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Bridging the gap between content and communication services

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Bridging the gap between content and communication services

The pressure and fierce competition created by the constant evolution of the telecom industry is forcing communication service providers (CSPs) to deliver a wider range of services. Delivering a broader portfolio in such a landscape creates varying QoS[1] demands on the network in terms of bandwidth, latency and reliability.

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Successful advertising has led many subscribers to believe that network capacity is infinite. Unfortunately, this is not the case. Networks are carefully dimensioned to make them as efficient as possible – meeting demand, without underutilizing resources. Providing users with differentiated offerings that match requirements and urgency (the willingness of enterprises and subscribers to pay for a service they need or want) generates revenue. With this as a backdrop, policy control, charging and billing functions have become key components of the networks and services of the future.

Challenges

The policy and charging rules function (PCRF) standard was first introduced in 3GPP release 7. As the initial standard was limited in scope, fulfillment systems and other CSP processes were used to synchronize user, subscription and account data between online charging systems (OCSs)[2] and the PCRF.

In the early days of mobile broadband (MBB) these systems and processes were managed manually, which, at the time, when offerings were based on flat-rate plans, was not a problem. However, since then the MBB market has grown significantly and CSPs have introduced an increasing number of differentiated MBB products. Delivering a broader portfolio makes it a challenge to provide subscribers with the products they pay for in real time – good QoE – and has put the separation of OCS, PCRF and fulfillment systems to the test.

Differentiated MBB services function in a completely different way from traditional voice and SMS, creating yet another challenge. For example, smartphones perform a number of background tasks; they can check for new e-mails periodically and some apps regularly download new data from the internet – such as a weather app, which may download updates as the subscriber moves from one location to another. In the early days of MBB, users were unaware of this automatic communication, and the result was bill shock. Thankfully, the regulators stepped in, introducing a number of new demands, such as the requirement to notify users when a subscription threshold is approaching or has been surpassed, and allowing users to manage certain aspects of their subscriptions. Today, MBB-enabled devices provide the functionality to manage subscription parameters, such as the automatic download of information from the internet, and most smartphones support features that reduce the bill-shock factor, such as the ability to switch location-based services and data roaming on and off.

Keeping track of users

To reach QoE targets for each subscriber and support user self-service, subscribers on the post-payment model were transferred to real-time charging

BOX A Terms and abbreviations

AF	application function
BNG	Broadband Network Gateway
BSS	business support systems
BYOD	bring your own device
BYOS	bring your own subscription
CSP	communication service provider
HBO	Home Box Office
IRL	in real life
MBB	mobile broadband
OCS	online charging system
OSS	operations support systems
OTT	over-the-top
P-CSCF	proxy call session control function
PCEF	policy and charging enforcement function
PCRF	policy and charging rules function
PDC	Personal Digital Cellular
UDR	user data repository
VoD	video on demand

instead. This shift created a need for OCS and PCRF synchronization to support the real-time application of policies relating to a user's subscription and account status.

An ever-increasing range of self-service capabilities is being made available to subscribers, allowing them to manage their packages and products. Storing data in one place makes it simpler to provide such capabilities, and enhances the user experience. However, self-service requires a flexible system that processes input and implements changes without the need for additional manual handling by CSP personnel: a zero-touch approach.

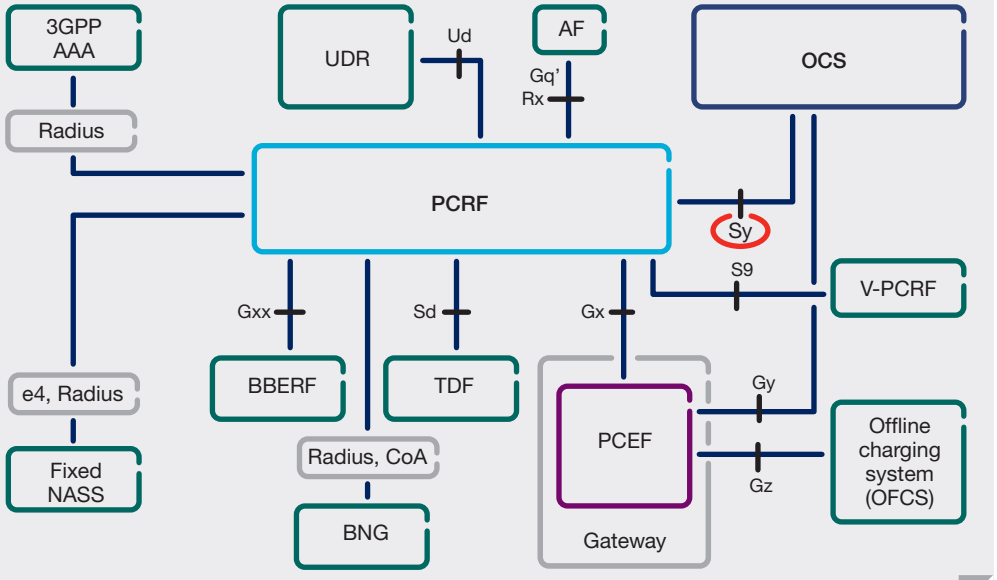
As fulfillment systems generally do not operate in real time (even if most modern ones are fast), using them to implement OCS-PCRF synchronization would result in a user experience that is not in line with subscriber expectations. The load created by the continuous and frequent updates to keep track of all users rapidly becomes unsustainable – hence the need to keep OCS and PCRF synchronized in a more efficient way.

