Mobile Network Operator Perspective Industry in general, Standards, Evolution

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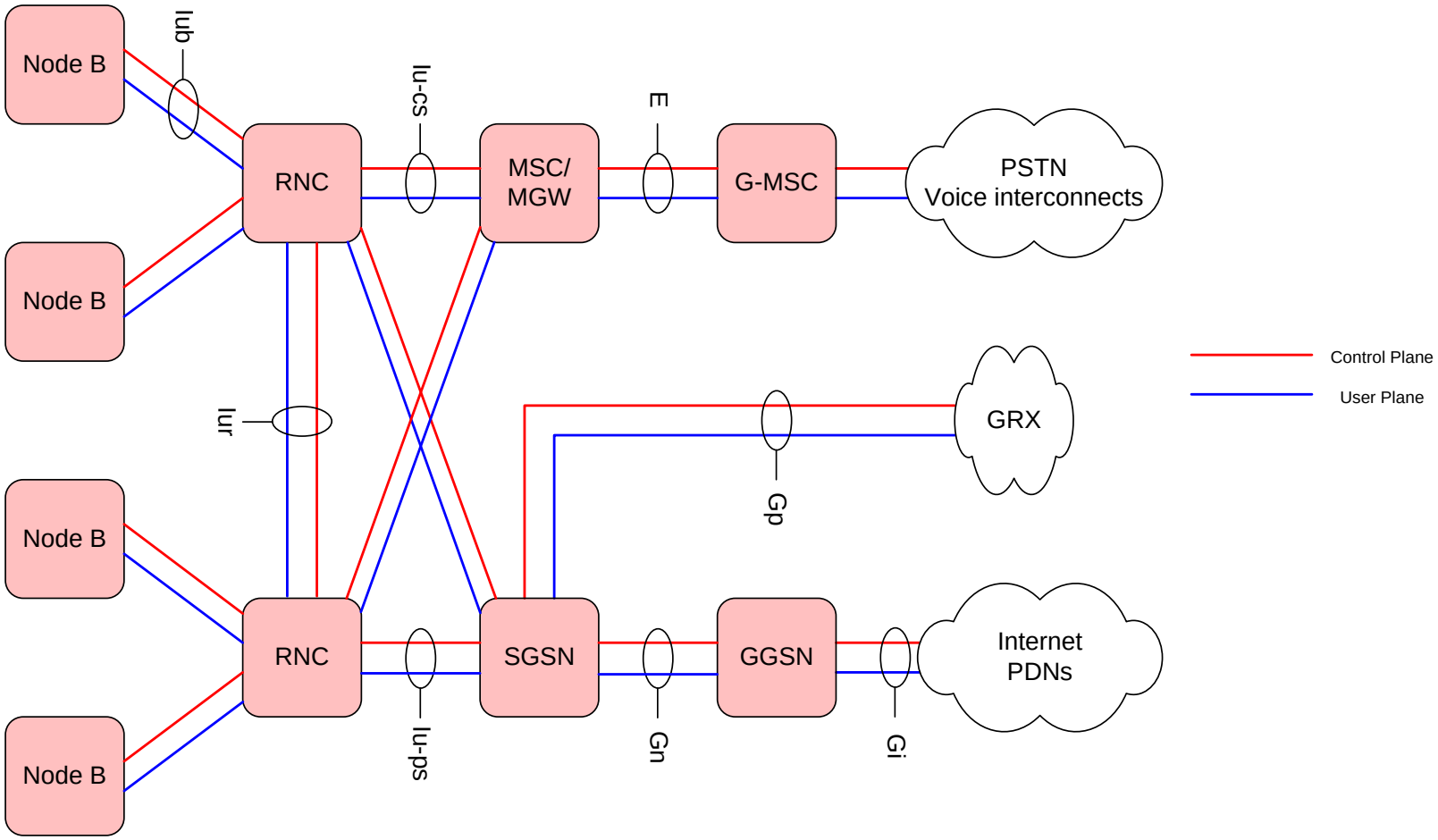
Mobile industry in general

Considering R99 UMTS architecture as a baseline, let's consider;

- Where are we now?
  - Access
  - Core
- What's round the corner
  - Building on where we are now
- Where are we going
  - LTE EPS
  - "True" IP and "Flatter" architectures

