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Alcatel reply to the:

European Regulators' Group

Draft Consultation Document on IP Interconnection

ERG (06) 42

Summary of Alcatel positions:

- **IMPACT OF VOIP:** EU policy needs to prepare for the dissolution of legacy PSTN voice markets in All-IP environments where different VoIP applications are either mere "features" of media rich service bundles, or they represent a low cost commodity service of weak economic value to market players compared to next generation multi-play revenues. Accordingly, the distinction between fixed – mobile – or media embedded voice service markets should be replaced by new market definitions built on access service bundles, QoS levels, signaling and bulk traffic transport. Such new wholesale markets will develop between competing players with totally different profiles (e.g. asset-based, customer-based, service-based or any combination thereof). Moreover, a basic set of mandatory services inherited from traditional PSTN communications (emergency services with localization, lawful intercept) will clearly distinguish revenue-based public voice services from "free" voice services with no QoS requirements.

- **IP INTERCONNECT MODELS:** The inherently dynamic nature of IP interconnection between next generation virtual/flexible "points of handover", will radically change the static interconnection model of today's legacy networks. Structured and managed SS7 interconnection will evolve into bulk IP handover/peering based on QoS /SLA (Service Level Agreement) arrangements located either at edge or core nodes. Policy will need to account for the multiple facets of competitive IP interconnection: PSTN-NGN Core, NGN Core – NGN Core, PSTN-NGAs (Next Generation Access), NGN-NGAs, as well as Vertical vs Horizontal IP interconnection within multi-platform networks owned by an integrated player. As regards PSTN interconnection, Alcatel has developed two distinct applications to address legacy (PSTN Emulation) and new (PSTN Simulation) cases.

- **IP INTERCONNECTION & COMPETITION:** Pure "service-based" competition will rapidly reach its most extreme forms of market maturity upon expansion of VoIP and web-based communication services offered at "application" level, which directly and massively compete with communication services offered at

"network" level. From the policy perspective, everything must be done to ensure development of facilities-based competition, in particular in the Next Generation Access domain where multiple access platforms over independent infrastructure networks are the best guarantee for economic growth based on ICT. The very nature of the players and of how they compete will soon evolve, calling for new competition measurement tools: Who owns/bills the subscription (service and user profile)? What is the service aggregate (IP handover) offered in retail, wholesale, resale? What functions allow transport interconnection / service differentiation / user / group traffic handovers?

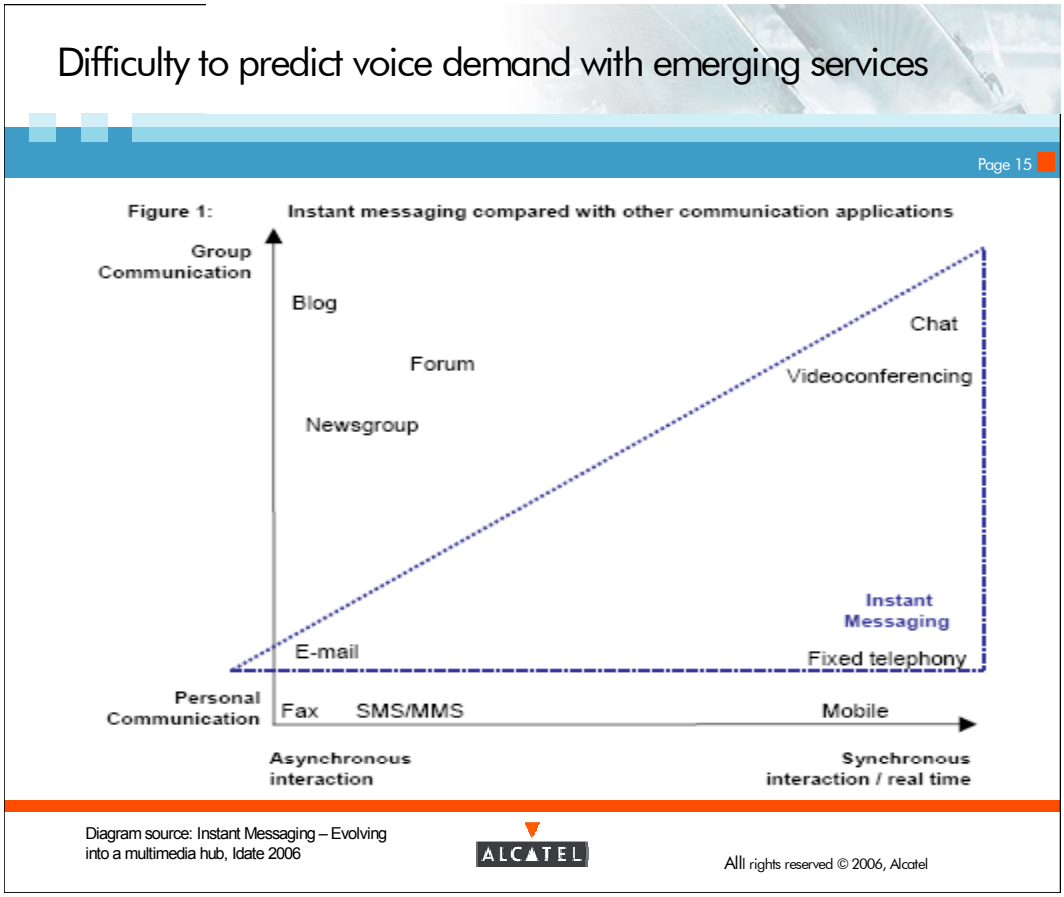
- **IP INTERCONNECTION & CHARGING PRINCIPLES:** Current per minute/distance dependent pricing in the traditional PSTN context, compared to distance-independent IP Pricing, will lead to a market driven, optimized and distributed interconnection model connecting with incumbent legacy resources This will encourage the emergence of dedicated market players (access and traffic carriers, end-user service providers). Moreover, it should be noted that the existing revenue sources of ISPs, would not be able to generate the funds required for infrastructure renovation required by the migration to NGN.