As illustrated in **Figure 1**, the PCRF connects to many other functions, that:

- supply the necessary information to make policy and charging decisions – such as subscriber and service information from the user data repository (UDR);
- request policy decisions – represented by the generic designation AF (application function) in the diagram – which could be, for example, the P-CSCF in the IMS architecture; and
- execute policy decisions (typically in the media plane) such as the PCEF and BNG.

The main focus of this article is the relationship between the PCRF (which manages users' connections to the network) and the OCS (which maintains users' dynamic state with respect to the online charging account), and how parameters such as the current rating plan, call costs, balances and bonuses are kept up to date with usage. It also highlights how adding features to the PCRF/OCS relationship supports the creation of new products.

FIGURE 1 **PCRF/OCS landscape**



Connecting policy and charging

By 2008, it had become clear that a link between policy and charging functions was necessary. This need became the basis of Ericsson's proposal for the connection that is now known as Sy – the interface between OCS and PCRF. The first version of the standard to include the Sy interface was 3GPP Release 11, and as standardization is by nature an incremental improvement process, the first implementation of Sy encompassed just the minimum set of operations to satisfy the initial set of use cases.

Connecting OCS and PCRF eliminates the need to duplicate subscriber data, simplifying the operations and business support systems (OSS/BSS) landscape and reducing the requirements placed on it. This simplification in turn results in fewer errors, reduced costs and improved business efficiency. It is this business efficiency that will enable CSPs to differentiate, target more of their existing subscribers with MBB offers, and move into entirely new market segments.

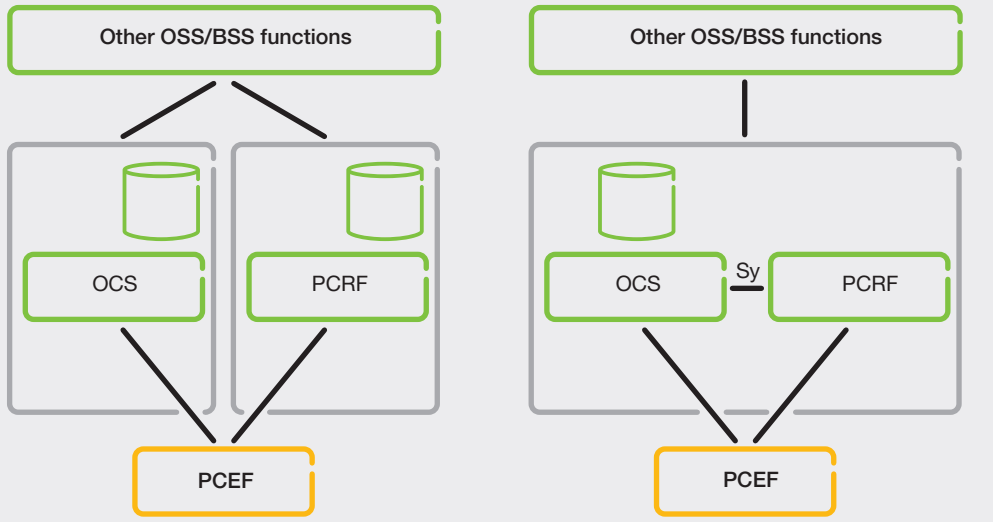
Subscribers benefit from the storage of all consumption and user data in a single place, because it allows CSPs to provide a complete overview of their subscriptions, including all the products they pay for.

