# NEXT GENERATION NETWORKS
# A view on migration paths from existing fixed and mobile networks

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# Why Next Generation Networks ?

- Convergence between the packet-based Internet and telephony networks
  - Driven by technological evolution
  - Demand for a universal service network
- Take the best from each
  - Service provision of the telephony network model
  - Openness and flexibility of the Internet model
- Possible Definition of a Next Generation Network
  - A packet transport based network where the transport, control and service layers are separated from each other and interact through open interfaces
- The target is well defined but how to get there ?

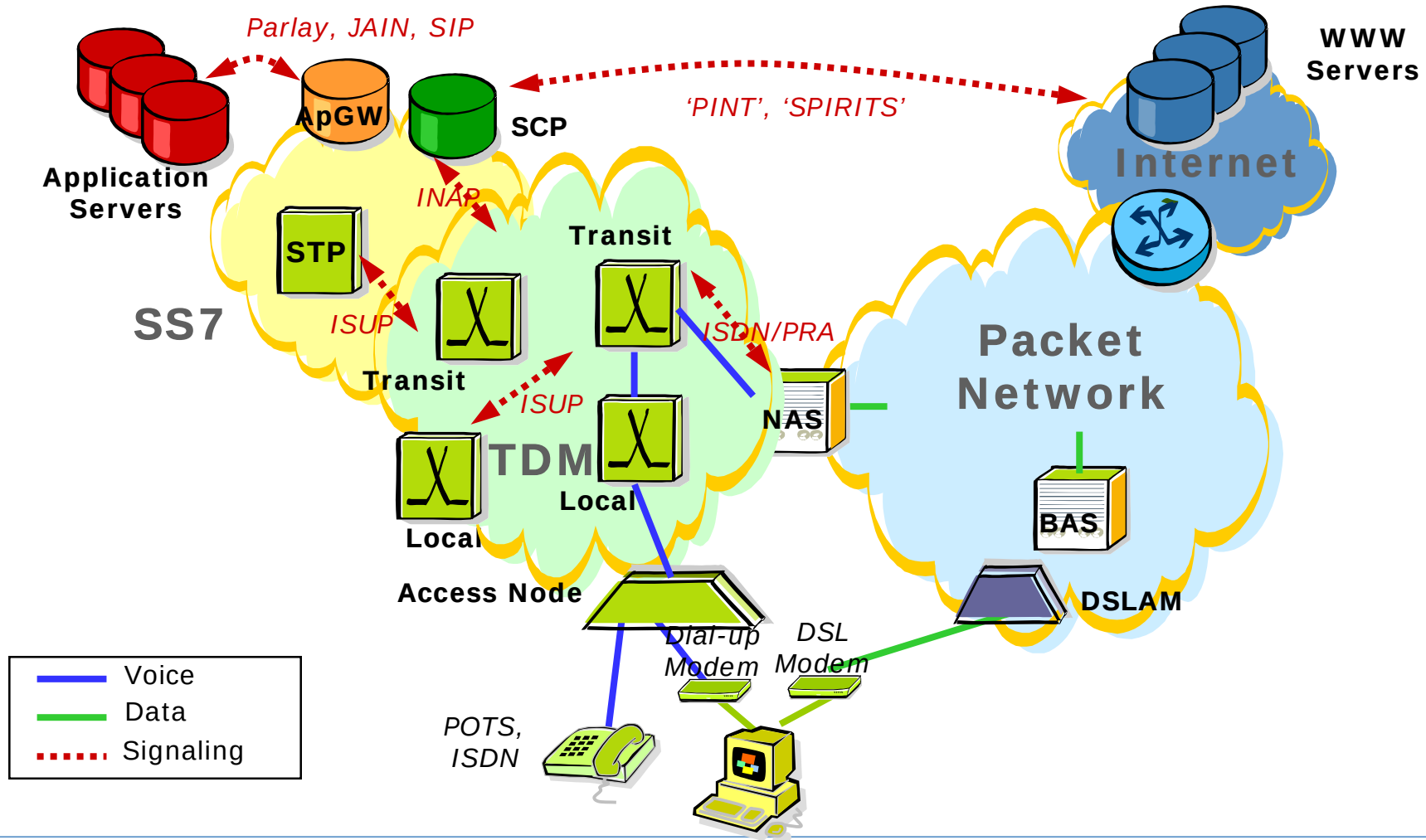
# Migration Rationale

- Migration of current telephony networks (2 billion users worldwide) should preserve the existing investments
- Key investments in any network are in provisioning access for end-users to the network services (80% of the costs)
  - Any technological changes become costlier when they get closer to end-users and should be justified by added value brought with them
- Migration must be driven by basic principles
  - Continuity of services offered to end-users
  - Inter-working between new and old technologies
  - Cost control of the migration process
- Migration should above all be driven by economic considerations
  - Network consolidation and optimization and/or
  - New revenues driven from new services

# Proposed Migration Approach

- Approach in 5 steps where each is justified by new services or advantages brought from consolidation
- Application of each step to the specific case of fixed and mobile (GSM and future 3G UMTS) networks
- The proposed migration steps are generic
  - Application of each step depends on the specific operator context
  - All are not compulsory and do not follow in the same sequence
  - There is no “one size fits all” migration scenario
- Network views of migration steps are not exhaustive
  - Emphasis put on significant network elements needed for service provision, on signaling relations between end-users and the network and between network entities

