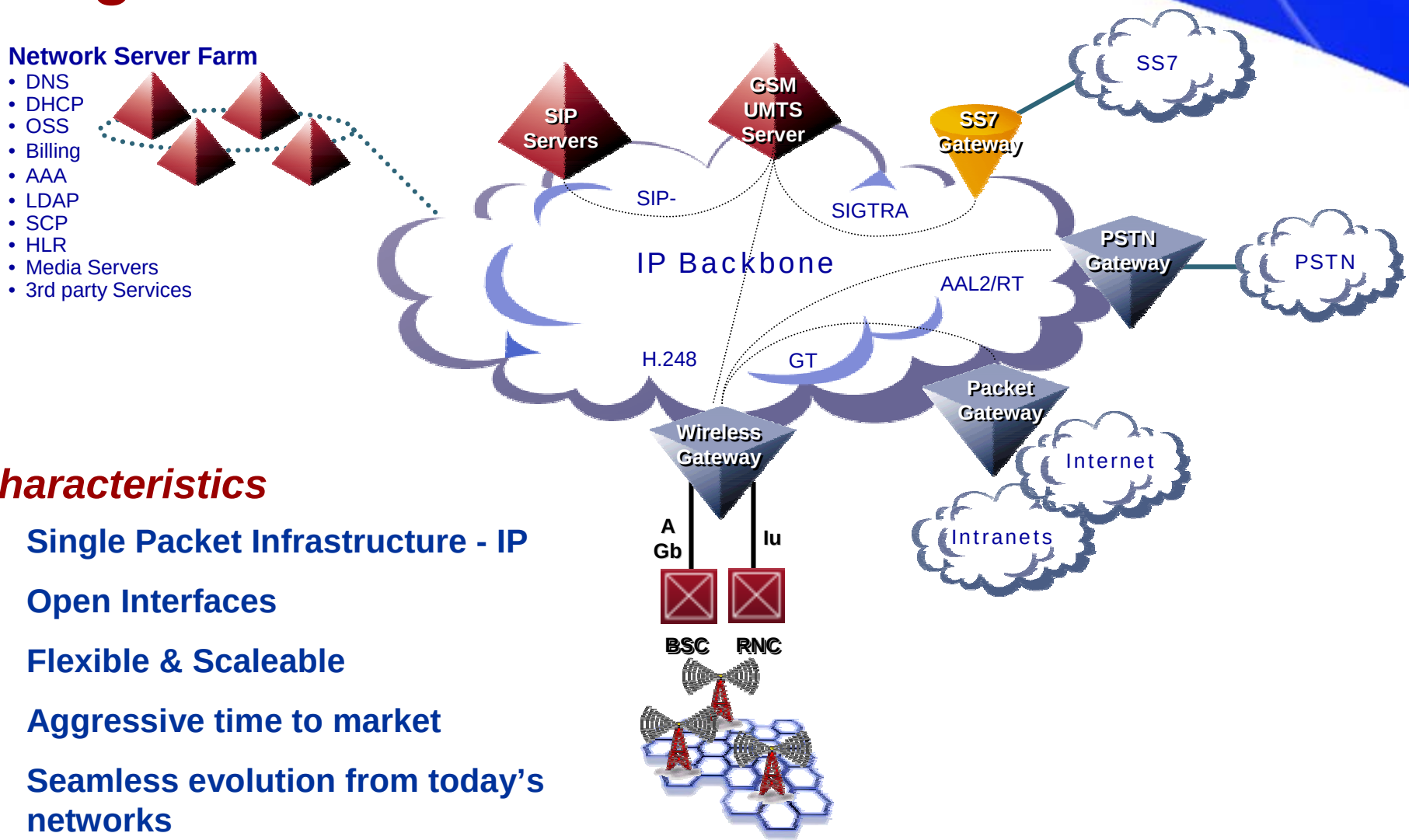
2G to 3G

Migration Strategy

4th October, 2001

Target 3G Architecture



Characteristics

- **Single Packet Infrastructure - IP**
- **Open Interfaces**
- **Flexible & Scaleable**
- **Aggressive time to market**
- **Seamless evolution from today's networks**

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Mobile Challenges Moving Forward

- **Introduction of 2.5G GPRS data traffic in 2001**
  - GPRS is packet mode data
  - Existing TDM Core infrastructure is very inefficient
- **Introduction of 3G UMTS data traffic – in 2002**
  - UMTS uses packet mode transfer in the RAN and in the Core network
  - Existing TDM RAN and TDM Core infrastructures are very inefficient
- **Evolution from TDM - FR- ATM – IP from 2001 onwards**
  - 2G is TDM
  - GPRS is Frame Relay
  - UMTS is initially ATM with an eventual evolution to IP

