PacketFront®
The Future of Broadband. Today

Open access for local exchange carriers

The benefits of introducing 3rd party service providers to your broadband network offering

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1 Introduction

The rapid expansion of the Internet and the advent of IP-based services have completely transformed the telecommunications industry.

- The exploding demand for IP bandwidth has created a situation in which decreasing consumer prices are putting severe pressure onto local exchange carriers.
- New, Internet-centric service providers are beginning to take advantage of the Internet to deliver a plethora of new services. Network operators have invested in, and are operating, the Internet infrastructure on which the services can be delivered, but these operators do not obtain incremental revenue from the providers, who use the operator's network as a channel to reach their own end users.
- Simultaneously, "hype" around triple-play services (data, voice and TV/video) is forcing network operators to bring new services to market. To develop and deploy new services to end users are often time-consuming, costly and complex.

This paper will discuss a business model in which these concerns are addressed – a business model that can be adopted fully or partly. The primary issue is to obtain fine-grained control over the IP services in the access network, and to do so using platforms that are flexible enough to withstand future technological developments.

Many communities deploying broadband networks have already discovered how the open-access business model can be utilized not only to open up the network for new service providers, but also to make the introduction of triple-play much easier, regardless of who is providing the services. And although the environments are somewhat different, there are lessons to be learned here for incumbent local exchange carriers (ILECs), competitive local exchange carriers (CLECs) and cable TV operators.

Habit and complex legacy systems have often called for in-house development of additional functionality in the OSS/BSS environment. Today, it is relatively easy to shorten the time-to-market for introducing triple-play services in a traditional access network by complementing it with a commercially available control system, rather than carrying out costly in-house development.

Such a system should make it possible to control the access to different services in an automated and cost efficient manner. Furthermore, it should provide the level of granularity which is a requirement for the successful distribution of tailored-made services to individual end user.

2 Today's challenges

2.1 A constant demand for more bandwidth

It was easy to predict bandwidth requirements in the voice-centric world of telecommunications. The increasing use of data communications, however, and the introduction of packet networking and, eventually, the Internet, led to fixed capacity being replaced by shared connectivity. It became harder to calculate network use, bandwidth use soared, and traffic became highly unpredictable. Network operators are now hosting large end-user populations characterized by a continuously growing hunger for bandwidth.

Many network operators face an urgent need to compensate for the loss of revenue that has been caused by increased price pressure for voice services, at the same time as the demand for Internet access bandwidth explodes and the price for this type of service falls as a consequence. This is a critical situation for the network operator, since the growth in the volumes of data traffic makes it necessary to increase investment into new, advanced network elements – at a time when consumer prices continue to fall. Revenue must be kept at a level that corresponds to rising requirements in some way.

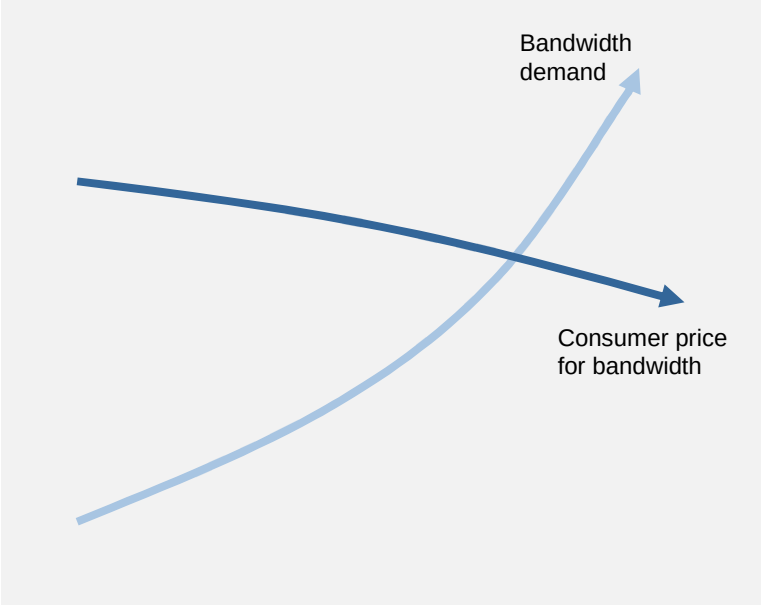

Figure 1: Increased demand for bandwidth at the same time as prices are falling puts pressure onto network operators.