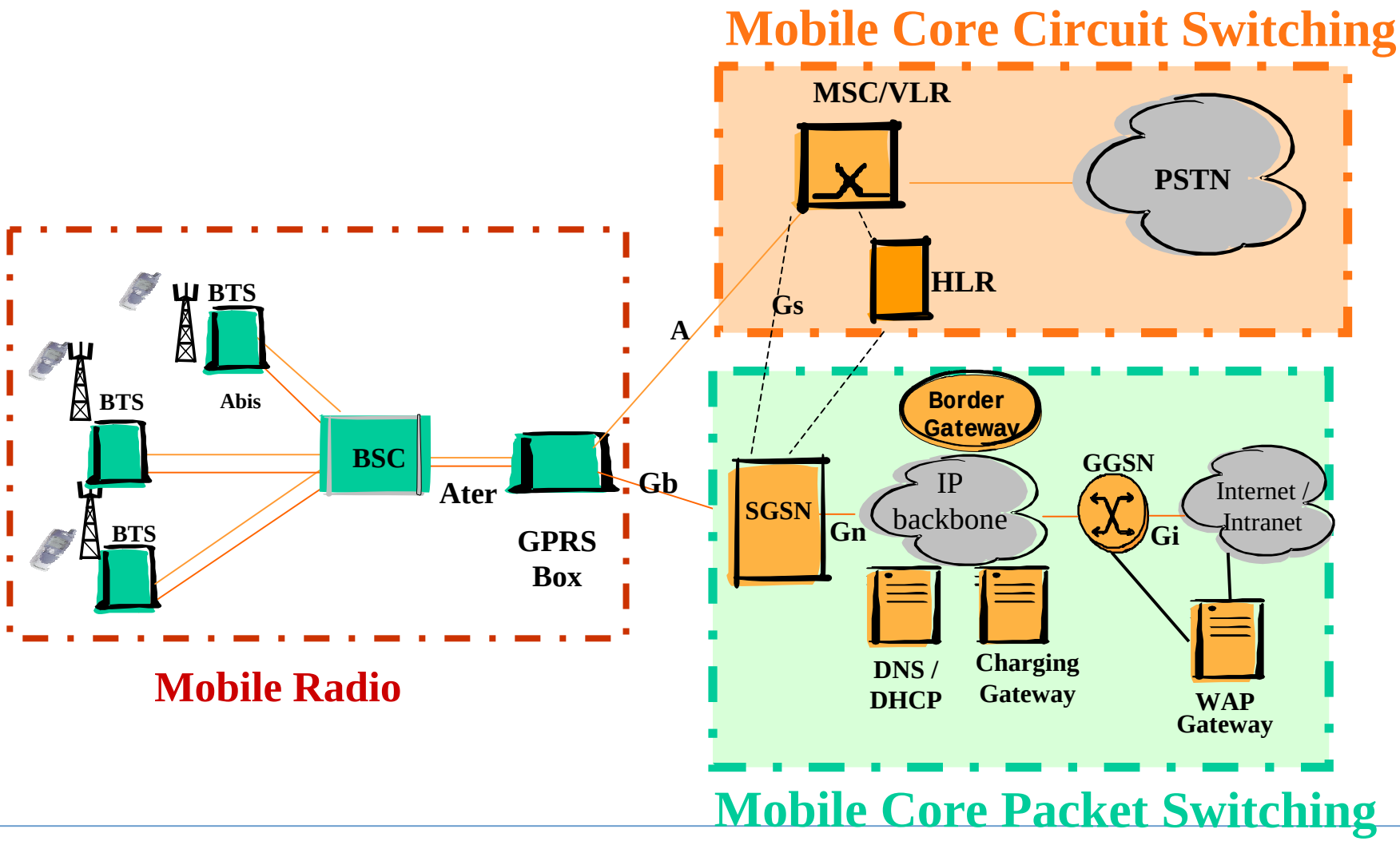
# Step 1 Fixed: Access to the Internet and Converged Internet/Telephony services



# Step 1 Fixed: Access to the Internet and Converged Internet/Telephony services

- Basic telephony service and its associated supplementary services
  - TDM based transport
  - SS7 based signaling
- Intelligent Network Services
  - Calling Cards, Free phone,Voice virtual private networks,…
- Internet access
  - In dial-up mode or in broadband mode with DSL technology
- Converged Voice/data services
  - Benefit from the simultaneous availability of a telephony access and Internet access in the case of broadband Internet access
  - Examples of converged services: Click-to-Dial, Internet Call Waiting, Web Augmented Calling, Unified Messaging,...

