

Solution Overview

The Automated Broadband Solution

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1 Executive Summary

The PacketFront automated broadband solution is designed for cost-efficient delivery of multi-play services on broadband networks. PacketFront's solution provides superior control of the service definition and service delivery, which allows operators to differentiate their service offering.

The PacketFront automated broadband solution provides:

- The ability to manage and differentiate each service.
- A high level of automation and a unique set of technical features, keeping the operational costs to run a FTTH network as well as the capital investments to a minimum.
- A variety of design options for the access network that gives flexibility in the choice of business models and services offerings.
- A solution which is technology agnostic meaning that the PacketFront solution can manage other vendor's FTTH equipment as well as other technologies such as DSL Wimax, CATV, EoC etc. This allows the operator to apply the same level of automation for service provisioning to all access technologies, and all end-users in the network.

The challenges arising from the complexity in deploying "multi-play" networks are addressed with PacketFront's products and the automated broadband solution. This solution is proven with a 10-year track record and is deployed in some of the most advanced, and successful broadband networks in the world today.

2 Broadband network opportunities and challenges

Building a viable business case for broadband deployment is a question of *automation* and *service differentiation*.

Automation – as a means of controlling the costs, including network operation and provisioning of services – is crucial for profitability. This is an area where PacketFront has unique expertise. The automated broadband solution from PacketFront has been built with one clear objective – to use advanced IP technology to facilitate a profitable broadband deployment.

Service differentiation and business model flexibility is the second cornerstone of the PacketFront broadband solution. The solution provides the tools for very granular service differentiation which increases average revenue per user (ARPU).

This Solution Overview explains how the PacketFront automated broadband solution addresses these key business challenges and opportunities by answering the following questions:

- How can operating a broadband network offering many services from multiple service providers to hundreds of thousands of end-users, be made cost efficient?
- How do you secure individual management of each service from every service provider (IPTV, Internet, VoIP, e-learning, e-health, etc)?
- How can service customisation help you as a service provider or network owner to increase the service-take-rate and eventually the ARPU?
- How do you implement future-proven solutions in particular in terms of network consolidations and cooperation?



3 The automated broadband solution – High-level overview

PacketFront's Solution Overview

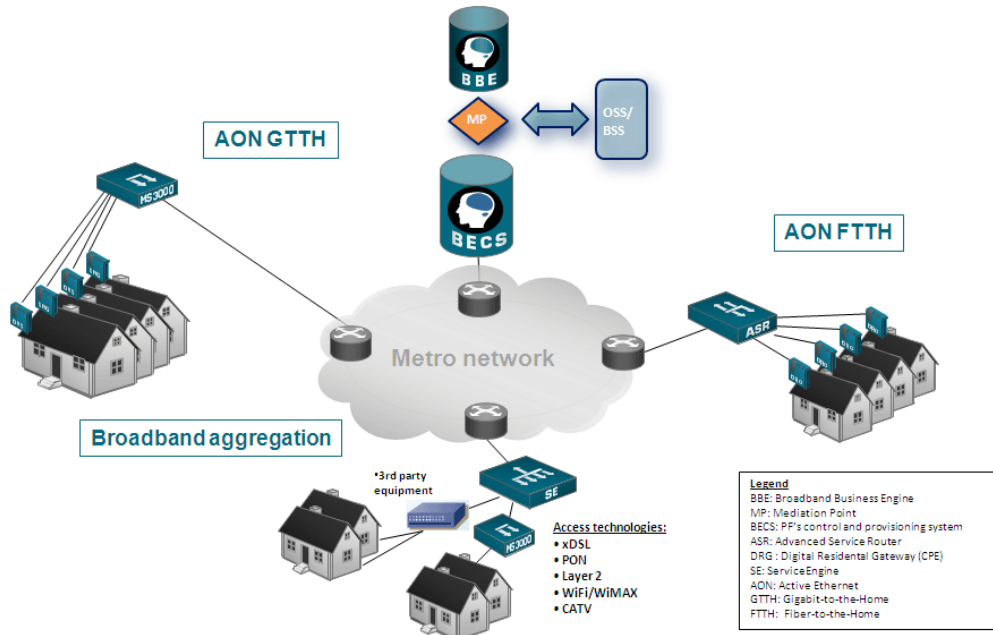


Illustration: Network overview of PacketFront automated broadband solution.

