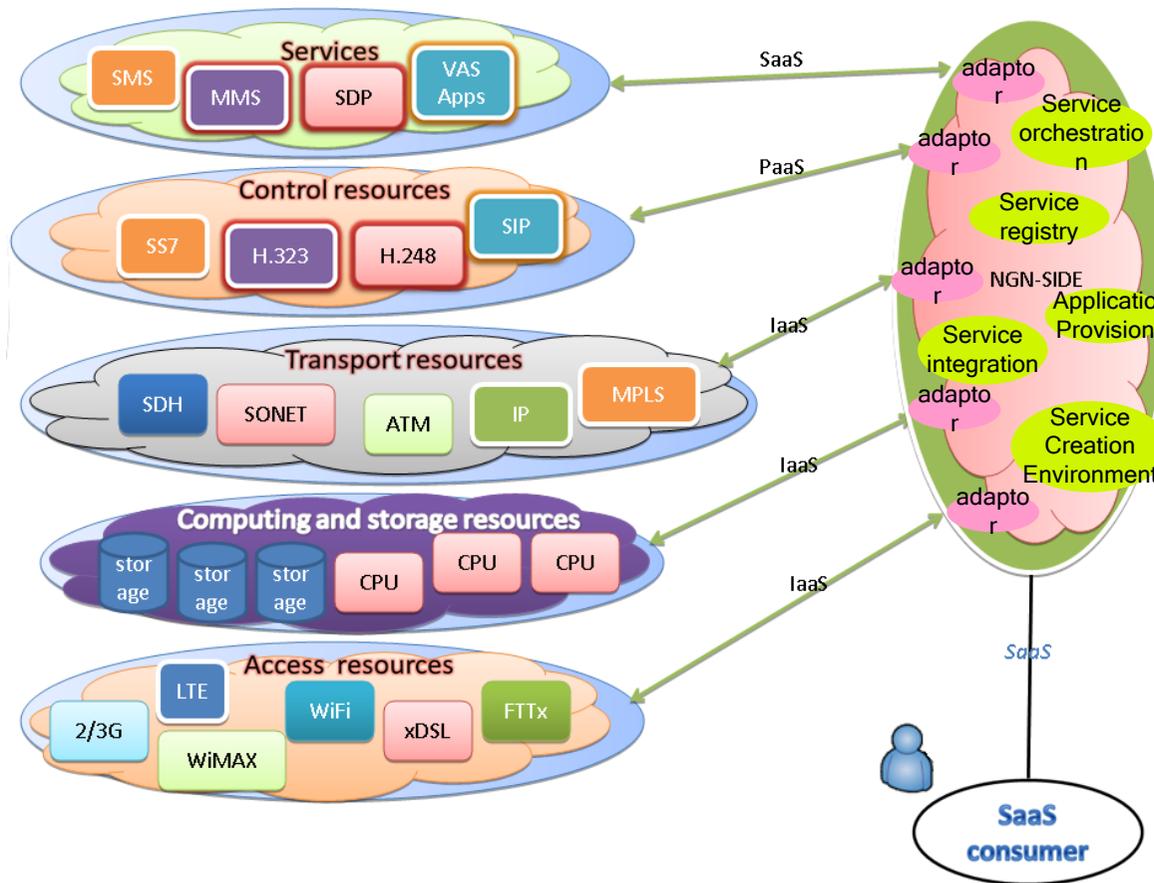
List of documents addressing the issue

- C801, NGN-GSI, Sept 2010, Geneva

Service entities	7) NGN-SIDE. 8) IaaS from Telecom domain such as access network resources (e.g. 2G, 3G, LTE, WiMAX, WiFi, xDSL, FTTx etc.), computing and storage resources, transport network resources (e.g. SDH, SONET, ATM, IP, MPLS etc.). 9) PaaS from Telecom domain such as control resources (e.g. SS7, H.323, H.248, SIP etc.). 10) SaaS from Telecom domain such as Telecom service (e.g. SMS, MMS, SDP, VAS APPs etc.).
Roles	7) Customer (SaaS Consumer) 8) Operator (NGN-SIDE provider, here NGN-SIDE build on cloud architecture)

Relevant business stake holders	Telecom operators, Capability providers
Analysis of the Usage Model	
Main Intent/Objective of the scenario in terms of usage model	NGN-SIDE is required to be built on the cloud computing platform and support the following cloud computing service provisioning models : SaaS, PaaS, IaaS
NGN-SIDE key features	NGN-SIDE build on cloud architecture

Scenario description



10) NGN-SIDE is built on the cloud computing platform.

11) Registration of cloud based capabilities with NGN-SIDE:

- a) IaaS from Telecom domain such as access network resources (e.g. 2G, 3G, LTE, WiMAX, WiFi, xDSL, FTTx etc.), computing and storage resources, transport

