TSG-RAN Meeting #23   **RP-040023**
Phoenix, Arizona, USA, 10 - 12 March 2004

Agenda item: 8.11.6
Title: Status report for SI
                  'Feasibility Study on the Evolution of UTRAN Architecture'
Source: RAN3

Status Report for SI for TSG RAN

Study Item Name: 'Feasibility Study on the Evolution of UTRAN Architecture' (RANimp-FSEvo)

SOURCE: Rapporteur   **TSG:** RAN   **WG**: 3

E-mail address rapporteur: Antti.Toskala@nokia.com
RAN WG3 contact: Sami.kekki@nokia.com

Ref. to SI sheet: `ftp://ftp.3gpp.org/tsg_ran/TSG_RAN/Work_Item_sheets/`

Progress Report since the last TSG (for all involved WGs):
After TSG RAN Plenary meeting #22, RAN WG3 has had two meetings. The updated TR resulting from discussions at RAN3#40 and from the email discussions after RAN3#40 were approved at RAN3#41 as v0.5.0 There were ten new contributions submitted to RAN3#41 for this SI but they were not treated due to lack of meeting time.
In the following the contributions and their status are summarised:

RAN3#40

	Example of an introduction scenario for a decentralised UTRAN (Siemens)	R3-040028	Not agreed
	Cell - UE split, SRNS relocation (NEC)	R3-040042	New open issue: Impact of RCS and UPS relocations on CN
	Mobility in Evolved UTRAN Architecture (Panasonic)	R3-040079	Not agreed
	Channel Type Switching in Evolved UTRAN Architecture (Panasonic)	R3-040080	In principle agreed.
	Discussion on Mobility Control in Evolved UTRAN Architecture (LG Electronics)	R3-040086	Agreed in principle, rapporteut to check if covered already in the TR
	A proposal for the evaluation of transport utilisation (Panasonic)	R3-040087	Partially agreed
	UTRAN Evolutions - Last Mile impacts for NodeB+ (Alcatel)	R3-040091	Noted
	Proposed Changes to the "Analysis of R99 Architecture" Section in TR25.897 (Nortel)	R3-040097	Approved via email afterwards
	On Transport Layer Utilisation with Node B+ (Nortel)	R3-040098	New open issue introduced in the TR: Availability of transport savings due to QoS differentiation
	Updates to Evolved Architecture based on iNodeB and RAN server (Lucent)	R3-040101	Agreed. New open issue introduced: Impact of RCS/iNodeB relocations on CN
	Analysis of the split RNC scenarios (Nokia)	R3-040125	Partially agreed via email afterwards (reworded Table 1)
	About the analysis in R3-031591 (Nokia)	R3-040126	Noted

RAN3#41

Channel Type Switching in Evolved UTRAN Architecture (Panasonic)	R3-040267	Not treated
Cell - UE split, Channel switching (NEC/Siemens)	R3-040301	Not treated
Cell - UE split, user plane efficiency (NEC)	R3-040303	Not treated
Cell - UE split, open issues (NEC)	R3-040304	Not treated
Cell - UE split, answer to R3-040125 (NEC)	R3-040305	Not treated
Example of an Introduction Scenario for a decentralised UTRAN (Siemens)	R3-040336	Not treated
Benefits of the Functional Separation (Siemens)	R3-040337	Not treated
Mobility and consequences for the RNL signalling load in the "Evolved Architecture based on functional separation" (Siemens)	R3-040343	Not treated
Comparison of proposals on Evolved architecture (Lucent)	R3-040364	Not treated
On Transport Layer Utilisation (Nortel)	R3-040389	Not treated

List of Completed elements (for complex work items):
- No complete elements

List of open issues:
- The number of open issues has increased for all proposals. Open issues per each proposal are listed in the bottom of the report.

Estimates of the level of completion (when possible):   35 %

SI completion date review resulting from the discussion at RAN WG3: RAN #25

References to WG's internal documentation and/or TRs: TR25.897v0.5.0 in R3-040579

Input for the Review of the SI on UTRAN Architecture Evolution

At RAN#22 there were several concerns presented about the lack of progress and lack of any agreements in the SI after some 18 months of work. Consequently it was decided to review this Study Item at RAN#23. [From RAN#22 report: "it is agreed to have March 2004 as completion date and to review the whole Study by then."]

The SI on UTRAN Architecture evolution was created in September, 2002, at RAN#17 [RP-020670].
In the course of the SI 5 different proposals have been introduced for the new UTRAN architecture. These proposals have been documented in the Study Area of TR25.897. Each proposal has a list of open issues associated to it. The number of these open issues has been increasing so far. The open issues concern e.g., the following: potential impact on CN, on RRC signalling delay, potential issues with SRNS relocations, potential impact on operator's O&M, etc.