PacketFront's fully automated broadband solution consists of two focus areas: On the one hand we provide an end-to-end **FTTH Access** solution, which includes all products designed for FTTH networks and on the other hand **Broadband Management Solutions**, which is PacketFront's software suite for service provisioning and element management in complex environments with multi-access technologies and multi-vendors in FTTx, xDSL, Wimax or other types of broadband networks

Broadband Management Solutions:

The core of the Broadband Management Solution is the PacketFront software - BECS and BBE, which provide network element management, automation, control and service provisioning in a broadband network independent of the used access technology or access equipment.

- **BECS™**, Control and Provisioning System: a fleet element manager with automation, control and service provisioning capabilities.
- **BBE**, Broadband Business Engine: efficient handling of business process in a broadband network. BBE is a modular tool and elements can be added according on demand. The modules currently available are:

- BBE – Core
- BBE – SMT, Subscriber Management Tool: controlling the subscribers.
- BBE – HMT, Helpdesk Management Tool: fast troubleshooting.
- BBE – BMT, Billing Management Tool: efficient billing.
- BBE – TMT, Ticketing Management Tool: track and report service changes.
- BBE – SSP, Service Selection Portal: end-user service self-management and services on demand.
- **Service Engine** series of service-enforcing routers which enable the deployment of consistent services across multiple access technologies. Service Engine aggregates access technologies such as xDSL DSLAMs, PON, Ethernet over coax, and wireless devices and is intended for central office installations.

FTTH Access:

The PacketFront FTTH access solution includes in addition to our BECS and BBE management systems a number of purpose built products for FTTH and FTTB networks.

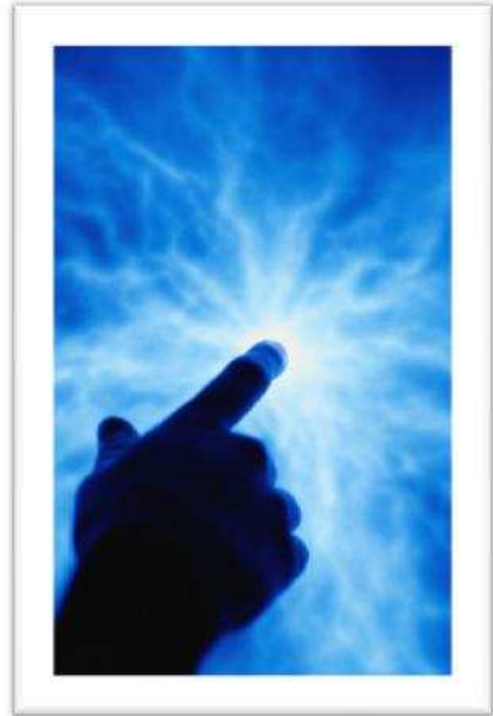
- **ASR 5000** series of Layer 2 and 3 access switches for high-capacity FTTH access, and cost-efficient aggregation of low bandwidth access technologies such as WiFi, WiMAX, etc.
- **MetroStar 3000** family series of high performance Layer 2+ with Gigabit service switch for large scale Gigabit-to-the-Home access.
- PacketFront's **DRG CPE** (Customer Premises Equipment) series includes end-user equipment for triple-play services. Digital Residential Gateways (DRG) series offers designs with different functionality to meet the various end-user and network operator needs. PacketFront has various DRG models for active Ethernet.
- **VMT**, Virtual Management Tool, is a business service solution that offers configuration, monitoring of VPN services in the area enterprise networks. VMT enables enterprise customers to run and configure their network in a VPN on the city network.

4 The tools to drive revenue

One of the top priorities for any broadband operator today is to increase the total service revenue. This places the focus on how to increase the customer base, and to increase ARPU. Ways to increase revenue include:

- Selling *more* to the *existing* customer base.
- Selling to *new* customers.
- Avoiding customers purchasing from the competitors (*reducing churn*).

In existing networks, we have seen that a greater service offering leads to a higher service take-rate and hence a higher ARPU. Furthermore, specific services can be targeted demographically, or geographically.



PacketFront's solution is designed to manage services – not just line connections, or ports, on the broadband switch. The PacketFront solution can manage each single service offered by each service provider individually.

Ease of use is also a key feature for increasing broadband consumption by end-users. Using the Service Selection Portal (SSP), end-users can self-provision any service – in real time. There are no delays waiting for the customer support desk to process their request. The self-provisioning is performed either using a PC.

