



Business Use Cases enabled by Policy-Centric Networks

An AdvOSS Solution Whitepaper

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Overview

Today's Service Provider Networks are distributed systems comprising several sub-systems and network elements that interact under complex scenarios to provide useful services to customers. Service provider networks are usually divided into two sub-networks on the basis of functionality; the access network and the core network.

The access network comprises the network elements providing accessing services i.e. network entry and act as points of policy enforcement.

The core network comprises of elements providing control and management decisions and service delivery points at the applications level.

Service Management and the placement of the Policy Manager

Recent years have seen explosive growth in the usage and deployment of converged services in telecommunication networks. These converged services include multi-media applications such as Voice over IP (VoIP), video, text messaging, file transfers, chatting, online gaming to name a few. On one hand, this unprecedented growth has created new and interesting revenue opportunities for CSPs to offer differentiated and premium services for subscribers willing to pay more for additional Quality of Experience (QoE); while on the other hand, it has also created extensive demand on service management.

Now service management cannot be performed by simple, traditional AAA systems. It requires complete platforms comprising of multiple functions working in conjunction.

Today's Service Management Platforms consist of several critical elements including AAA servers, Policy Managers and Subscriber/Subscription Management Systems. These platforms must have the capability for extensibility, scalability and programmability for realizing advanced business logic and use cases.

The Policy Manager is the nerve center of a modern Service Management Platform that enables advanced and complex service management scenarios and use cases; these scenarios in turn enable key service differentiation and revenue generation capabilities for CSPs.

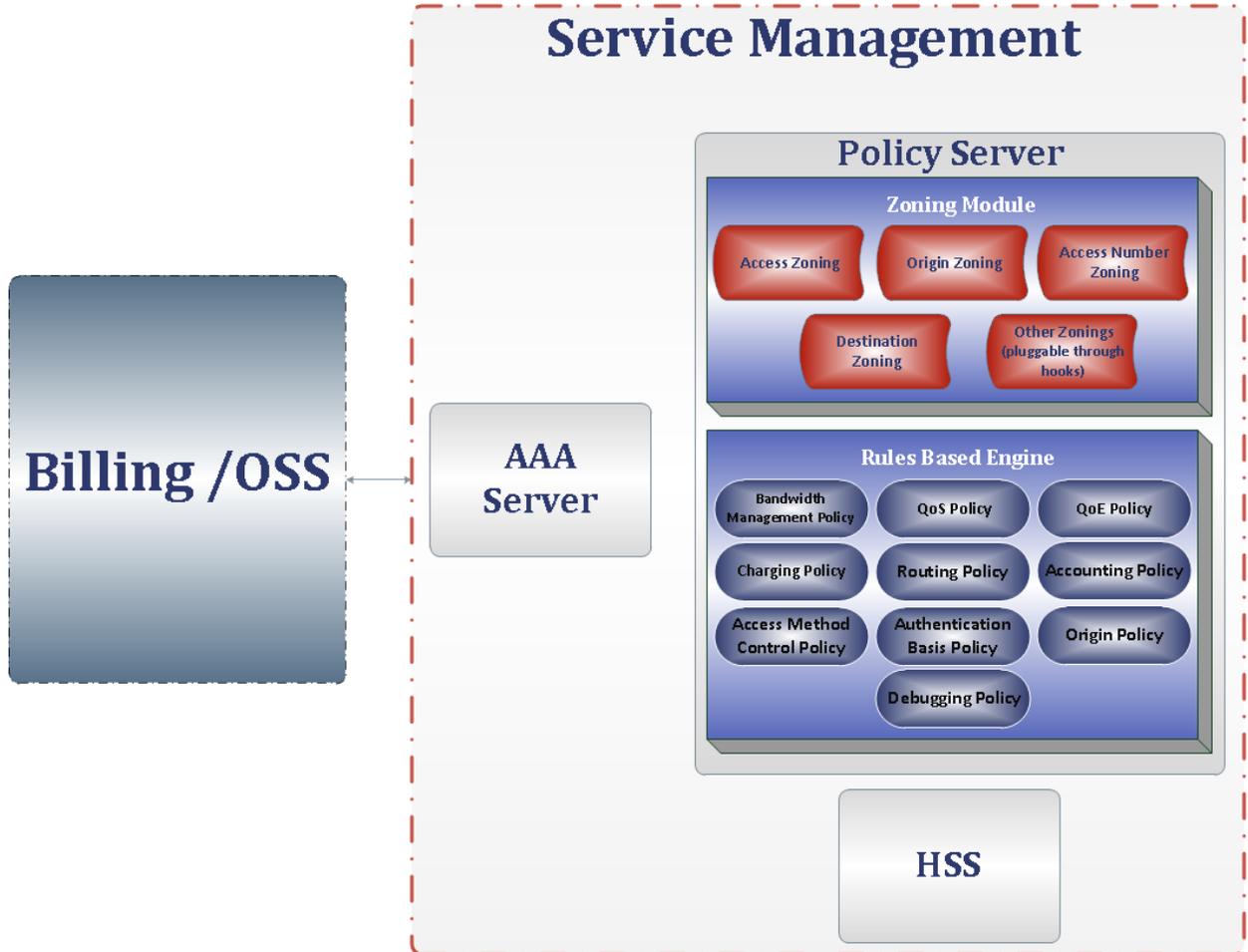
The Service Management Platform is thus the centralized Service Control entity in the network while the Policy Manager is the centralized entity in the Service Management Platform. Therefore, Policy manager can be called the central point of the core network. We call such a core network that utilizes Policy Manager as a Policy-Centric network.