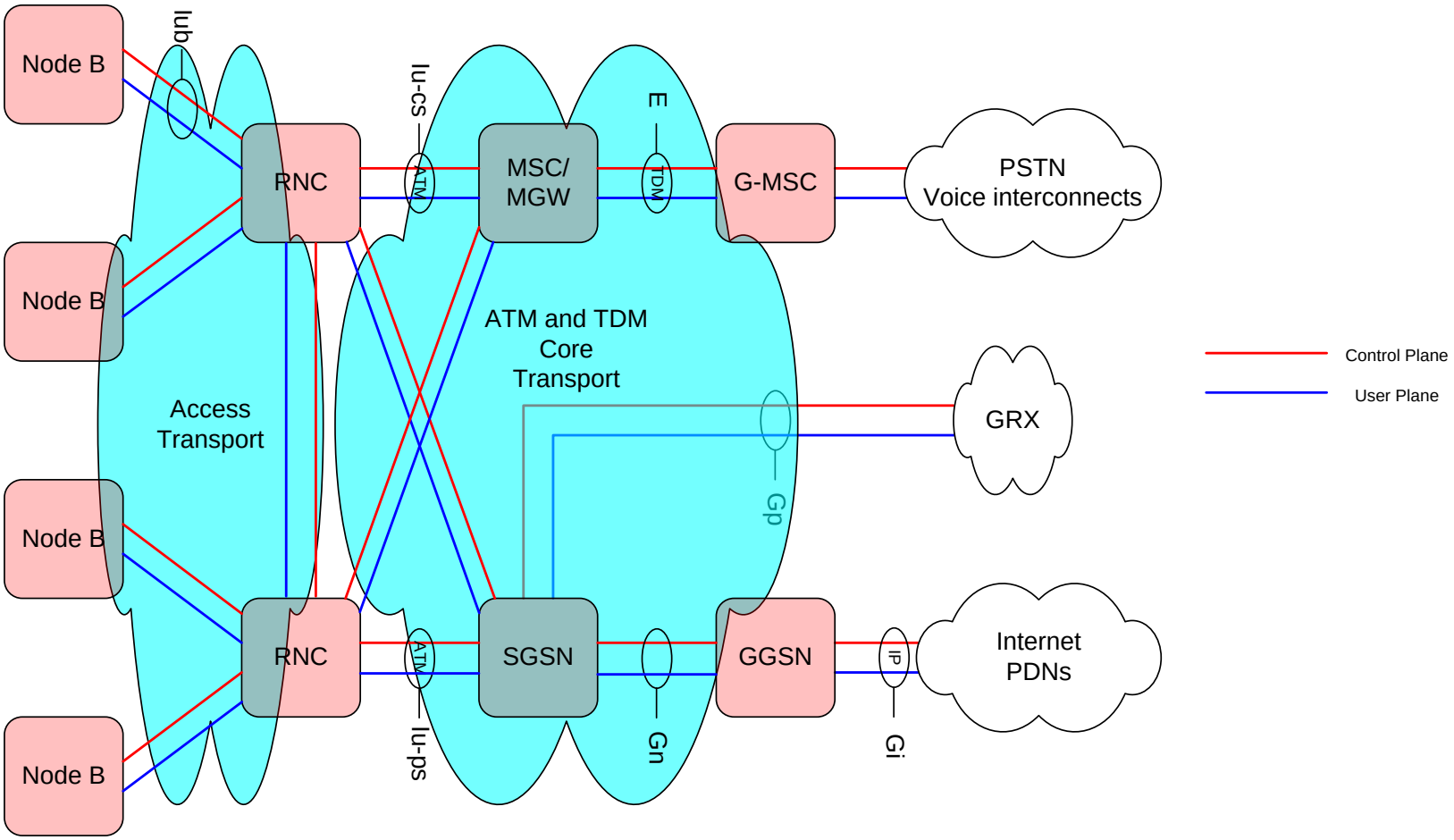
Revision - UMTS Architecture and Interfaces

3GPP R99



UMTS Architecture and Interfaces

But what's underneath the logical interfaces? Access first...



Where are we now - Access

The long predicted impact of the uptake of mobile data services on mobile network access transport has arrived...