Evolve to packet mode infrastructure

Everything Is Evolving to Packet

- **Fixed voice (PSTN) transit & access (QoS)**
  - NGN architectures based on ATM – evolution to IP pending QoS and standardisation
- **Wireless voice transit and access (QoS)**
  - GSM transit based on same NGN architecture as PSTN
  - GPRS is based on Frame Relay/IP Core
  - UMTS is based is ATM – evolution to IP pending QoS and standardisation
- **Consumer Internet services (Best Effort)**
  - Low-speed IP dial
  - High-speed DSL or cable
- **Business data services (SLAs)**
  - Frame Relay – the cash cow (includes L2 IP VPN)
  - ATM – for guaranteed services (includes L2 IP VPN)
  - IP VPN – fastest growing service from a small base (technology is still somewhat immature)
  - Leased Line – using ATM/PNNI routing

Technical Challenges

- **IP/MPLS QoS and traffic engineering are « emerging » technologies**
  - Over provisioning is not always an option
  - IP DiffServ offers CoS, not QoS
  - MPLS QoS and Traffic Engineering is not mature enough for large-scale deployment
- **ATM QoS and traffic engineering is mature**
  - Good enough to provide QoS and SLAs without over provisioning
  - Good level of interoperability between vendors
  - Well understood and trusted by operators and end users
- **« Legacy » traffic transport (fixed and wireless voice etc)**
  - All traffic can be transported over ATM using interoperable standards
  - A number of challenges still exist for IP (no interoperable standards for ATMoIP, or FRoIP etc)
  - MPLS is the best longer term option
  - True carrier grade packet Core equipment is required to support the PSTN and Wireless traffic and to integrate with the underlying Optical infrastructure

