IEEE P1903 NGSON
NEXT GENERATION SERVICE OVERLAY NETWORKS

NGSON WEBINAR

April 2013
INTRODUCTION:

1. Introduction to NGSON -
   • Mehmet Ulema, Manhattan College, USA (5 minutes)
2. The need for NGSON
   • Chen Shan, Huawei, China (5 minutes)
3. Reference Architecture
   • Niranth, Huawei, India (10 minutes)
4. Content Delivery, P1903.1
   • Seung-Ik Lee, ETRI, Korea (10 minutes)
5. Service Composition, P1903.2
   • Yi Jong Hwa, ETRI, Korea (10 minutes)
6. Self-Organizing Management, P1903.3
   • Joe Lin, NCTU, Taiwan (10 minutes)
7. Procedures for submitting contributions
   • Lisa Perry, IEEE-SA, USA (5 minutes)
8. Q&A (10 minutes)
What is NGSON

- An IEEE sponsored effort to standardize a framework of IP-based service overlay networks
- A set of context-aware, dynamically adaptive, and self-organizing networking capabilities, including advanced routing and forwarding schemes
Position of NGSON Standards

Applications

OSE (ITU-T)
NGN (ITU-T, ETSI)
IMS (3GPP)
SDP
P2P, Web, Cloud
EPC (LTE) (3GPP)
SDF (TMF)

Service Layer
App Support Layer
Transport Layer

NGSON

Business Layer
Service Related
Transport Related

IP
IEEE P1903 NGSON

NGSON (IEEE P1903) standardization

- Feb-2007, Idea published to IEEE
- Sep-2007, NGSON SG 1st meeting
- May-2008, WG 1st meeting
- 1Q 2009, WG completes the White Paper on NGSON
- 2Q 2009, WG completes the NGSON Requirements Document
- Jan 2010, WG Completes the NGSON Functional Architecture Document
- Oct 2011, NGSON AD becomes an IEEE Standard
- October 2011, IEEE ComSoc approves 3 new PARs
- Jan 2013 Participation changed from Client based to Individual based

October 2011, IEEE ComSoc approves 3 new PARs
<table>
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<tr>
<th>Document Status</th>
<th>1Q09</th>
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<th>3Q11</th>
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<td>White Paper Released</td>
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<td>Requirements Frozen</td>
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<td>Architecture Standardized</td>
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<td>Technical Specs Started</td>
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New PARs Approved by IEEE

• Content Delivery (P1903-1)
  – Technical Standard for Content Delivery Protocols of NGSON

• Service Composition (P1903-2)
  – Technical Standard for Service Composition Protocols of NGSON

• Self-Organizing Management (P1903-3)
Where to Find us?

• Website:
  – http://grouper.ieee.org/groups/ngson/index.html

• For questions:
  – Mehmet Ulema: mehmet.ulema@manhattan.edu
  – Niranath: namogh@huawei.com
  – Lisa Perry: L.Perry@ieee.org
Why do we need NGSON?

Chen Shan
Huawei

(Apr-2013/IEEE/Webinar)
## Current Challenges

<table>
<thead>
<tr>
<th>Operators</th>
<th>Platforms</th>
<th>Services</th>
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<tr>
<td>Google</td>
<td>Google App Engine</td>
<td>Gmail, Google Docs, Google Talk</td>
</tr>
<tr>
<td>amazon.com</td>
<td>Amazon Web Services</td>
<td>Youku, WeChat, Hulu</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Windows Azure</td>
<td>OMP (CMCC), 21CN (BT)</td>
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**Operator:** More and more enriched services and content on the Telecom networks are forcing the bandwidth requirements to grow exponentially, the cost of operators to great increase.  
**Services:** Exponentially increasing number of services and applications and their interactions.  
**Platform:** To have a better, more “efficient” way of providing these services and applications interaction and operation management capabilities.
Mobile Internet is challenging operators profitability and they need to think about transforming their networks and business model in the next 3 years (Developing country operators need to take important decision by Q3 2014. Business cannot be sustained by simply increasing the capacity or “dumb pipes”) – TellLabs Study
Telecom Stakeholders Perspective

- **Service providers:**
  - Context Sensitive Applications (X-Awareness)
  - Personalization of Services based on User Data

