Policy & Charging Rule Function

GENERIC REQUIREMENTS

No. TEC/GR/SW/PCF-001/01/Mar-14

DEPARTMENT OF TELECOMMUNICATIONS

TELECOMMUNICATION ENGINEERING CENTRE

Contents

History Sheet

S.No.	Name of the GR and Number	Issue	Remarks
1.	Policy & Charging Rule Function No. TEC/GR/SW/PCF-001/01/Mar-14	01	

Chapter 1

Introduction

1.1 This document specifies the generic requirement for the Policy & Charging Rules Function (herein after referred as PCRF). As broadband services become ubiquitous, across both fixed and mobile networks, it becomes increasingly important for the operator to be able to control the services and subscribers in real time. The capability in the network that is required to deliver on the vision of real time control of services, applications and subscribers is called Policy Control. The unique capabilities of the Policy Management solution should enable the operator to rapidly roll out convergent applications and services, and harmonize treatment of applications and services across multiple kinds of access networks.

1.2 Policy management is moving to front and center stage as service providers manage the mobile broadband traffic boom unleashed by the popularity of data enabled smart devices and applications. Most early policy deployments have focused on congestion control and fair data usage as a way to optimize network resources. However, mounting network costs and revenue objectives are driving the adoption of a broader set of policy use cases. These use cases are focused on personalization and adding value to cloud, over the top (OTT), and machine to machine (M2M) services, as well as more sophisticated approach to managing network resources.

1.3 PCRF can provide a network agnostic solution (wire line and wireless) and can also enable multi dimensional approach which helps in creating a lucrative and innovative platform for operators. PCRF can also be integrated with different platforms like billing, rating, charging and subscriber database or can also be deployed as a standalone entity.

1.4 Intelligent mobile broadband solutions enable service providers to manage mobile data traffic on existing wireless networks and evolve to LTE and IMS.

1.5 The PCRF will help service providers as follows:

a. Create, personalize and launch new services faster;
b. Add value to and share revenues with over the top application and device providers;
c. Accelerate service growth with cloud and machine to machine services;
d. Scale their networks to manage the explosion in data and signaling traffic;
e. To balance traffic across fixed and mobile networks leading to management of network congestion.
f. Stay ahead of the technology curve by evolving to LTE and IMS.
g. Improve the quality and reliability of their own services.
h. Offer different volume or speed limits to different customer classes or tiers
i. Apply “fair use” limits to manage network congestion.
j. Improve ability to meter and charge subscribers for service features and attributes.
k. Create personalized service offers tailored to individual customers.

1.6 Policy Server is a central component of next generation broadband networks, providing policy control and real time management of network resources. Using the Policy Server, service providers can balance network utilization and ensure appropriate conditions for any application, resulting in a scalable, highly efficient infrastructure for cost control and increased revenue.

1.7 The policy environment shall provide a simpler approach to creating policy tools related to charging and billing. An intuitive business rules engine enables providers to rapidly create, test, implement and get feedback on new policies.

1.8 PCRF shall enable a simple, rules-based graphical user interface (GUI) which enables service provider personnel to intuitively engage the system to create policy rules. The GUI is based on a “wizard” interface, which contains a large number of triggers, conditions and actions. Via interactive menus, the user populates the network with any number of “if/then” scenarios. If required, the rules can be modified later, according to variables defined by the service provider, without knowledge of specific language syntax.

