

Efficient Softswitching

Reduce core network OPEX by up to 50% while moving towards all-IP.

1. Executive summary

Telecom operators are facing considerable and growing competition for their key service, voice telephony. Competition comes not only from other operators but also from an ever-growing number of low-cost virtual operators and, most recently, from free Internet Service Providers. To address this threat, operators must drastically reduce service delivery costs. Telecom quality softswitching provides the means to do this. It enables a fully secure and user-transparent migration of today's network to an ultra-efficient, IP-based next-generation network. This offers huge OPEX reductions whilst also building the foundation for IP Multimedia Subsystem controlled all-IP networks.

The centralized network control and distributed switching inherent in softswitch network design offer big savings in operation and maintenance (O&M) and transport costs. Further OPEX savings result from the closure of many of the existing switch sites, saving rental, power and staff costs. A number of case studies have been undertaken to evaluate how softswitch technology can be used to reduce core network OPEX. These studies, together with the past operational experience gained from commercial softswitch operations, indicate that core network OPEX can be reduced by up to 50%.

For many operators efficient softswitching is the first step towards an all-IP vision. It enables a smooth migration of signaling and service traffic from a classic circuitswitched network to a multi-service IP network. Superior price/performance of IP based equipment and networks combined with improved scalability of softswitch nodes delivers much higher capacity per unit of investment.

2. Introduction

All IP – From Hype to Reality

After many years of promises and hype, IP voice services and solutions are beginning to make significant inroads among operators, enterprises and consumers. IP networks can now offer telecom quality rather than best-effort performance and it is clear that, whatever the technical challenges may be, a growing proportion of telephony traffic is going to be carried over IP networks.

From Vertical Integrated Network to Layered Network Architecture

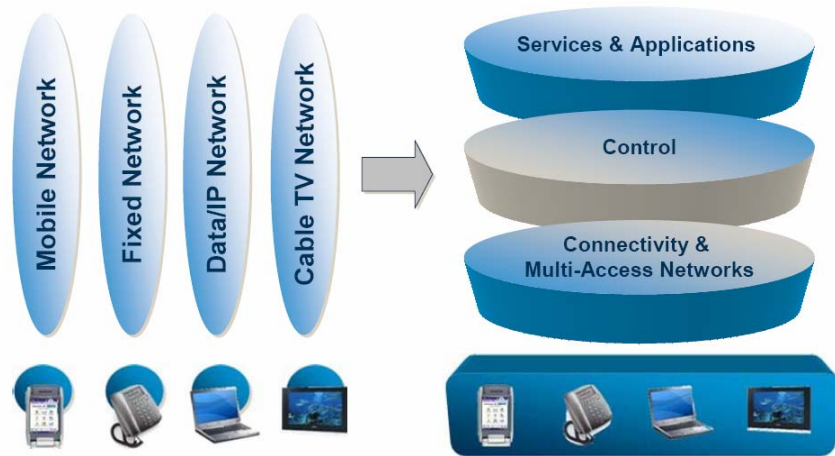


Figure 1 Single-service network vs. multi-service network (telecom quality)

Traditionally, vertically integrated networks have been built to deliver single services such as telephony or data access. Softswitching and IP technology enable a layered architecture approach, under which service execution, control and connectivity can be horizontally integrated across multiple access networks.

Softswitches separate the call control and switching functions into different nodes, consequently separating control and connectivity layers, (see Figure 2).