The 3GPP international communication standard is one of the most – if not the most – successful to date. The standardization process is inherently slow on account of the massive amount of input that has to be taken into consideration with each incremental improvement – and the process has both strengths and weaknesses:

- its greatest strength is that it enables interoperability between different vendors and CSPs worldwide; and
- its most prominent weakness is its sluggishness, which makes it difficult to keep pace with technological advancement and device development – both of which have an immediate and rapid impact on the way people communicate, access information and carry out transactions.

In short, the current version of the Sy standard basically does what it set out to do; however, it needs to be developed further. The existing Sy standard supports the propagation of spending limits for services from OCS to PCRF, enabling a subset of the data in OCS to be transmitted to the PCRF. This capability simplifies a large number of operations, such as fulfillment flows that would otherwise require interaction between OCS, OSS/BSS elements, and the PCRF. However, additional functionality that is supported by Ericsson Sy, such as sharing usage data as shown in **Figure 2**, will be required to keep pace with developments in the telecom industry.

FIGURE 2 The relationship between OCS and PCRF before and after 3GPP Release 11



Ericsson Sy

While Ericsson continues to drive the standardization process forward, the Ericsson Sy has been introduced. This definition of the interface adds to the functionality of the existing standard by supporting:

- the centralized handling of usage information – avoiding data duplication and the need for synchronization between OCS and PCRF, consequently reducing integration needs, lessening the time required to create and fulfill new products, and eliminating the need for routine data-synchronization processes;
- the creation of common product offerings – reducing time to market, as the introduction of a new product has an impact on fewer systems;
- the use of common user communication channels – CSPs can use existing systems for subscriber interaction, which limits the need to create new interfaces to back-end systems and hence contributes to reduced time to market; and
- cross-service promotions – as products are no longer distributed across several systems, CSPs can reward subscribers for their usage of one product with free-to-try usage of other products. For example, an online gamer can be rewarded with voice minutes for surpassing a threshold in the game application. By giving products exposure among subscribers, CSPs stand to benefit from higher revenue generation.

These additions to the standard, outlined in Table 1, provide the flexibility that is needed to create differentiated offerings. This differentiation is necessary to continue to monetize MBB, while at the same time meeting QoE requirements by creating a wide range of product offerings that address new segments, for example, as well as enabling cooperation with OTT providers, and meeting the needs of the non-smartphone subscriber.

To create a broader portfolio that can reach all potential subscribers and segments, differentiated MBB products need to be service specific and targeted toward the varying spending powers of different subscribers. A service-specific offering may, for example, provide access to just Facebook, YouTube or some other OTT service, and different packages – such as basic, bronze, silver and gold – can be developed according to subscribers' willingness to pay.

Table 1: Capabilities of 3GPP Sy and Ericsson Sy

Capability	Supported by Ericsson Sy	Supported by 3GPP Sy
Spending limits for services	Yes	Yes
Centralized handling of usage	Yes	Not yet
Common product offer creation	Yes	Not yet
Common user communication channels	Yes	Not yet
Cross-service promotions	Yes	Not yet
Single storage point for subscription data	Yes	Not yet

Online gaming in this context

One specific segment that is well suited to MBB is online gaming. There are a number of reasons for this:

- smartphones and tablet devices feature multi-core processors and graphics acceleration, making them capable of running modern multiplayer online games;
- games are increasingly being offered on a free-trial basis, and the user can then buy (in-game) access to subsequent levels, or purchase objects that improve the subscriber's experience of the game;
- most online games include some sort of in-game credit that can be purchased by the subscriber through their mobile-subscription account (which is linked to a bank account or credit card) or earned through achieving certain milestones;
- online games typically support multiplayer mode on one or several devices, enhancing the subscriber's experience by enabling them to play their favorite games with friends IRL or via the network and with random opponents; and
- gamers are accustomed to paying a premium for an enhanced experience.

The way game producers generate revenue is changing, with the catalytic effect of connectivity and device capabilities. The online-multiplayer-game segment is a demanding one that places stringent requirements on the network regarding:

- latency – the time that elapses between the moment a gamer performs an action on their controller and the moment this action is registered. To ensure a positive gaming experience, latency must be low so the game doesn't lag and lead to out-of-sync actions;
- text and voice communication – gamers need to be able to create gaming strategies and communicate while playing, voice communication needs to be supported and sound effects need to include proximity to be realistic; and
- in-game purchases – payment methods need to be simple and efficient so gamers are not without access to a game for an unnecessarily long time.

