Technical Specification Group Services and System Aspects   ***TSGS#4(99)283***

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Source: **Motorola**
Title: **IP, GPRS and 3GPP Release 2000**
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A number of operators and manufacturers, one of which is Motorola, have proposed that 3GPP's Release 2000 should, "Include the specification of an all IP based architecture option, evolved from GPRS, within the target scope of Release 2000[1]".

This paper proposes that such an architecture should be an allowed option for Release 2000, so that operators may choose between a hybrid circuit/packet architecture model and an all IP solution.

The paper discusses the work areas affected, its impact in existing solutions and its implications.

The group is asked to endorse the proposal, and thus authorise the necessary work required to develop the architectural option.

WORK AREAS AFFECTED

Release 99's support of IP should first be understood. From this, the level of work required to complete an IP/GPRS based architecture for Release 2000 will then become clear.
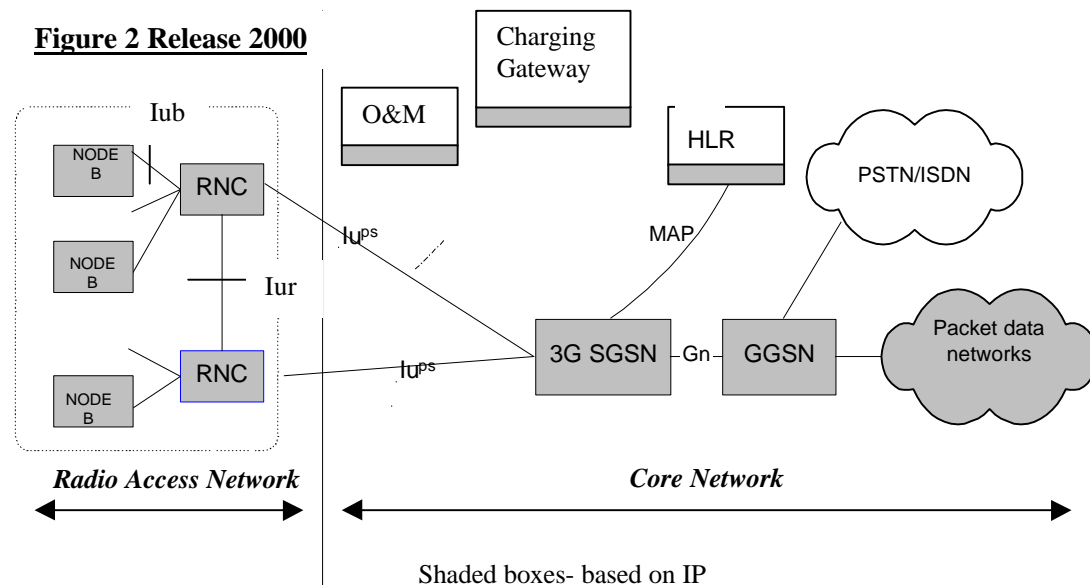
3GPP Architecture for Release 99

The 3GPP architecture consists of two network domains; the Circuit Switched Domain, centred on an MSC, and the Packet Switched Domain, centred on GPRS's GSNs. The general architecture for 3GPP Release 99 is shown in Figure 1. Note: for clarity, a number of interfaces have been omitted

Figure 1 Release 99

Shaded boxes- IP already exists

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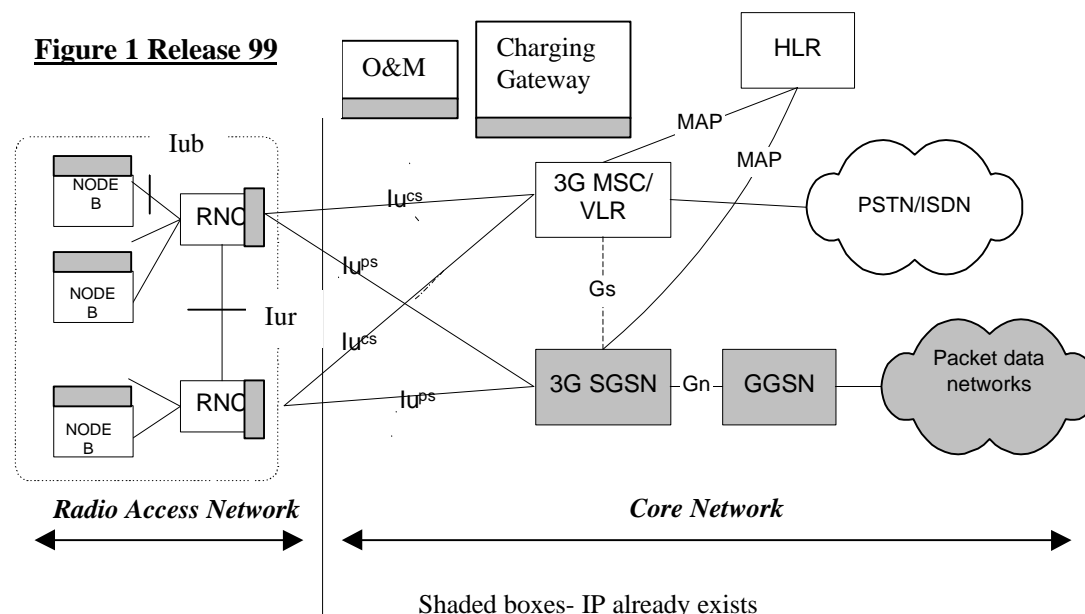
[1] "Contents and timing of the next release following Release 99", June 21st -24th /99, TSGS#4 (99)257

3GPP Architecture for Release 2000

It is proposed that Release 2000 will include an option to be wholly based on IP and will be developed as an evolution of GSM/UMTS Release 99. An example implementation is shown in Figure 2.