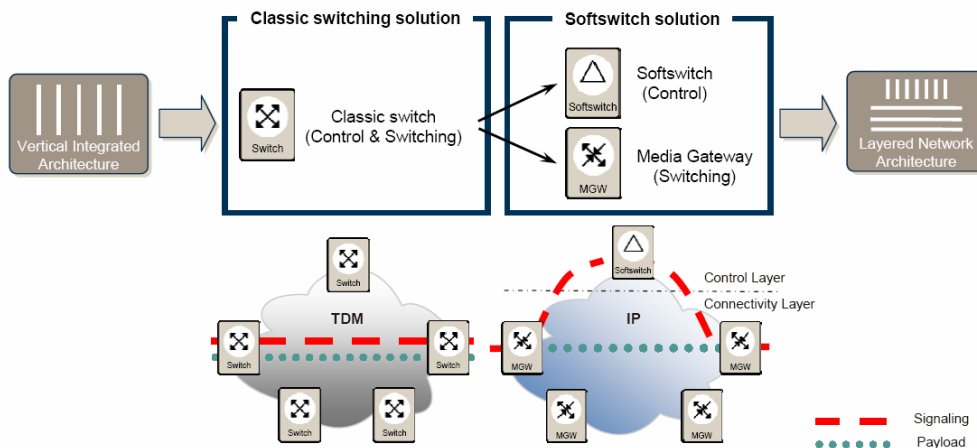


Figure 2 From vertical network to layered architecture

The new architecture also supports efficient IP transport of both signaling and payload which is not possible with classic switches. This means a single, common multi-service IP infrastructure that can handle all network services, including fixed and mobile communications, data services and even TV.

In the control layer, softswitches act as control servers for voice. They handle the signaling between network nodes and other networks to set the call up and manage

its path end to end. Media Gateways (MGw), controlled by the softswitches through a standardized Gateway Control Protocol, are responsible for the connectivity through the IP backbone network and for media stream processing. The MGw provides the interfaces to the access nodes and to other networks such as VoIP or TDM. This fundamental characteristic supports an evolutionary approach to network development, allowing migration of technologies and services as the need arises.

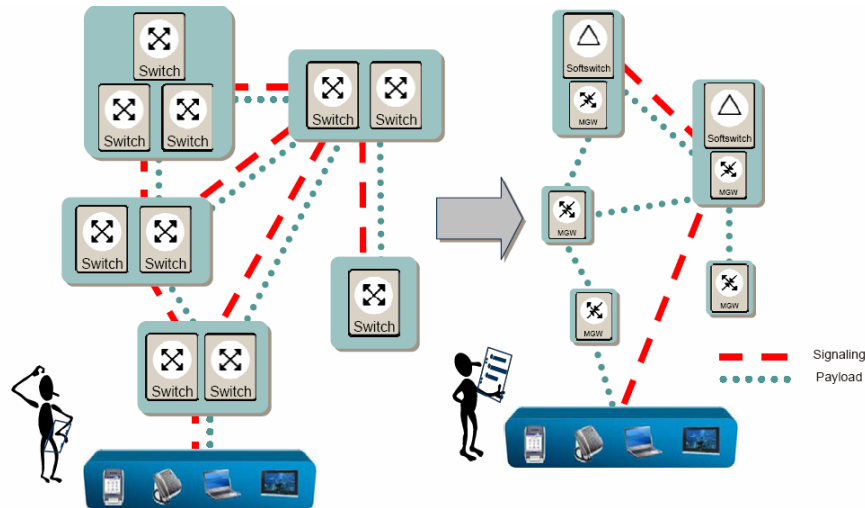


Figure 3 Initial network topology vs. softswitch network topology – All servers are centralized at just two main sites.

Another key benefit is that softswitch provides a much more efficient network structure (see figure 3). Sophisticated control servers process the network signaling, handle network intelligence and interface to the customer care and billing systems. This equipment can be centralized at the major sites to significantly reduce O&M costs. Small and relatively simple Media Gateways, which handle the actual service traffic in the connectivity layer, can be deployed widely and much closer to where traffic is originating and to interconnection points with other fixed and mobile networks. Since the majority of calls in most networks are locally terminated, the ability to provide local switching for calls on the same network and local break-out for calls to other networks can dramatically cut transport costs.

Additionally, MGw equipment is optimized for efficient packet transport of service traffic, compared to classic switches which use traditional Time Division Multiplex (TDM) transport. This offers further OPEX savings, especially in mobile networks where each voice call requires 60 to 80% less bandwidth in the transport network. Operator case studies, supported by live commercial experience, show that softswitching can reduce core network OPEX by up to 50%.