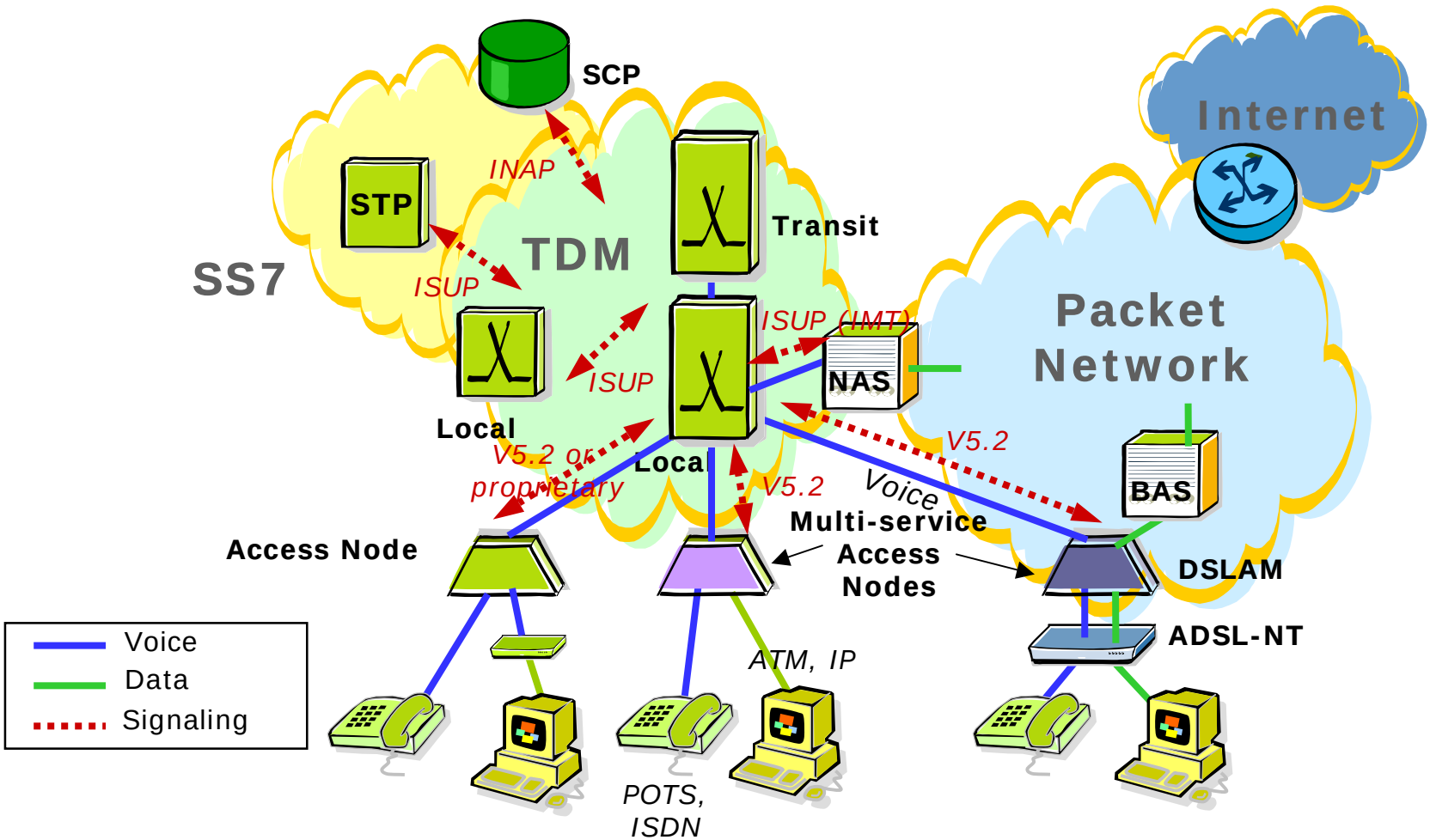
# Step 1 Mobile: Introduction of GPRS Packet Services



# Step 1 Mobile: Introduction of GPRS Packet Services

- General Packet Radio Service (GPRS) introduced as a solution for offering an always-on access mode to data services for mobiles
  - Optimized use of the scarce radio resource
    - Share the bandwidth for data services between users of a given radio coverage zone (cell)
    - Radio resources are not monopolized during idle periods
- No modification of the existing radio and core infrastructure for voice services
  - GPRS adaptation equipment added to existing radio infrastructure
  - GPRS specific core infrastructure re-usable in further evolution steps
- GPRS service platform
  - Offers access to Internet/Intranet data networks and to service portals (first step towards future UMTS services)
  - Optimize provision of 2G data services like Short Messages (SMS)