ERG1: Alcatel views on transition from PSTN to NGN IP Interconnection points

The first and most important aspect of transition is the profound impact of all forms of IP-based applications on PSTN voice markets and interconnection models. With the expansion of IP-based communication, different communication media offer specific benefits and constraints, while users arbitrate by choosing their preferred channel based on: **convenience** (ergonomics, skills, community), **context** (indoor/outdoor, fixed, nomadic, mobile) and **price** (service bundles, premium to low/no added value).

This much more sophisticated and complex variety of individual communication options will dramatically affect the "universal" nature of the person-to-person voice services known in today's PSTN, causing strong modification of user-perceived value and usage patterns. Accordingly, transition from PSTN to NGN IP-interconnection points also means transition in the nature of what actually needs to be interconnected (e.g. between service, control and transport planes) and to exchange what (bulk data, accessibility rights, service bundles).

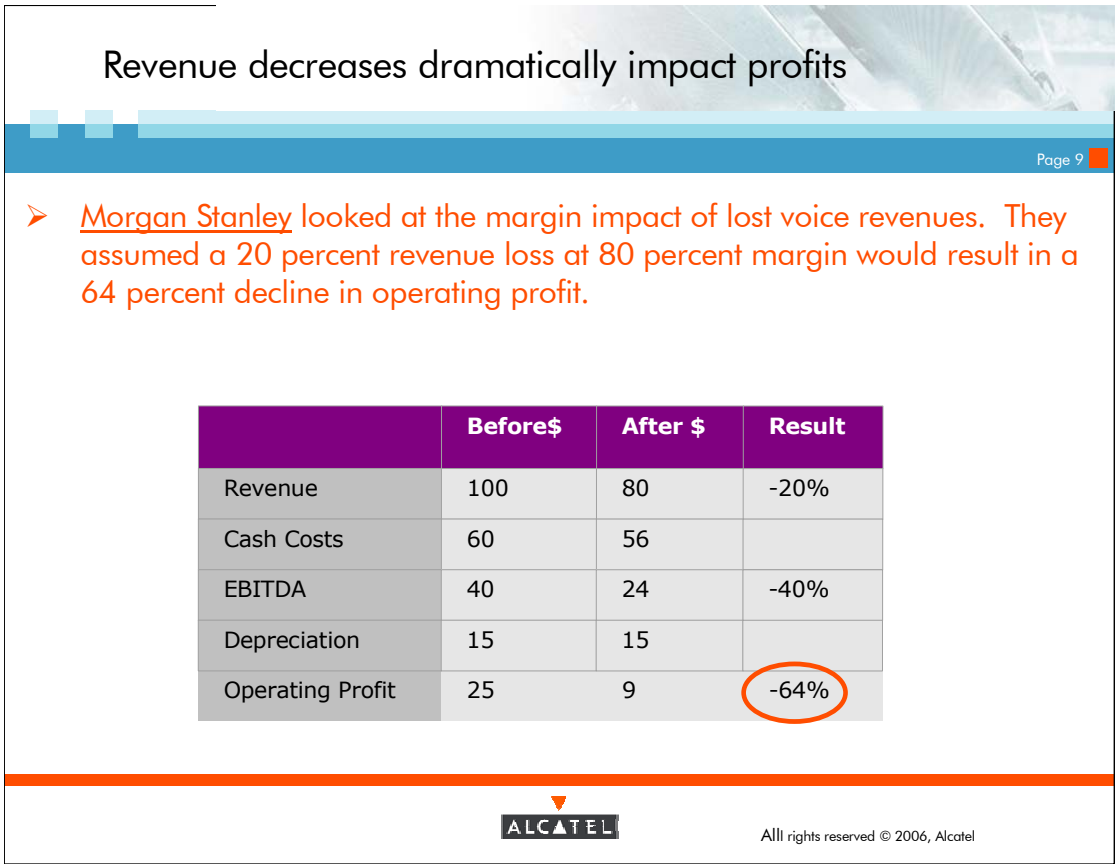
Figure 1: The new forms of person-to-person communications



The second major aspect of such transition is the economic impact that the wide variety of VoIP applications will have on the overall economy of traditional "electronic communications" markets. To simplify, in an NGN context, voice is a commodity service of little economic value – thus the requirements put to IP interconnection must both reflect and enable new business models. The real extent of the impact to be caused by the loss of voice revenues on the entire sector is still unknown or underestimated, but forecasts continue to report dramatic change.