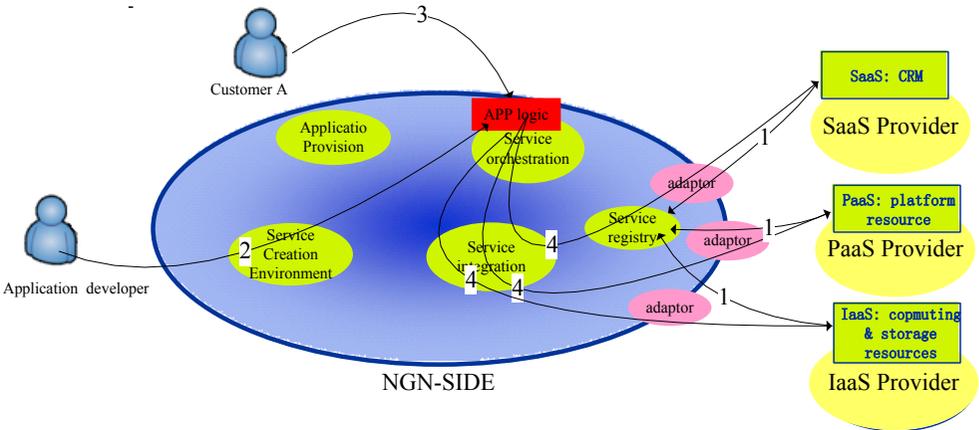
	<p>network resources (e.g. SDH, SONET, ATM, IP, MPLS etc.)</p> <p>b) PaaS from Telecom domain such as control resources (e.g. SS7, H.323, H.248, SIP etc.),</p> <p>c) SaaS from Telecom domain such as Telecom service (e.g. SMS, MMS, SDP, VAS APPs etc.).</p> <p>12) NGN-SIDE provide SaaS to consumers .</p>
Benefits analysis for relevant business stakeholders	<p>4) NGN-SIDE benefits the Capability providers with exposure of Telecom domain virtualized network resources.</p> <p>5) NGN-SIDE benefits the Telecom operators (NGN-SIDE provider) to provide cloud services in an efficient and economic way.</p>
NGN-SIDE requirements Analysis	<p>1) NGN-SIDE is required to be built on the cloud computing platform and support the following cloud computing service provisioning models : SaaS, PaaS, IaaS</p> <p>2) NGN-SIDE is required to support exposure of virtualized resources of NGN including connections, storages and computing.</p>

Item No. 4] Application scenario: NGN-SIDE acting as cloud service broker for cloud services

List of documents addressing the issue

- C801, NGN-GSI, Sept 2010, Geneva

Service entities	<p>4) NGN-SIDE.</p> <p>5) IaaS such as computing resource, data storage resource.</p> <p>6) PaaS such as platform resource.</p> <p>7) SaaS such as CRM service.</p> <p>8) The new B2B hosted application developed by Application developer.</p> <p>NOTE: “service” and “application” are used distinctively here</p>
Roles	<p>6) Customer A (end user of the Application)</p> <p>7) Operator A (NGN-SIDE provider, here NGN-SIDE act as a cloud service broker)</p>

	<p>8) Application developer (develop the new B2B hosted application) 9) IaaS Provider 10) PaaS Provider 11) SaaS Provider</p>
<p>Relevant business stake holders</p>	<p>Telecom operators, Capability providers</p>
<p>Analysis of the Usage Model</p>	
<p>Main Intent/Objective of the scenario in terms of usage model</p>	<p>NGN-SIDE is required to support Cloud Service Brokering function which offers intermediation, monitoring, transformation/portability, governance, provisioning, and integration services and negotiate relationships between various cloud providers (which provide different cloud service, e.g SaaS, PaaS, IaaS etc.) and consumers. Cloud Service Brokering is one part function of service brokering.</p>
<p>NGN-SIDE key features</p>	<p>NGN-SIDE act as a cloud service broker.</p>
<p>Scenario description</p>	 <p>The diagram illustrates the NGN-SIDE architecture. At the center is the NGN-SIDE entity, represented by a large blue oval containing several internal components: 'Application Provision', 'Service orchestration', 'Service registry', 'Service integration', and 'APP logic'. 'APP logic' is highlighted in red. External entities include 'Customer A' (top left), 'Application developer' (bottom left), and three cloud providers on the right: 'SaaS Provider' (with 'SaaS: CRM'), 'PaaS Provider' (with 'PaaS: platform resource'), and 'IaaS Provider' (with 'IaaS: computing & storage resources'). Interactions are shown with numbered arrows: '3' from Customer A to APP logic; '2' from Application developer to Service Creation Environment; '4' from Service integration to Service registry; '1' from Service registry to each of the three providers via 'adaptor' boxes; and '4' from Service integration to APP logic.</p> <p>5) NGN-SIDE subscribes and registers IaaS (Infrastructure as a service) capabilities or resources such as IaaS provider's computing resource, data storage resource. NGN-SIDE subscribes and registers PaaS (Platform as a service)</p>

	<p>capabilities or resources such as PaaS provider's platform resource. NGN-SIDE subscribes and registers SaaS (Software as a service) capabilities or resources such as SaaS provider's Customer Relationship Management service.</p> <p>6) Application developer develops a new B2B application in NGN-SIDE supported service creation environment based on PaaS provider's platform resource, SaaS provider's Customer Relationship Management service capabilities and install the application on IaaS provider's computing resource and data storage resource as a hosted application in NGN-SIDE.</p> <p>7) Customer A sign contract with NGN-SIDE provider to purchase this new B2B application and use it.</p> <p>8) The application invoke IaaS provider's computing resource and data storage resource, PaaS provider's platform resource and SaaS provider's Customer Relationship Management capabilities.</p>
Benefits analysis for relevant business stakeholders	<p>2) NGN-SIDE benefits exposure of cloud resources of non-NGN including SaaS, PaaS, IaaS.</p> <p>3) NGN-SIDE benefits the Telecom operators (NGN-SIDE provider) to provide cloud services in an efficient and economic way.</p>
NGN-SIDE requirements Analysis	<p>1) NGN-SIDE is required to support exposure of cloud resources of non-NGN including SaaS, PaaS, IaaS.</p> <p>2) NGN-SIDE is required to support Cloud Service Brokering function</p>