Policy Manager Requirements

A carrier grade Policy Manager needs to support the following requirements to comprise a compelling value proposition for Service Providers:

- It must be implemented as a generic rule-based engine, capable of evaluating arbitrary rules based on information collected from multiple network elements.
- It must hold a 360 degree view of the services due to its integration and close interaction with all service related network elements in the core network.

- Some of the integration points of the Policy Manager are:
 - Subscriber Data repository or HSS. HSS provides Subscriber information, their service profiles and subscription related information to the Policy Manager.
 - Rating and charging systems to take into account the information related to rating, charging, free volume and free minute counters etc, while evaluating policy rules.
 - AAA applications, to use them as a means to enforce policy decisions on enforcement points in the access network.
 - Typically, AAA applications also act as the Policy rules invocation points. The Policy Manager returns policy decisions to the AAA applications in the form of:
 - Any changes in service profiles or service behavior
 - Gating of service to allow or disallow access
 - Service QoS and QoE modification
 - Modification of how the service is to be charged e.g. prepaid or postpaid
 - Provisioning systems to dynamically provision different enforcement and service delivery points.
- It should provide policy evaluation based on groups of entities at different levels to optimize policy decisions and scale them in a flexible manner. This grouping is also called Zoning. Zoning is required at access level, request origin level, request destination or target level and network resource level. Grouping removes repetition of both, the configuration and rule evaluation.
- It must be able to support new business use cases as they are designed by the service providers to promote new and emerging business requirements. This requires the Policy Manager to be extensible and adaptive through simple run-time scripting, so that policy rules for new business use cases should be easily implemented without requiring a major software upgrade.
- Policy Manager must be highly scalable. Since it has to evaluate complex and arbitrary business logic in the form of rules, it must be able to do this efficiently and scale seamlessly with increase in the number of rules and the number of subscribers, subscriptions, zones and groups and other service related parameters.