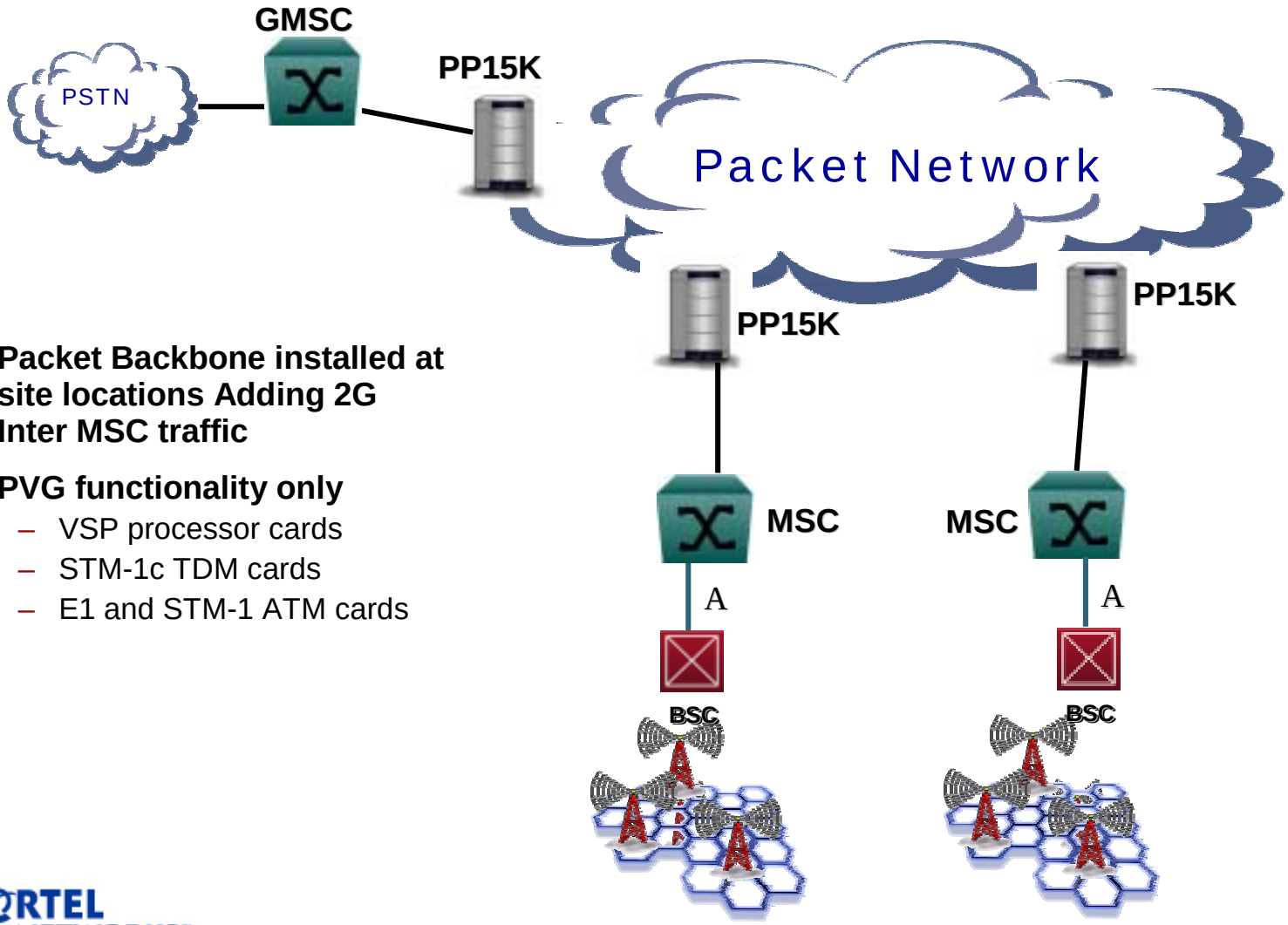
Network options

- **Build multiple networks per traffic type**
  - Single ATM-based network for multi-service traffic
  - One or more IP networks for other traffic (one for Internet traffic and one for business traffic)
  - Cost (capex and opex) is the issue
- **Build single network for all traffic**
  - IP can not offer QoS or SLAs required
    - This problem will be solved using MPLS in the future
  - ATM is not optimum for IP traffic
    - Depends on network architecture –star vs any-to-any
  - BGP peering and PNNI routing required