Chapter 2

Description of System and Architecture

2.1 PCRF System Architecture

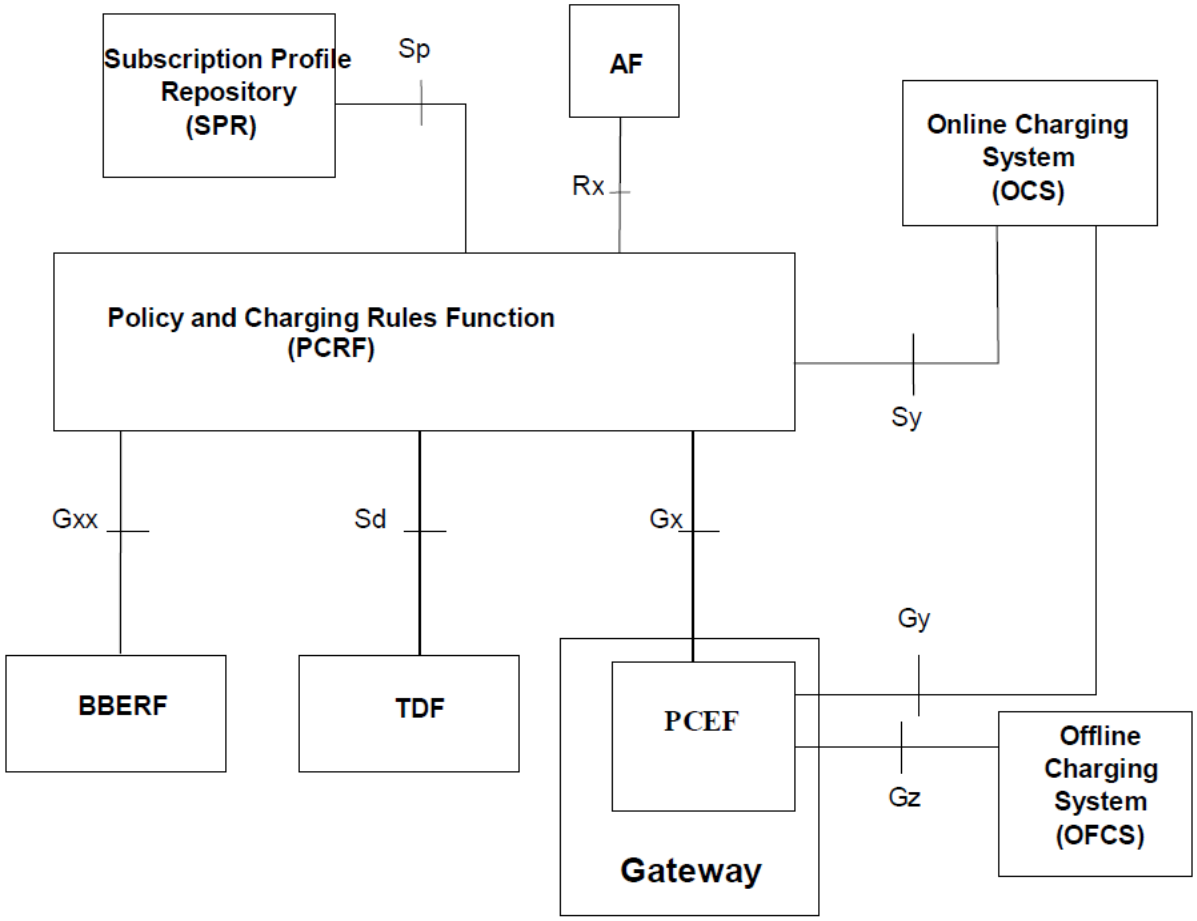
Policy and Charging Rules Function (PCRF) is a node designated in real-time to determine policy rules in a multimedia network. As a policy tool, the PCRF plays a central role in next generation networks/LTE. It is a component that operates at the network core and accesses subscriber databases and other specialized functions, such as a charging system, in a centralized manner. The PCRF has an increased strategic significance and broader potential role than traditional policy engines due to its working in real time.

2.2 The PCRF is the part of the network architecture that aggregates information to and from the network, operational support system and other sources (such as portals) in real time, supporting the creation of rules and then automatically making policy decisions for each subscriber active on the network. Such a network might offer multiple services, quality of services (QoS) levels and charging rules.

2.3 PCRF shall provide:

(a) The ability to manage network and subscriber policy in real time.
(b) The ability to efficiently and dynamically route and prioritize network traffic.
(c) An actionable, unified view of subscriber context based on a combination of device, network, location and billing data.
(d) Key inputs to revenue assurance and bandwidth management.

2.4 The PCRF function is part of 3GPP's PCC architecture, which also includes the Proxy Call Session Control Function (P-CSCF) and the Policy and Charging Enforcement Function (PCEF). The elements of the PCC provide access, resource, and quality-of-service (QoS) control. (Figure 1 as per 3GPP TS 23.203)



PCEF : Policy and Charging Enforcement function
TDF : Traffic Detection Function, AF : Application Function
BBERF : Bearer Binding and Event Reporting Function

Figure 1 : PCRF Architecture as per 3GPP

2.5 PCRF can be deployed on telecom grade /ATCA/COTS hardware.

2.6 The PCRF interfaces with the main packet gateway and takes charging enforcement decisions on its behalf. The centralized device can act as a policy decision point (PDP) for the wireless operator and gets as granular as individual subscribers.
Service providers can use PCRF to facilitate charging of subscribers based on their volume of usage of high-bandwidth applications, and also enable charging based on QoS guarantees, limit app usage while a user is roaming, or lower the bandwidth of wireless subscribers using heavy-bandwidth apps during peak usage times.