Categories of Policy driven decisions

Some of the examples of the categories of policy decisions that should be supported by an industrial strength policy manager are as follows:

- Authentication basis i.e. on what basis will the authentication be performed e.g. PIN, Calling number in case of voice, Network service Identity in case of data etc.
- Gating (allowing/disallowing) services at different elements in the access network
- Service profiles or service behavior modification in the policy enforcement points in the access network as well as application servers in the core network
- Quality of Service modification in the access network
- Network bandwidth control and management
- Allocation of different resources to subscriber sessions e.g. IP addresses, VLANs.
- End to End Quality of Experience (QoE) modification in enforcement points in the access and service delivery points in core networks
- Service charging methods e.g. prepaid or postpaid

- Routing of requests to multiple targets within the service provider network, and also to destinations outside the service provider network i.e. to other interconnected networks
- Charging and Rating
- Policies regarding subscriber's network access method
- Fair usage policies
- Time of day based policies for service quality and usage
- Proxying AAA requests to multiple targets

It is quite clear from the categories mentioned above that policy encompasses almost all aspects of service control and management. Policy Management solution has to support the above and any aspects of advanced service control scenarios. Some of these aspects can be packaged out of the box while the system must be able to support new and arbitrary requirements for policy based control as and when required.

Policy driven systems: Key business aspects

Some of the key business aspects that are driven by policy can be categorized as:

- Differentiation of services
- Monetization of services at multiple tiers or layers
- Personalization of services for subscribers at multiple levels
- Service promotions and customer loyalty
- Optimized resource handling in the network
- Speed of new services roll-out

The business aspects of policy management combined with the categories of service control that are covered by policy enable very important advanced business use cases for service providers to create value for their customers and differentiate their service offerings from competitors.

In this whitepaper, we describe some of these new business use cases enabled by policy control.

Policy-based Business Use Cases

We describe below some of the common use cases enabled by policy based service management. This list is however, by no means exhaustive. It is given just to emphasize the power and necessity of policy centric core network. A strong policy solution would enable implementation of rules of arbitrary complexity in an scalable manner.

Unlimited plans and Fair usage

Service Providers (CSPs) always want to create room for high paying subscribers who demand unlimited bandwidth and consumed data volumes without restrictions. Therefore, most CSPs have unlimited plans available for premium users. Although, such packages do

not have upper limits on bandwidth, CSPs usually want to have a policy in place called Fair Usage.

This policy dictates that the bandwidth of a subscriber on an unlimited plan with no data volume cap needs to be reduced by an amount if the data usage reaches a predefined upper threshold within a certain time of the subscription period. For example, such a policy rule might be defines as:

Reduce the bandwidth of a subscriber on unlimited plan by 200 Kbits/sec if she reaches an upper value of 20 Giga-Bytes in her usage/consumption of data volume before half of the month (assuming the subscription is on a monthly basis). The policy rule might say further that the bandwidth should be reduced by another 200Kbits/sec if the subscriber consumes 5GBytes volume in subsequent 5 days and so on.

The idea behind such a policy is to be able to provide premium service to high paying users while remaining “fair” to other lesser paying users so that the unlimited customers may not occupy most of the bandwidth, thus leaving no room for other users.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Volume usage tracking and metering
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Change of Authorization
- Provisioning engine

Speed and QoS control based on periodically consumed data volume limits

Bandwidth and other network resources involved in providing Quality of Experience (QoE) for the subscribers are scarce resources in most networks. CSPs may want to control such resources for individual subscribers based on how much volume of data they consume within a given period of time. This period of time may be daily, weekly, bi-weekly, and monthly or based on subscription’s period (billing cycle).

For example, a CSP may want to reduce bandwidth if the subscriber has exceeded the data volume usage beyond a threshold for that period. Example would be to reduce the bandwidth by 200Kbits/sec for one day if the data volume has exceeded beyond 2Gbytes during a 24-hour period. The bandwidth is returned to the original subscribed value when the period has expired.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Volume usage tracking and metering
- Policy Manager

- Subscriber and Subscription Manager (HSS)
- Change of Authorization
- Provisioning engine

Speed boost to all users when additional bandwidth available in the network

There are always some hours of the day when subscriber traffic load, and consequently bandwidth consumption is reduced. These are called off-peak hours. Examples may be at the start and end of the business day when people are traveling to and back to their homes, late night hours when most people are sleeping and so on. During these hours, bandwidth availability level becomes much higher in the network.

