TSG-SA Meeting #26
SP-040922~~883~~
Athens, Greece, 13-16, December, 2004

Agenda Item: **4 (plus 7.1 or 7.2 or 8.2 or 8.9)**
Source: **~~Vodafone~~Drafting Group**
Title: **Proposed Feasibility Study on 3GPP System Architecture Evolution**
Document for: **Discussion and approval**

In the RAN Future Evolution Workshop, many of the presentations pointed out the need for the 3GPP RAN to evolve to meet future demand and to maintain its competitive position for coming decades. Several interesting new technology components, such as OFDM with a flexible and broader RF bandwidth, were presented as potential candidates for the evolution. It was pointed out that such a technology enhancement should be applied to the 3GPP architecture as a whole and not just to the UTRA radio interface.

While the focus of many of the workshop presenters was on the radio technology, several of the presentations showed anticipated developments in the system architecture behind the radio interface (see REV-WS022, 23, 24, 25, 26, 27, 31, 37, 40, 41 at ftp://ftp.3gpp.org/workshop/2004_11_RAN_Future_Evo/Docs/). Although no detailed architecture descriptions were proposed, several speakers hypothesised about new architectural features. Examples include: connecting the Iu interface to the base station site, or, placing the SGSN functionality into the base station site. However important issues were frequently omitted (eg charging, legal interception, encryption of the user plane from the base station site), and, many of these topics are out of the scope of TSG RAN.

Several of these papers also showed the ëevolved RANí as a separate RAT, and, being linked to the existing UTRAN at the ì Giî level rather than at the ì Iuî or ì Iubî levels. This linkage at the Gi level makes the evolved RAN architectures share many issues with the ì Interworking WLAN scenario 4/5î architectures.

Hence it is proposed that 3GPP should initiate a feasibility study of the long-term evolution accounting for the above situation. In this paper, a Work Item Description proposing a Feasibility Study is presented for this study.

Additionally this WID aligns with the concept expressed in the SA 1 AIPN WID (see SP-040303) where it says in section 10: ì It is understood that e.g. SA2, SA3 and SA5 may be affected by the result of the TR. This work should however be done in separate WIDsî.

Concerning the time plan for this feasibility study, we propose to complete the work on the same timescales as the RAN work (ie complete the FS by June 2006 and envisage all relevant core specifications by June 2007).

The WI shall work as a umbrella WI, building blocks will be identified in the course of the feasibility study and may be completed independently with different timelines.

Draft **Work Item Description**

Title: 3GPP System Architecture Evolution

1 3GPP Work Area

X	Radio Access
X	Core Network
X	Services

2 Linked work items

TSG SA1: All-IP Network (AIPN) Feasibility Study

RAN Study item on Evolved UTRA and UTRAN

TSG SA1: 3GPP system - WLAN Interworking (with unique ID 31012)
TSG SA1: Session Continuity (with unique ID 31057)
TSG SA2: WLAN Interworking ñ Architecture Definition and stage 2 definition of WLAN access and Interworking (with unique ID 32018)
TSG SA2: System Enhancements for Fixed Broadband Access to IMS

3 Justification

~~With enhancements such as HSDPA and Enhanced Uplink, the 3GPP radio-access technology will be highly competitive for several years. However,~~ T~~t~~o ensure competitiveness in an ~~even~~ longer time frame, i.e. for the next 10 years and beyond, a long-term evolution of the 3GPP access technology needs to be considered.

Also, the ability of the 3GPP system to cope with the rapid growth in IP data traffic, the packet-switched technology utilised within 3G mobile networks requires further enhancement. A continued evolution and optimisation of the system concept is also necessary in order to maintain a competitive edge in terms of both performance and cost.

Important parts of such a long-term evolution include reduced latency, higher user data rates, improved system capacity and coverage, and reduced overall cost for the operator.

Additionally, it is expected that IP based 3GPP services will be provided through various access technologies. A mechanism to support seamless mobility between heterogeneous access networks, e.g. I-WLAN and 3GPP access systems, is a useful feature for future network evolution.

In order to achieve this, an evolution or migration of the network architecture, as well as an evolution of the radio interface, partly addressed already by individual WIDs, should be considered.

Architectural considerations will include end-to-end systems aspects, including core network and variety of IP connectivity access networks (e.g. fixed broadband access).

4 Objective

The objective of this feasibility study is to develop a framework for an evolution or migration of the 3GPP system for a higher-data-rate, lower-latency, packet-optimized, multi-RAT~~, access technology~~. The focus of this work will be on the PS domain with the assumption that voice services are supported in this domain. ~~Changes to IMS are not forseen as part of this WID~~

The main objectives is to address the following aspects:

1) Overall architecture impacts stemming from ~~activities~~requirements coming out from TSG-RANís Study Item on Radio Evolution (see SP-040915). The architectural developments should take into account the targets for the evolution of the radio-interface, e.g.:
    i. whether there is a need for a modified network architecture and/or different functional split between network nodes (compared to the current 3GPP architecture);
    ii. how to provide a very low latency (including C-plane) for the overall network (including core network, radio access network and radio access technology);
    iii. how to provide the efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence).

