

A Review on 5G Real time Billing and Charging System

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Abstract: 5G Technology stands for fifth Generation Mobile technology. The Evolution of telecommunications has been seen from 1G to 4G (LTE) to provide better customer experience in terms of speed, reduced latency and very importantly at affordable and reduce cost. Fifth generation technology along with its mobile computing changes will also have a huge change in the network architecture to support its claim to be FAST & AFFORDABLE Broadband wireless connectivity, using evolving technologies like Cloud computing for network components like Intelligent Network to have sophisticated Online Charging & Billing system, NFV as well as SDV implementation for better QOS. This paper focuses on all preceding generations of charging system along with proposed changes in Charging system for 5th generation technology.

Index Terms –CDR'S, CAMEL, Policy control, Online Charging.

I. INTRODUCTION

A traditional mobile telecommunications system provides offline charging where the CDR's are collected and then sent to the billing system after a service is delivered, i.e. no charging information is sent to the billing system during the service session. A user typically receives the monthly bill that shows the chargeable items during a specific period. Advanced mobile telecomm. Uses data applications with real time control and management, which requires a convergent flexible OCS (Online charging system). To address this issue UMTS Release 5 defines the charging functionalities that allows the network nodes to generate the CDR's accurately in UMTS R5 online charging furnishes real time charging information in order to dynamically perform credit control for network resource usage.

In 3GPP Circuit Switched (CS) service domain, the MSC server sends the CDR to the billing system for offline charging. The CS online charging implements two functions through Customized Application of Mobile network Enhanced Logic (CAMEL) [3GP04, 3GPO5e, 3GP06]. In PS service domain the CDR's generated by SGSN and GGSN are first sent to Charging Gateway for storage and then forwarded to billing system for offline processing. The CG is responsible for persistent storage of cdr's and some processing and error checking. The ps online charging is supported by gprs – ssf. The basic diagram of CS/PS charging is as shown in fig (1)

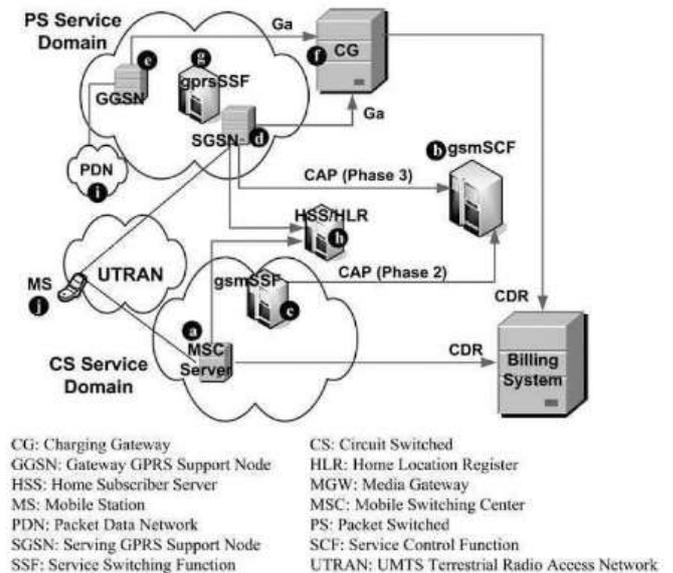


Fig 1. Charging for CS and PS service domain

This Paper contains following Information

- I Introduction to Charging System
- II CAMEL Evolution and Necessity.
- III CAMEL Specifications (Phases1-4)
- IV LTE Policy and Charging Control
- V 5G Real time billing and charging.
- VI Conclusion.
- VII Acknowledgement.
- VIII References

II. CAMEL Evolution and Necessity

ETSI has started in 1994 with the specification of Intelligent Network functionality in GSM, named Customized Applications for Mobile Enhanced Logic (CAMEL), developed and designed to work on GSM core network or the Universal Mobile Telecommunications System (UMTS) network. The framework has different tools for operator to allow them define additional features for standard GSM services and make it their USP while attracting customers to use their network services. The CAMEL architecture is based on the Intelligent Network (IN) standards, and uses the CAP protocol. The protocols are codified in a series of ETSI Technical Specifications.

Many services can be created using CAMEL, and it is particularly effective in allowing these services to be offered when a subscriber is Roaming, using different data plans based on his requirements, SMS, MMS, short code dialing, no-prefix dialing, daily data usage monitoring and dialing, unlimited calls etc.

CAMEL specifications were published in phases, with four phases has been established as of 2007:

1. CAMEL Phase I & II were defined in the 2G to 2.5G networks, and as such support adding Intelligent Network services to GSM networks which is although equally applicable for 3G networks but was not used.
2. Phase III defined in 3GPP Release 99 and 4.
3. Phase IV was defined in 3GPP Release 5.

III. CAMEL Specifications (Phases)

1. Phase I (Applicable only for Voice calls -- 2G)

CAMEL Phase I was only applicable for Mobile Voice calls for subscriber in it's home network i.e. HPLMN as well who's Roaming in Visiting Network i.e. VPLMN.

The Interrogating/Charging function here is based in the Home PLMN, and it interacts with the HLR (which contains the subscriber profile as well the location) to determine the type of charging to be done with the cost implications.

To enable various detection point and identify events with CAMEL Phase I and basic call was further distributed to BCSM (Basic Call State Module) to strengthen the grip of the IN system and provide flexibility as well as control to the gsm-SCF to bar calls (release call before connection), allow call to continue and edit few parameters before the call can be continued. gsm-SCF can also monitor call status and check if its connected and disconnected based on events.