One solution is to implement a strict separation between network and services, enhancing the number of services in the network and, eventually, creating a marketplace for these services. Such a separation allows new business models and new revenue streams to be generated, improving the average revenue per end user and lowering churn.

2.2 Increasing competition from Internet-centric service providers

Several heavyweight Internet players have recently launched Internet-centric alternatives to fixed voice traffic, and in some cases they have even introduced individual distribution of audio/video content. This development poses further challenges for access network operators. The players, such as AOL, Google and iTunes, are using the Internet to distribute their services, and have started to invest heavily into the platforms needed to begin delivery of voice-over-IP (VoIP), video-on-demand (VoD) and IP-television (IPTV).

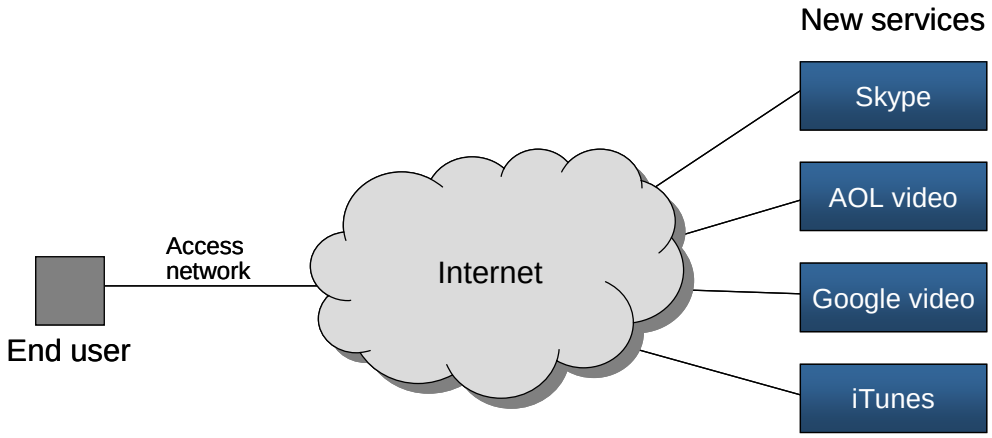

Figure 2: New types of service providers use the Internet to distribute their services.

Such services have undoubtedly been designed to keep network operators out of the future revenue stream! Some of these players are associated with large owners of attractive content (such as motion pictures), and there is thus a real risk that these players will be able to obtain a large share of the financial return that traditional network operators have aimed at by investing in delivery mechanisms for video.

One key question here is how long network operators will be willing to accept that a largely unrestricted amount of value-added Internet traffic passes through their access networks at flat-rate pricing. One solution is to filter out traffic from certain service providers, another solution is to introduce metered access, in which end users pay for certain services or for traffic volumes that exceed a certain monthly level. Filtering out traffic, however, is certainly not a recommended solution, because it will be difficult to retain a customer base that has previously enjoyed unlimited bandwidth.

An alternative, and preferable, way forward is to find incentives for the providers of the services to join forces with the network operators, sharing competence and resources to deploy a model from which both parties benefit. End users will also benefit, since they will be able to take advantage of higher quality, higher availability and security, and a wider range of services.

2.3 The complexity of providing triple-play services

While facing the challenges of decreasing revenue from voice, and increasing demand for more and cheaper bandwidth, network providers are facing requirements to offer other services, such as triple-play services – something which has been “hype” in the industry for a while.

The term “triple-play” is most often used to describe a common, IP-based network platform used to deliver telephony, data traffic and TV/video content fully parallel. Services that require large bandwidth are hosted side-by-side time-critical services, within the same physical access line. The concept of triple-play has much in common with the earlier concept of “network convergence” – although the emphasis now lies on how different services are channelled over a shared network platform, rather than on how such services may melt together.