Softswitching is also a critical step in the evolution to all-IP. Softswitching enables the very high volumes of voice traffic in today's networks to be securely migrated to a telecom quality, multi-service IP network. That means service control can be more easily migrated to the IP Multimedia Subsystem (IMS) in a phased and controlled manner – with full confidence that the real-time requirements of the IMS services are already well established in the connectivity layer. The softswitch server and gateway elements can also be fully integrated within the IMS domain.

Safe introduction of softswitch technology in the operator's network requires an open, standards-based solution designed for robust and resilient performance. This means applying modern softswitch technology to proven telecom platforms. Adopting this approach provides full network design flexibility and all the resulting OPEX savings. It also retains the features, functionality and platform characteristics that have evolved over many years to meet specific operational needs and service requirements. Over time, these softswitch platforms will evolve towards generic, high-availability server architectures, using commercial, off the shelf processors and open source operating systems. Such systems will integrate support for VoIP and traditional voice services.

Technology Challenges for Softswitch Solutions

Making an IP network suitable for voice communications poses a number of challenges. While today's IP networks work very well for data, voice traffic demands some work in the areas of quality of service (QoS), availability and security. Service reliability is by far the most critical factor for operators to deliver if they are to avoid becoming bit-pipe providers in a best-effort world.

Moving voice to an IP-based network is an evolutionary process that needs to combine the best of the telephony world with the best of the IP world. Guaranteeing all kinds of voice services in this network requires a rethink of how IP networks are designed and built. Not only will this network need to be flexible, it must also provide extremely high availability and help the operator offer new, differentiated services that are both dynamic and personalized.

Traffic characteristics for voice and data are very different. Real-time, near real-time and best-effort communication requirements need to coexist under different service conditions. The greater the service mix, the more technical challenges operators will be faced with – although the economic benefits will be greater. Getting all services to work well over IP requires a multi-service network that meets both customer expectations and network service requirements.

Another benefit to operators is the compatibility of subscriber services, signaling and billing systems with existing legacy networks. As today's networks are so widely deployed, with many legacy functions developed over several decades, operators must be assured that they can evolve their networks but still support the functions of the traditional networks.

3. Softswitch Benefits

Evolution Needs

Telecommunication is a dynamic, high-technology industry and operators must aggressively evolve their services and operational base to remain competitive. This becomes even more critical as service delivery moves to IP, opening up new opportunities and competitive threats. The following three attributes are very important to support easier and earlier access to new business-enhancing technology:

- **Softswitching:** Softswitching of high volume traffic is instrumental in migrating today's telephony traffic from circuit to packet based technology.
- **Layered architecture concept:** separating the different functional layers of the network. This in turn increases flexibility by allowing each layer to scale and evolve independently and work seamlessly across multiple access networks.
- **Standards compliance:** Full commitment to standards compliance and interoperability is essential to maintain an efficient multi-vendor network environment. This ensures that new network solutions are compatible with legacy systems and future-proof as telecom technology progresses, preserving flexibility and choice.

Reducing the Operating Expenditure

Aggressive reduction of recurring costs is essential to maintain competitiveness, improve margins, and secure the existing business. The largest addressable cost for both mobile and fixed infrastructure relates to network OPEX. Large cost savings are possible by restructuring the network: reducing the number of sites, fewer intelligent and complex nodes and therefore simplified operations. Softswitch solutions are essential to this process since they allow the application, control and connectivity functions to be handled independently.