CSPs are motivated to offer this available bandwidth as a benefit to the subscribers who are actively using the service during these hours. Bandwidth is added to the subscriber's session dynamically during these periods. The bandwidth is returned to the original subscribed value when the period has expired.

To handle this use case, the following are the key capabilities required of the system:

- Congestion awareness via congestion reports from network
- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Provisioning engine

Subscription based speed boost when additional bandwidth available in the network

This is a variant of the previous use case. The only difference is that the benefit of additional off-peak-hours available bandwidth is passed to subscribers who have purchased this feature as part of a subscription add-on.

To handle this use case, the following are the key capabilities required of the system:

- Congestion awareness via congestion reports from network
- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Subscription Add-On management

Add-ons and promotions

Service providers want to offer new promotions to their subscribers as add-ons to the basic plans from time to time. These add-ons usually provide a combination of speed boosts, better QoE for specific targeted applications, both OTT and those provided by the Service Providers, and volume boosts to subscribers during their billing cycle.

As an example, an available add-on might offer subscribers to boost their volume for the remaining period of the billing cycle by 1GB. Similarly, other add-ons may be defined that provide speed boost from 512Kb/s to 1Mb or more, and also offer a volume boost by 1GB in the same add-on. Similarly, add-ons might be offered that provide enhanced QoS profiles and bandwidths for specific OTTs like YouTube, Skype etc. or when the subscribers access corporate conferencing application hosted by the Service Provider itself.

These add-ons are available for a specific price that is added to the subscription for the period of the add-on. For example, the add-on period may be the remainder of the current billing cycle, or it may also be for the next three billing cycles. The prices may vary based on the period of the add-on.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Volume based usage tracking and metering
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Subscription Add-On management
- Subscriber service awareness by based on the accessed Application Server (optional in case the add-on requires it)
- Deep Packet Inspection and flow identification in access network (if the add-on requires it e.g. in case of OTT)
- Flow identification by the AAA and other policy server interface points
- Flow-based accounting and metering

Bill shock prevention

Most subscriber plans have volume limits. A substantial fixed amount of free volume is included in the plan. Any volume usage beyond that limit is charged at a pre-specified rate. If a subscriber's usage is very high and it crosses the plan limit early in the billing cycle, the subscriber may not be aware of the fact that she is being charged and not using the data for free any more. This may come as a shock at the end of the subscription period when the bill is generated.

Many subscribers go into a state of shock when they see bills that may be twice or even more of their base subscription amount. Heated arguments and bad relations leading to customer loss may follow as a result.

To prevent such bill shocks to subscribers, CSNs are keen to send alerts to subscribers triggered by crossing of certain thresholds on their usage. For example, alerts may be sent as emails, SMS or voice calls when usage crosses 50%, then 75% and then 90% thresholds.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Volume based usage tracking and metering
- Policy Manager
- Subscriber and Subscription Manager (HSS)

- Alerting Application integrated with multiple alerts mechanisms e.g. email, SMS, Voice Application server
- Subscriber portal for displaying various messages as prompts

Bill day and other forms of customer alerts

This is a more general form of alerting use case where a CSN may want to send alerts to subscribers on different types of events. Examples of such events include bill day alerts i.e. sending an alert 5 days before the bill date, post-bill day alerts if the subscriber has not paid her bill after 3 days of the billing cycle expiry, alerts about availability of any add-ons and promotions etc.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Alerting Application integrated with multiple alerts mechanisms e.g. email, SMS, Voice Application server
- Subscriber portal for displaying various messages as prompts

Daily Pass

There are several customers who subscribed to a CSN services but later on switched to a different CSN. Then there are customers who are skeptical about the usefulness and quality of services offered by the CSN. Finally, there may be subscribers who cannot afford to be on longer billing cycles e.g. monthly plans. They use pre-paid services whenever they need them without having to worry about paying regular monthly bills.