By the end of 2012, the number of MBB subscriptions had reached 1.5 billion worldwide – a penetration rate of just over 22 percent of the total 6.6 billion global mobile subscriptions. The figure for MBB subscriptions is set to rise to 6.5 billion and reach a penetration rate of nearly 70 percent by the end of 2018[3].

The remaining addressable market will come from the prepaid segment, and even if not all subscribers in this group have a bank account or credit card, they are still a target market for game producers.

There is an opportunity here for CSPs to take the role of the payment provider in this value chain, and enable prepaid customers make in-game purchases.

Naturally, game producers want it to be easy for people to play games. However, latency is an issue – a typical MBB subscription does not meet the latency requirements for multiplayer online gaming. There is yet another opportunity here for CSPs to safely prioritize up to 15 percent of MBB traffic without degrading the experience of other users.

The following example illustrates how the additional functions supported by Ericsson Sy enable the flexibility required by the online gaming segment.

A subscriber sees that a friend has given a particular game a very positive review. The subscriber searches for the game in the relevant store for their device, and installs it.

The connection from the subscriber's device to the game server carries information about the user's MBB subscription. This information, provided by the CSP, indicates whether or not the user's subscription includes gaming. If not, their experience while playing the game will be suboptimal.

This is a problem for game producers; unless people are able to test games under favorable network conditions without changing their subscriptions or paying for additional bandwidth, game producers will be unable to benefit fully from such opportunities to generate revenue.

If, on the other hand, the CSP enters into an agreement with the game producer to automatically provide users with a temporary upgrade of their MBB subscription free of charge, a vital link in the value chain is established, and the new user is immediately able to enjoy their gaming experience to the full.

In practice, game producers could, for example, be charged for 30-minute slots of gameplay – the amount of time the new user can benefit from their free trial. A temporary gaming MBB product is assigned to the user so their data is prioritized in the network, keeping latency within gaming limits. The gaming MBB product could include allowances for in-game communication – effectively VoIP – even if this service is not ordinarily included in the subscriber's MBB package.

When the trial period is over, the user is given the opportunity to purchase the game or extend the trial period – both of which must be paid for – and is then presented with a simple payment service offered by the CSP. In fact, it is not the software of the game the gamer is purchasing, but rather the right to play the game, bundled with the MBB product for the specific game. Once the transaction is complete, the subscriber is notified that they have just earned 60 voice minutes as part of a current promotion. The CSP can also provide the gamer with additional gaming-related promotions based on voice, messaging and other MBB usage.

The gaming example illustrates clearly how CSPs can bundle products in cooperation with application builders. The core functions – in particular the interaction between policy control and online charging – needed to enable such a partnership are equally relevant to other products provided by the CSP that can be bundled with OTT services.

A case for video on demand

Subscribers tend to purchase VoD from any source, and there is little or no loyalty involved in the purchasing process – people tend to buy from the provider that can offer the best service and ease of payment. And users will rapidly switch to another provider with a better service to offer. The subscription-based VoD model used by Netflix and many cable-TV providers increases the stickiness factor to some degree. From the subscriber's perspective, it is irrelevant whether a VoD product is branded by the CSP or by the content provider. Whether they buy access to HBO from their CSP, directly from the content provider or from their cable provider is immaterial. Several business models based on partnerships can be used to deliver VoD to subscribers:

- reseller model – the CSP bundles content from the provider with other offerings;
- sell-through – partners can bundle CSP products with their own products or sell CSP offerings directly to their subscribers; and
- mix – CSPs and content providers as well as other parties can bundle and provide sell-through offerings according to the needs of the subscriber.

