

# Convergent Online Charging

## Meeting the Needs of Operators for Next Generation Charging

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## Executive summary

Analysts believe that the key to success in the GPRS and UMTS market will not be single services, but the proper mix of mobile data services. So, it's a wide and attractive range of mobile applications instead of the killer application [1], [2]. This should motivate operators to move quickly, launching a wide range of attractive mobile applications and rounding out their service range with partner offerings.

The competitive edge and business success hinge upon the ability to not only offer all these services, but also charge for them flexibly. Powerful charging capabilities – in real-time, for every type of subscriber, for all kinds of content and services, and regardless of the type of network – are crucial.

### Charging methods and flexibility

In many cases, volume and time based charging still lacks transparency and is difficult to follow. Nevertheless, the average customer expects consolidated price information, regardless if charges are for access, transport, or volume. The only way to dispel confusion is to spell out charges before delivering services to both prepaid and postpaid subscribers [3]. Differentiated charging based on different

parameters – the price of the actual product, resolution of graphics, quality of service, player level, time of day, location, personal discount, contract type, service type, access fees, – that reflect the service's value will make or break mobile application offerings.

Swift, widespread acceptance of new mobile data services boils down to the right rates, loyalty, and bonus programs. There is no ideal recipe for success when it comes to tariffs and bonus or loyalty schemes. Mobile applications demand flexibility, differentiated rating, and rapid adaptation to changing market conditions.

### Minimum risk

While operators are on the safe side with prepaid subscribers because they pay in advance, operators' risk grows significantly with postpaid subscribers in the 2.5G and 3G world. They have no choice but to introduce continuous cost control and credit limits (threshold) for specific postpaid customers.

### Considerable savings potential

In a consolidated market, mobile network operators are looking at a host of largely proprietary billing systems once owned by companies

they have taken over, many of which are nearing the end of their life cycle. Replacing these disparate systems with a uniform group-wide system that satisfies 2.5G and 3G requirements could cut costs dramatically. Indeed, streamlined operation, easily communicated charging information for roaming, and group-wide tariff models spell tremendous savings.

The Siemens Convergent Online Charging solution rises to these charging and rating challenges. It is a flexible and highly scalable solution that combines real-time charging capabilities for all kinds of services and all kinds of subscribers with a wide range of pricing and tariffing options, as well as bonus & loyalty programs. Its interfaces enable smooth integration into the network operator's existing infrastructure. This solution empowers operators to charge prepaid and postpaid customers for access, services (for example, video streaming) and content, regardless of whether their networks are packet-oriented (GPRS, UMTS) or circuit-switched (GSM). The majority of new services calls for longer transaction times and generally cost more, which harbors new credit risk for the operator. This mandates credit limit checks for postpaid subscribers to minimize the oper-

ator's credit risk just as credit limit checks for prepaid subscribers have done for years.

Offering a uniform rating infrastructure for online and offline charging, it supports synchronous dialogs such as balance checks, Advice of Charge (AoC), and charge reservation. It also supports business models in which the operator and selected, trusted partners offer data services (walled garden), and offers secure interfaces integrating third party mobile data service providers.

## Introduction

This white paper covers trends in the mobile data services market, consumers' changing expectations, and the demands that new services place on convergent charging systems. The discussion centers on the following aspects of convergent charging:

- uniform charging and rating of voice, data, sessions, and content
- real-time monitoring of account limits and threshold supervision for prepaid and postpaid subscribers, respectively
- support for #7-based and IP-based traffic
- real-time charging in support of all kinds of networks (2G, 2.5G, 3G, WLAN)
- support for wholesale and retail business models

## The shifting market paradigm

Yesterday the main target was sales growth by winning new customers; today the recipe for survival and success reads profitability and customer loyalty. High ARPU (average revenue per user) and low churn rates are the new yardsticks for business success.

### New services for more business

Mobile data services and a changing value chain bring new sources of revenue to light. Operators can opt to charge network access fees, commissions for selling content via their distribution channel to millions of mobile users, for payment services, and for location-dependent information. Analysts predict content revenues in Europe will grow by 11.5 billion € p.a. up to 2005 [5], and multimedia messaging services (MMS), the successor to SMS, revenue will grow to US\$70 billion worldwide and US\$29 billion in Europe by 2007 [6]. The only way for operators to seize a considerable share of this new business is to address both postpaid and the mass market of prepaid subscriptions.