In this new context, markets like call origination/termination in fixed and mobile, Bitstream wholesale, and end-to-end broadcast will require complete revamping if they are to remain "relevant" to this new market reality.

Figure 2: The economic impact of VoIP on Voice revenues



Revenue decreases dramatically impact profits

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- Morgan Stanley looked at the margin impact of lost voice revenues. They assumed a 20 percent revenue loss at 80 percent margin would result in a 64 percent decline in operating profit.

	Before$	After $	Result
Revenue	100	80	-20%
Cash Costs	60	56	
EBITDA	40	24	-40%
Depreciation	15	15	
Operating Profit	25	9	-64%

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IP Interconnection

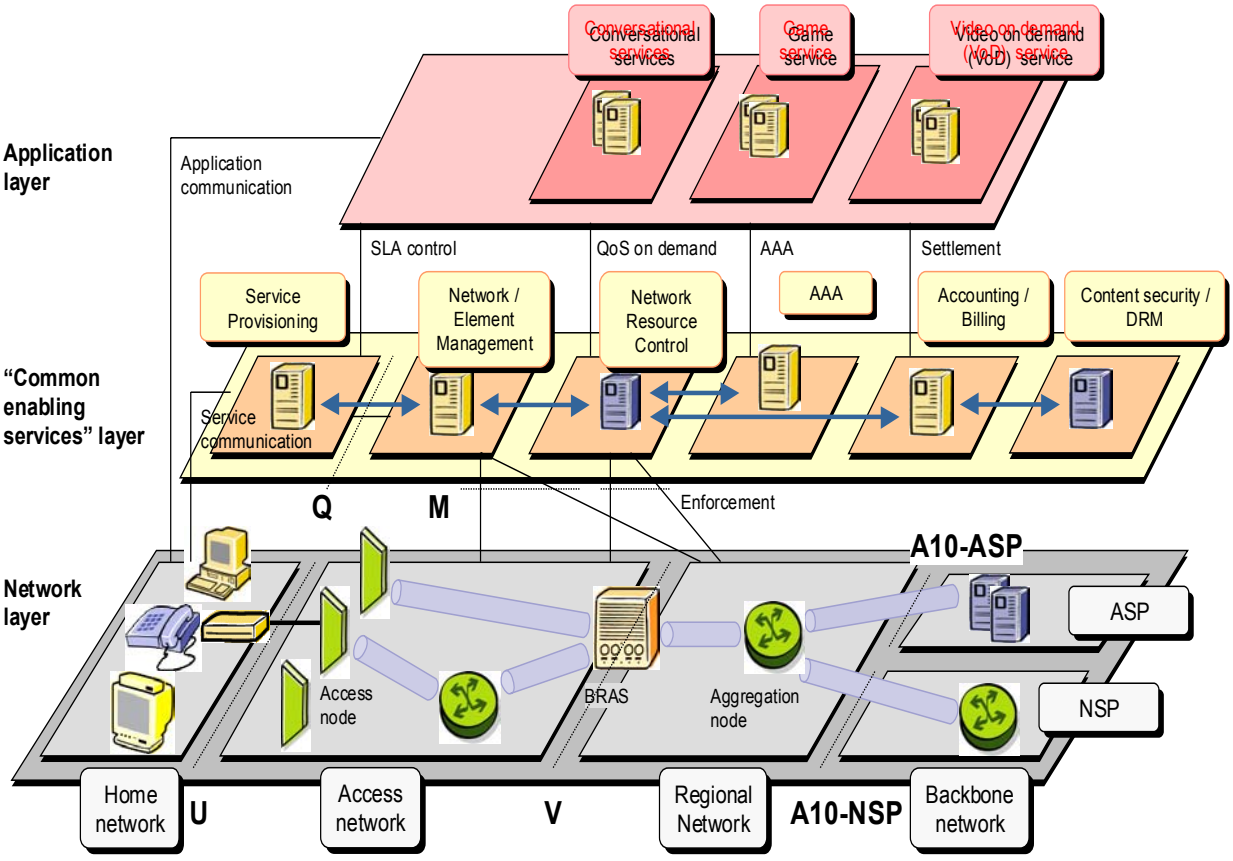
In this context, Alcatel sees interconnection changing in nature based on where, what and the value of the connectivity provided.

Table 1: Multiple forms of interconnection in an NGN IP environment

Interconnection	*Where*	*What*	*Value*
	At Edge or Aggregator	Edge router or BRAS	Access by ANP to ISPs and ASPs
	Between aggregator (ISP) and ASP	E.g. Gq' for IMS	ISPs providing IP services with SLA to application service providers

The DSL Forum provides a clear picture of the relation between business roles and interconnection.

Figure 3: DSL Forum analysis of layered interconnection (source DSLF)



Interoperability:

Technology-wise, interoperability depends on the level of standards maturity – as defined for Europe inside ETSI TISPAN (working group chaired by Alcatel).