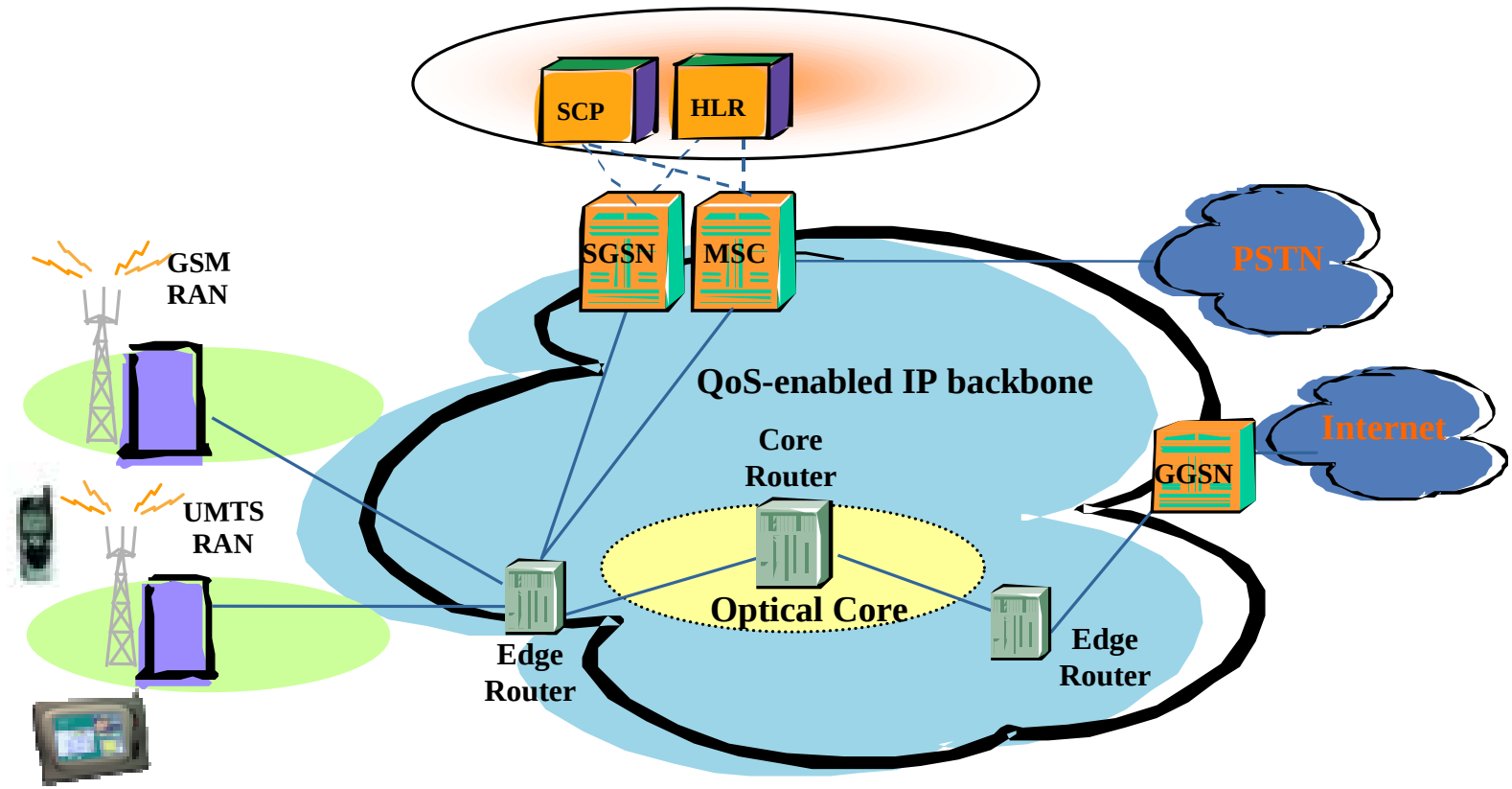
# Step2 Fixed: Network consolidation and introduction of new multi-service access nodes



# Step 2 Fixed: Network consolidation and introduction of new multi-service access nodes

- Switch consolidation
  - Maximize number of line, minimize number of nodes
  - Upgrade of switch fabric and processors for higher capacity and speed
- Access Consolidation
  - Add NGN-ready multi-service access nodes
    - End-user in native packet access mode
    - DSL but also other alternative next generation local loop technologies (cable networks, wireless local loop, satellite,…)
    - Introduce Voice-over-DSL (loop emulation service) and extend voice service offer without modification of the legacy switches
- Optimize interconnection to the data network for dial-up access
  - Interconnection at local exchanges level (offload transit level)
  - Use of ISUP and Inter Machine Trunks (IMT) instead of ISDN/PRA

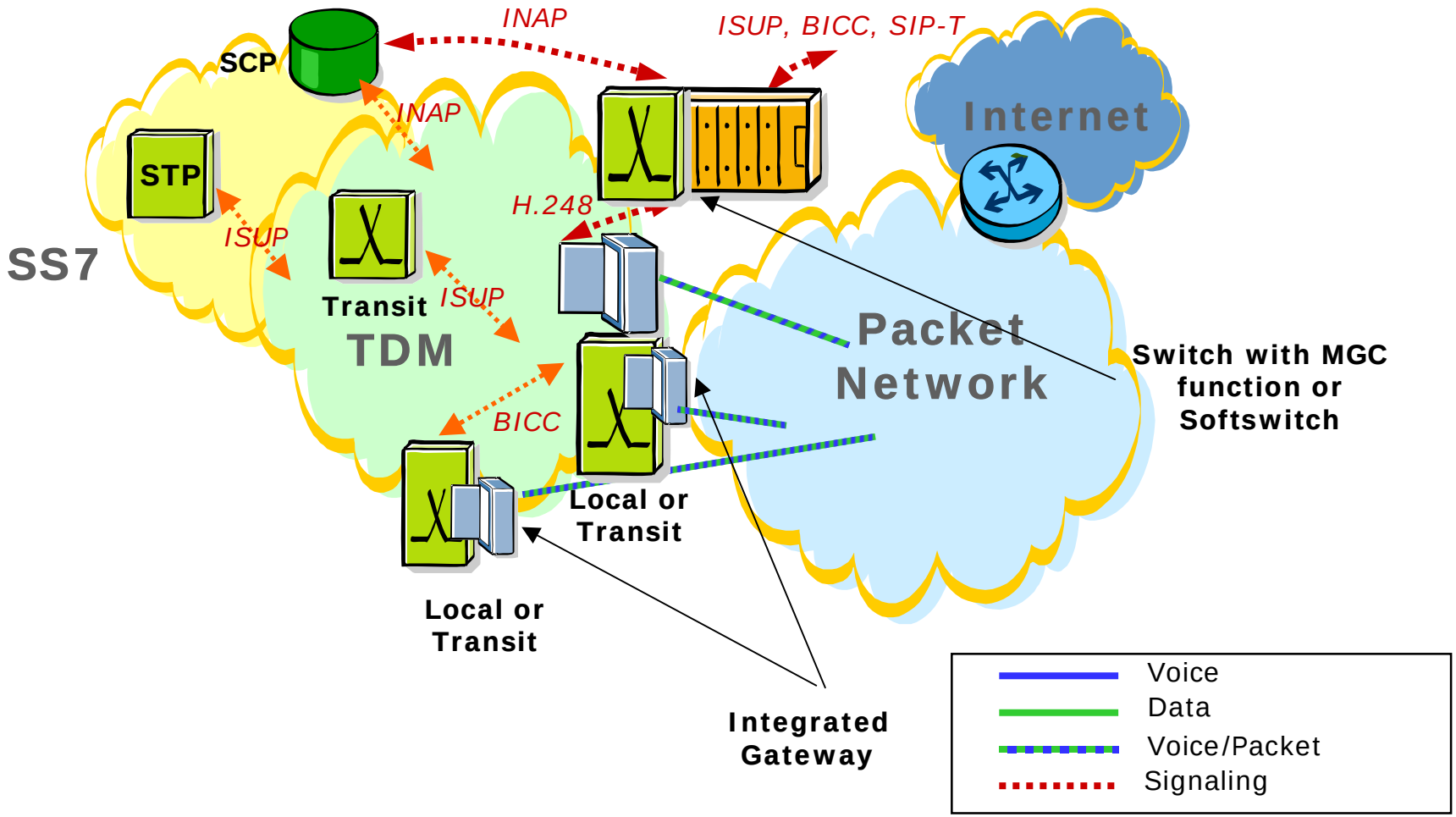
# Step 2 Mobile: Introduction of UMTS Radio Access Networks