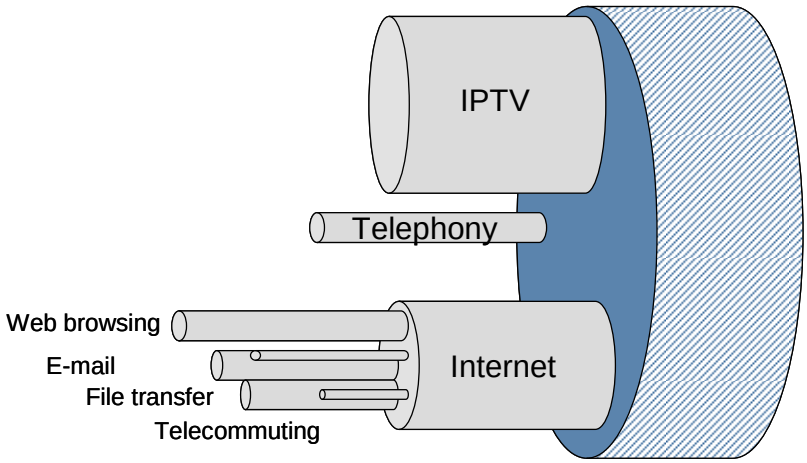

Figure 3: The common model of triple play in which telephony, data and TV are distributed over the same physical access line.

The design of a network for the simultaneous transport of voice, data and TV/video traffic is not trivial. This task is made even more difficult when the starting point is a network that has been designed to transport only one of these traffic types.

The introduction of TV/video services can be particularly cumbersome. The very nature of these services makes it complex to distribute them, given the severe technical requirements on security and quality. In addition, it is necessary to ensure that only paying viewers gain access to a certain TV channel, why significant technical requirements are put onto the underlying physical infrastructure.

Other factors that must be considered when discussing the supply of triple-play services are:

a) the time it takes to bring new types of services to the market;

b) whether the network operator will provide the TV/video content itself;

c) if so, whether the network operator has sufficient competence for providing TV/video content (technically and commercially);

d) whether the customer support helpdesk is prepared to receive phone calls from TV viewers not happy with the quality of the TV reception. End users have zero tolerance for interrupted TV/video services! The difference in end users’ tolerance levels between Internet and TV interruptions must be considered when deciding to provide TV services.

Many cable television (CATV) networks, as well as new players such as metro carriers, plan to introduce triple-play services, complementing their traditional services. It is expected that competition will become fierce when these operators reach the market with their combined services.

The question is, of course, when this will happen. All network operators are facing essentially the same problem: they need to add functionality that their networks were not designed to carry. The critical issue for an operator who wishes to implement triple-play is therefore how to overcome the cost and technical complexity associated with adding new services.

The most common proposal put forward for establishing a future-proof triple-play network is to start with an IP-based network and establish services on top of IP. This design will guarantee that the network and the services are separated, which makes the network easier to reconfigure. This is, however, not enough: the issue of how to carry out mass configuration of such a triple-play network, both in terms of end-user profiles and network elements should not be underestimated. The automation of time-consuming tasks in this area is one important key to minimising the cost of network operation, and eventually creating profit.

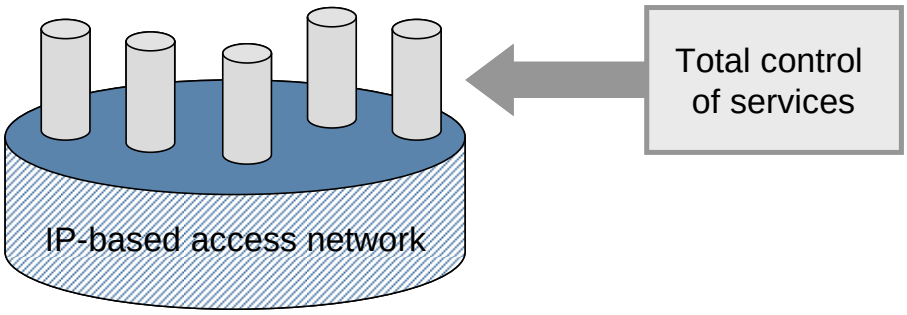

Figure 4: The total control of individual services in a triple-play network is essential. Similarly, automation when it comes to configuration of network elements, end-user profiles and service profiles allows cost efficiency in network operation.