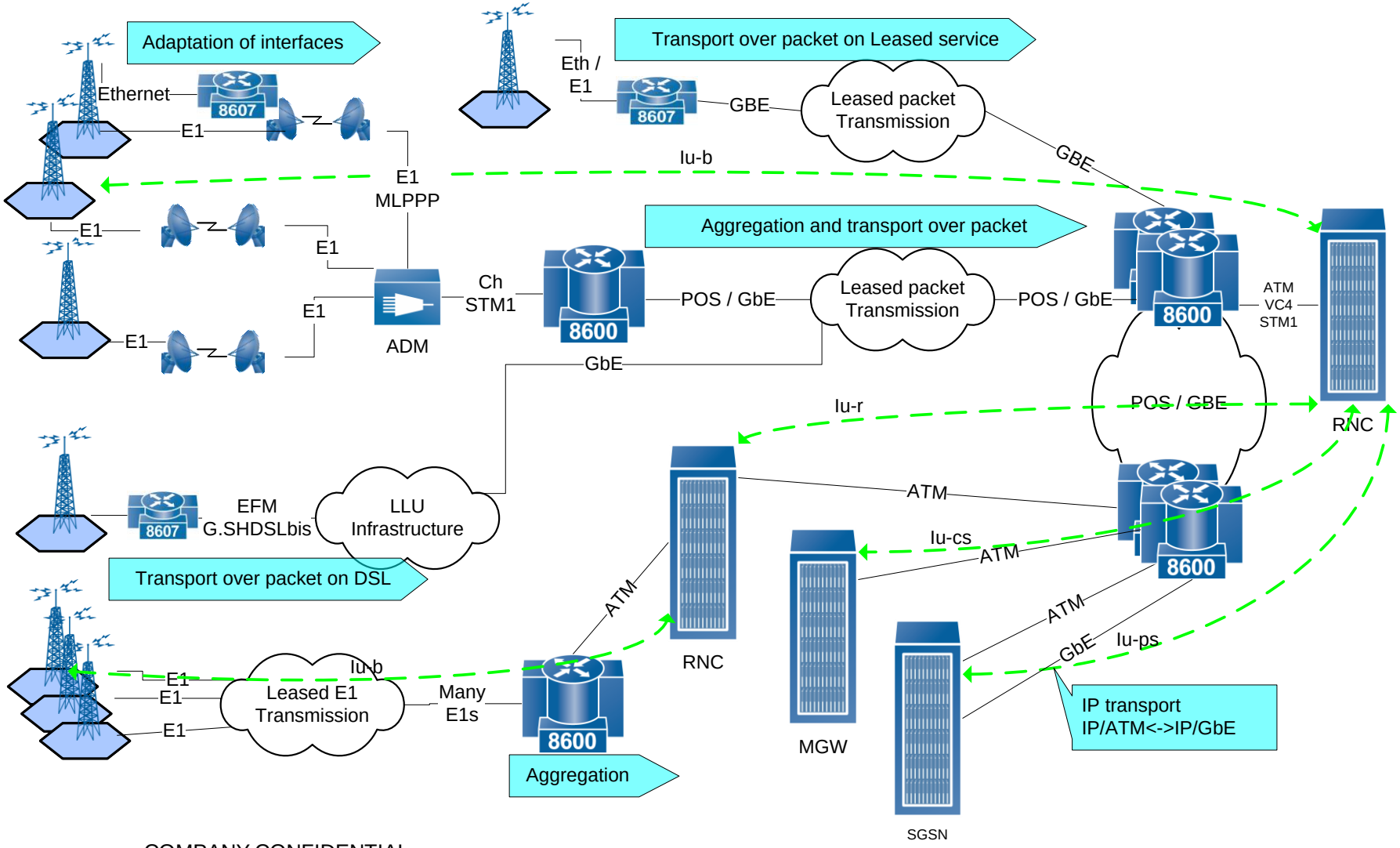
- Significant increase in peak rates
  - Widespread rollout of HSPA
    - HSDPA 7.2 and 14.4
    - HSUPA 1.8 and latency reduction
  - More Cat 10 devices around
- Significant increase in average rates
  - Many more users
  - User behaviour changes
    - the “all you can eat” effect

The result is widespread adoption of packet based approaches in the access transport network.

- Ethernet interfaces on base stations
- Packet based aggregation to exploit peak / average contention
- Packet leased services for lower cost

Packet based approaches for access

OUK examples for R99



Where are we now – Access

Widespread adoption of packet based approaches in the access transport network,

- Ethernet interfaces on base stations (with ATM pseudowires, or IP TNL*)
- Packet based aggregation to exploit peak / average contention
- Packet leased services for lower cost,

is solving some immediate challenges, and the optimisation of transport in the access network is progressing well.