# Step 2 Mobile: Introduction of UMTS Radio Access Networks

- Initial introduction of 3G UMTS radio access network (UTRAN) as coverage islands
  - Rest of the network coverage kept with legacy GSM 2G/2.5G radio
- Combined 2G/3G HLR, MSC, SGSN and GGSN network equipment support both types of access (Alcatel's approach)
  - Smooth upgrade of early 2G equipment
- Backbone data network introduced with QoS features
  - Edge router concentrates ATM streams coming from UTRAN
    - Front-end for both packet and circuit streams
    - Evolves into an access gateway in future evolution steps
  - Core router switches IP traffic with MPLS/DiffServ support
- New service capabilities with location based service support
  - Enhanced intelligent network interfaces for mobiles towards SCP

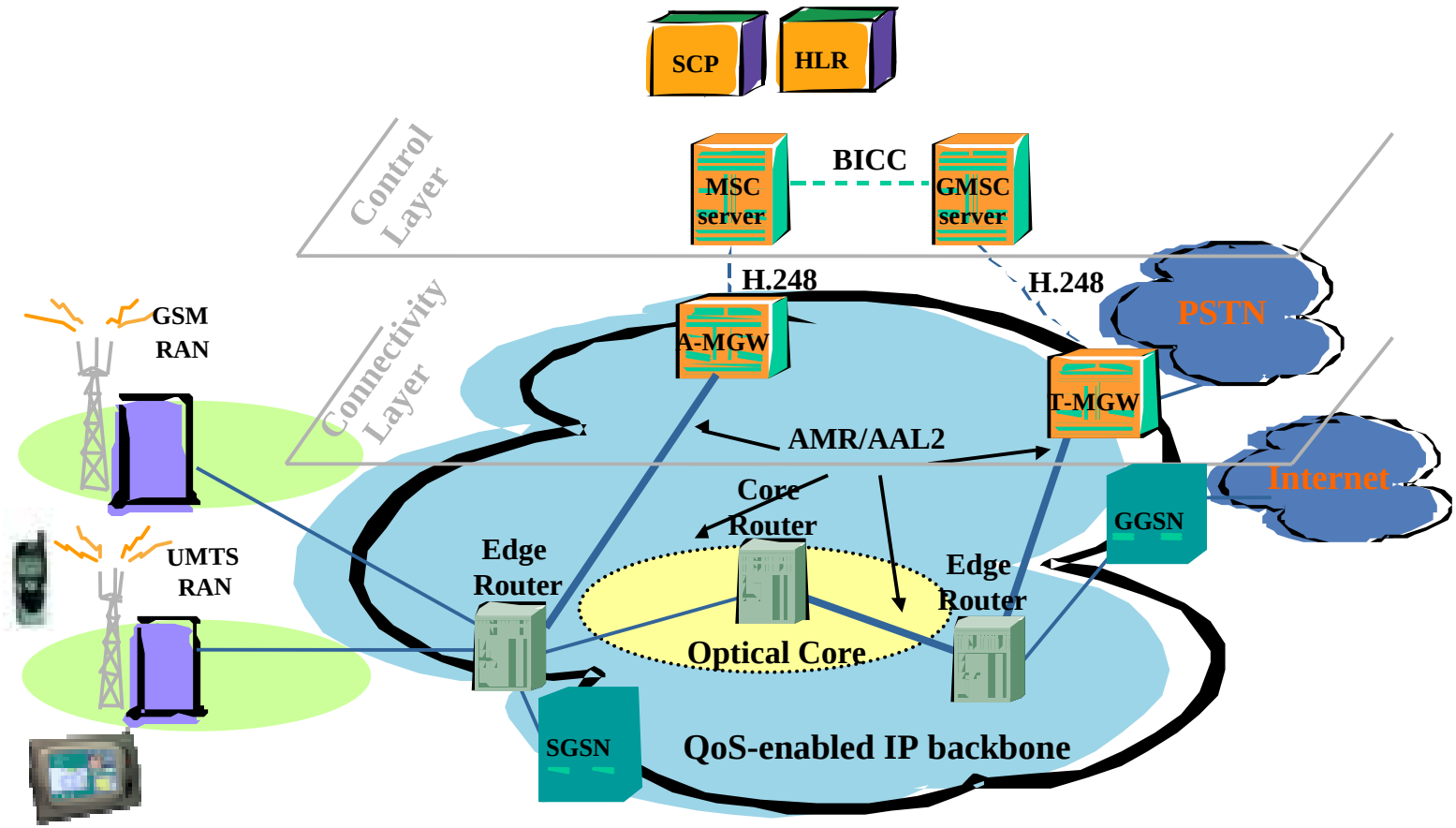
# Step 3 Fixed: Voice over Packet for Trunking