Phase I was defined in Release 96 in 1997.

2. Phase II (Voice calls plus Supplementary services like IVR, USSD -2.5G)

Phase II was built on phase I with additional detection points to provide further flexibility to add new services/ features to operators network.

Interaction between a user and a service using announcements, voice prompting and information collection via in-band interaction or Unstructured Supplementary Service Data (USSD) interaction

Control of call duration and transfer of Advice of Charge Information to the mobile station;

The ability to inform the gsm-SCF about the invocation of the supplementary services Explicit Call Transfer (ECT), Call Deflection (CD) and Multi-Party Calls (MPTY)

The ability, for easier post-processing, of integrating charging information from a serving node in normal call record

Phase 2 was defined as part of 3GPP Releases 97 and 98, in 1998, although it is referenced in the stage 1 specification of Release 96.

Below all Points in call conditions for both Mobile Originating and Terminating call along with its detection points for all CAMEL phases.

3. Phase III (3G – with charging control over data sessions, SMS)

It was built on Phase II with enhanced capabilities like support of facilities to avoid overload.

Capabilities to support dialled services, handle mobile events like non reachability and Roaming.

Control GPRS sessions, PDP context, Mobile originating SMS through both Circuit switched and packet switched network.

Location based charging feature with support from localized service area, regional charging facilities.

Phase 3 was released in 3GPP Release 99 and 4 in 1999.

4. Phase IV (3G – LTE with Call conferencing and Control functionality over services)

The fourth phase was built on capabilities of Phase 3 with features like support for Optimal routing or shortest possible routing of CS-call.

Gsm-SCF capability to create additional parties i.e. call conferencing in an existing call, create a new call unrelated to existing call, control over SMS through both CS and PS domain.

Capability to control session over LTE (IP- Multimedia subsystem) and allowing user more control to decide what and when the services it needs.

With Phase 3 and 4 in development the other set of network nodes were also made intelligent to cover more scenarios and detection point and provide fast and affordable usage of internet/voice calls for masses.

The same will be explained further in the next topic.
Phase 4 was released in 3GPP Release 5 of 2002.

IV. LTE Policy and Charging Control

LTE the first phase of all IP Next generation network and data on demand service, changed the entire layout of the charging system and now provided more control and intelligence to the network entities thus offloading charging system and bettering the customer experience in terms of QoS and costs.

The binding mechanism of Policy & Charging Control that associates a service data flow which includes Session binding, PCC rule authorization and QoS rule generation if applicable, bearer binding.

The PCC framework allows all IP traffic and with additional new protocols and new releases of DCCA (Diameter Credit Control Application) uses Online Charging system which is real time and uses mechanism of charging as per customer's selection of service i.e. either Volume based or Cost based.

Online charging system is basically a event-based charging mechanism which has various event points of itself which even a customer can choose from the vast packages deployed in a 4G network, which combined with PCRF forms a policy for a specific customer profile.

were required to be deployed and configured in premises of a mobile operator's network.

The introduction of Cloud computing and increasing subscriber base the requirement arises for a fast speed but affordable low cost network service which is scalable as well as flexible to incorporate all the features.

5G further ups the ante to 4G (LTE) and allows the logic and intelligence to various network entities thus enabling messages to flow at a very high speed and increase events along the network.

The IN in 5G will not be on-premises but will be Cloud based, scalable, automated, configurable, real-time and Open / Modular providing more control and better ways which includes charging/rating and billing of IOT's along with the existing telecommunications infrastructure

VI. CONCLUSION

Telecom Charging and billing are two of the most important activities in telecommunication networks. In this paper a review of charging system implemented for various Mobile technologies (from charging system initiation to 4G/LTE) is presented. The paper also shows proposed changes in 5G mobile technology, which will be cloud, based. It is the real time heart of all BSS: a scalable, flexible solution with a strong user experience focus and future proof product., roadmap, enabling real time convergent charging, policy control, decoupling and fast service creation. It lets the operator control credit while letting users control their costs through flexible packaging, bonuses and discounts.

ACKNOWLEDGMENT

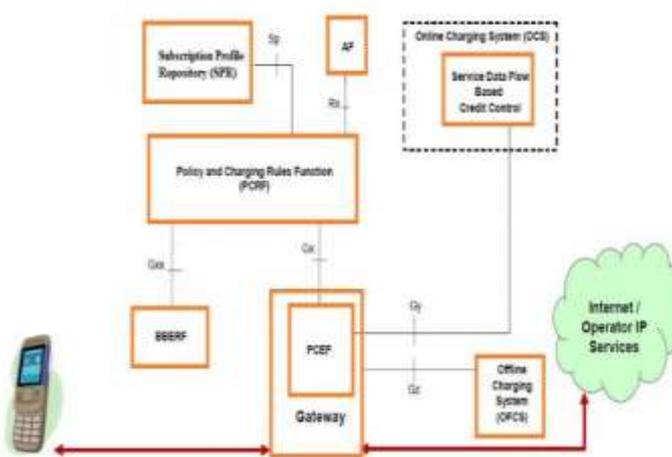
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Policy Control (PCC)

The PCC framework allows QoS and Charging control of IP traffic



Fig(2) Policy Control

V. 5G Real time billing and charging.

With CAMEL Phase I to Phase IV as well as Online Charging System with PCC the IN network components

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