### New partners for more business

An operator's value chain changes significantly as he diversifies to provide content, services, and access. New partnerships with content providers and sponsors will be born of offerings financed to some extent by advertising. When operators begin handling third party content and application providers, they will be keen to control access, certify partners, and present a uniform look & feel. For savvy applications and content providers, partnering with mobile operators is a win-win situation, particularly in light of operators' security, charging, credit, and fraud protection skills.

### Flexibility critical to success

Consumers often feel that volume-based and time-based charging lack transparency and are hard to follow. An operator can learn which tariff models suit his customers best by introducing attractive new pricing models that factor in parameters such as quality of service, financing through advertising, personal preferential terms, loyalty discounts, limited offers, and so forth.

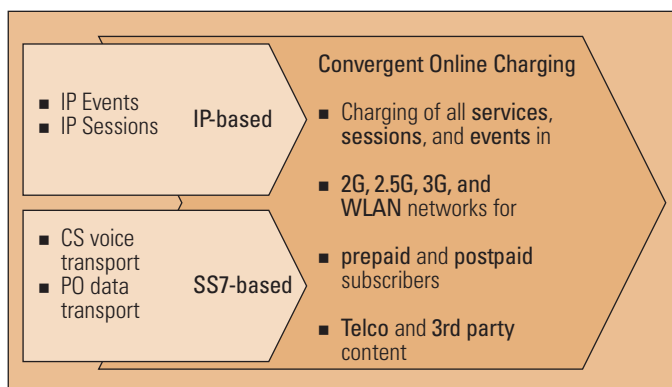


Figure 1: The principles of convergent charging

## What consumers want

Market conventions dictate that everyone involved in the value chain must get their money's worth for new, target group-focused content and services to succeed. If customers benefit from new offerings, they will be prepared to pay for them.

### All you can eat vs. a la carte

The Internet has shown that flat rates and advertising-financed offerings are an appetizer at best. Flat rates are rather unprofitable for vendors [7], [8]: Consumers are reluctant to subscribe to services and service packages for a long-term flat rate if used infrequently or perhaps just once. And they do not want advertising unless they have full control over type and extent [2].

### Name that price

Consumers want to know what a commodity costs before buying it, and a mobile service is no exception. If they opt for a package deal, they want a straightforward package price rather than bothering with separate charges for every service and provider. For example, they want to see a fixed price up-front before downloading music. If unable

to quote the final price in advance, an operator should at least be able to point out the fixed costs and warn the user to expect additional variable costs.

### Trust is good; control is better

Cost control should be continuous, convenient, up-to-date, and preferably free. This confidence-building measure is imperative to establishing a broad customer base for new services. Limiting an operator's risk towards third parties in new business models is another crucial factor contributing to an operator's business success.

### Special offers for special customers

Special offers like limited-period trial rates are attractive marketing instruments for the introduction of new products. Variable tariff models and loyalty and bonus schemes are the ties that bind customers to an operator. Like frequent flyer offerings, the latter rewards return customers with free SMS or download capacity.

## Prepaid vs. postpaid

The rise of mobile phones in recent years is largely attributable to the prepaid option. It entails no risk for operators and subscribers, and it is very popular with private customers, particularly young consumers who could well become lucrative postpaid customers tomorrow if operators succeed in gaining their loyalty early on. The prepaid subscriber base is huge, offering tremendous potential to operators attaching greater importance to future incentive and loyalty schemes [4], [9].

### Prepaid – buying up to the limit

Customers opt for prepaid offerings chiefly for its built-in credit limit. An IN-based prepaid system such as Siemens Prepaid@vantage also affords cost control by continuously calculating the price for the next chargeable unit of time. The service can only be continued if the remaining balance in the prepaid account suffices to cover the charges.

### Always up to date

Prepaid customer rating and account management is performed in real time. This makes the prepaid subscriber a no-risk customer whose account is always up to date. As an added benefit, customers may view their account balance at any time.

### Credit where credit is due

Before activating a postpaid customer's MSISDN, the operator checks the customer's creditworthiness and trustworthiness. During a postpaid customer's call, only data concerning the services used is collected (CDRs, call detail records)

It is correlated offline, rated according to sophisticated tariff/bonus and loyalty schemes, and compiled to generate a bill at the end of the billing period.