# Step 3 Fixed: Voice over Packet for Trunking

- Gradually offload voice trunking traffic to the packet network
- Network consolidation by removal of an upper transit level or optimization within a transit level
  - Voice-over-Packet trunking through integrated gateways in the LEX/TEX
  - Alternative solution based on external trunking gateways controlled by a Switch with Media Gateway Control (MGC) function or a Softswitch
  - Use of SS7 based BICC signaling for co-existence with PSTN/ISDN services
  - Reuse of existing IN services for business continuity
- First mastering of voice over packet technology at aggregate level
  - Simpler Quality of Service issues
- Service transparency of Voice over Packet use for end-users

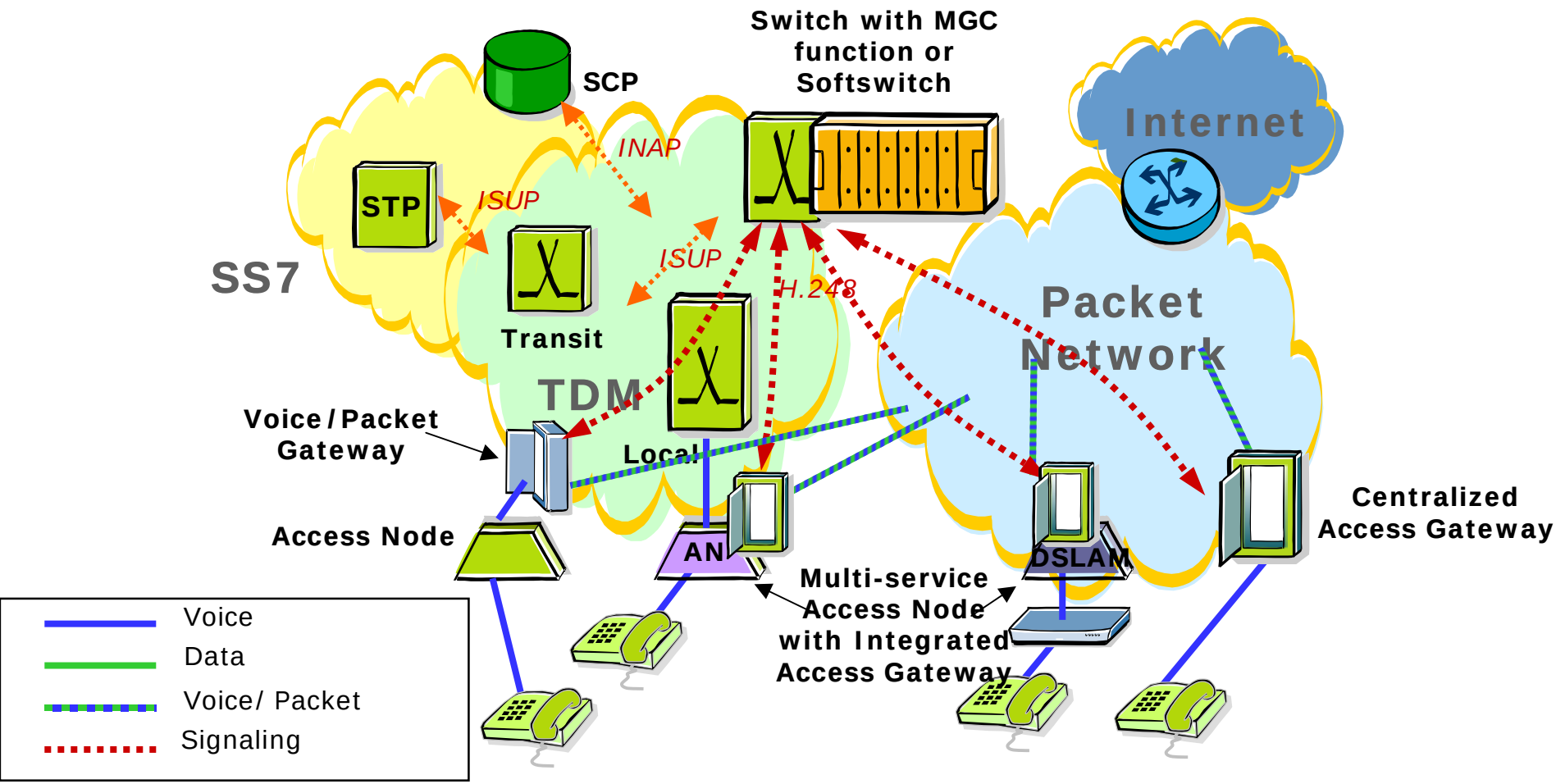
# Step 3 Mobile: Voice service over Packets (Core and Access)