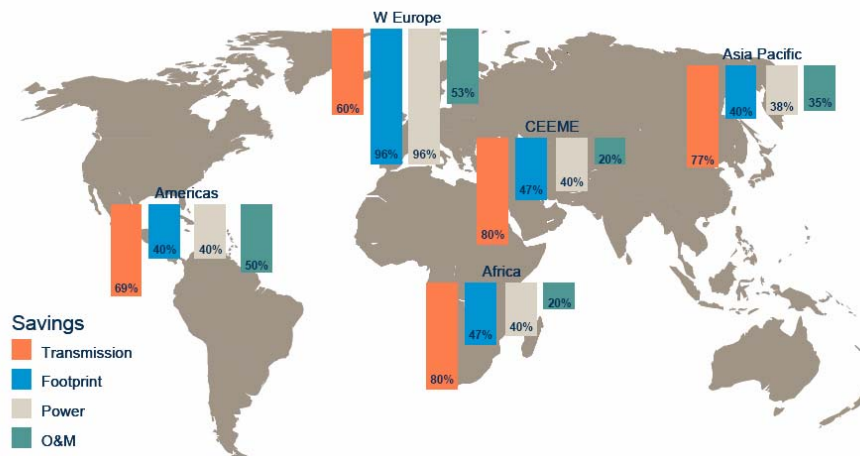


Figure 4 Current front line experience

A number of case studies have been undertaken to evaluate how softswitch technology can be used to reduce OPEX. These studies, together with the operational experience gained from commercial softswitch operations over recent years, indicates that core network OPEX can be reduced by up to 50% (see figure 5), focusing on the following areas:

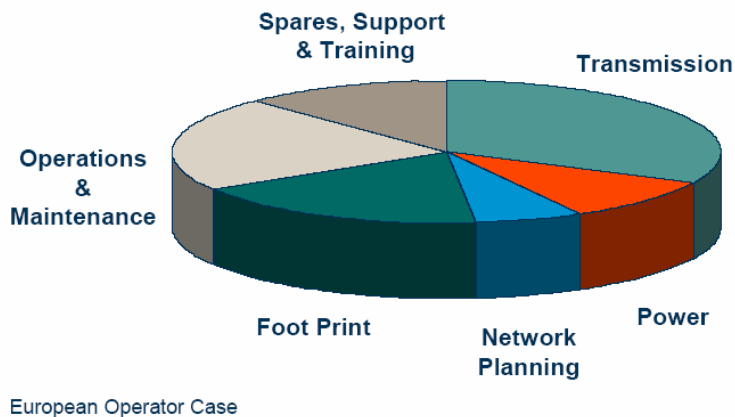


Figure 5 Core network OPEX reduction by up to 50%

Foot Print:

Reduced equipment footprint along with the centralization of control layer equipment can be used to close many sites and massively reduce the space needed at others. The flexibility of softswitch network design means that the main retained network sites can be located in low rental areas.

Power Consumption:

Simplifying the role of equipment such as servers and gateways means that the latest technology can be used most effectively to achieve higher levels of integration and reduce size and power consumption. Ultra modern servers and gateways that are initially used for network capacity expansion can also support a phased replacement of older network switching equipment offering great savings in power consumption and network footprint.

Transmission:

Packet backbone technology together with new standardized features for efficient voice coding reduces the bandwidth required for transmission of voice.

Operations & Maintenance (O&M):

The network planning benefits listed above also apply directly to O&M as well.

Additional O&M benefits include:

- a) Separation of the network layers allows the sophisticated server equipment to be centralized close to the major network operations centers. This facilitates a substantial reduction in O&M overheads and expenses.
- b) Pooling of servers and network level redundancy of network equipment and transport reduces the number or severity of critical O&M events and allows the maintenance of close to zero network downtime during normal working hours.
- c) Rationalization of network technology and transport infrastructure reduces network complexity and the number and criticality of alarms.

Network Planning:

Moving the transport network to IP greatly reduces the complexity of provisioning and dimensioning thousands of point-to-point TDM links, as is required for today's signaling and traffic networks.

Spares, Support & Training:

Rationalizing the function of servers and gateways and modernization of the hardware reduces the number of hardware types. This in turn reduces hardware support costs and training needs. Such costs are further reduced if the softswitch solution is based on the same platforms as found elsewhere in the existing network.