2.7 PCRF Server is a carrier/telecom grade platform used to implement the convergent policy management, real-time policy decision solutions across core network domain and content application domain for the network service providers.

PCRF Server includes a 3GPP compliant implementation of Policy and Charging Rules Function to provision, manage and execute the Quality of Service policies, Bandwidth control policies, Subscriber aware policies and Application gating policies in the 2G/3G and LTE networks.

2.8 PCRF Server shall provide a flexible and scalable software platform for the development and management of any type of policy solutions specialized for telecom industry. PCRF Server also offers flexibility in integration with various core network equipment or B/OSS systems using industry standard (e.g. 3GPP) or non-standard interfaces/protocols. PCRF Server enables the rapid prototyping and provisioning of new policies or products for innovative and unique services/applications to the subscribers.

2.9 Policy Solution/Server comprises the following components/subsystems (Figure 2)

a. One or more policy servers which provides the policy and charging management functions
b. Subscriber Profile Repositories (SPR)
c. A Configuration Central Management Subsystems for centralized provisioning and management of the policy servers

Figure 2 : PCRF's Subsystems

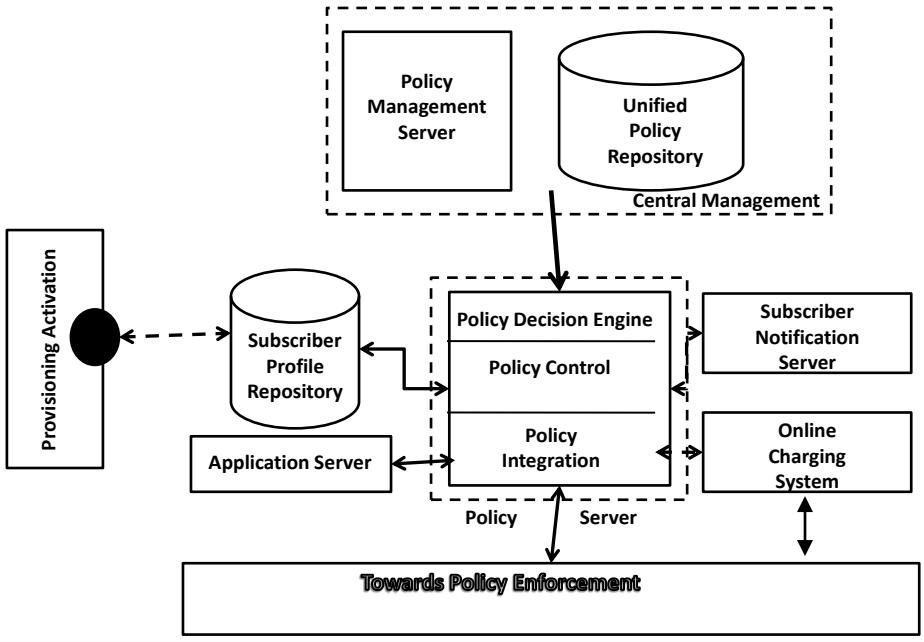


Figure 2 : PCRF's Subsystems

2.9.1 Policy Server

The PCRF server is the main server engine that process the policy requests from the core network elements or B/OSS systems at real time. The main components of the PCRF Server are the Diameter based 3GPP Gx Connector, Diameter based 3GPP Rx Connector, Diameter based 3GPP Sy Connector, Policy and Charging Rules Server, Policy Decision Platform, Subscriber Profile Cache and Subscription Management Service.

The Policy Server has a rules engine and acts as the standards based Policy Charging and Rules Function (PCRF) in the network. The rules engine operates on triggers, processes conditions, and then performs appropriate action(s) based on the conditions. The rules engine can be invoked based on any interface trigger. The rules engine can be triggered by a message from either the GGSN or DPI via Gx interface, the SPR via the Sp/Sh or SOAP/XML interface or GUP interface, as well as the application function via the Rx interface. The rules engine can also be triggered by internal timers which can be used to support a variety of time of day based applications/use cases. Policies can be developed quickly using Policy Rules wizard.