- **Telecom operator:**

- **Subscriber:**
  - Participation and profit sharing
  - Rich QoE and Privacy

- **Platform:**
  - Abundant Service Creation and Control Capabilities easily and quickly
  - Virtualization, Self Organization
Strategy for NGSON standards

User/Terminal

Applications

3rd Party Services

STORES

Service Platforms

IP based SERVICE INFRASTRUCTURE
(X-Aware Service Ecosystem)

Secure access & operations
Multi-Level Virtualization
Increase service innovation
Heterogeneous service types
Fast service blending

Emerging terminal platforms
Enable competitive Business models
E2E loose coupling
Convergence of services
E2E QoS

Self Organization Adaptation
Huge App market
Lower OPEX
Inter-operable service systems
Exploit underlay
Thank you!

Contact: chenshan@huawei.com
IEEE Standard for the Functional Architecture of Next Generation Service Overlay Networks
P1903-2011

Niranth
Huawei

(Apr-2013/IEEE/Webinar)
Agenda

- Background
- Introduction to NGSON Architecture
- Evolution with NGSON
Use Cases

- Automated adaptation of Service Characteristics during (Multimedia – Video, Voice, Text) Service Delivery based on Contexts (Current Device Type, Mobility, Available bandwidth, Content Popularity, etc.)

- User centered Service Composition to create context aware and personalized services. Eg. Personalized Tour service, Content recommendation service, etc.

- Service Orchestration of the Service Delivery value chain by combining services from different industries (Web, Energy, Telco, Health, Governance)

- Self Organization of the Core Network and Application Layer to achieve OPEX optimization - adjusting the structure and functions of NGSON

- Opening APIs to Applications for Service Layer Operations thus allowing programmability of Service Delivery.
NGSON enables Service Ecosystem

Unified Service Dir for BSS system and Service system, description, registration, discovery, support

Engine based service combination system support mashup/blending of bss and service

Meet with intelligent service/application interaction management, support distribution of data and files, support data and service migration and distribution,

Service network level user ID Broker and manager

Context to make service more dynamic and customized.
NGSON Requirements

Common
- Addressing
- Interaction
- Interworking
- Cross-layer
- ID Management
- QoS
- Security
- Service framework to 3rd party providers
- Infrastructure virtualization
- Global ID

Service
- Service routing
- Service registration
- Service Discovery and Publication
- Negotiation
- Service Composition
- Charging
- Seamless Mobility
- Context Awareness
- Service related Self Organization
- Brokering
- Service Co-ordination
- Service Collaboration
- Virtualization
- Messaging for O&M through Service Routing
- Service related P2P Overlay
- Service replication
- Community based services

Delivery
- Network Routing
- Transport Related Functions
- Self Organization Adaption
- Identity
- Resource Virtualization
- Network Composition
- Resource Scheduling
- Network Traffic Optimization
- Transport related P2P Overlay

O&M
- Manageability
- FCAPS
- Lifecycle management
- Service arrangements and provisioning between providers
IEEE NGSON Architecture

Features

- Self Organization
- Context Awareness
- Dynamic Adaptation
- Service QoS

Static & Dynamic Service Chaining and Instantiation

Maintenance of Service Dynamic Information

Self Organization of NGSON structure and functions.

Service, Network, Device, User contexts mgmt.

QoS Negotiation and Assurance

Content adaptation, cache and forward techniques

Legend

- Entity standardized by NGSON
- Entity standardized out of NGSON
- Reference Point standardized by NGSON
- Potential reference point FFS
- Logical Reference point for composite service

R1, R2, R3 and R4 are external reference points

R5 - R90 are internal reference points
X-Aware Service Ecosystem

AS, Apps, ...

CPE, Mobile Handset, ...

IM, LBS, Social N/Ws, ...

NGSON

Device Awareness

Application/Service Awareness

User Awareness

Network Awareness

Application Awareness

Software Defined Network (SDN)

Telecom N/Ws (NGN, IMS, EPC)

Other N/Ws (Web, P2P, IT)
The BIG Picture

NGSON based Service Layer Infrastructure

- IMS (SR <-> CSCF, IDM <-> GUP, SPD <-> PDF, CD <-> MRF)
  - Enhancing IMS Service Interactions

- EPC (LTE) (SPD <-> PCRF, CD <-> P-GW)
  - Construct the MBB App Layer for 3GPP EPC

- SDP (Media <-> CD, Orchestration: SC, SR, SDN)
  - Scaling SDP. Orchestration of value chain in multiple provider env.

