Mobile Wireless Internet Forum

ARCHITECTURE PRINCIPLES

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Abstract:

This document serves the following functions:

(1) It communicates the Architecture Principles,

(2) It identifies very high level, overarching goals of MWIF, from which architecture requirements and project plans can be developed in order to influence SDOs [Standard Development Organisations] and specification creating bodies.

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1 INTRODUCTION

The Architecture Principles provide direction for the architecture definition work in the MWIF.

Thus, this document serves to:

- Provide high level direction to MWIF activities,
- Identify high level MWIF project objectives, and
- Identify SDO areas and specification creating bodies which MWIF will seek to influence such as 3GPP for example.

All subsequent MWIF activities and Technical Reports [including the Architecture Requirements, MTR-002] will be traceable to an Architecture Principle described in this document.

1.1 Objectives

The main objective of this document is to provide the Architecture Principles for the Mobile Wireless Internet Forum (MWIF) that could serve as the basis for the development of the MWIF Network Reference Architecture, including core and access Network. Thus it will serve as the guiding value to uphold the requirements, and architectures.

These Architecture Principles intend to provide a high-level direction to MWIF activities and identify the general areas, which MWIF will seek to influence in Standards bodies (3GPP, 3GPP2 and IETF) and strive to align the specifications with target architecture for the promotion of interoperability of IP equipment and services.

1.2 Definitions

This document employs the following terminology:

- Must, Shall, or Mandatory — the item is an absolute requirement of the Technical Report (TR).
- Should — the item is highly desirable.
- May or Optional — the item is not compulsory, and may be followed or ignored according to the needs of the implementers.

1.3 Overview

The Architecture Principles laid down in this document will lead to the derivation of a single open mobile wireless Internet architecture that would enable seamless integration of mobile telephony and Internet services, meeting the needs of network operators and Internet service providers, independent of the access technology.

1.4 Release plan

It is the objective of the MWIF to provide timely industry direction for mobile wireless internet. In order to accomplish this, the MWIF will periodically release Technical Reports. The period in which Technical Report will be released will be frequent enough to meet the objective of timely industry direction.

This Technical Report is one of a series intended to specify the MWIF architecture. At the time of release of this report, the following MWIF Technical Reports are scheduled:

MTR-001 MWIF Architectural Principles

MTR-002 MWIF Architecture Requirements

MTR-003 MWIF Layered Functional Architecture

MTR-004 MWIF Network Reference Architecture

MTR-005 MWIF Gap Analysis

MTR-006 MWIF IP Transport in the RAN

MTR-007 MWIF IP Radio Control / Bearer in the RAN

The Architecture Principles document is a historic document. MWIF will, however, periodically review this document and update it as necessary (in line with the MWIF approval process) to meet the objective of "Timely Industry Direction For Mobile Wireless Internet". The Principles outlined herein allow flexibility and room for improvement in the MWIF Architecture over time.

2 REFERENCES

[1] IETF RFC2700 Internet Official Protocol Standards

3 ABBREVIATIONS AND GLOSSARY OF TERMS

3.1 Abbreviations

3GPP	Third Generation Partnership Project
3GPP2	Third Generation Partnership Project 2
AAA	Authentication, Authorization and Accounting
API	Applications Programming Interface
BSC	Base Station Controller
BTS	Base Transceiver Station
CAMEL	Customized Application of Mobile network Enhanced Logic
CDR	Call Detail Records
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISP	Internet Service Provider
LAN	Local Area Network
MM	Mobility Manager
Node B	3GPP terminology for a base transceiver station.
OAM & P	Operations, Administration, Management and provisioning
OTAP	Over The Air Provisioning
PSTN	Pubic Switched Telephone Network
QoS	Quality of Service
RAN	Radio Access Network
RNC	Radio Network Controller
SDO	Standards Development Organisations
SNMP	Simple Network Management Protocol
UTRAN	UMTS Terrestrial Radio Access Network
VNO	Virtual Network Operator
VoIP	Voice over IP

3.2 Definitions

Applications: Applications are service enablers—deployed by operators, services providers, manufacturers or users. Applications are invisible to the user. They do not appear on a user's bill.

Legacy terminals (networks): Legacy terminals (or legacy networks) are those terminals (or networks) that employ GSM MAP or ANSI 41 call signalling or location management.