Table 2: Summary of technology standards enabling NGN-NGN service feature interoperability

SERVICE APPLICATION	STANDARD	AVAILABILITY	Use at Interco IP HANDOVER
Fixed	ETSI TISPAN	R1 available, R2 upcoming	With R1 and IBCF (Interconnection Border Control Function)
Mobile	3GPP	R6 available, R7 upcoming	From R6, R7 defines scenarios in which IMS is used as transit network.
Video	ETSI TISPAN	IPTV within R2	Video VLAN/VC at Service-aware edge access manager

Service-wise (core service set common to all interconnected NGNs) – interoperability depends on exchangeable customer OSS data. With TISPAN and 3GPP IMS the UPSF (User Profile Server Function /HSS (Home Subscriber Server) are concentrating the subscriber configuration data in a virtually single place in the network. This allows for easy operation of the OSS/BSS and reduction of OPEX.

Quality of Service (QoS):

Introductory statement: both voice and video are sensitive to packet loss. Voice is also sensitive to latency. This means that both will require a guaranteed end-to-end QoS on an individual session basis. QoS on a bundle or link basis will not always provide the required "QoE" (Quality of Experience) for an individual session as e.g. an overall acceptable packet loss may be degrading a single session.

A naive and incorrect interpretation of QoS is that VoIP without QoS is by nature a free service but of bad quality. Numerous services available supporting calls on a national and even international level clearly show that on average free offers of VoIP calls tend to be of good quality, the underlying issue being however the lack of any form of guaranteed reliability.

QoS in a VoIP context does not allow you to differentiate up front with a good versus a bad service per se. Core to the value proposition is the concept of "predictable service". This concept means that on average a VoIP call in its simplest form is on average of acceptable or even good quality but the quality can deteriorate dramatically when other Internet services are active over the same access line. A typical example is a VoIP call for a teleworker, which suddenly drops to unacceptable quality if the mail decides to sync in the middle of the call.

To achieve "guaranteed" QoS, the application needs a way to reserve bandwidth to impose the communication service. In reality this means some kind of priority mechanism is set up on the access line and the QoS enabled traffic is handled as priority traffic and is managed by the defined processes[1].

A key issue for competing operators is to what extent access and core asset owners are allowed to reserve such QoS control for themselves creating a unique differentiation, and to what extent equivalent or similar QoS should be made available as a wholesale capability, based on negotiated market conditions.

Network structure (architecture and topology):

The TISPAN NGN architecture allows for peering points towards PSTN and with other IP networks:

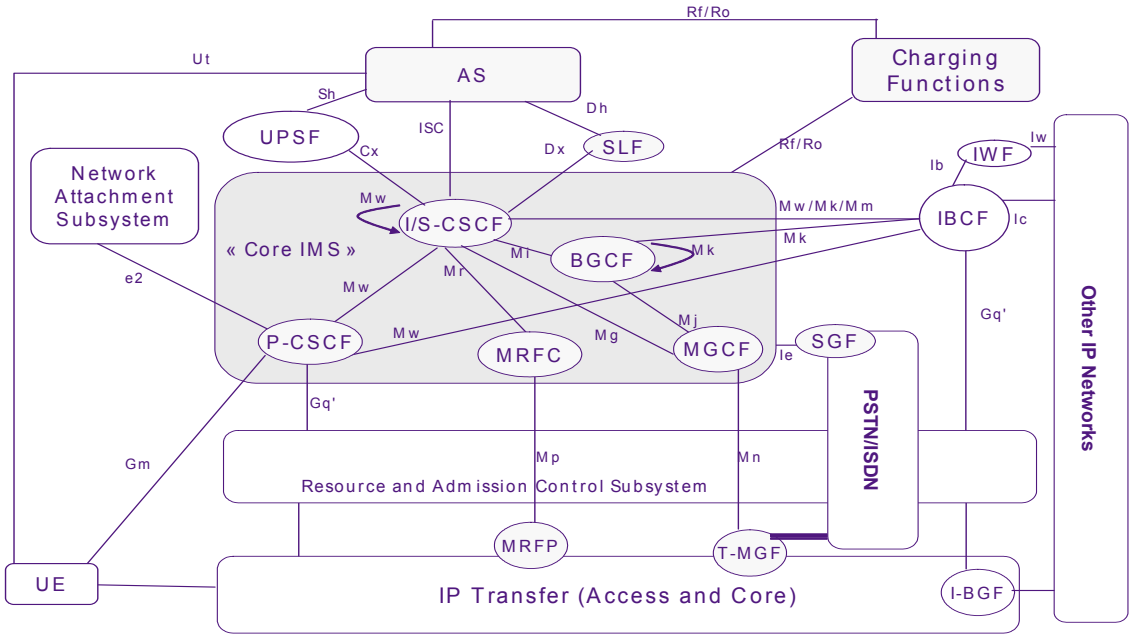
- **Interconnection to PSTN** happens through media gateways controlled by MGCF (Media Gateway Control Function).
- **Interconnection to other IP networks** happens to border gates controlled by IBCF (Interconnection Border Control Function).