PacketFront's solution gives operators the flexibility to create their own service offerings, and to tailor the offerings to their customer base. The PacketFront view is that network technology should never limit the network operator's ability to produce and/or provision any type of service.

To maximize revenue, a network owner and/or a service provider must address the following areas:

- Service differentiation
- Pricing and packaging strategies
- Ease of use
- Services on demand
- Security

4.1 Differentiated data and Internet services

PacketFront's automated broadband solution offers a number of features that are crucial for service creation, packaging and deploying services, management of data and internet services, as well as the collection of statistics and market data to be used to build intelligent service promotion campaigns and offerings.

4.1.1 Bandwidth management

Each service offered on the access line requires individual treatment so that:

- a) the service reaches the end-user with high quality
- b) the service reaches the end-user securely
- c) the service reaches the end-user within an acceptable timeframe
- d) the service is prioritized correctly; for example, a phone conversation or movie download is not interrupted

These requirements are achieved by setting the following parameters on a per-service basis:

- a) QoS,
- b) Security,
- c) Bandwidth
- d) Priority

The PacketFront solution offers unlimited flexibility of managing each service individually thereby utilizing the total bandwidth to the home more efficiently. In BECS, services are easily defined, which simplifies both service differentiation and the deployment of new services.

In BECS, *QoS*, *security*, *bandwidth* and *priority* are managed by the service definitions. For instance, the service definition can be set so that data is provided at speeds ranging from a dial-up modem to a full duplex 1000 Mbit/s Gigabit Ethernet connection, depending on the access technology. Parameters can be set for each service type. For example, it is possible to assign different bandwidths to different clients for the end-user. A PC with internet access can be allowed 2 Mbit/s, while an IP-based digital TV service can run at 30 Mbit/s on the same access line.



4.1.2 Information provided for successful service offerings

Network statistics and market data are crucial information for successful service offering campaigns. These kinds of information can be provided by the Broadband Business Engine (BBE) and this information guides network owners and service providers to a successful roll-out and a higher service take-rate.

4.2 Differentiated IPTV and video services

The differentiated data and Internet services described in this solution overview make it possible for the PacketFront broadband solution to offer immense flexibility and to give individual treatment to network services, such as IPTV and Video-On-Demand.

4.2.1 TV channels on demand and à-la-carte packaging

In the PacketFront solution, the network itself manages access to content, and has the option of allowing end-users to order, cancel or change their channel subscription themselves. Using the Service Selection Portal (SSP), end-users can select the TV channels of their choice. The TV channel will then be provisioned and activated automatically via the access network. Costs are minimal, even when customers select individual channels, or pay-per-view on TV. This opens up the opportunity to offer channels “à-la-carte” instead of bundling channels into a static service model, or even to offer a combination of both models.

4.2.2 Realtime protocol monitoring

In a network where the broadband connection is the only source for TV content for the end-user, the importance of a reliable monitoring tool is critical. The ASR 5000 and Service Engine both include a feature that monitors all multicast traffic running through the network - in real time. In the event of traffic disturbances, the Realtime Protocol Monitoring feature provides network operators with the data needed to localize the position of the faulty element, and thereby, to correct the problem.

4.3 Service pricing strategies – usage, time or flat rate?

The flexibility in the PacketFront solution allows many types of pricing strategies. Information is collected from the network about how much data has been transmitted, who transmitted it, where the data was transmitted, and the period during which it was transmitted. BECS provides this information and it can easily be transmitted to external billing systems, serving as billing data records.

Services can be billed based on volume, time, flat rate or any combination thereof.

4.4 Easy-to-use on-demand services

In general, the use of technologies and services increase if end-users can simply manage the technology. Using the Service Selection Portal (SSP), end-users can easily subscribe to, and provision, the services in real-time.

4.4.1 Easy-to-use bandwidth-on-demand

Occasionally, end-users need more bandwidth for a limited time period than they normally use. The PacketFront solution provides a flexible way of meeting this need using the “bandwidth-on-demand” option, where end-users are able to temporarily upgrade. The end-users manage the bandwidth-on-demand themselves, and no manual intervention is required.

Ease of use stimulates the customer to use the services, increases customer satisfaction, and limits customer churn.

4.5 Security options

There are a number of options available to maximize security in the network. For example, most users lack the necessary expertise to manage all security issues in their computers, so they must trust the network to take care of these issues. However, some users want to manage security issues themselves and actually consider the dependency on the network as a limitation. The PacketFront solution offers different security options for different users.