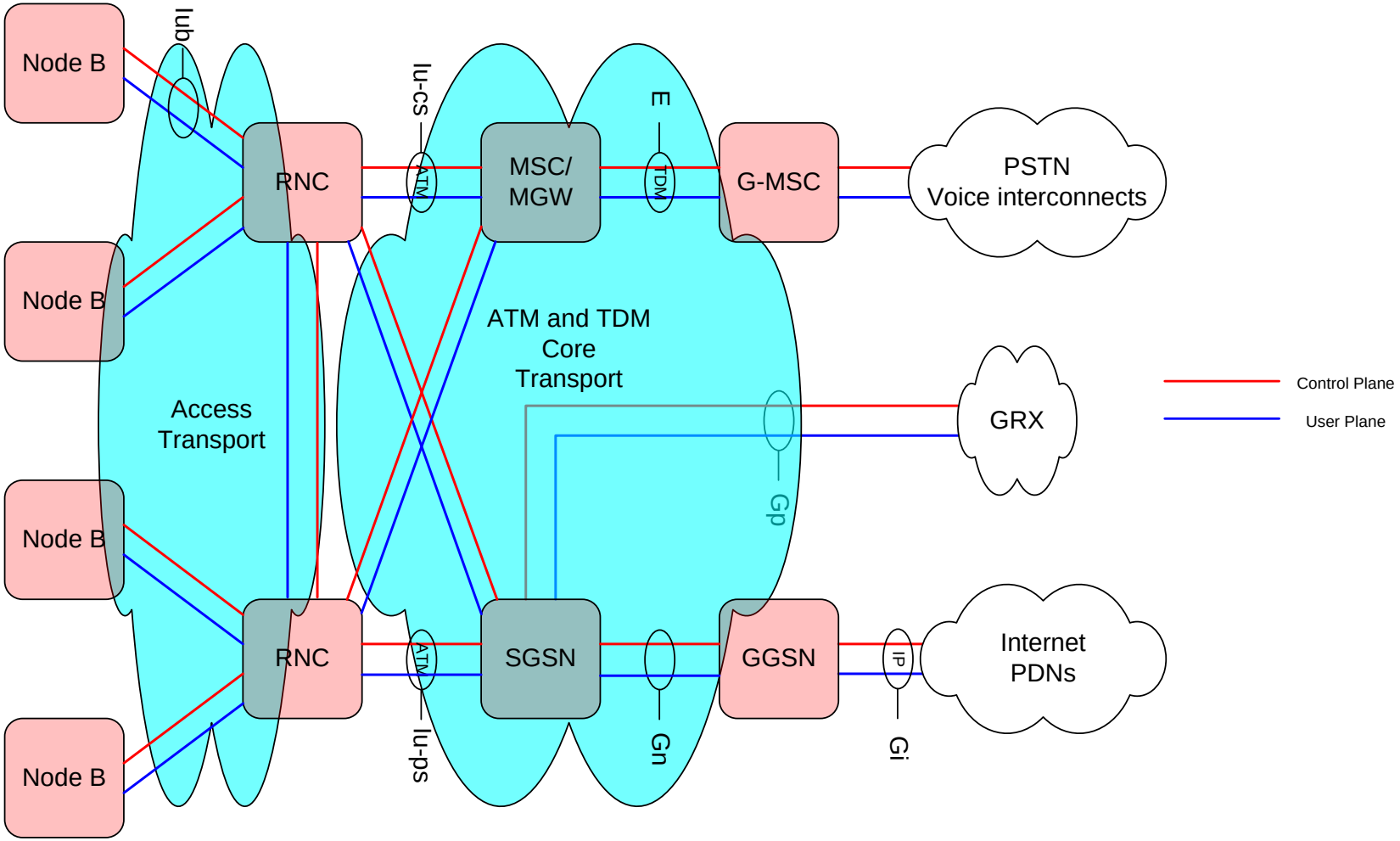
But the architecture of the Radio Access Network hasn't changed much, so we still have control and User plane coupling and service specific bearer control;

- Element scalability optimisation is challenging
- Transport domain boundaries dictated by RAN elements
- Access technology substitution is non-trivial

*It doesn't matter to much which of these is used since in either case it is just transport, isolated from user plane by the UTRAN frame protocol.

UMTS Architecture and Interfaces

What's underneath the logical interfaces? Now for the core...