2.9.2 SPR- Subscriber Profile Repository

SPR is the repository to store all business assets, technical assets and configuration items used by the PCRF Server and Central Management Server. This is a mandatory component to run PCRF .

Policy's SPR should act as the policy solution database to store subscriber profile, quota, and state information of the Policy Server to use in its policy execution. The SPR should be deployed in networks to store subscriber profile information and inter session state information (e.g. usage and quota tracking). The SPR should be deployed in a variety of configurations according to the customer needs and requirements, in a standalone redundant HW configuration or together with the other PCRF components within the same platform.

2.9.3 Policy Management Platform/Central Management Subsystem

Central Management Subsystem is the centralized server node to monitor and manage the PCRF Server and Repository Server. It's the core component for PCRF Server to provide the OA&M functions. The Management Platform provides a consolidated view of system alarms and logs and has an interface to external systems.

2.9.4 In addition PCRF server can also have following Components/functionalities (This clause is optional)

(a) SPR Proxy subsystem - It is a component that exposes the Web Services API within PCRF Server for management of the internal Subscriber Profile Repository (that is, subscriptions and subscribers).

(b) Load Balancer – It is the key component in the distributed deployment environment for PCRF Server. It provides the Diameter application level load balancing capability

2.10 Convergent Architecture incorporating the Policy Management solution for both 2G/3G Network

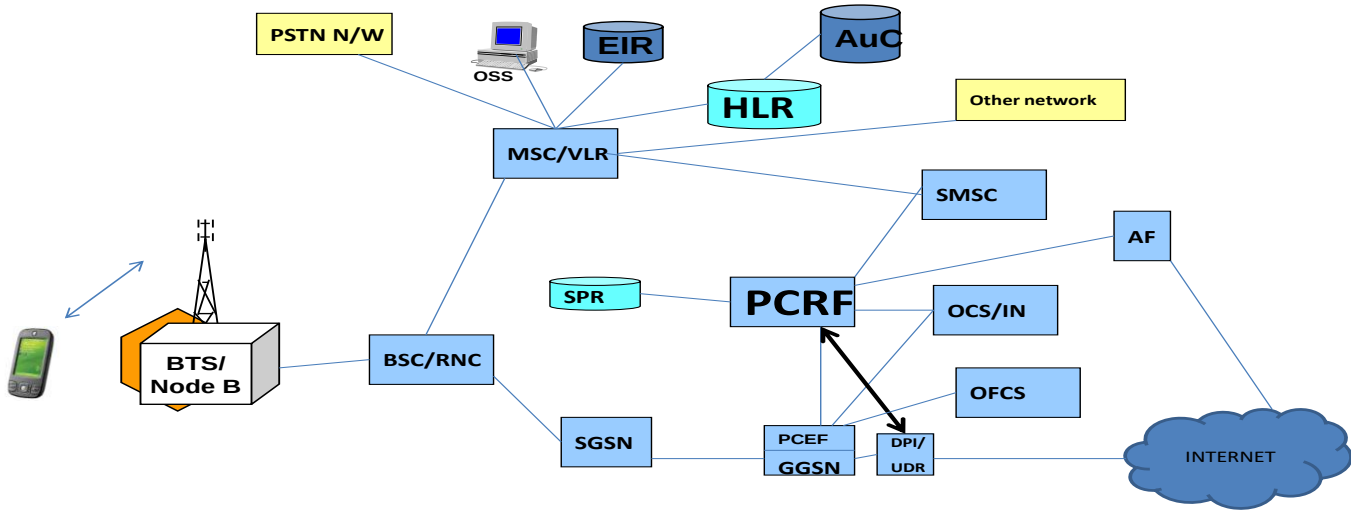


Figure 3 : PCRF in 2g/3g

2.11 Convergent Architecture incorporating the Policy Management solution for both 2G/3G and 4G/LTE networks.

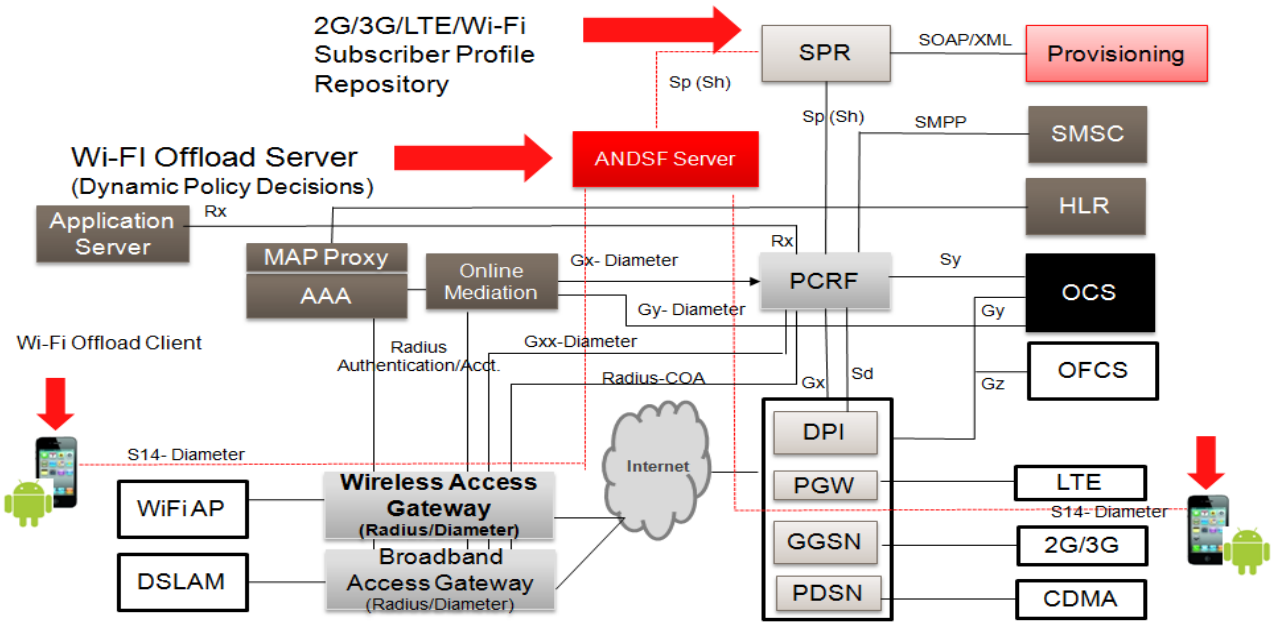


Figure 4

Chapter 3

Functional Requirements

3.1 General

The Policy and Charging Rules Function (PCRF) shall balance network utilization and ensure appropriate conditions for any application, resulting in a scalable, efficient infrastructure for efficient control and utilization. At the Policy Server's core, there shall be a high-speed rules engine, with which Operator can configure according to unique business rules using subscriber, application or network related data elements.