2) Overall architecture impacts stemming from the work in SA1 on an All-IP Network (AIPN) (see TR 22.978), e.g.:
    i. support of a variety of different access systems (existing and future) and access selection based on combinations of operator policies, user preferences and access network conditions;
    ii. how to realize improvements in basic system performance e.g. communication delay, communication quality, connection set-up time etcÖ .;
    iii. how to maintain the negotiated QoS across the whole system; in particular to address include inter-domain and inter-network interworking.

3) Overall architecture aspects of supporting mobility between heterogeneous access networks, including service continuity. E.g.:
    i. service continuity between I-WLAN and the 3GPP PS domain;
    ii. how to support multiple radio access technologies and terminal mobility between different radio access technologies;

iii. how to maintain and support the same capabilities of access control (authentication, authorization), privacy and charging when moving between different radio access technologies.

Migration aspects should be taken account for the above, i.e. how to migrate from the existing~~to or evolve to any new~~ architecture.

~~The architectural developments should take into account the targets for the evolution of the radio interface. These include:~~

- ~~significantly increased peak data rate~~
- ~~the desire for a very low latency system~~
- ~~that the system should be optimized for low mobile speed but also support high mobile speed~~
- ~~that the system should be optimized for IP traffic and should support VoIP traffic efficiently~~

~~In order to achieve this, studies should be carried out in at least the following areas:~~

~~a) how to support multiple radio access technologies and terminal mobility between different radio access technologies (eg between I-WLAN and 3GPP);~~

~~b) how to maintain and support the same capabilities of access control (authentication, authorization), privacy and charging when moving between different radio access technologies;~~

~~c) how to maintain the negotiated QoS across the whole system; in particular to address include inter-domain and inter-network interworking~~

~~d) whether there is a need for a modified network architecture and/or different functional split between network nodes (compared to the current 3GPP architecture);~~

~~e) the possibilities to reduce the number of network entities and to simplify/reduce the number of interfaces;~~

~~f) how to migrate to, or evolve to, any new architecture (this being a strong requirement);~~

~~g) how to provide a very low latency for the overall network (including core network, radio access network and radio access technology);~~

~~h) how to provide low C-plane latency;~~

~~i) any additional concepts which reduced CAPEX and/or OPEX (including at least the cost of the backhaul) and mechanisms to allow for efficient implementations;~~

~~j) how to provide the efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence);~~

~~k) how to provide the capability for ëhigher layersí to appropriately render content / provide services according to the radio interfaceís capabilities/technology; and~~

~~l) how to provide support for access selection based on combinations of operator policies, user preferences and access network conditions;~~

In the course of conducting this feasibility study additional individual ~~building blocks~~Work Items may~~will~~ be identified to address certain aspects and to care for the respective specification work. The timelines of those Work Items~~building blocks~~ may or may not concur with the timeline of this feasibility study.

5 Service Aspects

The results of the SA 1 AIPN WID should be considered, and, along with the results of this FS, the capabilities of the 3GPP system should be enhanced, enabling more advanced services. As a result, some updates to SA 1 specifications can be anticipated.

6 MMI-Aspects

None anticipated.

7 Charging Aspects

To be studied. E.g. charging may depend upon the RAT that was used.

8 Security Aspects

The study will have to consider security aspects during the course of the work.

9 Impacts

Affects :	USIM	ME	AN	CN	Others
Yes		X	X	X	
No	X				X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
23.8xx	Feasibility study on 3GPP architectural developments	SA 2	?	SA#31	SA#32 Note: Some interim conclusions might be needed as early as June í05 ~~to guide work in RAN~~.	Technical Report

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments

11 Work item raporteurs

[Chris Pudney, Vodafone]

12 Work item leadership

SA 2

13 Supporting Companies

~~Vodafone~~ Vodafone, Ericsson, Siemens, DoCoMo, Nokia, LG Electronics, China Mobile, TeliaSonera, NEC, Huawei, Fujitsu, TIM

14 Classification of the WI (if known)

~~?~~x	Feature (go to 14a)
~~?x~~	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

~~The building blocks of t~~This feature ~~are~~is constituted by the 3 main Objectives listed in Section 4. The objectives shall be tracked individually in the workplan.
~~Note that further building blocks may be added later as the feasibility analysis progresses and substance for normative specification work is identified.(list of Work Items identified as building blocks)~~

14b The WI is a Building Block: parent Feature
~~*Is this a building block of the RAN evolution ì featureî , or, vice versa?*~~

(one Work Item identified as a feature)

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)