4. Stepwise Evolution

This evolution, described in the following sections, supports a sustainable business model by enabling operators to modernize their telecom networks, introduce IP multimedia services and, ultimately, implement a converged IMS based architecture that handles fixed and mobile services as well as new multimedia services.

Step I – Cost Reduction through Softswitch

For telephony operators, the first – and most urgent – step is cost reduction through modernization of the aging circuit-switched network. This involves the introduction of softswitch solutions that separate call control from connectivity and access, as shown in figure 6.

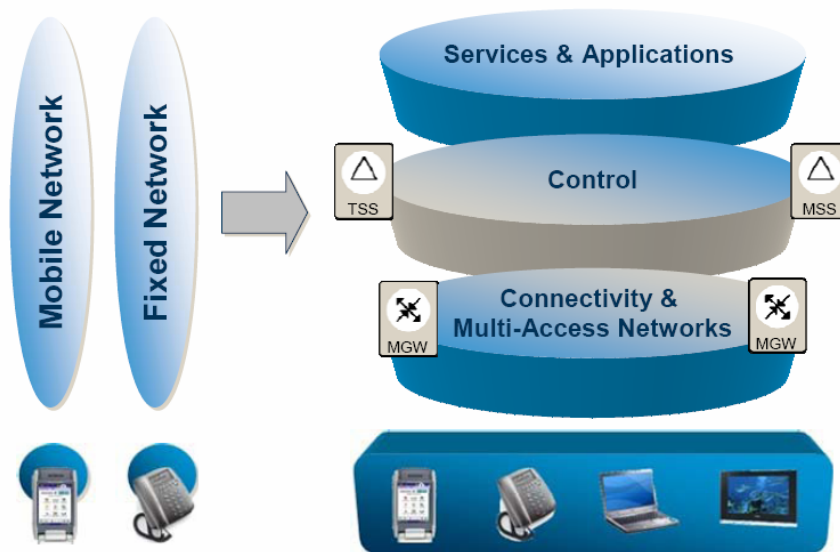


Figure 6 From vertical architecture to layered architecture

Softswitch solutions implemented on proven telecom quality platforms offer the secure migration that is needed for a good end user experience. It also enables reuse of legacy equipment and further protects investment in processes and knowhow. A key requirement for softswitch solutions – besides the usual telecom quality demands of scalability, and cost efficiency – is the compatibility of subscriber

services, signaling and billing systems with existing legacy networks, in order to protect current telephony revenues and margins.

In the light of this, the migration from circuit switching to the modern softswitch solution is likely to be carried out in parallel with evolution Step II.

Step II – Enabling Multimedia Communication

While operators modernize their telecom network to reduce costs, Step II in the evolution process is to introduce new IP multimedia services in order to gain new revenues, as illustrated in figure 7. Here, IMS solutions will play an important role. IMS solutions offer a wide range of SIP (Session Initiation Protocol) based multimedia services capabilities. The same IMS core is used for fixed and mobile systems, meaning it will support fixed-mobile convergence with services like IP Centrex, WeShare1 and multimedia telephony.

For users, IMS-based services enable person-to-person and person-to-content communications in a variety of modes – including voice, text, pictures, and video, or any combination of these – in a highly personalized way.

In addition, IMS takes the concept of layered architecture a step further by defining an architecture where service enablers and common functions can be reused for multiple applications.

For these reasons, IMS will become the dominant solution for both fixed and mobile operators' multimedia business. IMS enables services to be delivered in a standardized, well-structured way that truly makes the most of layered architecture. At the same time, it provides a future-proof architecture that simplifies and speeds up the service creation and provisioning process, while enabling legacy interworking.