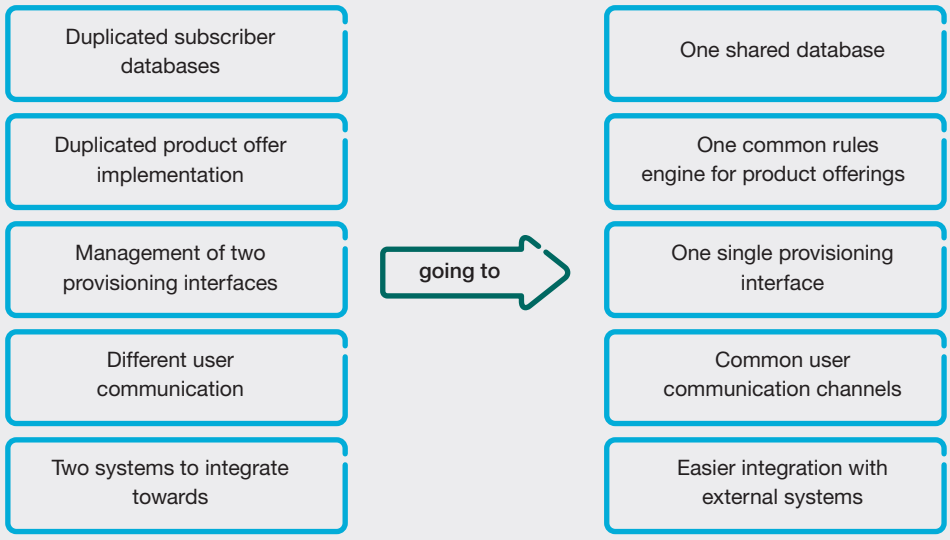
According to the reseller model, the CSP can either rebrand or uphold the brand of the provider and sell the bundle as part of its own portfolio to its subscribers. Telia, for example, resells Spotify to its customers bundled with its smartphone offerings without rebranding.

With the sell-through model, the CSP actively enables direct OTT-to-subscriber transactions by exposing relevant assets to the provider, such as guaranteed-bandwidth MBB – the appropriate asset in the gaming example. And MBB products are configured to provide services based on delivering the right user experience as a part of the OTT service bundle.

A case for service-specific internet

In this example, subscribers are offered, say, a social-networking bundle that provides access to a predefined list of sites. The CSP can create many different bundles of sites in the same way that cable-TV providers offer different packages picked from a range of channels to

FIGURE 3 **Benefits of Ericsson Sy**



support further segmentation of the addressable market.

Partnering with a music-streaming provider allows CSPs to offer music bundles, for example, as add-ons to standard MBB offerings. Otherwise, the music-streaming service could be sold as a dedicated product – the CSP is effectively a reseller in this case. This model can be used for many different applications, such as internet-radio services, or access to an individual TV channel.

CSPs could create a set of enterprise services bundled and cross-promoted with other services. At the same time, access to OTT and other non-enterprise services is handled as a series of separate private subscriptions connected to the same device(s): which is essentially part of the challenge enterprises are facing with the bring your own device (BYOD) model.

From an employee perspective in the context of BYOD, you bring your own subscription (BYOS). Enterprises can pay for subscriptions to support enterprise-specific services. It must be possible to add an individual's device to the enterprise subscription. Otherwise, the user will be charged for enterprise services on their private subscription, which may result in a depletion of the monthly bundle, prepaid balance or, in the worst case, result in bill shock. It may even result in a user not being able to access essential enterprise services. In essence, BYOD and BYOS are similar to employees using enterprise devices to run private applications and subscriptions.

Synchronization and new business models improve user experience

There are many benefits to be gained from establishing an advanced connection between an OCS and a PCRF:

- **fulfillment and related provisioning flows are simplified;**
- **user consumption and usage data is stored in one place;**
- **product offerings can be created for additional segments;**
- **subscribers can be provided with self-service capabilities; and**
- **notifications and interaction with the user can be handled efficiently if all consumption is tracked in one place rather than in multiple separate systems and in many databases.**

Above all, such advanced connectivity leads to lower dependency among systems, which in turn lowers the overall complexity of the entire landscape. And of course, complexity goes hand-in-hand with cost.

Building partnerships with content providers widens the scope of the product portfolio, enables bundling of products and content, and facilitates cross-product promotion. CSPs can become resellers for content providers, who can in turn become resellers for CSPs – all of which enhances the user experience.

The scope of Sy today is a good starting point, but additional standardization of this interface is a prerequisite for advanced OCS-PCRF interaction that enables a differentiated portfolio and leads to an enhanced user experience. In the interim, Ericsson Sy is one step ahead of industry development.

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began his career in data communication, specializing in the X-Series Standards. He joined MTN South Africa in 1994, where his focus was on value-added services and charging. In 1999, he joined Ericsson, working with product management for charging systems. He is now senior expert and head of Business Development and Strategy with Business Unit Support Solutions, Solution Area Revenue Management, where he focuses on the future evolution of the Ericsson BSS portfolio to meet the demands the Networked Society will put on next-generation BSS.

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