3.2 3GPP / IETF Compliances

(i) TS 23.203, TS 29.210,TS 29.212 ,TS 29.213 and TS 29.214 of latest releases.
(ii) PCRF shall support for RFC 3588/6733 (Diameter), RFC 4006 (Diameter Credit-Control Application), RFC 4090 (SCTP), and RFC 793 (TCP).
(iii) PCRF shall support applicable RFC's for IPv6 (e.g. RFC 2460,RFC 4443, RFC 4861, RFC 4862, RFC 5095,RFC 6342, RFC 3162, RFC 6052,RFC 1981, RFC 4291)

3.3 Features

Policy enforcement actions shall include real time changes to QoS or bandwidth (per subscriber, tier or application), charging for applications or services, quota via service- or application specific buckets, application optimization and admission control to assure application performance.

(1) PCRF on the basis of usage reports received from PCEF should apply the following policies, at a minimum:
- Existing IP session level. PCRF stores usage counters at session level and update the SPR every time the user disconnects.
- Configured period of time (a month or a configured number of days or hours).
- Based on a billing cycle. PCRF stores usage counters during a billing cycle and reset them on the specified billing date.

(2) PCRF shall be capable of Dynamic Policy control comprising of functionalities such as Binding, Gating Control, Event Reporting, QoS control and IPCAN Bearer establishment.

(3) PCRF shall support for Multiple PCEF

(4) PCRF shall be able to initiate Network-initiated dedicated bearers on the basis of the Application used (Rx interface).

(5) PCRF shall support Time of day Policy Activation by sending Revalidation Time. PCRF shall be able to provide a new value for the revalidation timeout by including Revalidation Time in CCA or RAR.

(6) PCRF shall notify the user by sending SMS or email at occurrence of certain events like monthly quota or charge expiry or any time that data user session is terminated notifying user about the actual traffic usage and remaining quota left until expiration date

(7) PCRF shall be able to converge usage accumulators across multiple accesses i.e for fixed access via Radius accounting and for Wireless access over Gx interface.