# Step 3 Mobile: Voice service over Packets (Core and Access)

- Generalization of UTRAN access
  - Voice coming in packet mode (ATM/AAL2) from the access network
- Leverage on the QoS-enabled IP backbone to support voice services in NGN way
  - Keep voice in original packet mode for mobile-mobile calls
    - Avoid unnecessary and quality decreasing encoding/decoding
  - Evolution of 2G/3G integrated MSCs into MSC servers (Alcatel's approach)
  - Use of the H.248 open interface to control Media gateways
- Media gateways for Access and Trunking functionality
  - Based on the same platform as the Edge Router
  - Mediation device for voice applications over ATM/AAL2

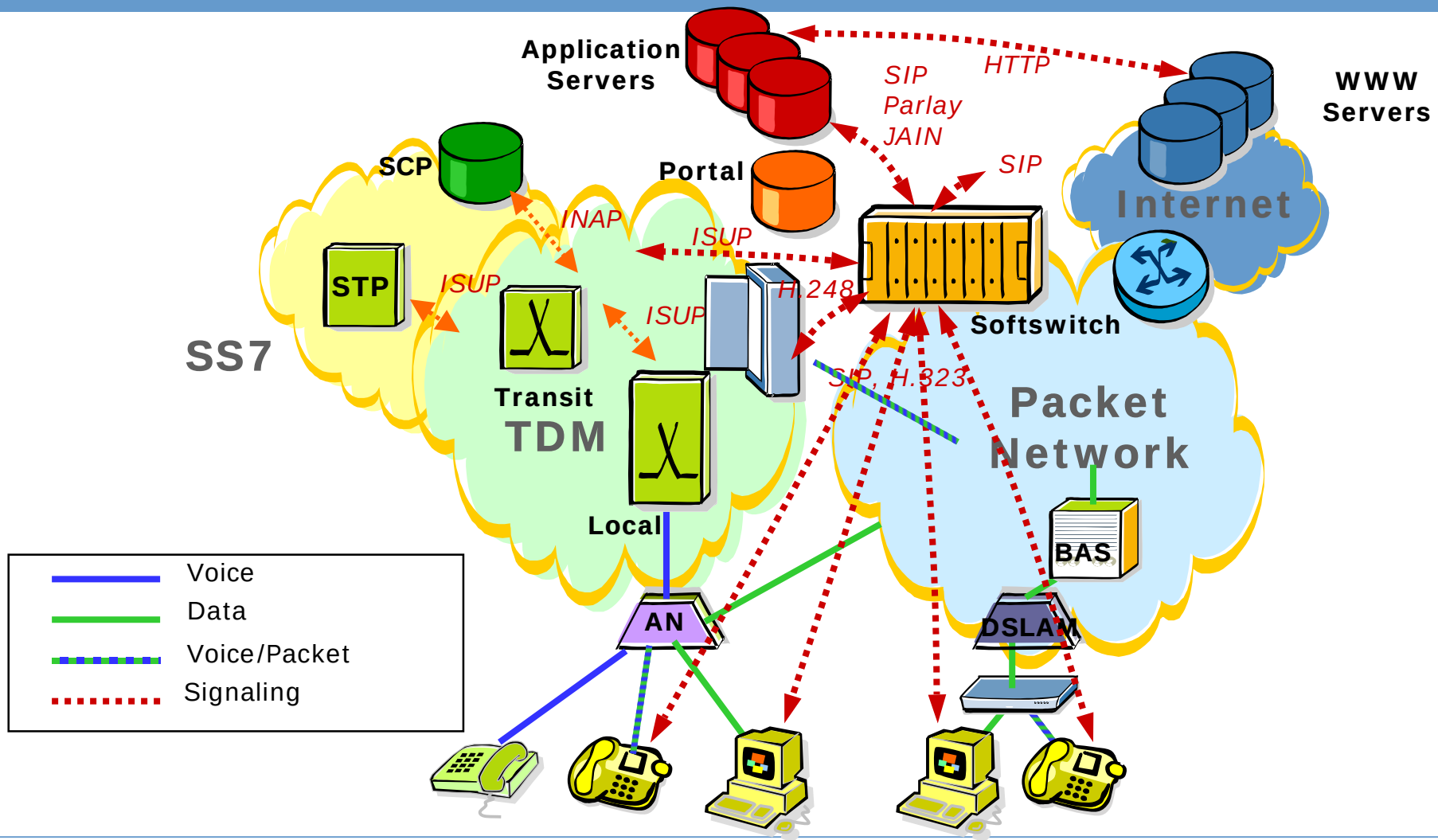
# Step 4 Fixed: Voice over packet up to access level



# Step 4 Fixed: Voice over packet up to access level

- Extend use of packet transport to the access network for voice services
  - Introduction of Access Gateways
    - Integrated within next generation multi-service access nodes or
    - Standalone centralized access gateways
  - Access gateways are controlled by a switch with MGC function or a softswitch
    - Same services portfolio as on the PSTN/ISDN
    - Tighter integration of voice and packet services
- Improved network consolidation
  - control of the voice traffic from fewer MGC Switches or Softswitches
  - Voice traffic gradually moved from the control of old generation switching equipment to the control of upgraded MGC switches or Softswitches