Mobility Management: In the control layer, this represents the ability for an end user to move between IP subnets. Mobility management functionality in the control layer includes Inter-administrative Domain Terminal Mobility and Macro Terminal Mobility.

Open interfaces: interfaces that are publicly defined to a sufficient level to allow different vendors and/or designers to design, build and supply equipment, applications or services that will interoperate.

Plug and play: This is the capability for easy installation and configuration of a network entity, especially Node B/BTS or other Base Station/Access Point Functional Entity.

Services: Services are the portfolio of choices offered by services providers to a user. Services are entities that services providers may choose to charge for separately.

4 ECONOMIC PRINCIPLES/BUSINESS GOALS

This section contains the "bedrock" requirements of the MWIF architecture. All subsequent Architecture Principles and MWIF Goals defined in this document shall be traceable to the Business Goals described below. The MWIF architecture shall be designed in such a way as to enable and support the following Business Goals.

4.1.1 Significant cost reduction

- Perceived data traffic domination of total network traffic and corresponding need to leverage data communications cost curve
- Integrated, multi-service network with significantly lower infrastructure and operations costs
- Multi-vendor procurement
- Modular & incremental infrastructure growth

4.1.2 Accelerated time to market

- End user services
- Infrastructure

4.1.3 Variety of services with open service creation environment

- Faster services & applications development
- New business development opportunities
- Alignment of data services and the Internet

4.1.4 Grow Internet services business

- Take advantage of wireline Investment in Internet, VoIP, IP-based services and applications

5 ARCHITECTURE PRINCIPLES

5.1 Embrace Internet Technologies and Services

The MWIF architecture shall adopt [1] existing or evolving IETF protocols to extend wireless support services, and will inter-operate with other next generation fixed or mobile networks (Next Generation Networks), and media gateways (legacy and PSTN).

5.1.1 Adoption of Internet Technologies

In order to meet the intent of this principle, the MWIF architecture will extend Internet technology in the following areas:

- IP (layer 3) in access networks and core networks for both transport & control
- Adoption of IP end-to-end (includes the terminal) –

The MWIF architecture will adopt:

- the Internet official protocol standards (currently listed in RFC2700 [1]) for use in mobile networks, where appropriate
- IP end-to-end (includes the terminal) – [2]

MWIF will influence the enhancement of IETF protocols to meet emerging mobile requirements.

5.1.2 Adoption of Internet Infrastructure Services

The architecture shall support the following minimum set of Internet services::

- Authentication
- Authorization
- Accounting
- Naming & Addressing
- Mobility Management
- Network Management
- Quality-of-Service Mechanisms – Support in the Infrastructure for QoS
- Security
- Session Management
- Resource Management
- Policy Framework
- Directories/Databases

[1] This adoption of IETF protocols is not intended to be exclusionary of other standard or protocols.

[2] IP through the RAN (future target)

5.2 Separation of Concerns - Separation of Services, Control and Transport

5.2.1 Logical Separation of user transport and control

The purpose of this principle is to optimise the scalability of the MWIF Architecture (and reduce congestion) – subscriber bearer traffic will increase at a different rate than the signalling associated with that bearer usage. In addition, the transport layer shall be independent of specific applications and services such that any resource in the transport layer can be flexibly used to support any network or third party offered service at a given instance of time.

5.2.1.1 Separation of Session Management and Service Control

Session Management deals with the management of sessions in the network.

Service Control deals with management of subscriber specific services or service agent functions.

5.2.1.2 Separation of Media Gateway and Media Gateway Controller for wireline legacy and wireless legacy network interoperability

This principle ensures that the separation of bearer from signalling traffic is maintained in the MWIF architecture interfaces to other networks including wireline legacy and wireless legacy networks (e.g. ANSI-41 and GSM-MAP signalling networks, and the PSTN).

5.2.2 Separation of Mobility Management (MM) from Session Management

This principle allows the Session Management to be isolated from the mobility aspects of the subscriber. These include:

- Terminal Mobility
- Session Mobility
- Personal Mobility

Refer to MTR-002 for detailed definitions of the above terms.

Session Management should be independent of mobility specific information - (Mobility Management is the tracking of movement and/or location and network connectivity of the terminal).

Mobility Management shall provide a set of common capabilities across the various access networks.