4.5.1 *Restricted multicast access*

In the PacketFront solution, the network controls access to the content. This ensures that end-users will never be able to view a TV channel that they have not paid for. The solution complements, or even eliminates, the need for smartcard readers in set-top boxes. Furthermore, all traffic is traceable and can be monitored. As a result, abusive user patterns are easily detected and managed.

4.5.2 *Data retention and retrieval*

In order to meet EU data retention and retrieval directive 2002/58 ey, telecom and datacom companies are required to save certain customer related information such as IP addresses for a defined period of time. PacketFront's solution provides this capability as well as the ability to convert the information into formats required by national laws.

4.5.3 *Port mirroring*

All traffic on an ASR or Service Engine port can be mirrored to any other port. This is part of the law enforcement requirements to monitor traffic.

Illustration: A screenshot from the Service Selection Portal (SSP). From SSP, end-users can easily sign up for, and activate, services themselves in real time.



5 The tools to control costs

The typical high-risk costs in a broadband business case occur in two areas:

- predicting the operational costs (Opex)
- managing the system costs (Capex)

For Opex, the following costs are hard to predict:

- the amount of man-hours spent on network upgrades – how many system engineers are required?
- the number of times end-users will contact the customer support centre, and the time spent on troubleshooting different faults
- the estimated time needed for provisioning a service upgrade from 1 Mbps to 10 Mbps, or for adding another TV channel, for one end-user
- the number of man-hours spent on changing the configuration setting for a service with 100,000 end-users



The list above can be extended with over a hundred detailed operational questions that all have an impact on the business case of running a complex triple-play network.

The traditional response is to develop central in-house systems to manage some of the operational tasks. This is a difficult and costly approach.

Based on experience with customers and using customer feedback, PacketFront has designed the automated broadband solution to address both the Opex and Capex issues.

5.1 Low operating costs with BECS and BBE

BECS, the engine for automation, together with BBE, which supports the business processes, lower the operating costs. Operating costs are hard to predict, and are unfortunately often underestimated, which reduces the profitability for network owners. By design, PacketFront's solution is focused on automating tasks that by nature are repetitive and that consume large amounts of man-hours.

Key automated functions are:

- Configuration changes
- Software verification and upgrades
- Provisioning of new services
- Provisioning of service changes
- Mass deployment
- End-user self-registration
- End-user service selection

The PacketFront broadband solution provides automated configuration of network elements. BECS stores and manages all configuration changes in the network. Managing multiple services that are used with many thousands of end-users usually requires a lot of manual input. Using BECS, the PacketFront solution manages multiple services in an automated manner, reducing the manual work to an absolute minimum.

The handling of business processes in broadband networks is a further operational cost which tends to consume a high amount of operational resources. BBE is built to support the fulfilment, assurance and billing processes in broadband networks. BBE provides a seamless view for several applications handling tasks that network owners/service providers face on a daily basis. For example, end-users moving to new addresses, notice periods and suspending/reinstating end-users are tasks that are efficiently handled in BBE. Furthermore, BBE provides valuable statistics and market data, which are essential when promoting broadband services to selected customer groups.

Mass deployment of network elements is also performed using automation. Installation of ASRs does not require high-cost network engineers; you simply connect the fibre, and the ASR will automatically receive the correct software version and configuration files when it connects to the network. The same procedure applies when a network device is replaced.

Services are defined in BECS and a service configuration profile is automatically distributed through the network elements to the end-user clients - with no manual intervention involved.

Self-registration and self-provisioning are also supported using automation. End-users can subscribe to a service, and obtain immediate access to the service without any manual interaction, thereby avoiding the delay at a customer support help desk.

Finally, a FTTH broadband network has a long life cycle. Providing a 100Mbit/s or faster broadband connection to the end-user, as in PacketFront's solution, is sufficient to carry almost any broadband service of the future.

With regard to future-proof network deployments, the capability for providing a Gigabit connection to the home makes it possible to offer the desired bandwidth to those users requesting and paying for Gigabit speed, e.g. business users, power users, etc. and will meet end-user demands for the long term market.

5.2 Low capital investment – out-of-the-box solution

One of the most underestimated challenges in a CAPEX budget for broadband operations is the system side. It is not only very complex, it is also very costly. It is commonplace for provisioning/OSS/BSS projects to run heavily over budget due to an endless need for upgrades and changes.