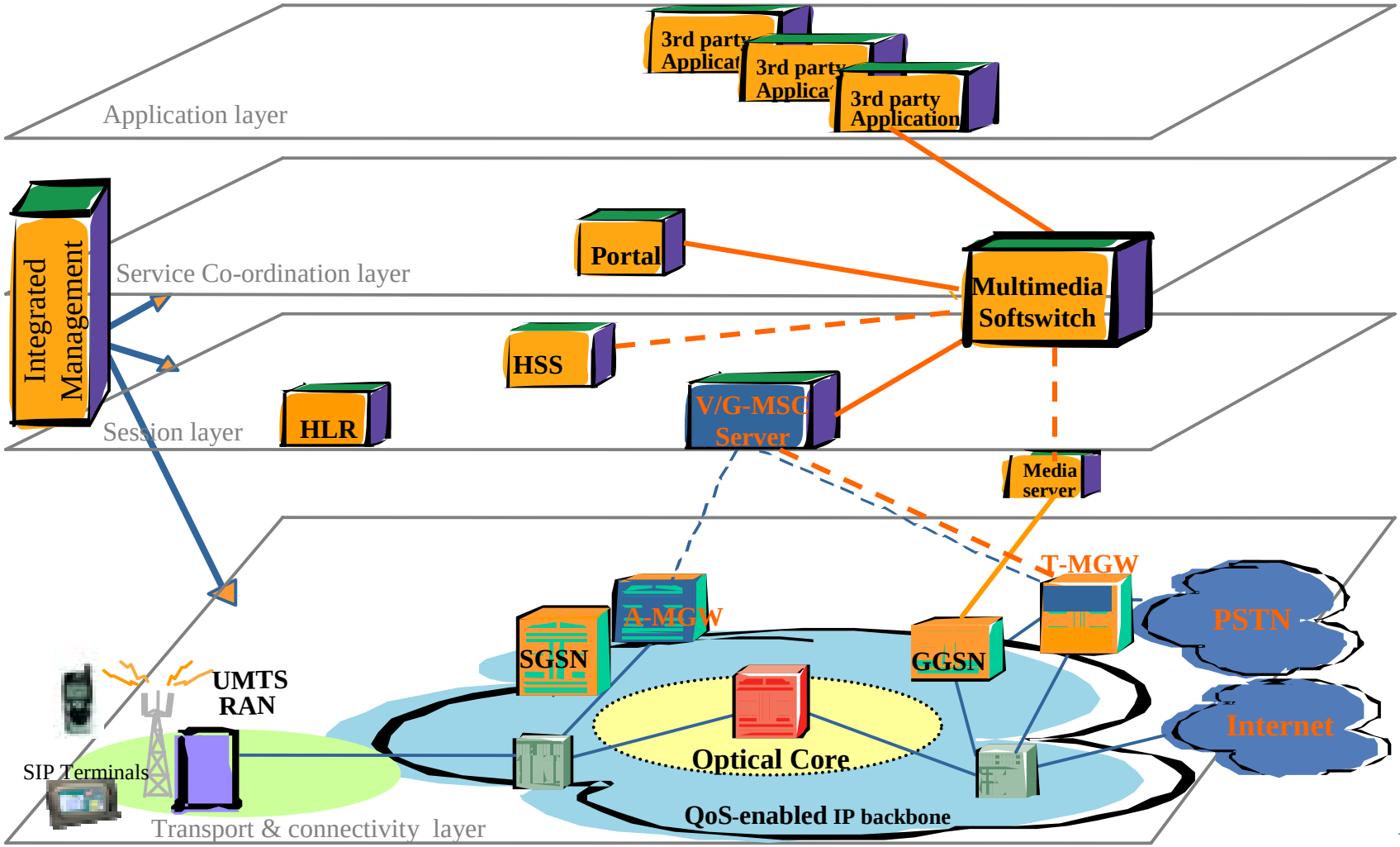
# Step 5 Fixed: Multimedia Services



# Step 5 Fixed: Multimedia Services

- End-users connected through next generation multi-service access nodes will adopt IP terminals for multimedia services
  - Better benefit of the high bandwidth, always-on and interactivity associated with such next generation access networks
- New IP terminals will be controlled by Multimedia Softswitches through a new type of NGN signaling
  - SIP or H.323
  - Access network will focus on resource provision under the softswitch control depending on the service used
- A multimedia softswitch offers network services but also third party services through portals and open interface
  - Network operator becomes the intermediary broker between application providers and their clients

# Step 5 Mobile: Multimedia Services



# Step 5 Mobile: Multimedia Services

- IMS is the operator solution to differentiate from commodity-priced best-effort data services
  - Offering end-to-end Quality of service
  - Network operator as the broker of added-value services
    - Services can be offered by 3rd party service providers
  - New business model unlocking new revenue sources
- Multimedia Softswitch providing new services
  - Re-use of the currently deployed packet switched IP backbone and network equipment (SGSN and GGSN)
  - New NGN signaling with new type of end-user terminals
    - SIP protocol with proper extensions to ensure end-to-end QoS per service invocation
  - Open interfaces towards 3rd party service provider
  - Inter-working with voice services through interface with MSC Server

# Conclusions

- Migration to NGN is an evolution of existing networks
- Driven by
  - Enhanced capabilities of Broadband access
  - Demand for new services from customers
- Speed of migration depends on
  - Widespread acceptance and appropriation of new services
  - But also on the maturity of the newly introduced technologies
- There is no universal migration scenario
  - Each migration depends on specific operator conditions, strategy, and…available budget
  - Migration process must be self-financed by revenue from new services and/or cost reductions from network optimization
  - Interoperability with the installed base is a key condition for success

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# Thank You !
# Questions ?