Single hybrid network is the best option

Packet Backbone Roll-out

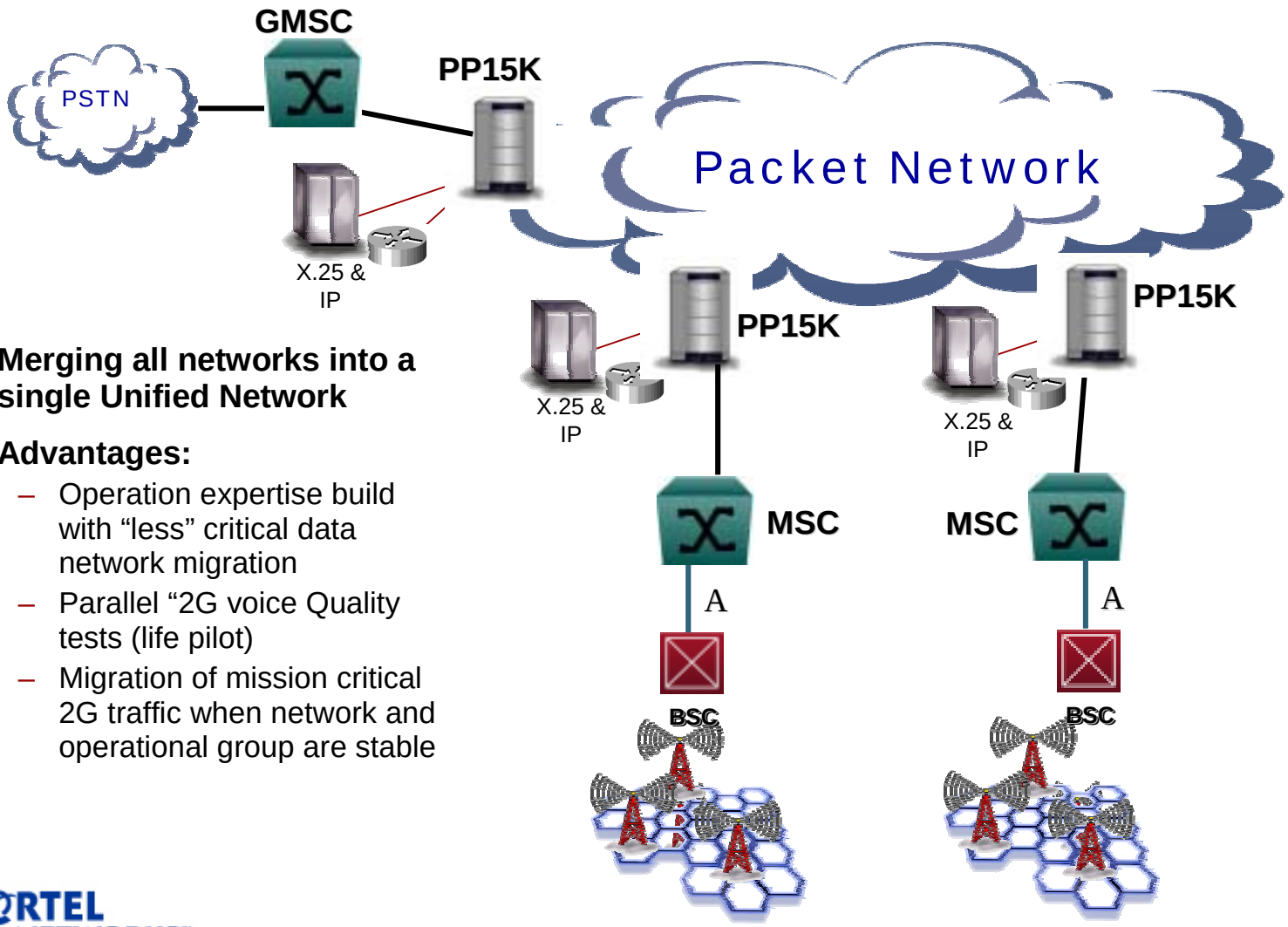
Step 1a - adding the 2G voice traffic



- **Packet Backbone installed at site locations Adding 2G Inter MSC traffic**
- **PVG functionality only**
  - VSP processor cards
  - STM-1c TDM cards
  - E1 and STM-1 ATM cards

Packet Backbone Roll-out

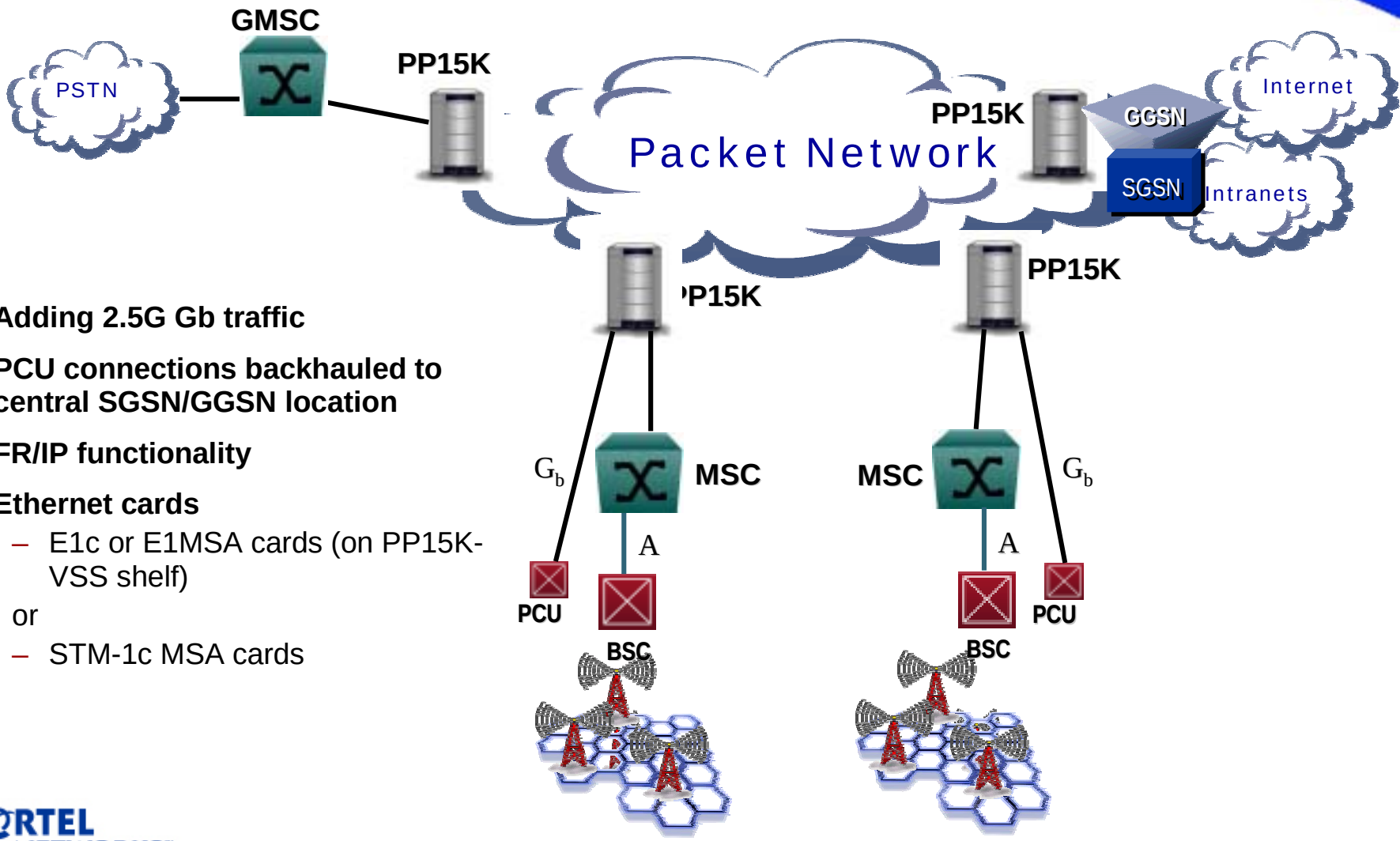
Step 1b - optional - adding the data networks