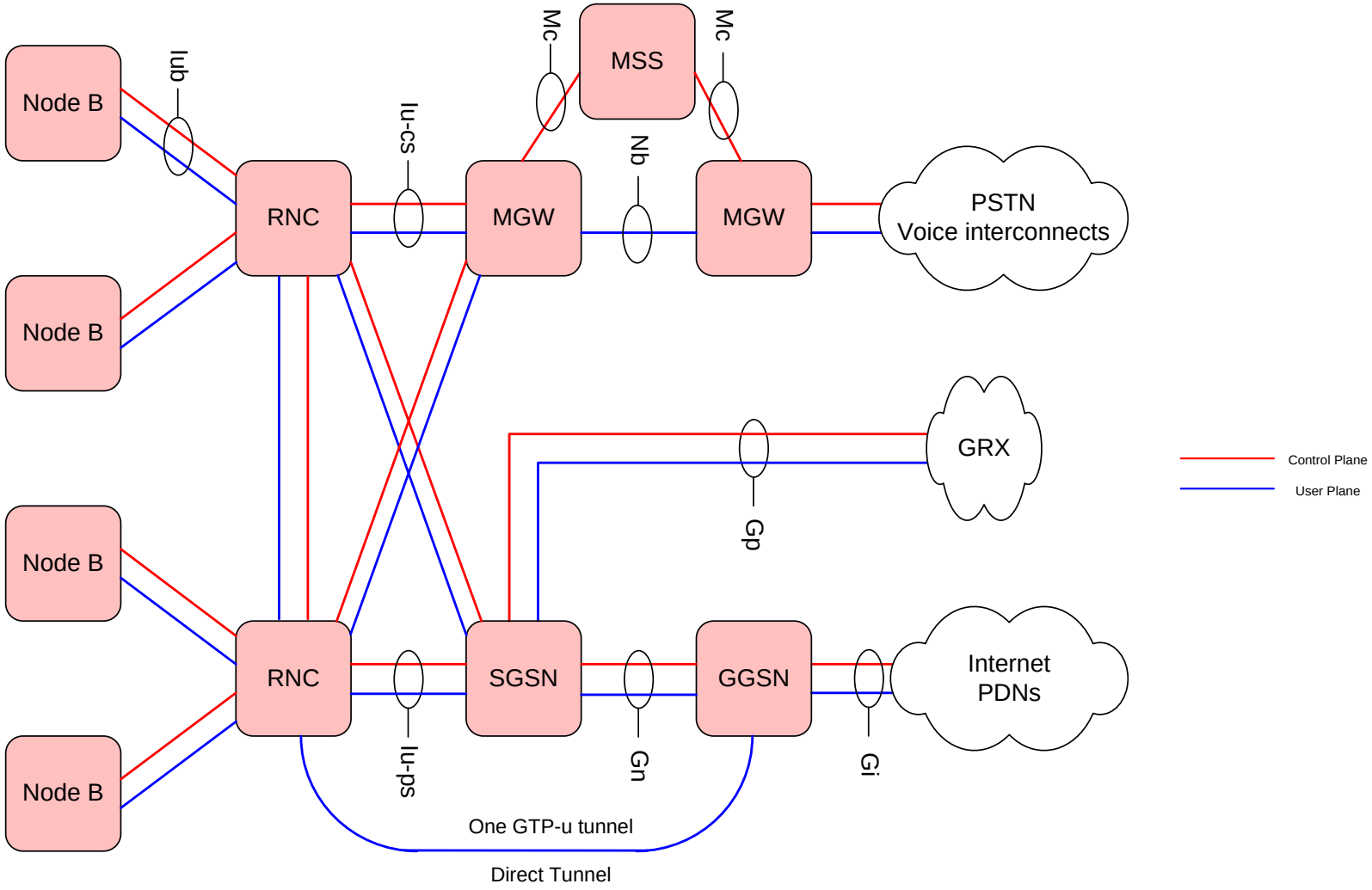
Where are we now - Core

Although they may have started from a pure R99 architecture, operators faced scalability challenges much earlier in the core network. Consequently many have already introduced some evolutions;

- R4 Bearer independent CS core
- IP Transport Network Layer
- VoIP transit (and interconnect soon)
- Sigtran (signalling on IP)
- R7 Direct Tunnel (One GTP-u Tunnel)