One question that must be solved is how to set up and invoice different IP-based services to individual end users. A new type of network management is needed, with rapid service establishment (the rapid establishment and tear-down of video streaming is particularly important), and the possibility of addressing individual end users in an easy manner. It will not be possible to take full advantage of the triple-play network without such management capabilities.

3 Will an open-access business model address these challenges?

The “open access” model describes a model in which it is possible to introduce 3rd party service providers into the broadband network while the control of the network, the end users and the distributed services are maintained by the network operator. This model was pioneered by utility companies who were interested in long-term infrastructure investments such as fibre-optic technology, but the model can also be applied to established local exchange carriers who are considering the addition of services such as TV and other services that can be regarded as non-strategic.

Such a business model will attract new players, stimulate service growth, and enable a more complete service offering to the end users. This is a win-win-situation for both the network operator and the service providers, and the open-access model is a way forward for both parties.

The fundamental idea behind the open-access model is to enable ownership of the network infrastructure to be separate from service delivery, and to share the risks and revenue from broadband deployment. A full-blown open-access model promotes the distribution of services from competing service providers over shared infrastructure, and thus stimulates the innovation and differentiation of services. Local exchange carriers, however, may choose to adopt parts of the model only, and can decide which service areas should be open for 3rd party providers. In its simplest form open access resembles the wholesale model, where network capacity is rented out to 3rd party service providers.

3.1 Open access per service

A more sophisticated version of the open access model – and this is where it differs from the wholesale model – treats each service separately. This provides more advanced opportunities to differentiate between services than the wholesale model does, where treatment can be given only at the level of the access line.

3.2 Lessons to be learned

A model in which risks and revenue are shared, as is the case in the open-access model, has for a while been used worldwide by community-based, FTTH networks. These networks provide lessons to be learned for actors considering the open-access model. Costly and time-consuming processes of in-house development and marketing of services are avoided, and instead a “controllable fat pipe” is provided to the end user – a pipe that is filled with services from 3rd party service providers. The split-ownership philosophy allows the owners of these networks to share the risks and revenue with the service providers under a risk/revenue-sharing agreement.

3.3 Why risk/revenue sharing and a network-centric model are attractive to a local exchange carrier

The future use of triple-play networks will probably depend on how easy it is for end users to order and benefit from services, and on the range of services offered.

A key success factor will likely be to identify the incentives for Internet-centric service providers to adopt a more network-centric business model, a model in which they use the network operator’s access network to deliver services to the end users.

Of course, “traditional” service providers, who are already using a network-centric model for their service distribution, will also benefit from the added value that an open-access network offers.

For Internet-centric service providers (and “traditional” service providers, such as CATV operators) there are clear advantages when distributing services over a network allowing service differentiation, control per service, and advanced customer support. These advantages are not available to Internet-centric service providers when distributing over the Internet. It will, quite simply, be easier to deliver a superior service over a dedicated channel in the network. The clearest advantage is for bandwidth-consuming IPTV services, since it will be possible to channel the content separately to the end user.

An agreement that shares risks and revenue may mean that the margin per service is somewhat lower for the network operator. However, it will be possible to bring more services to the market more rapidly, increasing the total service offering to end users and increasing each end user’s spending on broadband services.

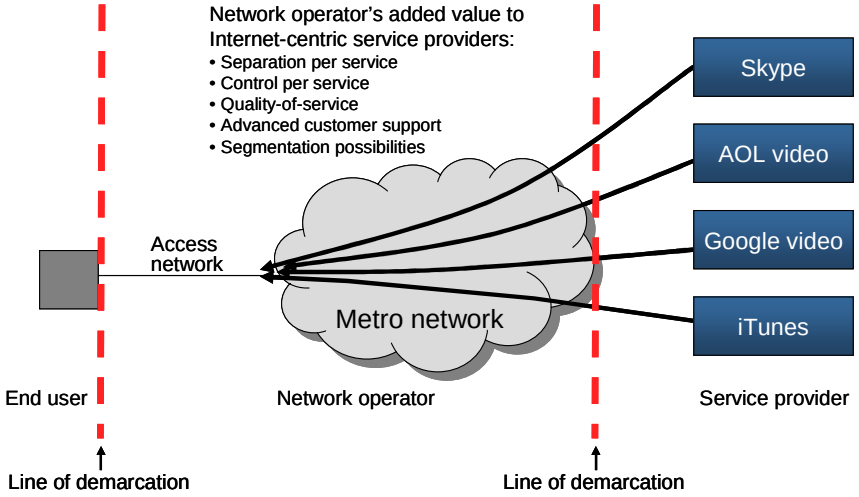

Figure 5: There are many incentives for Internet-centric service providers to distribute services over a network-centric model that facilitates open access per service.