(8) PCRF shall support RADIUS CoA/diameter Gxx.

(9) PCRF shall support multiple SMS notifications in multiple languages (with different texts) to multiple parties at usage thresholds. For regional / local language support SMPP/ HTTP interface towards external application server for translation and Unicode/ 7 bit encoding schemes as per 3GPP may be provided. The system shall inform the subscribers (via a web page, SMS, email) that they have reached the set threshold and the speed that they will be getting during the remaining period of the validity period/billing cycle.

(10) PCRF shall have 3GPP R9 Gx compliant usage reporting based on Monitoring-keys AVP's (Service Based)

(11) PCRF shall have overlapping IP-Addresses over Gx interface allowing for policy control with PCEF nodes that provide support to MVNO operators

(12) PCRF shall be able to do Bandwidth Control based on time of the day, special day, day of the week.

(13) PCRF shall be able to define policies based on subscriber dynamic parameters like RAT Type and Roaming Status.

(14) PCRF shall be able to give right service to right subscriber for eg. Gold subscriber should be able to get higher QoS as compared to Bronze. It shall be able to do service authorization based on subscription. For eg. Gold subscriber should be given all services, bronze denied few.

(15) PCRF shall have multiple auto provisioning profile. Subscribers which are not provisioned in PCRF should be provisioned using this. This profile can be selected based on RAT Type, PLMN or combination.

(16) Multiple subscribers shall be able to share common quota in PCRF along with their individual limit. For e.g., 5 members of family have combined limit of 2Gb and individual of 500 Mb. After that there should be an option to deny service or QoS should be degraded.

(17) Single Account: Subscriber having 2G, 3G should be able to have a common account.

(18) The offered equipment shall provide for implementation of Fair Usage Policy based on the operator decision. It shall be possible to configure the Fair Usage policy based on the subscriber plan, APNs, radio access technologies etc. with settable parameters for each of the items in terms of triggering threshold and the throttling speed.

(19) PCRF shall facilitate to classify users into heavy usage QoS Profiles based on configurable historical information. Example: User has exceeded his monthly usage limit in two consecutive months.

(20) It shall be possible to allow a subscriber to continue at committed speeds in case he agrees for a top up/higher slab.

(21) At the end of the validity period/billing cycle, the system shall automatically remove the throttle and reset the speed to the original higher values.

(22) The system shall allow for the configuration of rules based on IP address/Domain name/Port number/Service/APN etc which will enable operator to typically offer services like subscription based unlimited access to specific sites/services like Twitter/Facebook, corporate Intranet, email downloads, Movie downloads, Streaming etc.

(23) It shall be possible to facilitate charging each URL differentially (post paid as well as prepaid) over the same APN.

(24) The system shall support time based usage and charging rules.

(25) Hardware and software of PCRF shall support IPv4 and IPv6.

(26) PCRF shall be able to integrate with any charging system on 3GPP compliant Sy interface.

(27) PCRF shall support Gx/Sd interface towards standalone DPI/TDF Functionality.

(28) PCRF shall support quota roll over for unused quota to next billing cycle in case of postpaid users.(Optional)

(29) PCRF shall support quota roll over for unused quota to next active pass/top-up in case of prepaid users.(Optional)

(30) PCRF shall support policy for M2M communication

(31) Offered PCRF should be a converged platform for any access technology.

(32) PCRF shall have integrated capability to generate event records for Policy data , which can be exported to Business Analytic system for producing usage/device reports.

(33) PCRF shall have the capabilities to multiple plans for pre-paid users.

(34) PCRF shall support integration of any 3rd party AVP if required.

(35) PCRF shall support Full GUI Based Policy creation environment.

(36) PCRF shall support usage metering based on different categories of traffic: local versus roaming, P2P versus streaming, etc

(37) PCRF shall manage policy control and quota at the device level for users with multiple devices (e.g. phone and laptop data card where only one number (MSISDN) is published.

(38) PCRF shall facilitate for new service promotions The policy decisions must use the modified QoS and Quota for a limited period of time, and revert back to original limits after the promotion period ends

(39) PCRF shall have capability to redirect users to a web portal based on pre-set usage thresholds, or other criteria.