- **Merging all networks into a single Unified Network**
- **Advantages:**
  - Operation expertise build with “less” critical data network migration
  - Parallel “2G voice Quality tests (life pilot)
  - Migration of mission critical 2G traffic when network and operational group are stable

Packet Backbone Roll-out

Step 2a - adding the 2.5G Gb traffic

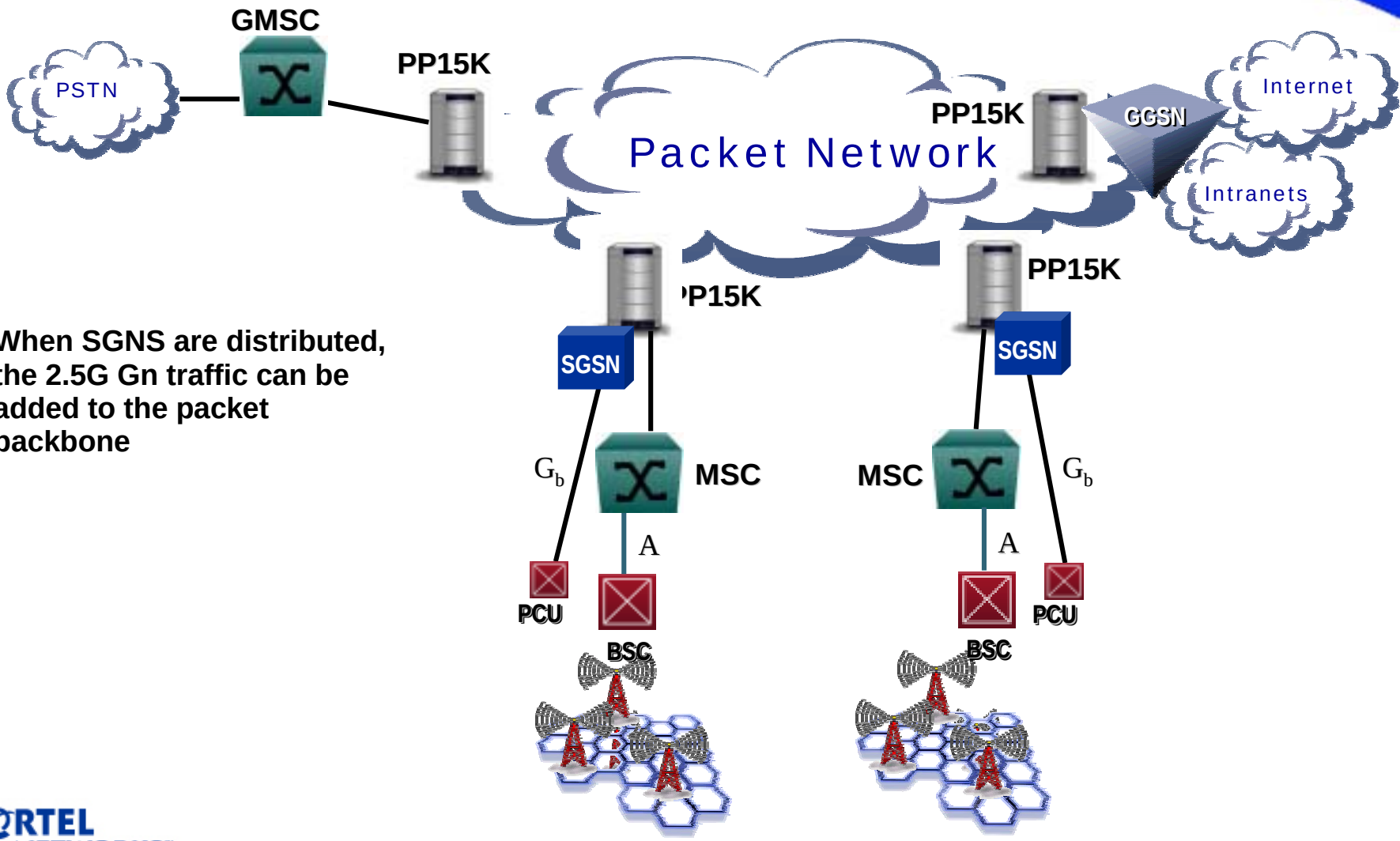


- **Adding 2.5G Gb traffic**
- **PCU connections backhauled to central SGSN/GGSN location**
- **FR/IP functionality**
- **Ethernet cards**
  - E1c or E1MSA cards (on PP15K-VSS shelf)