Another incentive to adopt a revenue-sharing model is the access that such a model provides to the valuable asset that network operators posses – their customer relationship. It is essential for service providers, both Internet-centric providers and network-centric providers, to gain access to end-user data. Such access opens the possibilities for advanced customer segmentation and offers valuable marketing tools, given that the network platform can support these functions. Using this asset in a number of profitable ways strengthens the role of the network operator (see Section 3.4 below).

3.4 Adding value to 3rd party service providers

A broadband network that is configurable on a per-end user, per-service basis allows the operator to open the network to many service providers. Further, it makes it immediately possible for network operators to offer added value to service providers, channelling traffic to end users over the network.

One added value that network operators can offer to 3rd party service providers concerns the quality of service. This is particularly important for TV services, as described above. It is, of course, possible to manage traffic in the access network, performing such tasks as defining bandwidth limitations, quality-of-service levels and other technical parameters. The technical properties of a service delivered to an end user can be highly customized, as can the charges levied.

Further added-value that can be offered is the opportunity to control each individual service delivered to the end users. In a well-designed access network services are established by a control system that is capable of addressing individual end users and services can be added or changed nearly instantaneously. The distribution of restricted content can therefore be controlled within strict limits.

In connection with control per service, per end user and per network element, the importance of automation becomes apparent. Automation is a vital factor for lowering operational costs in these types of network, which rapidly might become complex and resource-thirsty as a result of instantaneous changes in end-user profiles and service configurations. Network operators will themselves discover the value of automation when renting out network capacity to service providers.

To provide adequate customer support for services distributed over a best-effort Internet connection, is a challenge. Internet-centric service providers have a hard time tracking their services all the way to the end-user premises, making it difficult to troubleshoot the network and to operate an efficient help desk. A network-centric approach, when operated correctly, allows each service to be monitored individually and in real time – all the way to the individual port on the end user's customer premises equipment (CPE). This capability is of real and tangible value to providers of content and services, and it can be used as a differentiator.

The network operators have detailed knowledge of all the services ordered by any end user in the network, and the degree to which they are used. Operators also have geographical and demographic knowledge of the end-user population, and detailed individual billing histories. This is valuable information for a marketing department, enabling it to package and market attractive service offerings to the customer base.

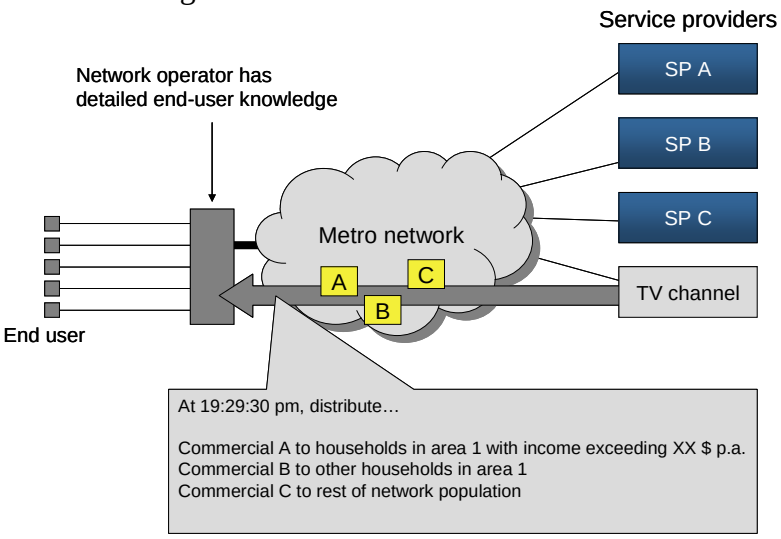

Figure 6: Fine-grained control allows end users to be segmented and targeted with customized services.