For all these types of customers, a CSN may want to offer single day based pre-paid plans where the subscribers don't have to become a permanent subscriber making regular billing cycle based payments. Such plans are a key to attracting new subscribers and an important marketing tool for services.

For example, a plan may offer a fully featured data usage plan for one day only with unlimited volume.

A subscriber may buy the "Daily Pass", use all the services and the service is discontinued at the end of the day with an offer about available regular plans sent to the subscriber through a portal page or alerting mechanism.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Quota Manager

- Alerting Application integrated with multiple alerts mechanisms e.g. email, SMS, Voice Application server
- Subscriber portal for displaying various messages as prompts

Night unlimited and other time of day based plans

CSNs may want to target specific groups of users. They attract them to subscribe their services by offering specialized plans that give speed and volume boosts in specific times of day. Examples include night unlimited packages that give unlimited or very high volumes during night hours e.g. from 10pm to 8am.

Other types of plans may be targeted towards students, boosting the speed and volumes in hours important for students studying for exams etc. such as very late night and early morning and evening etc.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Volume based usage tracking and metering
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Change of Authorization

Pay As You Go models

Many subscribers want to use services by topping up their prepaid accounts when their volume falls below a certain threshold. They don't want to subscribe to a plan that does not take into account their usage pattern and demand. CSNs offer Pay As You Go plans that can be recharged and topped-up multiple times when the balance is depleted. This is especially useful for users who are roaming or travel a lot but want to access services when they are on the move. Such plans are strictly prepaid in nature and require real-time quota reservation, tracking and management.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Quota Manager
- Integrated Voucher Management
- Subscriber portal for account recharge

Subscriber initiated Turbo Boost

In this use case, the subscriber realizes the need for speed and/or QoS boost and uses the service provider supplied self-care portal to increase the speed temporarily. The subscriber

may be using streaming media applications that can be either OTT applications (inside the pipe) or any application services provided by the service provider itself.

As an example realization, this use case can provide the subscriber self-care web-page with a Turbo Speed Boost button and an associated time period with it e.g. one day or in hourly time-slots where the subscriber may choose to increase the bandwidth to a higher level than the original subscribed one. The bandwidth returns to the originally subscribed one when the chosen period is over.

This facility may be available only to users who have bought this as an Add-on to the basic subscription.

To handle this use case, the following are the key capabilities required of the system:

- Policy Manager
- Subscriber and subscription Manager
- Self-care portal integration with Policy Manager
- Subscription Add-On management
- Change of Authorization

Automatically detected and network Prompted Turbo Boost

This is a very advanced use case and requires even more capability in the CSN network. In this case, the network detects the need for Turbo Boost based on subscriber behavior, such as when the subscriber uses OTT media streaming applications like youtube (OTT), or CSN supplied applications such as gaming or video conferencing.

The system detects and prompts the subscriber to enhance QoS and speed via a self care portal page or SMS etc. The subscriber can subsequently use the self care portal to enhance her experience for a specific period of time as in the previous use case.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber service awareness by based on the accessed service delivery function (Application Server)
- Deep Packet Inspection and flow identification in access network in case of OTT
- Flow identification by the AAA and other policy server interface points
- Flow-based accounting and metering
- Policy Manager
- Subscriber and subscription Manager
- Self-care portal integration with Policy Manager
- Subscription Add-On management
- Change of Authorization