### Where prepaid and postpaid intersect

Operators seeking to thrive in the 2.5G and 3G world must encourage consumer acceptance and use of new mobile data offerings [3], [4]. Regardless of payment option, prepaid and postpaid customers want the same things:

- straightforward, transparent pricing,
- loyalty and bonus schemes, and
- cost control.

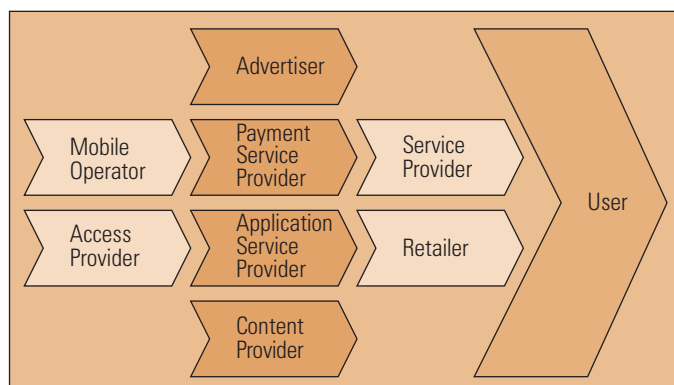


Figure 2: M-commerce value chain

## The touchstones of next-generation charging

Which option a user selects depends solely on the preferred payment and account-balancing method.

With converged prepaid and postpaid charging, operators can offer many attractive tariffs that help win customers and inspire loyalty. Case in point: An operator may offer an enterprise tariff in a package with VPN that use white lists to distinguish between business and personal calls. The call is billed to the company's postpaid account or employee's private (prepaid) account depending on which number was called.

A family rather than a company account could be offered to private customers. In this case, parents maintain a postpaid account while children hold prepaid accounts. Parents transfer a certain amount from this postpaid account to each child's prepaid account. If a child calls his parents, charges are reversed and debited to the parents' postpaid account. A special tariff applies if children call each other, or friends and relatives annotated in a friends and family list.

The GPRS and UMTS environment mandates integrated charging for access, content and data at the system level. Next-generation charging systems must offer:

*Comprehensive charging for 2G, 2.5G and 3G services.* To do this, the system must support all existing and future network elements such as application servers.

*The parity principle: equal services for prepaid and postpaid subscribers.*

- AoC offering price transparency

- real-time threshold supervision to minimize risks for consumers and operators

*Flexible rating:*

- fast introduction of new tariff models

- flexible bonus schemes

- common tariff models for prepaid and postpaid subscribers supporting rules such as time- and location-based rates, one-off or periodic charges

- specialized tools for content providers, for example, for updating bonus schemes

*Support for new business models.*

PayCircle is an initiative launched by Siemens and other leading vendors (<http://www.paycircle.org>). It advocates open interfaces that enable charging for third-party content and applications. These can then be incorporated into new business models.

## The Siemens Convergent Online Charging solution

*Interfaces required for integration into*

- existing infrastructure such as CRM, fraud management, ABC, online bill presentation

- administration tools enabling users to manage their accounts

*Scalability, reliability, flexibility.*

The solution must be able to handle innumerable CDRs, complex pricing rules, and multitudes of real-time transactions, and fulfill obligations to and contractual relationships with third parties. High availability and performance are now standard in telecommunications, and particularly at times of peak traffic, they are indispensable for satisfying real-time requirements.

*Modular product portfolio.*

Few operators start from scratch, so the next-generation charging system must mesh seamlessly with existing, often proprietary, infrastructure comprising CRM, ABC, EBPP, and other systems. Siemens has the necessary system integration skills, and our systems have the interfaces required for integration.

With the benefit of expertise in prepaid and payment solutions based on its successful @vantage technology, Siemens is currently developing a modular, highly scalable, and flexible next-generation system for convergent charging. The system enables network operators to charge online for transport/access (e.g. volume-based charging), services and sessions (e.g. video call with a guaranteed QoS), and content and events (e.g. Web pages, video/audio on demand or hard goods) in both packet-oriented networks (GPRS, UMTS, IP) and circuit-switched networks (GSM). In addition to online charging with credit checking and synchronous checking in real time, the Siemens Convergent Online Charging System also supports hot billing with defined response times for network elements that do not yet offer real-time capability.

The Siemens Convergent Online Charging System is based on the 3GPP standard for charging and billing.