5.3 Open Interface Requirements

The MWIF Architecture shall allow flexibility in deployment of multiple vendor products of same or different systems.

5.3.1 Open All Pertinent 3G Interfaces – RAN Internal Interfaces, Core Network Interfaces

5.3.1.1 Radio Access Network Interfaces

- Support independence of the base station from the base station controller
- Enable plug & play components
- Support open interfaces for OAM&P
- Support open interfaces for Location Services
- Leverage current evolution of the RAN within existing SDOs, namely 3GPP2 and 3GPP

- Ensure, for 3GPP, that I_u, I_{ur} and I_{ub} interfaces are open and "plug-and-play"
- Ensure, for 3GPP2, that A interfaces are open and "plug-and-play"

5.3.1.2 Core Network Interfaces

- Support open interfaces between functional entities
- Support open interfaces for OAM&P
- Support open interface for Location Services
- Support open interface for Lawful Intercept
- Enable plug & play components

5.3.2 Floating Transcoder Function

The resultant MWIF Architecture shall allow operators to place the transcoder function in the most practical, cost-effective part of the network.

5.4 MWIF Core Network Independence of Access Technology

The resultant MWIF Architecture shall be designed to ensure that a common core network can be used with multiple wireless (UTRAN, IS-2000, Wireless LAN, etc.) and wireline access technologies (xDSL, Cable, Digital Broadcast, etc.).

Independence of access allows harmonization of core network design, which is a key design goal as Operators' networks expand within and across regional boundaries.

Transport independence – Layer 3 shall be independent of the underlying transport mechanism (L2 and L1). Furthermore the operators shall have the freedom to utilise any combination of L1 and L2 transport technologies. Transport independence allows:

- Enable Independent Evolution of Core Network and Access Networks
- Common Core Network Mobility Management Function Independent of Access Technology
- Common Core Network Mobility Management Function Which Supports Session Hand-over between Access Networks
- Interoperation with other IP Core Networks

5.5 Global Alignment

5.5.1 Eliminate regional/country differences in key interfaces

MWIF will define and promote a single, global all-IP core network architecture, independent of RAN or other access.

5.5.2 Global Access to Services

In order to ensure the widest level of services for subscribers, MWIF supports global access to services when roaming (regardless of access type) via common:

- Authentication, Authorization and Accounting
- Mobility Management
- Naming and Addressing
- Directories/Databases

- QoS Mechanisms
- Policy Framework
- Session Management
- Resource Management
- Security

In order to ensure the widest level of services for subscribers, MWIF supports globally accessible services via:

- Support of open APIs
- Enable a common representation of user service profiles
- Enable access to services across any network utilizing service brokering

5.5.3 Interoperability with 2G and non-IP networks and services

5.5.3.1 Legacy networks via gateways

Support for legacy networks and terminals: The resultant MWIF Architecture shall provide support for roaming terminal (with appropriate multi-mode and multi-band functions). In addition the resulting architecture shall provide handover between legacy networks and the MWIF network

5.5.4 Legacy services

The MWIF Architecture shall allow operators to implement a set of 2G compatible services which meet their business needs

5.6 Scaleable, Distributed Architecture

5.6.1 Scaleable Architecture

The resultant MWIF Architecture should give Operators the ability to grow specific functions within the network without unnecessary growth in other functions that is common in traditional systems.

5.6.2 Promote Distributed Functional Entities

The resultant MWIF Architecture will, by virtue of a distributed design, support this principle by:

- Distribution of monolithic functionality into a distributed IP based system, thus enabling a far more scaleable, open network, with open, standardi zed interfaces;
- Enabling deployment of new features and services– allowing feature servers to obtain new loads from multiple sources– and enabling less development time;
- Allowing operators to utilize wireline voice-over-IP equipment in support of mobile voice services; and
- Providing the key to evolve from traditional circuit-switched network for telephony to an All-IP network supporting integrated voice, data and multimedia services.

The MWIF distributed architecture goal will allow Operators the followi ng benefits: lower costs through scalability and flexibility, innovative new services and accelerated time-to-market but recognizing that there is an associated risk for increased regulatory intervention due to increased number of interfaces and elements.