(40) PCRF shall have centralized policy store and business rules engine – which makes policies flexible, highly-configurable rules-based editor to add, and adapt policies governing subscriber data usage.

(41) PCRF shall have Pooled Quota Accounts for multiple MSISDNs/Subscribers for family plans, Allow for Dynamic Grants for subscriber and pooled quota’s, Ability to have a Maximum Leakage Value to control leakage on each pooled quota,

Ability to have a Maximum Leakage Value to control leakage subscriber quotas when multiple Primary PDP contexts are used with the same MSISDN.

(42) The PCRF shall support pass management features which enhances the individual quota features by allowing overwrites to the basic quota allowance through Passes (one time overwrite), Top-ups (one time plan extension) and Roll overs (credits for unused allocations from previous Plan periods). These quota types are available for subscriber quota only. The network operator can provision instances of these quota types via the SPR provisioning interface to flexibly and dynamically alter subscriber quota enforcement. The instance parameters are interpreted using some preconfigured system attributes for the Pass or Top-Up type.

(43) PCRF Server shall provides the following OA&M functionality:

(a) Topology Management - It shall be possible to make physical architecture with system information and interconnections in different topology with dependencies.

(b) Performance Management – It shall be possible to monitor the real time performance items like CPU usage, throughput, etc, Query/count the performance history, get the time based view/graph (histogram graph, pie graph, etc)

(c) Alarm Management - PCRF shall have capability to generate real time alarm & with marking the alarm events. (e.g.: Reasons for an alarm, Query/count the alarm history, Modify the alarm threshold. e.g.: CPU usage > 90% result in alarm).

(d) Log Management - PCRF server shall have log facility to help in diagnose the problem.

(e) High Availability - As a critical component of the network, PCRF Server shall provide true high availability (HA) through a distributed architecture, wherein the components are protected through a carrier-grade active redundancy deployment model. PCRF Server is designed and tested to ensure 99.999% solution availability at the hardware and software level. The solution rapidly detects when a component is unresponsive, distributing the workload transparently across the remaining elements of the solution.

(f) Geo redundancy: In cases where a geo redundancy is required an additional identical site is implemented. All the subscribers and service provisioning data are replicated between the sites. Each site can cope with the full required traffic capacity. Upon failure of the PCRF site the Gx clients needs to connect to the other site that is defined as the secondary site and reinitiate the Gx sessions.

(g) Scalability -The PCRF application shall scale from very small test deployments of two (or even a single server) to the very largest scale deployments. The PCRF distributed architecture delivers carrier level scalability. It relies on the solution design that ensures linear scalability across the critical processing engines.

(44) It should be possible to integrate PCRF with Content (e.g. Video) optimization system

(45) The PCRF should support IMS based VoIP services running over both GPRS access, HSPA access & LTE access.

3.4 QoS

PCRF shall support QoS Control for Default and Dedicated Bearer. QoS Control should be possible on below mentioned levels:-

(a) QoS control at service data flow level

(b) QoS control at IP CAN bearer level

(c) QoS Conflict Handling

Chapter 4

Interconnectivity & Interoperability Requirements

4.1 Interconnection:

4.1.1 The PCRF shall support capacity scaling through interconnection of multiple devices, also the supplier shall describe how the individual devices are connected and any limitations (number of individual devices, physical distance between devices etc).

4.1.2 The Policy Solution shall be built using a distributed/networked computing model. Capacity is increased by adding additional physical servers, logically referred to as clusters. A cluster has interfaces to external northbound and southbound entities, and, potentially, one other cluster for Stateful geo-redundancy.

4.1.3 The PCRF shall interoperate with broad range of networks and application platforms such as Deep Packet Inspection Devices, SMS Servers, Charging System, GGSN, PDSN, Device Management, ASN Gateways, WiMAX Home Agents, and CDMA Home Agents.

4.1.4 PCRF supplier shall provide appropriate IOT reference/certificates.

4.1.5 The PCRF supplier shall provide details of all third-party products with which there policy solution interoperates.

(a) Support for both IPv4 and IPv6 subscriber identifiers as per TS 23.203, TS 29.212 and TS 29.213.
(b) Support for IPv4 and IPv6 as underlying user plane for protocols (Diameter)
(c) Using IPv6 subscriber ID's over IPv4-based Diameter or using IPv4 subscriber ID's over IPv6-based Diameter should be supported.
(d) Mixing of IPv4 and IPv6 ID's for separate sessions (for example, one subscriber has an IPv4 address while another has an IPV6 address) will be supported.
(e) IPv4 transport on some interfaces with IPv6 transport on other interfaces (for example, Rx over IPv4 forwarded to Gx over IPv6) will be supported.