  or
  - STM-1c MSA cards

Packet Backbone Roll-out

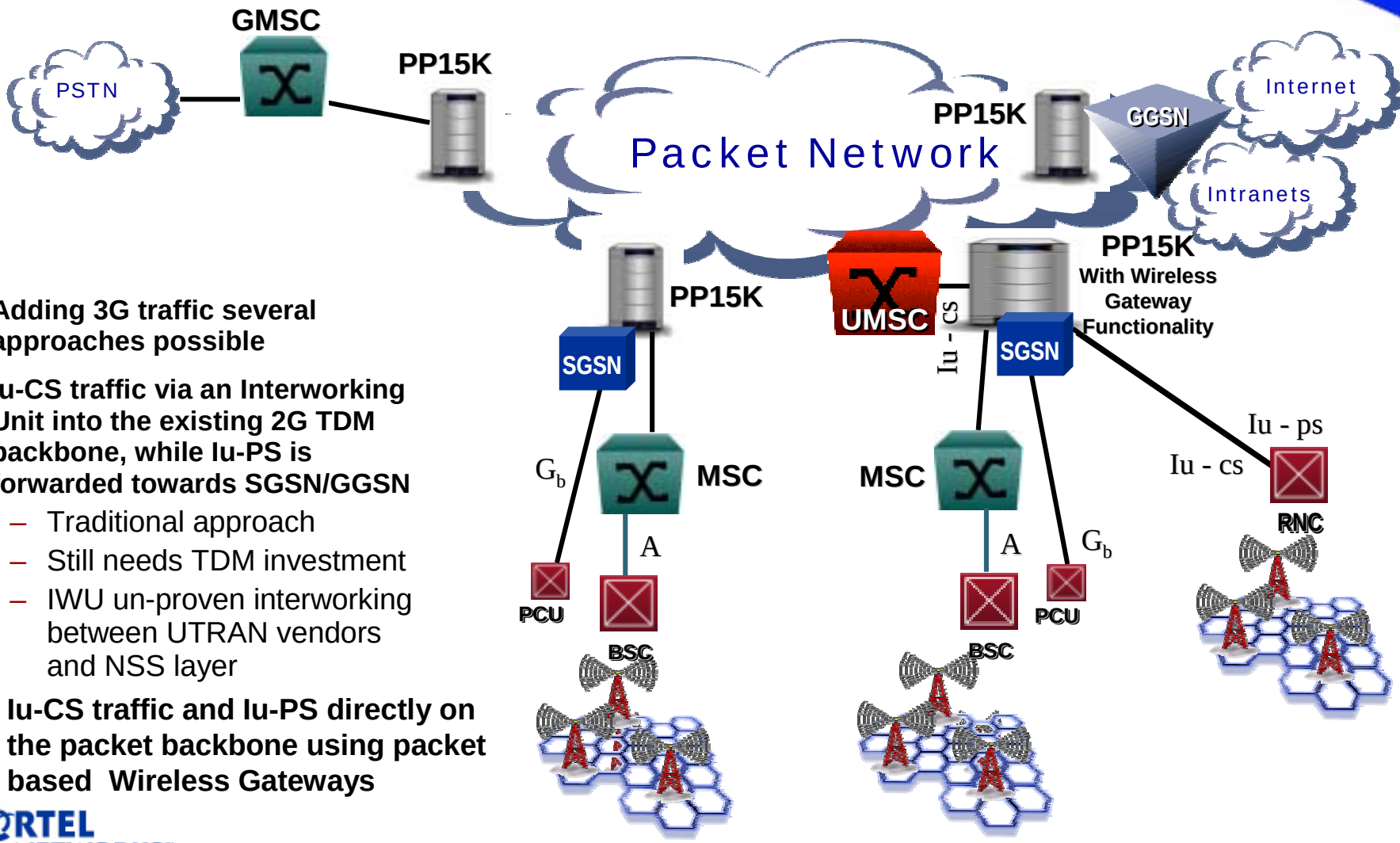
Step 2b - adding the 2.5G Gn traffic



- **When SGNS are distributed, the 2.5G Gn traffic can be added to the packet backbone**