5.7 Quality & Reliability

5.7.1 End-to-end Quality-of-Service mechanism

The resultant MWIF Architecture will enable the flexibility to apply QoS to a wide variety of services at the appropriate places within the architecture – recognizing that QoS is implemented in many places within both the Core Network and Access Networks.

QoS is a set of service parameters which can be assigned to a subscriber on a per session basis – the MWIF architecture should allow this capability and the ability to charge based on QoS.

The QoS offered to a subscriber will be controlled by a combination of usage policy and resource management. Furthermore, policy comprises both user and network level usage rules.

The MWIF architecture shall support

- the capability to negotiate an end-to-end QoS at the commencement of a session and to dynamically change the QoS during the session dependent on availability of network resources, the service required by the user and the requirements of the end terminal applications;
- the capability to maintain QoS during a hand-off, or, where this is not feasible, e.g. due to unavailability of network resources, to negotiate necessary changes in the end-to-end QoS.

5.7.2 Reliability

Platform, element and system (or sub-system) reliability is driven by a combination of Operator, subscriber, and regulatory needs (e.g., emergency services) - the MWIF architecture must account for these variations and expectations.

5.8 Security

5.8.1 Adopt Internet Trust (Security) Models

The resultant MWIF Architecture shall employ multi-layered security, dependent on requirements of the application.

5.8.2 Support authentication, confidentiality, integrity, non-repudiation

The resultant MWIF Architecture shall:

- Support mutual authentication (between network and subscribers, subscribers and 3rd party service providers, etc.), confidentiality, integrity and non-repudiation;
- Support encryption - most appropriate level to satisfy customer and 3rd party needs;
- Ensure data protection (rights of access, privacy).

5.9 Network and Service Management

5.9.1 Allow Operators/ISPs to independently upgrade sub-systems

The MWIF architecture shall allow equipment/software upgrades with a minimum of disruption to other sub-systems: the architecture must allow functional entities to be upgraded (enhancements, capacity growth, added entity) without changing other components.

5.9.2 Standardized, compatible network management interfaces

The resultant MWIF Architecture—both Core and Access networks -- shall provide the capability to use current industry standard network management protocols, e.g., SNMP.

OAM&P functionality in the MWIF architecture shall include:

- Configuration Management
- Fault Management
- Performance Management
- Billing Management
- Security Management

5.9.3 Flexible, scaleable accounting and billing

The MWIF Architecture shall support the capability for multi-tiered, flexible usage-sensitive billing, (packet/octet/byte, content, session length, XML based CDRs, level of QoS. For example, multi-tiered billing may be used to provide revenue sharing among network providers, content providers, ISPs, etc.

5.9.4 Over the Air Services

The resultant MWIF Architecture shall support Over the Air Services such as terminal code downloads or OTAP.

5.10 Services

5.10.1 Future Services

The MWIF architecture shall support the capability for a wide range of services, including real-time, non-real-time, multi-media services

5.10.2 Rapid Service Creation

The resultant MWIF Architecture shall enable rapid service creation (from near real-time to weeks, rather than years).

5.10.3 Support of Third Party Service Development

The resultant MWIF Architecture shall include mechanisms for Operators and third parties to rapidly develop and provide services and for users to customise their service profile.

- Development by third party but provided by the Operator
- Service offered by third party – the Operator can broker this third party service
- New service/business model – separation of service provider from network provider (the dot.com model). This will enable different means of revenue generation for both service and network providers (e.g., billing service, micro-payments).

5.10.4 Support software re-use/re-usability

The MWIF Architecture shall support:

- Maximum use of API's or other standard interfaces; and
- Allow the capability to re-arrange network functional blocks to support an Application Service Provider's needs.

5.10.5 User customization of services

The architecture shall enable the subscriber to change the behaviour of their service to suite their requirements – both dynamic (real-time) and static (batch).

5.10.6 De-couple subscriber from geographic based provider

The MWIF architecture shall de-couple subscriber from the geographic based provider to enable:

- Virtual Network Operators (VNO)
- Subscriber Roaming – i.e., independent of the terminal i.e., personal mobility

5.11 Support Regulatory Requirements

The MWIF Architecture shall provide the capability to support various regional, national, state or local regulatory requirements including, for example:

- Legal intercept
- Number portability (Service Portability)
- Malicious call trace
- Identity restriction

DOCUMENT HISTORY

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