In 3GPP, the IBCF is introduced in R7 as an option. In earlier releases, IP interconnection is already possible via I-CSCF interconnection for SIP URI, and via BGCF interconnection for Tel URI.

We note that the interconnection to other IP networks may also carry PSTN traffic that could be handed over to the PSTN after transiting via one or several IP networks. More generally, IMS can also be used as a transit network for its own non-IMS users, for interconnecting enterprises and for other network operators providing connectivity to both PSTN and IP endpoints. It can be anticipated that gradually interconnection with PSTN will fade out to the benefit of full IP connectivity.

In the mobile environment, not only interconnection between caller and called networks is required, but also between visited and home network for each party of the connection (caller, called). Two models of interconnection are possible, i.e. interconnection at GPRS level (when GGSN is in home network – this is the more typical scenario), and interconnection at IMS level (P-CSCF to S-CSCF, when GGSN is in visited network).
The TISPAN NGN supporting IMS today and IPTV tomorrow is by definition "access agnostic". TISPAN R1 focused on DSL access but R2 will definitely extend to other access technologies. 3GPP defined IMS with the requirement of agnostic access in mind. 3GPP has defined the specific features for control of the mobile access network, whereas TISPAN R1 has defined the DSL access specific control with NASS and RACS.

Figure 4: Overview of IMS-based interconnection (source ETSI TISPAN)



Topology of NGN interconnections: unlike in the PSTN there is little hierarchy expected in NGN. The NGN network architecture is flat compared to the clear hierarchy of PSTN. Interconnection requirements are ventilated across a large range of functional families as listed below.

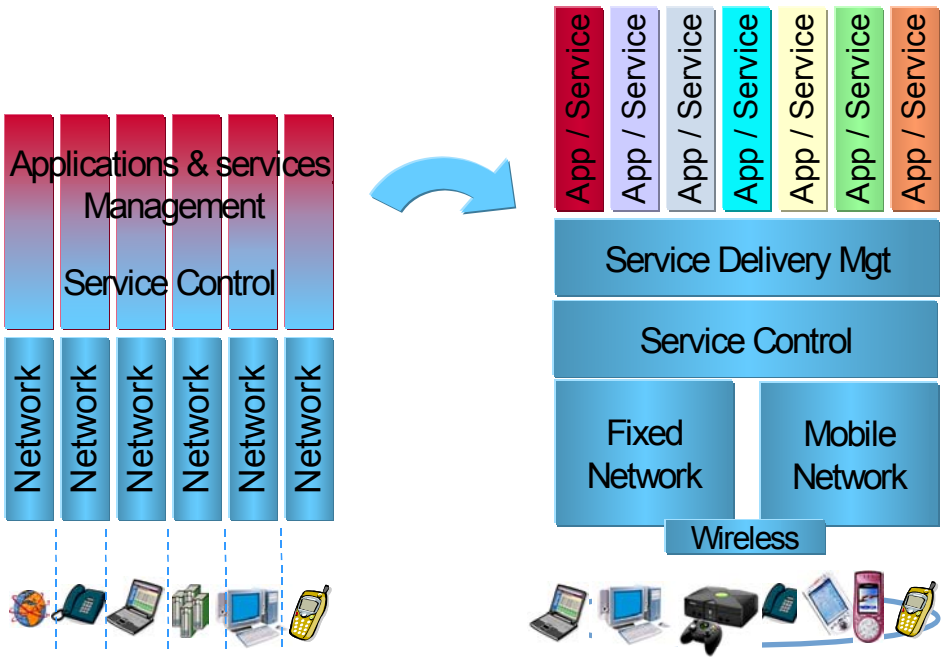
Table 3: List of NGN IP functional family interconnection requirements

Functional Family	Interconnect Requirements
Transport Functions	• Service independent transport (transparency • Open interfaces • End-to-End QoS
Control Functions	• Bearer capabilities • Call/session set up • Application service • Admission Control • Security
Service/ Applications Functions – building blocks	• Real-time (e.g. VoIP) • Streaming (e.g. IPTV) • Non real-time (IM, presence) • Multi media (e.g. IMS)
Service User Profile Functions	• OSS interfacing • Exchangeable data parametering • Identity Management
Legal requirements	• Emergency calls • Localization • Legal/lawful Interception • Personal data protection • Network integrity/security • Open access

Network costs:

The evolution to a common IP infrastructure allows a shift from service offering according to a vertical or stovepipe model to an integrated model.