- Cloud (NGSON uses Cloud)
  - Providing PaaS layer, building the SaaS, using IaaS

Other N/Ws (P2P, Web)

- Other Industry (M2M)

- Smart Grid
  - Grid Management
  - Vouching
  - Smart Metering

- E Health
  - mHealth, eHospital, Medical Record, Remote monitor

- Grid & Plan
  - dispatch automation
  - Environmental

- Education
  - meteorological Development and Reform

- Internet Web
  - Email, Weather, Social, Hotel, Air ticket

- Telco Service APP
  - Presence, CALL, Customer Care, Location, SMS

- Government
  - IMS
  - SDP, Media, Orchestration
  - Constructing the EPC

- Other
  - Industry

IEEE
References

- NGSON White Paper 1.0

- NGSON PAR -
  http://grouper.ieee.org/groups/ngson/P1903_0001_r0_PAR.pdf

Thank you!

Contact: namogh@huawei.com
P1903.1: Draft Standard for Content Delivery Protocols of NGSON

IEEE P1903 WG

Seung-Ik Lee (ETRI)
<seungiklee@etri.re.kr>
Contents

• Introduction
• Relevant FEs and interfaces
• Basic operations
• Use cases
Introduction

• Purpose of P1903.1
  – for network operators, service/content providers, and end users
  – to provide and consume content services based on advanced content delivery capability of NGSON
    • with context-aware and dynamically adaptive features.
  – to provide interoperability of content services between network operators and content providers.
FEs and Interfaces for CD
FEs and Interfaces for CD

• CD FE
  – supports content delivery from a service to another service, from a service to an end user, from an end user to another end user, or from an end user to a service. It performs cache and forward functionalities.

• SDN FE
  – supports discovery and negotiation of services for content delivery using the service information published in NGSON.

• CIM FE
  – dispatches context information to SDN FE and SR FE to support their context-aware operations for content delivery.

• SR FE
  – provides the service routing capability in NGSON based on static and dynamic service information.

• SPD FE
  – is responsible for QoS negotiation and assurance during service interaction for content delivery.
Basic Operations for CD

- Content Delivery Request Operation
- Content Discovery Operation
- Content Location Update Operation
- Content Storage & Cache Operation
- Content Delivery Channel Setup Operation
- Transport QoS dispatch Operation
- Context Information Request Operation
- Content Delivery Service Operation
- Transport QoS enforcement Operation

SR FE | SDN FE | CD FE | SPD FE | CIM FE | Services /End Users | Underlying Network
## Basic Operations for CD

<table>
<thead>
<tr>
<th>Protocol Operations</th>
<th>Reference Points</th>
<th>Description</th>
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<tbody>
<tr>
<td>Content location update</td>
<td>R5 (CD FE - SDN FE)</td>
<td>CD FE requests and updates content location information from(to) SDN FE</td>
</tr>
<tr>
<td>Content discovery</td>
<td>R5 (CD FE - SDN FE)</td>
<td>CD FE requests content location discovery from(to) SDN FE</td>
</tr>
<tr>
<td>Content delivery request</td>
<td>R10 (CD FE – SR FE)</td>
<td>SR FE forwards the content delivery request from end users and services to CD FE</td>
</tr>
<tr>
<td>Content storage &amp; cache</td>
<td>R14 (CD FE – Service)</td>
<td>CD FE manages its storage and cache</td>
</tr>
<tr>
<td>Content delivery channel setup</td>
<td>R14 (CD FE – Service)</td>
<td>CD FE sets up delivery channel to receive contents from Services</td>
</tr>
<tr>
<td>Transport QoS dispatch</td>
<td>R11 (SPD FE – SR FE)</td>
<td>SR FE dispatches service QoS requirement to SPD FE</td>
</tr>
<tr>
<td>Transport QoS enforcement</td>
<td>R20 (SPD FE – Underlying Network)</td>
<td>SPD FE receives the information of transport related QoS from the underlying networks</td>
</tr>
<tr>
<td>Context information request</td>
<td>R12 (SR FE – CIM FE)</td>
<td>SR FE requests and receive the context information to(from) CIM FE</td>
</tr>
<tr>
<td>Content delivery service</td>
<td>R14 (CD FE – Service)</td>
<td>CD FE provides delivery of content to Services or End users</td>
</tr>
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</table>
Use Cases