A network operator can therefore achieve a highly strategic position as mediator between service providers and individual end users. Additional revenue can be obtained from information management, and from other innovative sources.

3.5 Destination-based services – for the differentiation of Internet services

The added-value that the network-centric approach presented in this paper offers will be an essential benefit to a majority of service providers. However, there may be scenarios when content and/or service providers do not agree to participate in a co-operative environment, choosing instead to "free-ride" the Internet connection. In these scenarios the operator has measures to take in order to protect itself.

The principle is similar to that of the traditional telephone industry, where on-net and off-net traffic are differentiated. The service normally called "Internet" can be split into two (or more) services, where access to the local network (on-net) is offered as one service, and access to the Internet (off-net) is offered as another.

It is a key requirement that tariffs and bandwidth can be differentiated between the local network access and the Internet. The access line can be provisioned up to 100 Mbps (the value here depends on the access technology used), and local network access can thus be offered at a very high bandwidth. High-speed access to the local/internal access network will provide first-class experience for Peer2Peer traffic, local gaming, backup services, access to community sites, e-health, e-learning and local-based TV. It is also possible to include access to certain "Partner sites" within this higher bandwidth class, for example providing content from Disney, instead of creating separate services for these service providers.

Different tariffs will be applied depending on where the source of the content is located, locally or not, to provide what is known as "destination-based services". Treating the services differently in terms of QoS, security, priority etc. adds further possibilities for differentiation between on-net and off-net services. This provides network operators with another valuable tool for charging end users for Internet traffic to certain destinations. This can be used, for example, to charge end users a particular tariff for the content of an Internet-centric service provider.

Examples of services that may be offered are:

- Up to 100 Mbps for local network access with unlimited on-net usage, including:
  - local community sites and partner sites
  - on-net Peer2Peer traffic
  - on-net gaming
- Up to 1 Mbps for off-net Internet access.

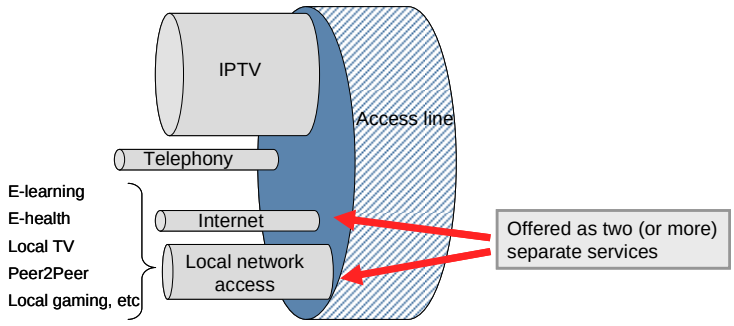

Figure 7: Local network access can be separated from Internet access, providing a valuable tool for opening new revenue streams from traffic to Internet-centric service providers.

3.6 Innovative and market-driven service development

An open-access environment stimulates service innovations. Experience has shown that creation of services with local character are particularly encouraged, such as e-health, e-learning, distribution of local TV content, etc. These are services of non-strategic value to the network operator, and enrich the broadband network with a set of services that complements the network operator's service offering.

New services are rapidly introduced in networks that are capable of fine-grained control, and services can be configured within moments. It is easy to test services on a small scale or with specific populations before they are launched on a wider scale, a procedure that closely resembles practices used in the consumer goods industry.

4 Open access per service for full flexibility

Open-access network technology can complement traditional management in access networks. There is no need to replace existing infrastructure, instead control and provisioning of open-access networks can be implemented in close integration with existing network elements, systems and operations support – while also supporting existing billing arrangements.

Complementing traditional networks with open-access technology in this way adds a level of highly granular control in the access segment of the network, and automates to a large extent service and end-user configurations.