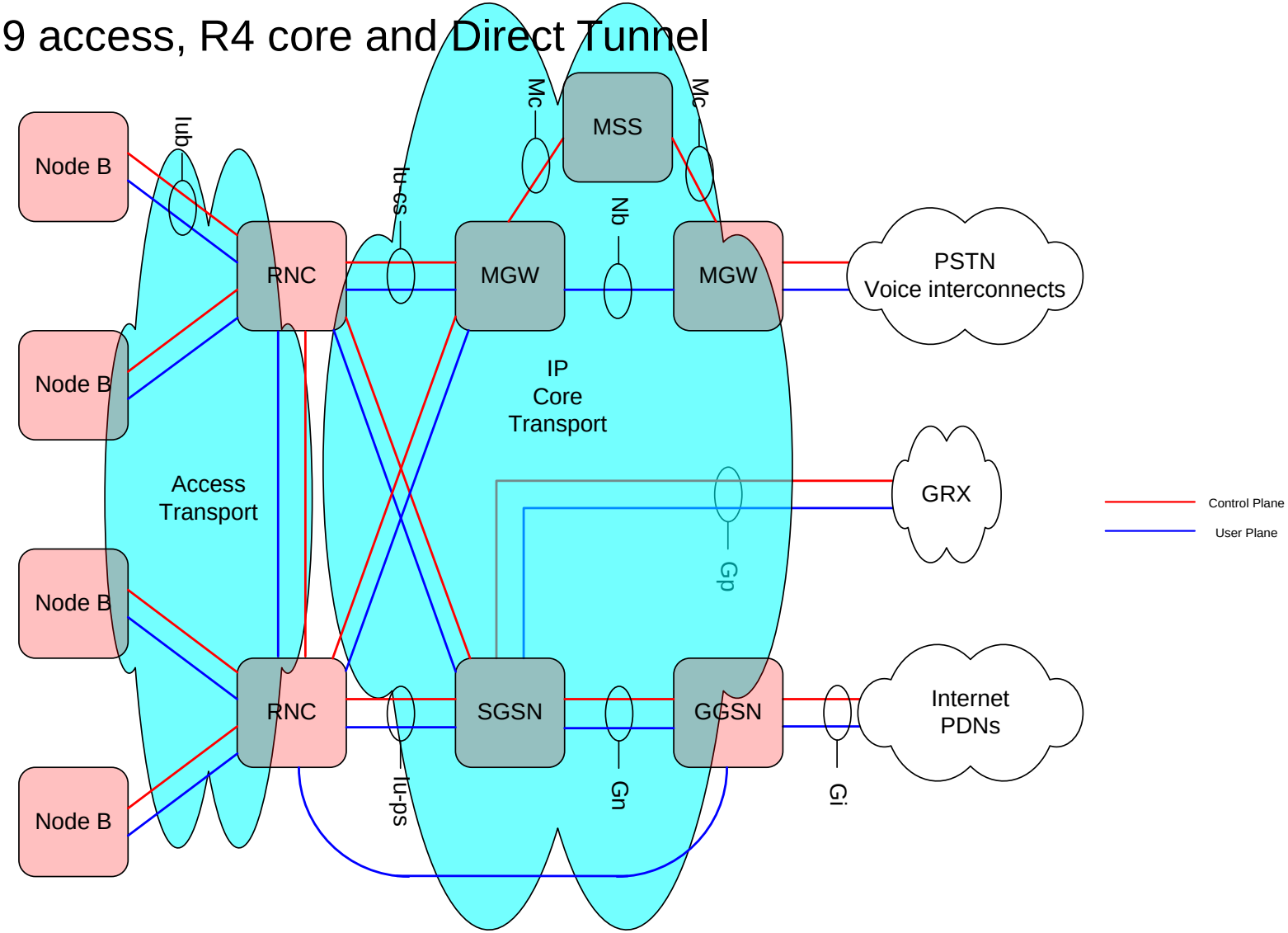
UMTS Architecture and Interfaces

R99 access, R4 core and Direct Tunnel



UMTS Architecture and Interfaces

R99 access, R4 core and Direct Tunnel



Recap and what next?

To recap, operators typically have:

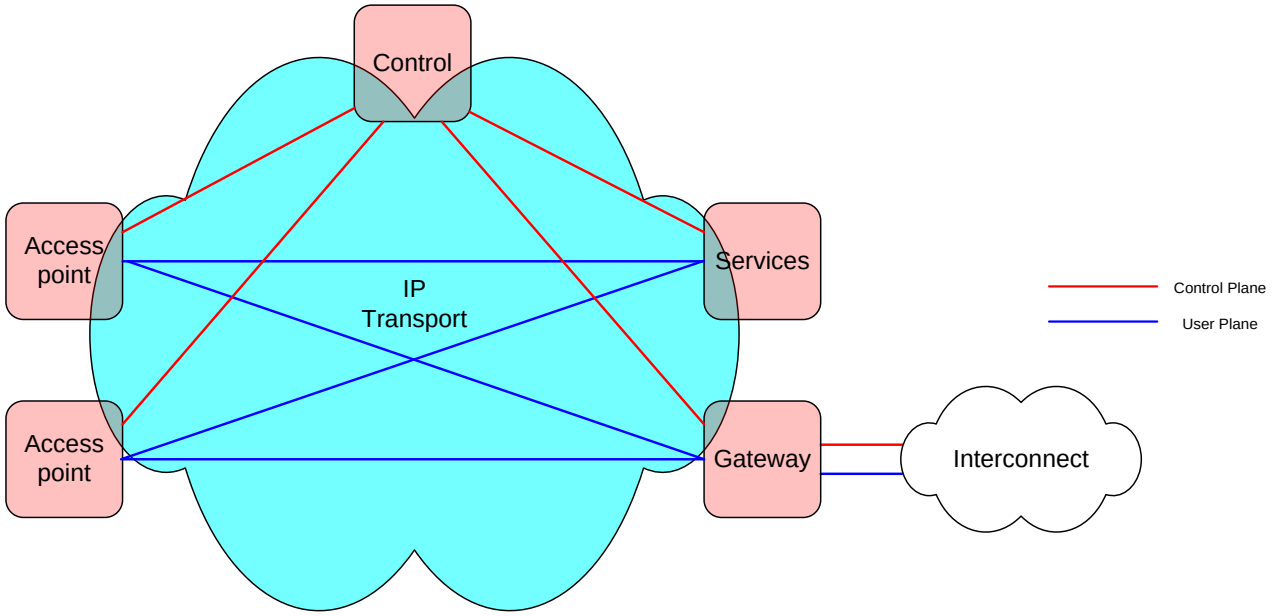
- significant R99 legacy, particularly in the access domain.
- Challenges in the access network being met by changes in transport, without much change in RAN architecture.
- Challenges in the core network being met by changes in transport coupled with some architectural change “cherry picked” from releases up to 3GPP R7

Together these have achieved some separation of Call control, Bearer control, and user planes and furthered the adoption of generic IP transport, so what’s next?

Recap and what next?

Operators have achieved some separation of Call control, Bearer control, and user planes. So what's next? We need to consider what we are aiming for. Maybe it is something like this:

- Total separation of control and user planes
- Ubiquitous IP transport
- No architectural constraint on transport domains

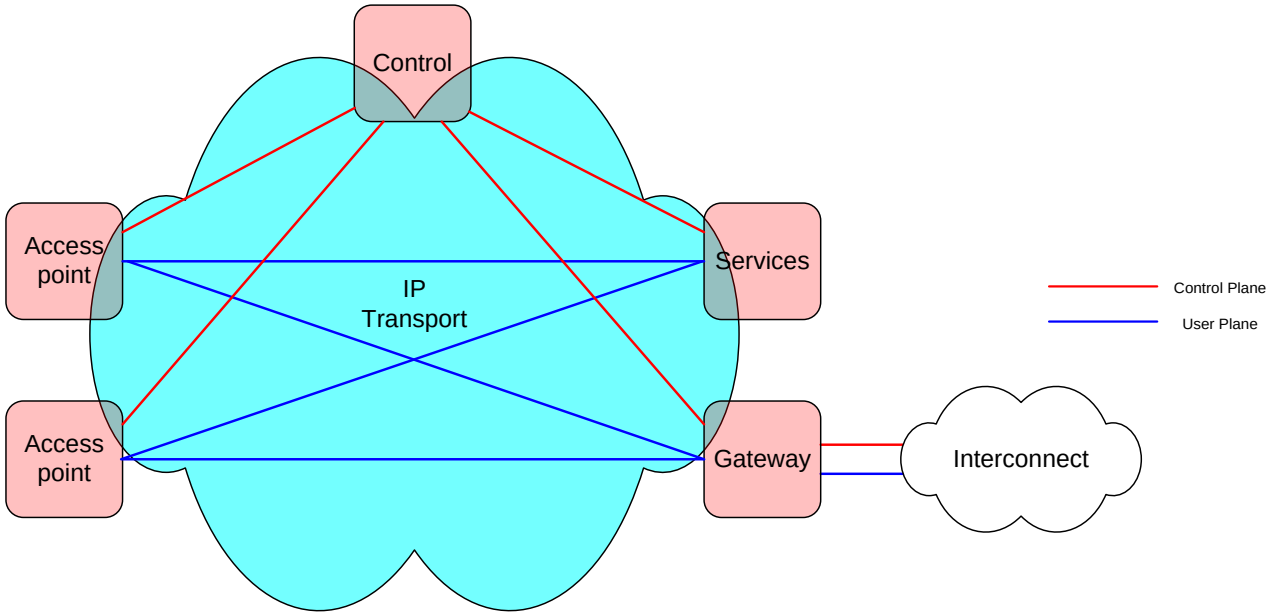


3GPP R8 and “LTE”

3GPPP R8 is a significant step towards this goal, including many things often referred to just as LTE, but more correctly termed LTE-SAE (System Architecture Evolution).