Figure 5: Evolution from vertical to integrated service offerings based on IP

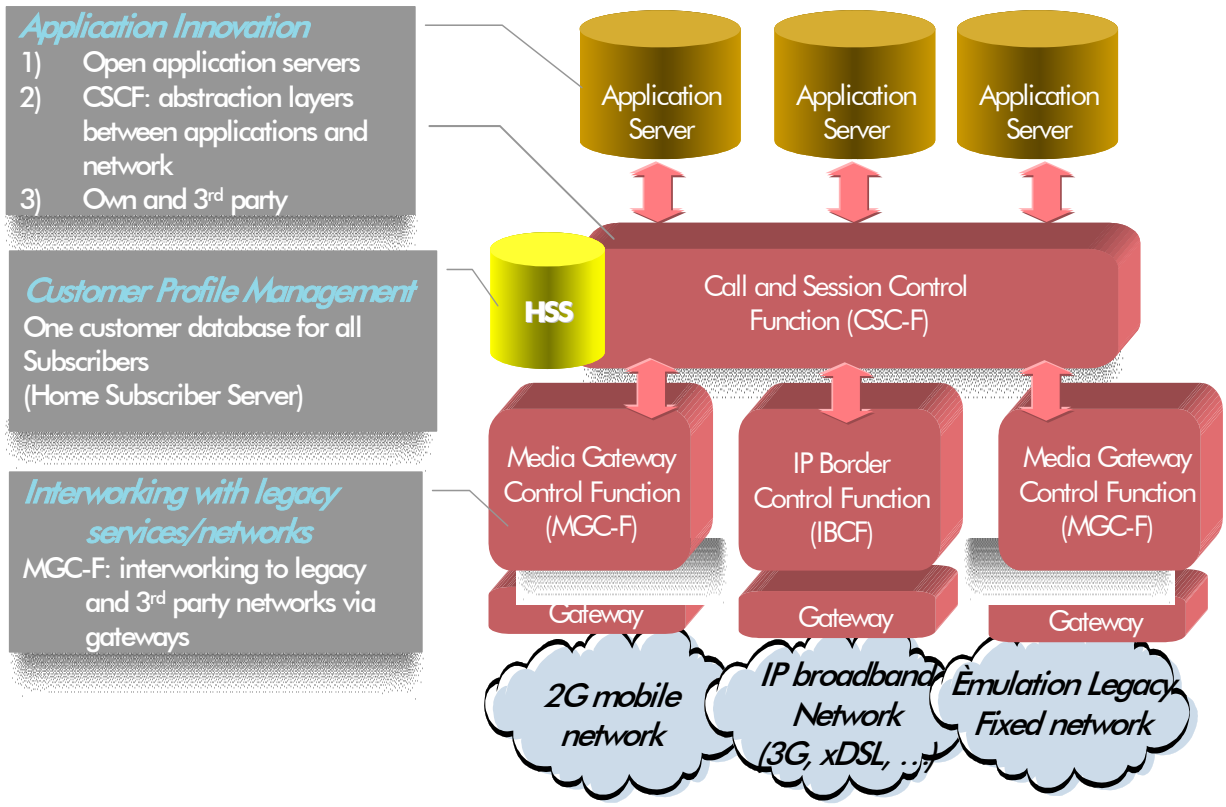


This has several advantages both from an operating point of view as from a service offering point of view.

- **Operational:** Instead of operating services individually with distinct technologies, an integrated mode of operation becomes possible. The OPEX decreases as operation of the network and introduction of new services are simplified. Service profiles (i.e. subscriber data) are maintained in the HSS, and not in the individual elements, within a unified database. The layered architecture (Media Plane, Control Plane, Application Layer) allows for specialization by operators with further reduction of the OPEX. The underlying unique transport network and shared accesses also reduce the CAPEX significantly.

- **Service:** A blended (more than merely bundled) service offering becomes possible with increased customer satisfaction and creation of new revenue sources for providers. Nomadicity and mobility become possible.

Figure 6: Alcatel synthesis of integrated IP-based service resource blending



ERG2: Alcatel views on "local" Interconnection in NGNs

In the context of this consultation, we have interpreted "local interconnection" to mean, "a service provided by an access asset owner who supports some type of first mile providing access to service applications provided by his own organization or by competitive players who do not own access assets in the access area". In traditional local interconnection regimes based on circuit-switched TDM, one of the main ambitions of the access owner is to get rid of the "foreign" service traffic at the earliest point possible, with the objective to offload such traffic at the access level of the network.

As long as we consider basic services, this trend will persist in the VoIP space. Which means that if an access provider just supports a transparent pipe to an ISP who will support a set of basic services, there is little interest to fundamentally change today's model. Specific requests from access providers have been seen to confirm this interest

whereby a flexible access solution is requested that facilitates traffic delivery to a large number of "ISPs".

The nature of VoIP and growing competition naturally tends towards developing more complex communication services, including services beyond the strict field of person-to-person communications. User groups no longer remains limited to the offers made by traditional telecom players such as asset owners and ISPs, but the Internet community as a whole is discovering a vast array of communication related assets, which are more and more easily available.

The model where the incumbent as SMP (Significant Market Power) dominates the emerging world of IP-based communications is becoming more and more questionable. In a context limited to electronic communications, the role of the SMP would probably remain, but in this wider Internet context, existing SMPs and other facilities-based players are increasingly motivated to act as "capability" providers for the web community. Clearly the owner of communication assets can offer specific capabilities, which bring value to the web community, for example, the ability to:

- Easily establish different forms of communication to any user,
- Determine location (e.g. for emergency services),
- Control the quality of the service provided over the assets.