Siemens' profound system integration experience enables smooth integration with CRM, online bill presentation, accounting, and statistical systems. Operators may even continue using classic billing systems, thereby protecting their investments.

Siemens Convergent Online Charging integrates with legacy network infrastructure and offers charging capabilities for manifold network-independent services. The system's core comprises four modular units: one each for service logic, convergent charging service logic, a common database, and rating logic.

### Service logic

Network elements address the service logic module via a #7, an IP or a ticket interface. Its components perform different functions depending on the interface (for example, user interaction or black and/or white list screening). Network elements such as proprietary

application servers that do not support online interfaces address the hot billing interface.

If required, the charging component initiates interaction with the subscriber before executing the service. It provides charge information (AoC) and notifies the subscriber when his or her account limit is reached. If necessary and desirable, it could even solicit the subscriber's explicit agreement.

### Convergent charging service logic

The convergent charging service logic is the Convergent Online Charging solution's nerve center. It monitors and controls transactions based on subscriber-specific charging models, using internal and external components for account balance and profile management, rating, or CRM.

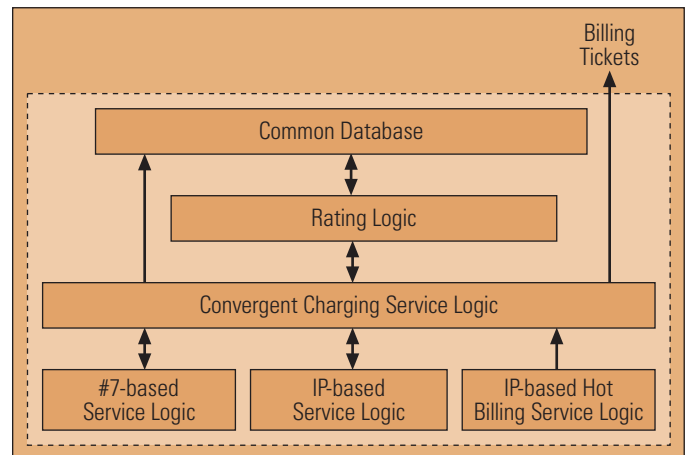


Figure 4: The functional units of Siemens Convergent Online Charging

### Rating logic

The Siemens Convergent Online Charging solution offers flexible real-time rating for online and offline charging. It supports billing based on a range of flexible, swiftly defined criteria, permitting network operators to leverage target group-focused tariff models as a marketing tool.

### Common database

The Siemens Convergent Online Charging solution manages internal accounts for prepaid and postpaid subscribers in real time. Using defined thresholds to prevent overdrawn accounts, the system checks for sufficient credit before and while delivering a service. And it supports multiple and shared accounts based on currency or other units.