One key problem is that many software tools are extremely specialized. A large array of these tools is required in a broadband network to achieve a sustainable platform for automation, control and provisioning. This often results in a conglomerate of different software systems, often from different vendors. Dependencies between the systems are usually created with continuous upgrades and integration work as a result. The network owner becomes the integrator/developer of a solution that needs continuous maintenance, development and support.

A key objective for PacketFront is to develop a complete and pre-integrated solution that works “out-of-the-box”. This reduces the cost dramatically, and reduces the time to become

operational from several months, or even years, to less than one week. At the same time, the PacketFront solution is built on individual modules that provide open and flexible interfaces for integration to existing systems.

Existing third-party systems, e.g. billing or Customer Relation Management (CRM) systems, are easily integrated through the open and standardized interfaces of BECS Mediation Point, or Broadband Business Engine (BBE).

5.3 New business models – open access per service

Key opportunities with the PacketFront automated broadband solution are:

- *Multiple service providers* offering their services to the end-users. This gives end-users the freedom to select the service provider of their choice and avoids the lock-in effects seen in closed networks.
- *Different service providers per client (set-top box, PC or IP phone)*. This makes it possible to have different service providers for Internet services, telephony services, IPTV services, etc. It also makes it possible to have different Internet providers for different PCs within the household, all at the same time.
- *One client can have different access speeds for two or more services*. The service provider for Internet services and ASP services can be different, even if the same PC is used.

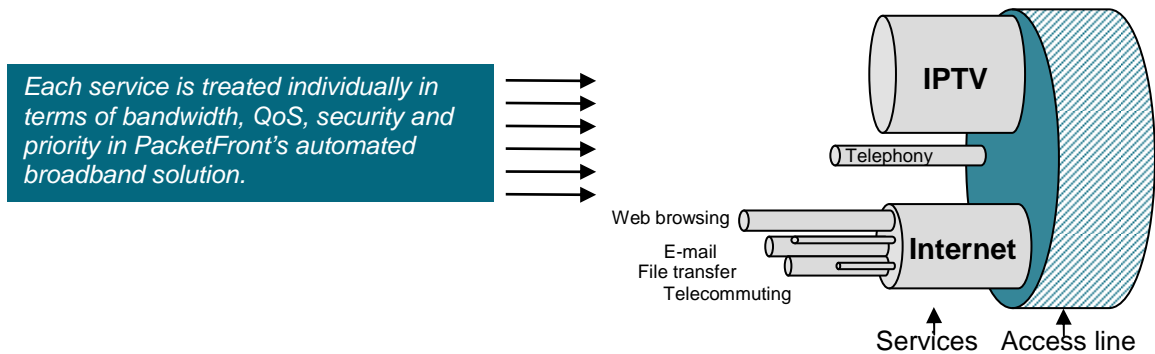


Illustration: Treatment per service is a key factor for a successful open-access network.

6 The tools for the future

The telecom landscape is changing and more and more broadband networks are merging, consolidating or cooperating in one or other way with each other. Different access technologies and multi-vendor equipment is common and the challenge is to make these heterogenous networks homogenous by having one unified platform for provisioning, control and maintenance.

PacketFront's network management software applications – BECS and BBE - can be applied for aggregation of other access technologies, resulting in a single management system managing and automating a multi-vendor networks. This has several positive effects:

- Operational costs are reduced since customers, services and networks are managed in a consistent and unified way.
- Automation of the whole network results in efficient business processes with very little need for manual intervention.

And because the merged network is seen as one network, products and services are created and delivered in the same way, thereby achieving a faster time-to-market and an improved competitiveness in the marketplace.

In other words, the future of broadband operators is secured due to benefits of consolidation enabled by service aggregation, which are:

- Efficiencies of economies of scale
- Lowered CAPEX and OPEX
- Enhanced market position



7 Summary

This overview has explained PacketFront's scope of competence and at the same time we hope to inspire you in ways to improve your broadband network. In addition, we have outlined possible changes and challenges which can confront you in the future. Selecting PacketFront as your business partner ensure you that you are equipped you for all future demands and that you have companion with great experience.

PacketFront seeks an open dialogue with you to simplify your daily business live and to keep your end-customer satisfied. Ultimately, your success depends on the loyalty and contentment of your end-customers.