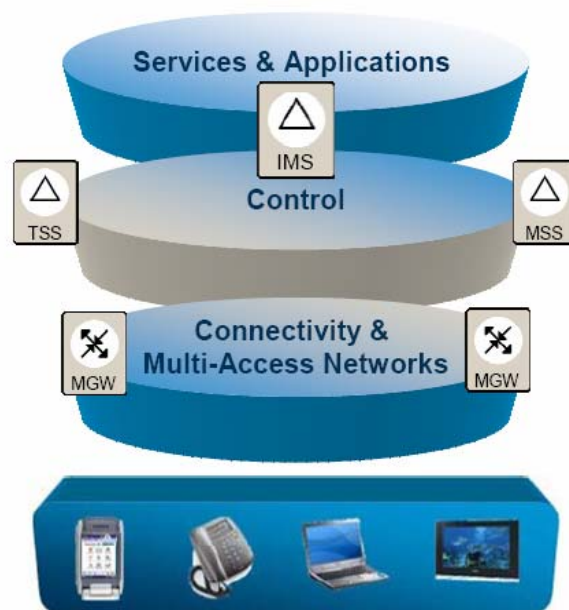


Figure 7 A Converged IP based multi-service network

Step III – A Converged Multi-service Network

The focus of Step I in the evolution process is to deliver traditional telephony services over a more modern and cost efficient network. In Step II, which is carried out in parallel with Step I, multimedia services, such as video telephony, instant messaging, WeShare and IP Centrex are introduced to boost operators' top line. These services are SIP-based and the network is based on the IMS standard.

However, as mentioned earlier, IMS will in the long run become the dominant solution for fixed and mobile operators' multimedia business, including telephony. It is also foreseen that IMS telephony services will be standardized and eventually may replace classic telephony. To reduce risks and uncertainties in this process, a smooth migration from current services to IMS is required.

Softswitch elements such as Media Gateways, Media Gateway Controllers and Access Gateway Controller can be reused in the IMS architecture. This enables a phased migration of realtime communications to IMS and means that the introduction of softswitching is a fully future-proof step in the migration to all-IP.

Operators can start modernizing their network in volume, while also having a clear roadmap to the IMS world. The final target will be reached once all legacy equipment has been removed and SIP is fully introduced.

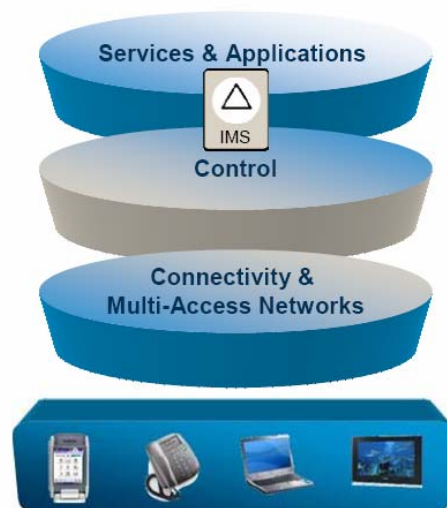


Figure 8 IMS controlled all-IP network

5. Conclusion

Today's operators need to modernize their existing telephony networks to maintain QoS and reduce costs in order to stay competitive. At the same time they need to introduce IP multimedia services at the earliest opportunity in order to capture new revenues. In order to retain their competitive edge, operators cannot delay the process any longer – they need to act quickly.

A three-step telephony modernization evolution strategy has been developed to help operators achieve these short-term business goals, and evolve to a layered architecture concept suitable for both fixed and mobile services that deliver voice, data and multimedia services. Central to this evolution is a full-featured softswitch architecture that enables operators to maintain their existing voice offerings and margins. The parallel introduction of IMS solutions enables expansion into new areas and enhanced service offerings – boosting the top line.

Over time, IMS will provide the architecture for traditional telephony services in addition to multimedia services. But making this happen requires experience and know-how of both the IP network and telecoms worlds. It demands the best of both worlds in order to meet customer expectations.

Aggressive reduction of recurring costs is essential to maintain competitiveness, preserve margins, and secure the existing business. The largest addressable cost for both mobile and fixed infrastructure relates to core network OPEX.

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