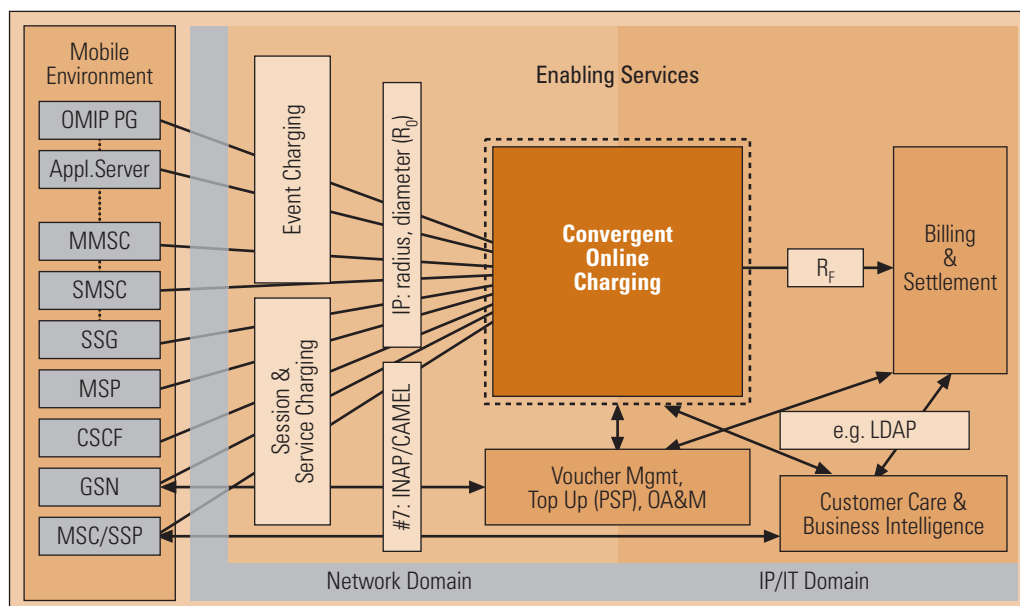


Figure 3: The Siemens Convergent Online Charging architecture

## Value propositions

With more than 150 million subscriptions installed or on order, Siemens is the world market leader in the GSM prepaid market. Our experience teaches that migration to a Convergent Online Charging solution is the key enabler for a new mobile data market and brings considerable benefits to the operator. Convergent Online Charging:

- supports new business models with trusted and untrusted third party content and application providers, including toll-free, split charging, and premium charging models with correlated access and content,
- reduces financial risk using real-time threshold supervision (for prepaid and postpaid subscribers),
- increases revenue by leveraging a range of charging services and rating options for a variety of applications, and reduces the subscriber churn rate,
- increases flexibility and speed allowing new tariff models and bonus & loyalty schemes courtesy of a single rating system for CS and PO networks and prepaid/postpaid plans,
- drives down operational and administrative overhead courtesy of a uniform, integrated charging architecture for prepaid and postpaid subscribers.

It also lives up to users' expectations. Subscriber benefits include:

- transparency: AoC
- minimized risk: due to cost control and credit limit supervision for pre- and postpaid subscribers
- acceptance: MNO as single point of handling charges for access, service and content in IP and SS7 networks
- ease of use: no additional registration, no terminal device upgrade, same functionalities independent of contract type
- attractive rewards: support for multifaceted tariff models and bonus & loyalty schemes

## Conclusion

Thorough analysis of market conditions and the requirements of end users, subscribers, and mobile operators indicates that migration to a Convergent Online Charging solution will facilitate and accelerate the development of a broad mobile data market.

Siemens' record of accomplishment in pioneering prepaid and payment solutions speaks for itself, as does the success of the @vantage portfolio. Siemens is blazing the trail again in Convergent Online Charging. The solution outlined in this white paper rises to all challenges in the field of charging and rating. Modular, highly scalable, and remarkably flexible, this system satisfies the demands of next-generation charging.

Siemens works closely with the customer, conducting business-consulting workshops to produce a detailed, well-founded business case that takes all the specifics of the situation into account. Siemens Convergent Online Charging ranks among the most powerful and cost-effective solutions for the emerging mobile data market, and the Siemens approach makes it the operator's first choice in custom solutions.

## Abbreviations

ABC	Administration and Billing Center	MNO	Mobile Network Operator
AoC	Advice of Charge	MRFC	Media Resource Function Controller
API	Application Programming Interface	MSC	Mobile Switching Center
ARPU	Average Revenue per User	MSP	Mobile Smart Proxy
CAMEL	Customized Applications for Mobile network Enhanced Logic	OA&M	Operation, Administration and Maintenance
CCF	Call Control Function	OMIP	Open Mobile Internet Platform
CDR	Call Detail Record	OMIP PG	OMIP Payment Gateway
CRM	Customer Relationship Management	PO	Packet-Oriented
CS	Circuit-Switched	PSP	Payment Service Provider
CSCF	Call Session Control Function (3G.IP)	QoS	Quality of Service
DIA-		RADIUS	Remote Authentication Dial-In User Service
METER	Enhancement of RADIUS	R <sub>f</sub>	Off-line Charging Reference Point between an IMS Network Entity and CCF
EBPP	Electronic Bill Presentment & Payment	R <sub>o</sub>	On-line Charging Reference Point between an application server or MRFC and the ECF
ECF	Event Charging Function	SMS	Short Message Service
GPRS	General Packet Radio Service	SMSC	SMS Center
GSM	Global System for Mobile Communication	SSP	Service Switching Point
GSN	GPRS Support Node	UMTS	Universal Mobile Telecommunication System
IN	Intelligent Network	VPN	Virtual Private Network
INAP	Intelligent Networks Application Protocol	2G	2nd Generation (GSM)
IP	Internet Protocol	2.5 G	2.5th Generation (GPRS)
LDAP	Lightweight Directory Access Protocol	3G	3rd Generation (UMTS)
MMS	Multimedia Message Service	3GPP	3rd Generation Partnership Project
MMSC	Multimedia Messaging Service Center		

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