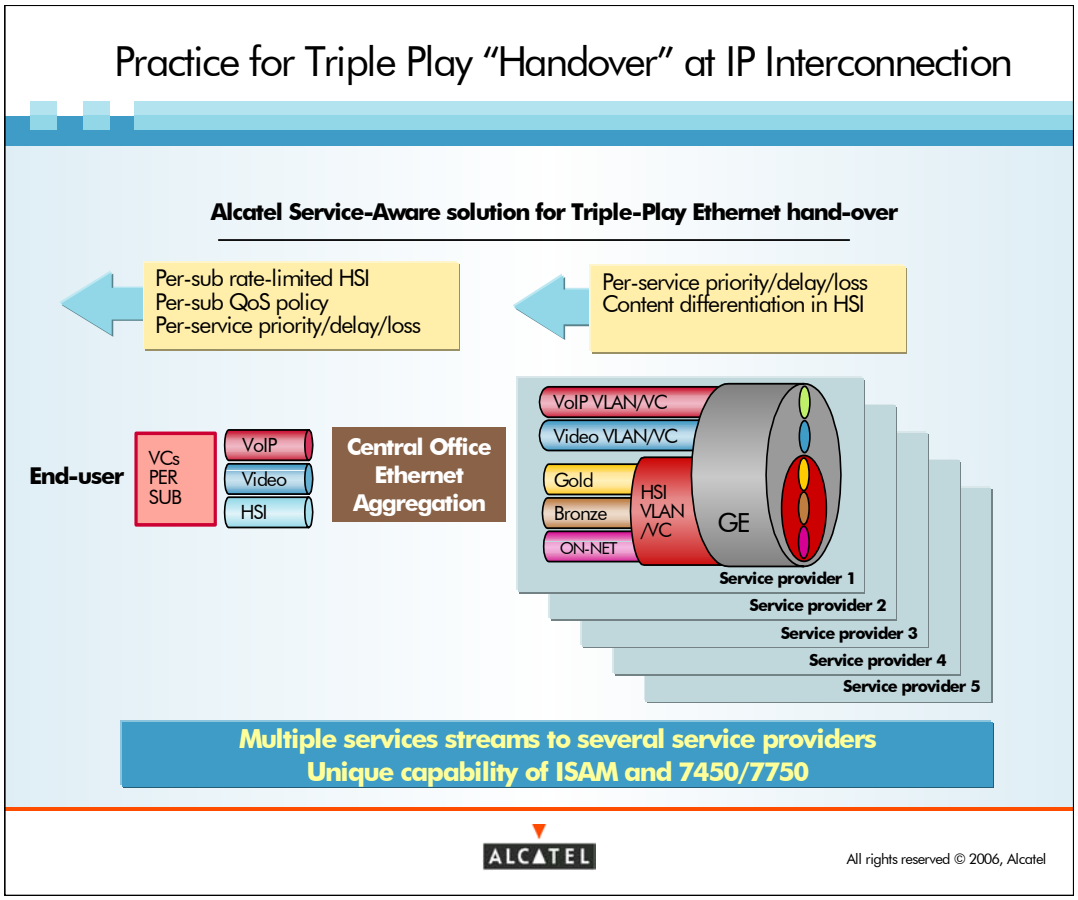
Additionally, the SMP owns feature-rich payment assets, which could enable existing Internet players to more effectively price, their services. The most advanced SMPs realize that they can set up new wholesale regimes whereby they evolve their access interconnection offering into a capability-sharing offering. This capability sharing will be done relying on technologies such as SOAP/XML, EJBs and SIP servlets.

The new capability wholesale regime could be either an evolution of the existing "local interconnection" regime of the incumbent, or offered by larger ISPs as a set of capabilities relying on their existing "local interconnection" regime with the incumbent.

Interconnection options

In an NGN context, "service-aware" equipment enables IP interconnection and Triple Play handovers between the host access provider and interconnected service providers according to a large variety of QoS and services features specified by Service Level Agreements (SLA).

Figure 7: Alcatel synthesis of logical Access Interconnection options



ERG3: Transition towards NGN & implications on existing SMP products and bottleneck facilities

The pace of transition in the market differs from operator to operator, with some going for a radical migration towards NGN, while others are choosing a more gradual evolution. The choice is often based on the status of the legacy network: i.e. the balance between maintenance of the largest part of network versus only smaller parts of the network with end-of-life equipment.

Basic policy and regulatory issues regarding PSTN services at IP Interconnection:

Policy and Regulatory approaches to publicly available services based on NGN must remain coherent with the basic services that ensure the public interest or business models regulated in today's PSTN offerings:

- "Legal interception" and "public security" services (access to user data and content)
- "Emergency" services (call termination, and caller localization)
- "Interconnection" services (number portability, carrier Pre/selection)
- "Call handling" (CLIP/CLIR, MCID) and related public interest services
- "Call billing" (e.g. single bill for all communication services)
- "Lifeline" (ie the fact of powering the traditional phone set from the local exchange, thus ensuring access to all users in case of emergency).

However, when considering IP-based interconnection, Alcatel underlines the need for policy makers to take into account new market realities such as:

- Due to deregulation and the emergence of **mass-market VoIP**, the traditional PSTN voice market value has already been reduced by 2 thirds (1 third in long distance, 1 third in access markets). The only value left being provided by functions such as "call control, subscriber management and supplementary service platforms". As shown throughout this response, pressure from VOIP applications will further decrease the overall value of voice. Operators with decreasing revenues will not be able to invest and the risk of a downward spiral becomes reality.