Packet Backbone Roll-out

Step 3a - adding the 3G traffic (Phase 1)



- **Adding 3G traffic several approaches possible**
- **Iu-CS traffic via an Interworking Unit into the existing 2G TDM backbone, while Iu-PS is forwarded towards SGSN/GGSN**
  - Traditional approach
  - Still needs TDM investment
  - IWU un-proven interworking between UTRAN vendors and NSS layer
- **Iu-CS traffic and Iu-PS directly on the packet backbone using packet based Wireless Gateways**

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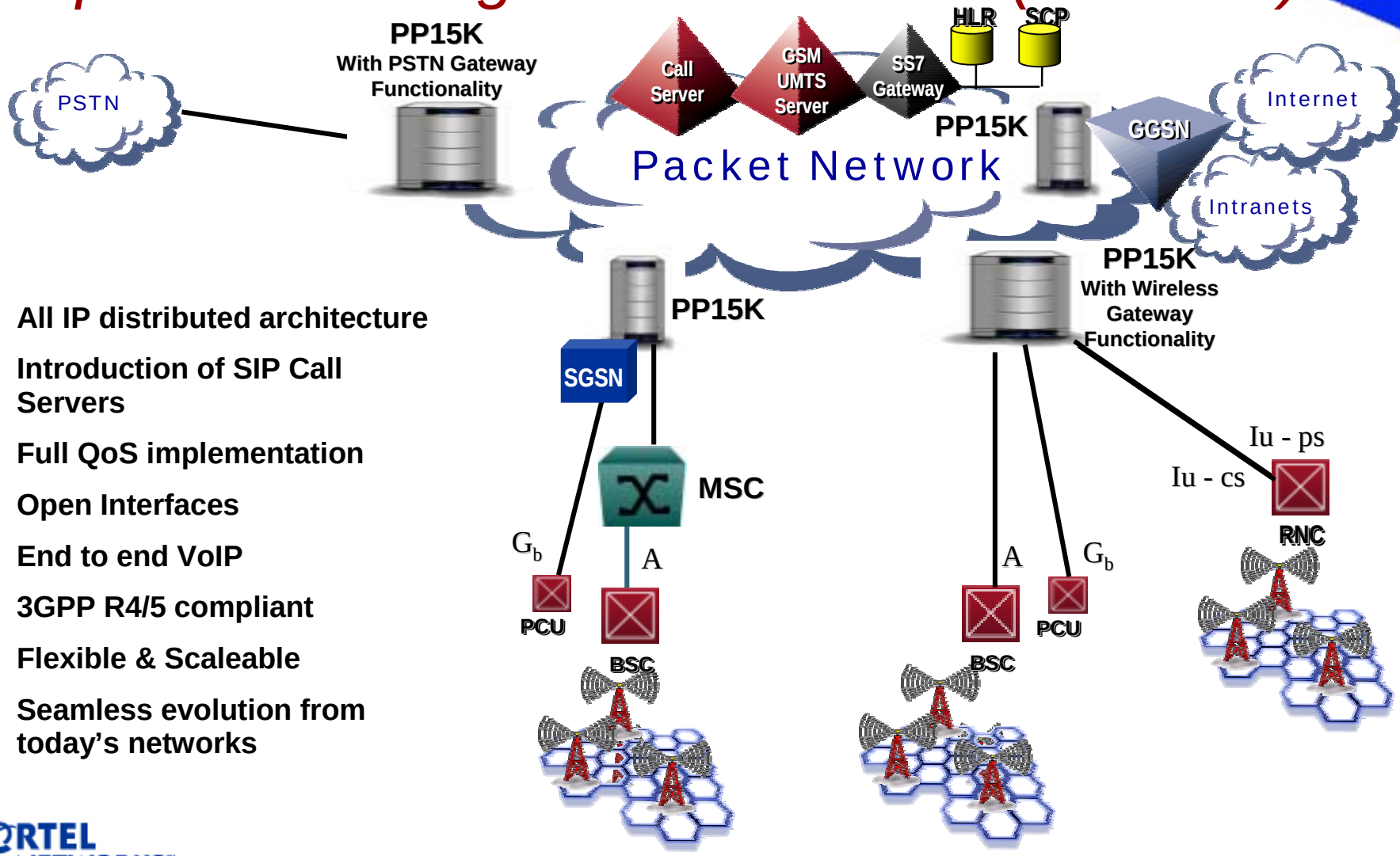
Packet Backbone Roll-out