Some of the proposals introduce a new, additional proposed-to-be-standardised UTRAN interface that splits the existing RNC into two separate physical network elements. Some proposals are based on the idea of moving some of the RNC functionality down to NodeBs without the need for a new interface.

While some companies do see benefits, so far there are no agreements on any of the claimed benefits of the architecture proposals. At the current status of dicussions it is not yet possible to draw agreements on the justification for the new UTRAN architecture.

However, there is a general agreement in RAN WG3 that the new architecture would have to have some significant advantage over the existing architecture to make its introduction justified.

During the SI it has been agreed that some of the other ongoing and completed WI/SI (e.g., HSDPA) are bringing at least partially similar advantages to the existing architecture as is the intention of the proposed new architectures.

Proposals + open issues

1) Evolved Architecture based on new location of radio functions
   Open Issues:
   1. Extension of the RNC Id (Uu impact)
   2. Content of the UE context in NodeB+ (control and user plane part ?). How is the UE context established in NodeB+ ?
   3. Amount of mobility traffic and performance (QoS perception of users) of rt services due to frequent relocations needs to be studied
   4. Optimum location of PDCP (options captured so far: NodeB+ or RNG)
   5. Last mile issue, MDC location. The issue with SHO and Seamless Relocation with the proposed architecture regarding the last mile capacity needs to be studied further. Whether the constraints of the underlying TNL network (e.g. topology and link bandwidth) have to be considered for making SRNS Relocation decisions or any other RNL decisions needs to be further studied.
   6. How does the QoS differentiation up to the edge of the network improve transport efficiency?

2) Evolved Architecture based on functional separation
   Open Issues:
   1. New functional interface between RCSs (server pooling)
      - In case of a m-n relation between RCSs and UPSs?
      - In order to support load distribution among RCSs
   2. Funtional split to be studied between UPS and RCS.
   3. Funtional content, performance and specification impact of Iui to be studied
   4. Delay caused by Iui to be studied (procedural aspects, additional protocol stack)
   5. Gain v.s. pain of introducing new network elements in the UTRAN needs to be studied.
   6. Termination of NBAP in RCS and forwarding of NBAP in UPS?
   7. Frequency of RCS and UPS relocations and their consequencies vs. SRNC relocation
   8. Signalling load in RCS, UPS, RCS/UPS relocation vs. SRNC relocation (some internal signalling now external)
   9. How does the QoS differentiation up to the edge of the network improve transport efficiency?

3) Evolved Architecture based on UE/Cell split
   Open Issues:

1. Negative effect of the new Iui interface on the delay performance of RRC?
2. Applicability and role of Megaco in Iui?
3. Multiplicity of RCSs, UPSs and their relationship and redundancy?
4. Termination and forwarding of NBAP in UPS?
5. Increased O&M burden when distributing cell related functions to UPSs?
6. *Relocation from an RNC to a UPS+RCS? **CLOSED** (ref. R3-040042)*
7. Frequency of RCS and UPS relocations and their consequencies vs. SRNC relocation
8. Signalling load in RCS, UPS, RCS/UPS relocation vs. SRNC relocation (some internal signalling now external)
9. Impact of UPS relocation on the Core Network
10. How does the QoS differentiation up to the edge of the network improve transport efficiency?

4) Evolved Architecture based on iNodeB and RAN server
Open Issues:
1. Soft handover handling between legacy RAN and Distributed RAN
2. Inter-RAN server interface
3. Multiplicity of RAN servers vs. iNodeB:s
4. Impact of multiple Iu-u interfaces on Core Network functionality and performance
5. Coupling between Control and User plane establishments
6. Impact of Iu_u streamlining/Relocation of UPS on Iu Control plane/RANAP
7. Frequency of RAN Server and iNodeB relocations and their consequencies vs. SRNC relocation
8. Signalling load per RAN Server, iNodeB, RAN Server/iNodeB relocation (some internal signalling now external)
9. How does the QoS differentiation up to the edge of the network improve transport efficiency?

5) Proposed common basis for the categorization and evaluation of UTRAN Architecture Evolution solutions
Open Issues:
1. The potential performance issues (referred to in the text) w.r.t. to the split of U- and C-plane processing, e.g., the increase in RRC signalling delay and the issues related to the co-ordination of the physically separate functional entities
2. Channel switching between dedicated and common channel states in case of separated cell, multicell and user related functions.
3. Operational and Management challenges involved in flexible location of functions
4. The number of new network elements in the final architecture
5. The effect of the increased number of NEs to the operation and management of the network and to the cost of operations
6. The number of new interfaces needed in the final proposal
7. The potential issues with new interfaces to be standardised, w.r.t. to procedure delays, amount of signalling traffic, etc., related to e.g., relocations of User plane and Control plane entities.
8. The standardisation effort of the proposed new multivendor interfaces
9. How does the QoS differentiation up to the edge of the network improve transport efficiency?

Agreements in TR25.897

There are no agreements in TR25.897.