• Name-based content routing
  – the content is discovered based on content name rather than its location

• Context-aware content routing
  – the content caches or sources can be selected based on the user and network context (e.g., traffic, proximity, load)
Use Cases

• Content delivery services in high quality and volume
Use Cases

- NGSON as an SDN application
IEEE P1903.2

Draft standard for Service Composition Protocols of Next Generation Service Overlay Network

Jong-Hwa, YI
ETRI
29 April 2013
IEEE P1903.2

• Project scope
  – This standard specifies protocols among Service Composition (SC) Functional Entity (FE), Service Discovery and Negotiation (SDN) FE, Context Information Management (CIM) FE, Service Routing (SR) FE and Service Policy Decision (SPD) FE to support service composition capabilities in next generation service overlay network. The capabilities of service composition aim to support service chaining and instantiation, specification interpretation, service brokering and execution, and context-aware and dynamically adaptive service composition.
Functional Architecture

• Provide a framework of IP based context-aware, dynamically adaptive and self-organizing networks
  – Including service composition capabilities
  • NGSON takes a role of aggregating the interactions among multiple components services for a single composite service
Functional Entities involved in Service Composition

- SC FE
- SDN FE
- CIM FE
- SR FE
Service Composition in NGSON

• SC FE is responsible for execution of composite services
• Supports static & dynamic service composition
  – Static SC: during a service design and pre-provisioned before runtime
  – Dynamic SC: during a runtime
    • dynamic service chaining
    • dynamic service instantiation
• Main functions
  – Service brokering function
  – Specification interpretation function
  – Composite service adaptation function
  – Charging event supporting function
NGSON based service scenarios
- Dynamic Service Composition
NGSON based service scenarios
- Smart streaming services
Current status of P1903.2

- Output document, July 2012
  - 1903-12-0015-00-WGDC-output-ts-service-composition

- Purpose
  - to enable network operators, service/content providers, and end users to provide and consume composite services based on advanced service composition capability of NGSON
Current status of P1903.2

- Service composition is one of the key functionalities of NGSON to support dynamic service adaptation using different types of contexts
- P1903.2 draft is in initial stages of development
- So, contributions are very welcome!
Thank you!

IEEE P1903(NGSON)
Http:// grouper.ieee.org/groups/ngson/
SELF-ORGANIZING MANAGEMENT IN NGSON

Prof. Fuchun Joseph Lin
fjlin@ieee.org
National Chiao Tung University
April 29, 2013
Outline

• Key Features of NGSON
• Self-Organizing Management of NGSON
• Operations for Self-Organzation
• Triggers for Self-Organization
• Self-Organizing Management Protocol Standards for NGSON
Key Features of NSGON (1)

- Intelligent Service Routing
- Context Awareness
- Dynamic Service Adaptation
- Dynamic Service Composition
- Self-Organizing Management
- Both Service and Content Delivery
Key Features of NGSON (2)

- NGSON nodes host one or several NGSON Functional Entities (FEs).
- Services and end users use NGSON to deliver service and content.
- NGSON supports dynamic service composition.
- NGSON supports self-organizing management.
Why Self-Organizing Management

- Optimize NGSON Operations for Operators via
  - Self-Configuration,
  - Self-Recovery and
  - Self-Optimization.
Self-Organizing Management of NGSON

1. If Controlled by Overlay Management
   » Define Operations for Self-Organization
   » Define Triggers for Self-Organization

2. If Not Controlled by Overlay Management
   » P2P Self-Organizing Management
Operations for Self-Organization

- “Self-Configuration” Operations
  - ADD NGSON FUNCTION ENTITY
  - DELETE NGSON FUNCTION ENTITY
  - MOVE NGSON FUNCTION ENTRY
  - COPY NGSON FUNCTION ENTITY
  - ACTIVATE NGSON NODE
  - DEACTIVATE NGSON NODE
Triggers for Self-Organization

- Two Types of Triggers
  - Self-Recovery (Deal with Failure Recovery)
  - Self-Optimization (Deal with Performance Optimization)
    » Either for overload or under-load conditions
Self-Organization Illustration

- **NODE 1**
  - SReg FE, SDN FE, SR FE

- **NODE 2**
  - SP FE, SC FE, SPD FE, CD FE, SR FE

- **NODE 3**
  - IDM FE, CIM FE, OM FE, SR FE

- **NODE 4**
  - SReg FE, SDN FE, SP FE, SC FE, SR FE

FEs on NODE 1 are re-allocated to NODE 2 due to the failure of NODE 1.