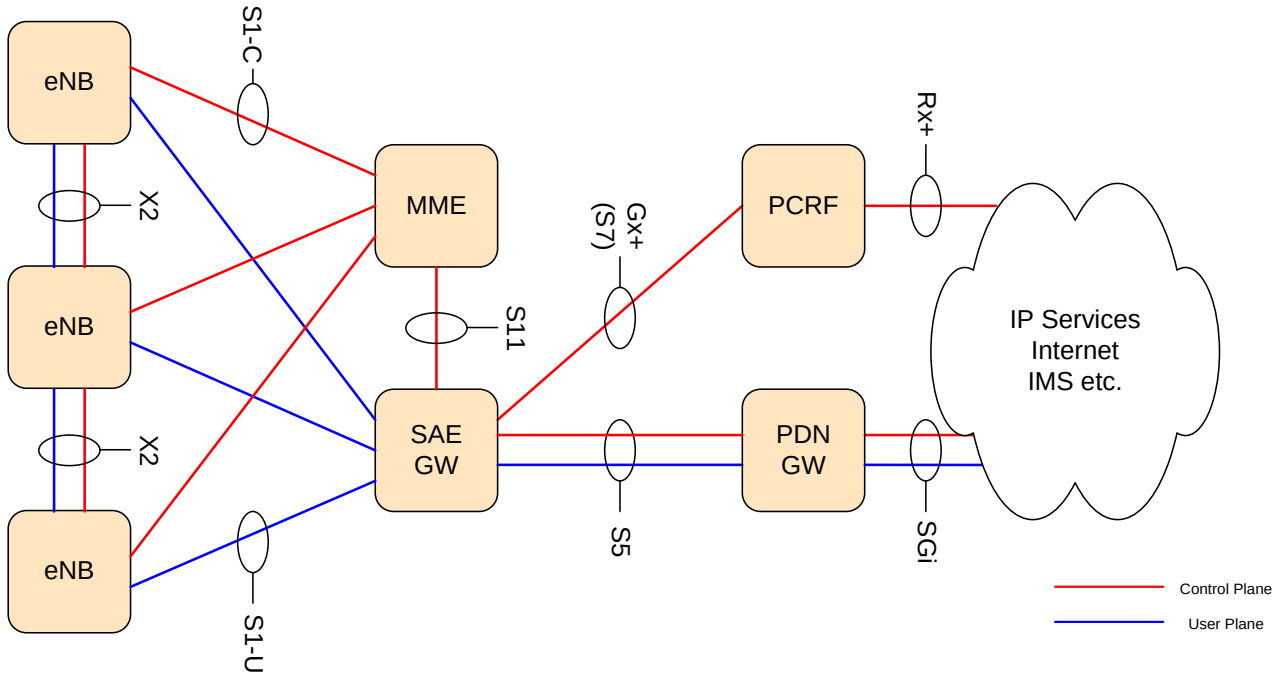
- LTE access
- Support of alternative access technologies
- The EPC (Evolved Packet Core) – note, packet only! voice support is IMS.

An EPC and an appropriate access technology is an EPS (Evolved Packet System)



EPS Architecture and Interfaces

Packet Switched domain only - No CS support.



- All interfaces use an IP TNL.
- E-UTRAN consists of an eNB and nothing else, there is no access / core demarcation to impose on the underlying transport network.
- Control and user planes are mostly decoupled.

Summary

Implementing System Architecture Evolution will benefit operators by

- Enabling all IP transport with simplified network architecture
- Distributing control and decoupling from user plane
- Supporting multiple alternative access technologies
- Incorporating IMS integrating services into a single (packet) domain

Together, these will enable more flexible scalable networks with reduced time to market for new services and, last but certainly not least, reduced cost to serve.

Further reading:

http://3gpp.org/releases

http://www.ngmn.org/nc/downloads/techdownloads.html

Thank You

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