Figure 2 Release 2000

Iub

NODE B — RNC
NODE B
Iur
NODE B — RNC

Charging Gateway

O&M

HLR

PSTN/ISDN

Iu^ps

MAP

Iu^ps

3G SGSN — Gn — GGSN

Packet data networks

Radio Access Network

Core Network

Shaded boxes- based on IP

Packet-Switched/IP Core Network in 3GPP Release 99

IP is already supported in Release 99 in the following ways.

- Gn – Between the 3G SGSN and 3G GGSN. A full IP based control plane and user plane deployment of this interface will available.
- The billing & accounting interfaces between the GSNs and the Charging Gateways are based on IP.
- O&M interfaces on GSNs are based on IP.
- MS to Core Network interfaces are based on GSM 04.08 SM. This provides session management suitable for "pure" IP sessions.
- MS to Core Network interfaces to support IP based multimedia. While the exact multimedia protocol to use is under discussion, it has been agreed that an open, multivendor protocol will be selected (e.g. H.323) and deployed.
- Mobile IP. This is used between the MS and Foreign Agent located at the GGSN.
- MExE/WAP. Client/server based value added service platforms will be deployed. WAP is particularly suitable for wireless IP systems.

IP is not yet supported in Release 99 on the following interfaces and would have to be defined in Release 2000.

- MAP - Between the HLR and GSNs. Currently, this is based on SS7 transport.
- Gs - Between the SGSN and MSC. This is based on SS7 transport.
- CAMEL stage 3 – Between the CAMEL Node and SGSN. This is based on SS7 transport.

The use of SS7 transport could be replaced by CTP/IP[2]. Backward compatibly with SS7 based nodes would be via interworking functions.

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[2] CTP (Common Transport Protocol)*: CTP is a generic term used to describe the protocol being developed by the SIGTRAN Working Group of the IETF. This protocol is specifically designed to transport signaling protocols, which require a telecom carrier-grade QoS, over IP networks. It supports traditional telephony services and the new multimedia services.

Radio Access Network in Release 99

IP is supported in Release 99 on the following interfaces.

- Iu^{PS} – Between the RNC and 3G SGSN. A full IP based control and user plane deployment of this interface will available.
- Iu^{R}– Between RNCs. An IP based control plane deployment of this interface will available. O&M interfaces on Node B and RNC are based on IP.

IP is not supported in Release 99 on the following interfaces and would have to be defined in Release 2000.

- Iu^{B}– Between a Node B and RNC. A full IP based control and user plane deployment of this interface will be required.
- Iu^{R}– Between RNCs. A full IP based user plane will be required.

IP enhancing functions in Release 99 and Release 2000

In order to support telecom "Real-time" services on the full IP solution in Release 2000, the following additional system-wide functions and features are required.

- Real-time QoS management. In order to support real-time services, such as speech and video, QoS management in the IP domain is being strengthened in Release 99. If this work is not completed on time, this will be completed in Release 2000.

- Optimisation of IP over the radio interface. Where IP is transmitted across the radio interface at an MS to Core Network service level, for example using H.323's IP user plane, Release 2000 would adopt compression techniques to reduce IP overhead.

- Interworking between Release 99 systems and Release 2000 systems. This work will include Core Network handovers, interworking between MAP interfaces based on SS7 and IP, and customer service continuity of value added service platforms such as MExE/WAP. By anticipating the shift in Release 99 to an IP based Release 2000, this requirement for interworking can be substantially reduced.

- Migration of existing GSM/UMTS service set, e.g Telephony, call forwarding, etc into an IP based standardised architecture solution within 3GPP, as well as adding the new multimedia capabilities.

Impact

The IP based version of Release 2000 will reuse the existing non-transmission related protocols from RAN Release 99. The major work is oriented to ensuring the use of IP transport for higher layer protocols, replacing SS7 in the core network and ATM in the RAN. The existing specifications can then be re-used without any, or very little, modification. This will allow operators to take full advantage of the rapid development of IP-based solutions, offer end-to-end IP-based services, and provide synergy with fixed-network deployments of IP networks. The commonality of higher-layer protocols will ensure interoperability, both within and between networks and terminals.

This work will be contribution driven, and operate in parallel with development of the circuit-switched solutions and higher layer protocols. There should be very limited areas of contention between this architectural option and "circuit-switched" solutions, since both options are allowed.

Implications

1. It is achievable - both economically and in a timely manner.
2. It is compliant with the fundamental structure of UMTS (i.e. it is not a new incompatible variant of UMTS.
3. It capitalises on the IP-core network development of GPRS, by reusing and extending many of the basic concepts introduced.

4. It does not prevent the further development of circuit switched or ATM based solutions.
5. The platforms/subsystems can still be interfaced with the existing circuit switched or ATM based platforms (all currently proposed architectures).
6. The air interface is not affected therefore spectrum efficiency, regulatory aspects and terminals are not affected.
7. Future, higher speed air interfaces (such as BRAN which intend to implement only Iu-packet interface) could capitalise on this architectural model.
8. The standards are contribution driven and the supporting industries will provide the necessary resources.
9. The proposal is in the spirit of open interfaces, compatibility, multi-vendor architectures, competition and choice for the customer in the market.
10. It should not prevent users, of an operator who has implemented an IP only solution, roaming to another network whose operator provides a hybrid solution and vice versa.

Summary

As the above highlights indicate, IP, via GPRS and the UMTS IP domain, is already substantially integrated into Release 99. This provides a solid basis to move towards a full IP based architecture as an option in Release 2000. The current level of IP integration in Release 99 provides enough confidence that this will be achievable. The group is asked to endorse the proposal, and thus authorise the necessary work required to develop the architectural option.