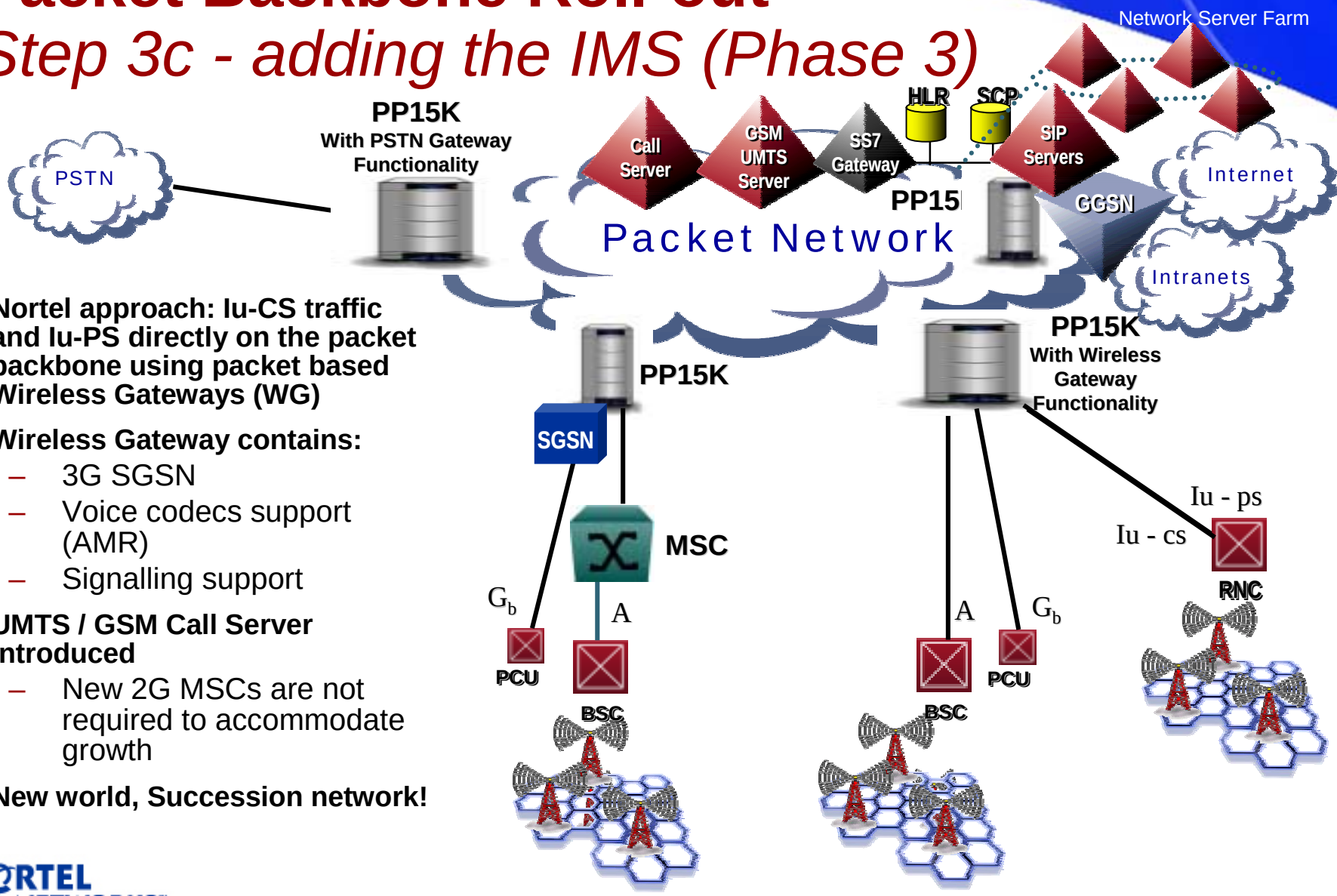
Step 3b - evolving the 3G network (Phase 2)



- All IP distributed architecture
- Introduction of SIP Call Servers
- Full QoS implementation
- Open Interfaces
- End to end VoIP
- 3GPP R4/5 compliant
- Flexible & Scaleable
- Seamless evolution from today's networks

Packet Backbone Roll-out

Step 3c - adding the IMS (Phase 3)



- **Nortel approach: Iu-CS traffic and Iu-PS directly on the packet backbone using packet based Wireless Gateways (WG)**
- **Wireless Gateway contains:**
  - 3G SGSN
  - Voice codecs support (AMR)
  - Signalling support
- **UMTS / GSM Call Server introduced**
  - New 2G MSCs are not required to accommodate growth
- **New world, Succession network!**

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