- **Legal interception** is not possible in a large number of VOIP cases (worldwide intranets, business VPNs and Closed User Groups, peer-to-peer session links, fully unbundled loops by ISPs), moreover, in most countries, interception agencies are not ready to exploit native IP data. Nevertheless, Legal/lawful interception will remain a legal requirement. It is not because it is difficult or impossible that the requirement could be dropped – and the vendor community is active in developing new LI technology to cover an ever-growing range of communication services. In mission-critical cases, one alternative would be to prevent those services that cannot be intercepted.

- **Lifeline** obligations, however, are largely outdated and could be abandoned given the large number of alternative devices to traditional phone sets that are already available (without a lifeline service guarantee) such as mobile and cable terminal devices. This is the sole feature of the PSTN universal service set of obligations that cannot be guaranteed for VoIP terminals (locally powered). This handicap could be temporarily overcome using autonomous battery solutions with minimum duration guarantees (e.g. 8 hours CPE autonomy in case of mains failure).

- The level of granularity for **mandatory location data** differs considerably from one type of network/user to another (e.g. identify caller's building but not necessarily which apartment). A best effort compromise will need to be reached by policy makers in cooperation with Industry (ie based on technology constraints).

Alcatel views on IP Interconnection issues and related network equipment:

- **Feature Parity:** Today, full feature PSTN/ISDN service parity (black-phone to SIP phone feature compliance) in NGN is not realistic. However, this is not yet seen as a market requirement (for example, operators usually make Class 5 replacement with a limited set of features), proving that there is a market for a product that only contains the "most used features": Call Forwarding, Call Barring, … Many service providers have launched a number of services additional to POTS such as ISDN and, later on, DSL-based broadband access services. While each service has had varying success, an increasing number of service providers are examining their range of service bundles. This will lead to removing outdated legacy solutions like consumer ISDN, which have been superseded by more attractive end user services today. When considering feature parity, it is important to define the scope. Service providers should be encouraged to carry out a rationalisation of the number of service combinations replacing some services with more effective alternatives. In markets with growing competition there is a clear trend to selectively phasing out certain PSTN/narrowband service options in favour of stronger alternatives. Secondly, many service providers have included some functions in their current network that have never been explicitly promoted or commercialised as service features on the market. Feature parity should only relate to those commercialised services all-to-all, which have been implemented in a significant way.

- **Geographic location:** This Alcatel basic function enables a number of location related services (emergency call tracing, call charging, call barring, time/zone call tracing, location based IN services, caller authentication and registration.

- **Trunk gateways** are boxes that simply translate from one protocol to another (e.g. from PCM-over-channel-x to IP-over-Ethernet) and vice versa. They act solely on the media plane (voice). The question on feature parity as such is not relevant for trunk gateways. Trunk gateways are located at the border of the IP network and the PSTN. Their exact location is not relevant.

- **Media Gateway Controller**: The media gateway controller (trunk gateways or access gateways) uses various forms of Media Gateway Control Protocols (MGCP, MeGaCo, H.248). The MGC can serve as an NGN based replacement of older C5 exchanges by H.248 controlled Access concentrators where feature parity is absolutely required.

- The **Softswitch** is used in a **PSTN-Simulation scenario**, where the end user is aware of service change, since he gets special equipment at home to connect additional equipment. The Softswitch based solution is also used for the IMS based **PSTN-Emulation scenario** where full feature parity is not a hard requirement.

ERG4: Advantages & disadvantages of charging principles in NGN

In this reply we consider the term "NGN" to cover, in particular, all forms of VoIP services as defined in the scope of IMS/TISPAN.

As noted, pricing structures will naturally push the evolution of interconnection to a "lowest cost point".

- Support for **IP to IP services** is not necessarily considered to be free but is considered to follow a pricing model, which is independent of distance[2]. This means that if an IP to IP call is handed over at an interconnection point, the amounts charged across the interconnection point is independent of the location of the interconnection point itself.
- Support of **call termination to traditional POTS** users irrespective of whether they are served by a TDM or VoIP infrastructure do not change. This implies that in most markets the call charges for local termination are fundamentally different from the call rates, which are applied when the call is handed over at a remote interconnection point.

Whenever the new pricing model is applied, specific interconnection architectures are appearing especially in some markets where cable players are actively involved in voice. These architectures tend to follow an evolution towards the lowest possible interconnection cost and rely to a large extent on partnerships between the competitive player(s), who has a considerable presence in the market in question, and other national or foreign players.

The concept described above applies equally well to the international context where the price difference between call termination in the target country and remote countries are fundamentally different. Again, the least cash out solution would result in an IP peering to an IP player in a market who has access to local PSTN interconnection points.

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[2] It should be noted that "pricing" can be independent of distance whereas "cost" is naturally dependent. An IP connection of 1km is clearly costing less than a 10000 km connection. For conversational services the quantification is rather straightforward, this is not the case for streaming services that may be proxied.