SP FE, SC FE, SPD FE, CD FE, SR FE, SReg FE, SDN FE

NODE 2

SPD FE, CD FE, SR FE

NODE 2

SPD FE, CD FE, SR FE

NODE 2

IDM FE, CIM FE, OM FE, SR FE

NODE 3

IDM FE, CIM FE, OM FE, SR FE

NODE 3

NODE 4 is added and SReg, SDN, SP and SC FEs are re-allocated from NODE 2 to NODE 4.
Self-Organizing Management Protocol Standards for NGSON

- Self-organization is one of key features of NGSON as next generation overlay network standards.
- P1903.3 has been approved by IEEE in December 2011 to define Self-Organizing Management Protocol Standards for NGSON.
- The standards will address both OM-involved and non OM-involved self organization.
- You’re welcome to join the WG in defining P1903.3 protocol standards.
Thank you!
1903 Working Group—
Submitting Contributions

Lisa Perry
29 April 2013
myProject

- Using your IEEE account Username and Password, log into myProject at https://development.standards.ieee.org/my-site
- If you don’t have an IEEE account, they are available to anyone and membership is not required!
Manage Your Activity Profile

- Log in myProject at https://development.standards.ieee.org/
- On the myProject Home Screen, click “Manage Activity Profile.”
- On the “Manage Activity Profile” page, scroll down and click on the “+” sign next to IEEE Communications Society.
- Click on the “+” sign next to the Sponsor, Standards Development Board.
- Scroll down and click on the “+” sign next to the Next-Generation Service Overlay Network (NGSON) Working Group (COM/SDB/1903_WG).
- To join the project activity, scroll down and click to check the boxes next to COM/SDB/1903_WG and its three projects, P1903.1, P1903.2, and P1903.3.
- Click the “CONTINUE” button.
Manage Your Activity Profile (cont.)

- Confirm your interest area and enter your affiliation information.
  - The field will auto-populate as you type. Select from the list or type in your company/organization.

- Click the “CONTINUE” button again, and a confirmation screen will show your interested activity area(s) and affiliation(s).
1903 WG Document Repository

- The 1903 Working Group will maintain a document repository at https://mentor.ieee.org/1903/documents.
- To access the repository, you can switch from myProject to Mentor by clicking the eTools tab in the upper-right corner of the screen and selecting “Mentor” from the “SIGN IN TO” dropdown menu.
- Once in Mentor, click the “mentor” dropdown menu to navigate to “1903” [Options will depend on your involvement level.]

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Uploading a Document in Mentor

1. From the group’s Mentor area, click “Documents” in the top left corner.
2. Click “New Document”.
3. Choose a document group for the document from the “Group” dropdown menu.
4. Enter a title for the document.
5. Enter an author and/or affiliation. This will display next to the document title in the list.
6. Click “New Document” to create the document entry.
7. Click “Browse...” and select the document file you would like to upload. There are no restrictions on the type of documents you can upload.
8. If your group allows public access to files, check “Allow public access to this file” to allow public access to this document. [NO PUBLIC ACCESS TO CONTRIBUTIONS]
9. Click “Upload Document” to upload the file.
Revising a Document in Mentor

Revisions do not overwrite the original document although they have the same name and document number. Revisions appear along with the original in the document list with a separate revision number. Revisions have a unique URL and will not show up in place of the original if a revision is linked to directly.

1. From your group’s Mentor area, click “Documents” in the top left corner. If you don’t see “Documents”, click the “more” dropdown menu and select “Documents”.

2. Click “Revise” next to the document you would like to post a revision to.

3. Enter a new Author and affiliation, if it is different, and click “Revise Document”.

4. Click “Browse...” and select the document file you would like to upload.

5. If your group allows public access to files, check “Allow public access to this file” to allow public access to this document.

6. Click “Upload Document” to upload the file.
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