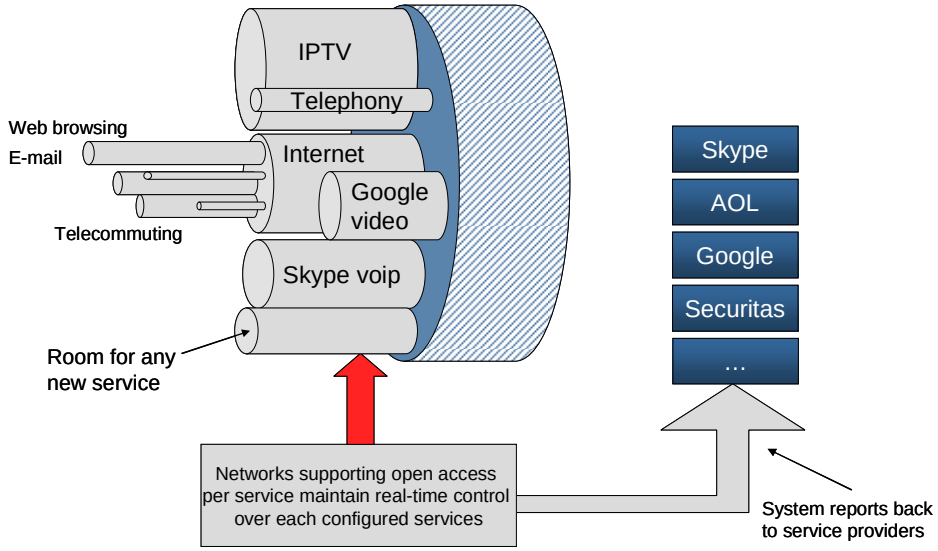

Figure 8: Triple play with open access per service

4.1 Automation and control of individual policy decisions

A well-implemented control and provisioning system should require a minimal amount of manual labour to configure the network elements, to register services, and to configure service profiles for the end users. This is vital, since the cost of operations is often expanding more rapidly than revenue from new services deployed in access networks.

Tasks such as a) initial configuration and software download for network elements, b) provisioning of network elements, and c) provisioning of services, are all resource-demanding in broadband deployment and should be automated. The latter is universally recognised as a bottleneck. The automation of these processes will minimize operating cost and maximize end user convenience.

4.2 Fine-grained control allows open access per service

Traditionally, end users are recognized on the link level in the network: they are configured as individual entities and mapped to their respective services. The fine-grained control described here allows open access to be offered per service. It should be emphasized that attempts to establish an open-access business model without a network that supports control per service will undoubtedly fail. It is essential to be able to treat each service individually when setting parameters such as bandwidth, quality, security, shaping, and priority.

A system in which service configuration is automated and the end users are well-defined and individually addressable provides a perfect environment to deliver services containing restricted content, services that require end-user authentication. One example is TV channels that transmit movies, where rapid, user-initiated set-up of a service may be translated into payment for, and instant access to, a motion picture over the network.

The allocation and handling of IP addresses is a critical, and resource-heavy, task in an open-access network. End users may be associated with a variable number of IP addresses, depending on how the users are defined, and which service provider they currently subscribe to. It is therefore recommended to let the control and provisioning system take care of IP addressing in the access network, and map this against the pool of IP addresses that the different service providers have disposal of.

5 Conclusion

An open-access business model will catalyse the establishment of new revenue streams and stimulate service innovation. It allows network operators to turn to 3rd party service providers to share the risks and revenue of triple-play deployment. In particular, it provides unlimited variation in presenting added-value for Internet-centric service providers who are currently entering the broadband access market via the Internet with their new types of services.

The underlying technical platform for an open-access business model enables rapid configuration and delivery of a wide range of services to the end users. Regardless of who is providing the services – whether the network operator chooses to offer all services itself, or 3rd party service providers are invited – the cost efficient delivery of multiple services to individual end users is crucial.

The presence of a control system that gives a fine-grained control and a high degree of automation is a key success factor for an open-access network.

- Fine-grained control makes it possible to give each service individual treatment in terms of quality-of-service, bandwidth needed, level of security, priority, etc. This enables advanced service differentiation, service innovation & customization, end-user segmentation, and targeted marketing.
- In a network characterised by dynamic end-user behaviour, as are most triple-play and open-access networks, automation in network and service configuration is essential to keep operating expenditures at a minimum.

The open-access business model and its associated network architecture discussed in this paper will provide powerful opportunities for the network operator, offering a high degree of flexibility and an efficient tool for innovative ways of generating revenue streams.