Data volume and QoS control based on Access Devices

In this use case, the system identifies the subscriber's device used to access the network and discriminates service based on the access device. For example, a subscriber may have different volume limit or QoS profile when using a USB dongle device attached to the laptop, than when the subscriber is using a fixed Customer Premises Equipment (CPE). This type of service is useful in controlling network congestion and total Quality of Service for users. Users who are using limited functionality devices can be subjected to smaller quotas or QoS profiles when they actually do not support enough bandwidth for media streaming. Also, this type of service can be useful for parental controls and corporate environments where subscribers may have different devices for children in the house and do not want to give them larger volumes or strong streaming media capabilities. In this case, the service access through a specific device may need to be blocked after the volume limit has been exceeded.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- Device type awareness of AAA applications
- Volume usage tracking and metering per device
- Change of Authorization

Data volume and QoS control based on user identities

In this use case, the subscribers have multiple identities associated with a main account. Network services may be accessed through different identities individually and simultaneously. The system identifies the subscriber's identity and discriminates service based on the identity.

For example, a subscriber may have different volume limit or QoS profile when using a particular username than when using a different username, where both usernames are associated with the main account. One username may have greater volume limit and better support for media streaming than the other.

This type of service can also be very useful for parental controls and corporate environments where subscribers may have different usernames for children in the house or corporate may have different identities for different types of employees and do not want to give them larger volumes or strong streaming media capabilities. In this case, the service access through a specific username may need to be blocked after the volume limit has been exceeded.

To handle this use case, the following are the key capabilities required of the system:

- Subscriber Session Management
- Policy Manager
- Subscriber and Subscription Manager (HSS)
- User identity awareness of AAA applications during authentication, Authorization and Accounting

- Volume usage tracking and metering per username
- Change of Authorization

Shared Wallet and multiple quota management

This is an advanced use case where subscriber plans can get very complex and difficult to handle if policy manager is not part of the CSN solution. It involves managing multiple quotas in the subscriber's wallet for different combinations of user identities and device types and specifying different service profiles and volume limits for these combinations as part of the subscriber plan.

As an example, consider the following scenario:

A plan offers a total volume of 10GB and a total bandwidth of 2Mbits/sec with a maximum of 1Mbits/sec and 5GB reserved for streaming media and for certain OTT applications, accessed with a particular username with a particular CPE type.

The same plan may have different volume limits, QoS profiles and time of day based speed enhancements for three different user identity and access device combinations for the same subscriber account. This gives the users very fine grained control for parental controls, corporate Internet access policies etc.

Conclusion

Due to the explosive growth of data centric services coupled with OTT applications, demand for fine grained control of bandwidth, QoS and QoE on access networks has grown exponentially in recent years.

CSPs require policy driven decisions to meet the demands of service differentiation and value creation for their customers.

Policy driven systems are the real difference between the new generation of CSPs and the traditional ISPs providing only data pipes. Policy enables advanced and differentiated revenue models and feature monetization capability.

Some of the key objectives of a policy centric service deployment model for CSPs are:

- New revenue generation possibilities
- Speed of new services roll-out
- Customer satisfaction and loyalty
- Optimization of network resources
- Personalization of services by customers

All of the above objectives are highly important for CSPs and a lacking of policy based control in the network can become a serious handicap in today's competitive marketplace.

We have captured some popular and in-demand business use cases driven by policy in this paper. The cases captured are by no means exhaustive. In fact policy can be used to realize

even more advanced and complex use cases through its extensibility and programmability on the fly through run-time scripting.

It must be realized that for even relatively simple business use cases, an attempt to realize them without a sophisticated rule-based engine or in other words, the Policy Manager, will most likely take an order of magnitude more time to roll-out services and result in extremely complex systems.

Policy manager provides that central glue between various elements of service control and charging and holds a complete 360 degree view of the network functions. It therefore reduces complexity, and can make intelligent decisions to enforce policies as part of highly advanced use case realizations.

About AdvOSS:

Service Providers of today need more than individual products to realize their demanding objectives and innovative business models. To do this, they need cohesive and integrated solutions spanning all aspects of their business.

AdvOSS is a Canadian company and a vendor of technologically advanced solutions that enable any service provider to realize all their needs in aspects of service delivery, management and charging in a fully integrated way.

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