4.1.6 The Policy server shall be deployed including a 3GPP compliant Subscriber Profile Repository (SPR)/User Data Repository (UDR), to allow storage of subscriber information such as rate plans, and a 3GPP compliant Diameter Signaling Controller to load balance across multiple Policy Servers.

4.1.7 The PCRF shall support the Gx, Rx and Sd interfaces compliant to 3GPP 23.203, 29.210, 29.212, 29.213 and 29.214. the DPI functionalities resident in GGSN shall be leveraged for making policy decision.

(a) Gx Interface is used for provisioning service data flow based on charging rules. It is located between the PCRF and the Policy and Charging Enforcement Function (PCEF).

(b) Rx reference points is used to exchange application level session information & media related information between the PCRF & Application function/Application Server. This information is the part of the inputs used by the PCRF for the Policy and Charging Control Decisions.

(c) The Sd reference point is located between the Policy and Charging Rules Function (PCRF) and the Traffic Detection Function (TDF)/ DPI. The Sd reference point enables a PCRF to have dynamic control over the application detection and control (ADC) rules at a TDF.

4.1.8 PCRF shall also have S9 interface to provide transfer of (QoS) policy and charging control information between the Home PCRF and the Visited PCRF in order to support local breakout function.(3GPP TS 23.203).

4.1.9 PCRF shall support the Sy interface compliant to 3GPP 23.203, 29.219. It is used between PCRF and OCS for sending limits reports.

4.1.10 PCRF shall support Sp interface which is used between the PCRF and the SPR. This interface allows the PCRF to request subscription information related to transport level policies from the SPR based on a subscriber ID, a PDN identifier and possible further IP CAN session attributes, as specified in 3GPP TS 23.203.

4.1.11 PCRF Server shall support the Ud interface between the PCRF and the UDR(if interfacing with UDR). This interface allows the PCRF to create, read, modify and delete user data stored in the UDR using the access interface. It is based in LDAP. This interface supports subscriptions/notifications functionality to allow the PCRF being notified about specific events that may occur on specified user data in the UDR. The events can be changes on the existing user data, addition of user data, and so on. PCRF Server supports the Ud interface based on LDAP protocol. (3GPP TS 23.335 and TS 29.335).

4.1.12 PCRF Server shall provide a RADIUS based AAA interface which is connected with external AAA server. It receives the AAA-Start and AAA-Stop radius message forwarded from AAA server when IP-CAN session is established or terminated. It works with AAA management (component that provides the mapping between the IP Address and the MSISDN) to manage the mapping between IP address and MSISDN. PCRF Server also provides the connector and the processing flow used to provision policy rules to a non-3GPP enforcement point via RADIUS / RADIUS CoA interface.

Chapter 5

Quality Requirements

5.1 Qualitative Requirements (QR):

The system shall meet the following qualitative requirements:

a) The equipment shall be manufactured in accordance with international standards ISO 9001 for which the manufacturer should be duly accredited for the latest issue. A quality plan describing the quality assurance system followed by the manufacturer shall be required to be submitted.

b)The MTBF (Mean time Between Failure) and MTTR (Mean Time to Restore) predicted and observed values shall be furnished along with calculations by the manufacturer.

5.2 Reliability

The PCRF system shall provide the following telecom grade characteristics and a high availability:

(i) Always-on
(ii) The PCRF system shall have geo-redundancy and high availability at least 99.999%
(iii) Automatic software recovery
(iv) Data replication across Geo-Graphical locations.
(v) Overload control and overload protection
(vi) Software updates and upgrades during operation
(vii) Upgrade and update of Operating System during operation
(viii) Online backup
(ix) Hot-swap hardware replacement
(x) HW should be dual stack to support IPv4 as well as IPv6.
(xi) The entire PCRF solution must not have a single point of failure. Failure of a single module shall not result in a disruption of service. All critical components such as power supply, fans, management/ control modules shall be redundant.
(xii) Logs and other OA&M activities must not impact the performance of the PCRF
(xiii) The system application design shall be modular in nature and shall have a distributed architecture
(xiv) The PCRF system shall be able to add new feature sets without service disruptions of affecting basic functionality.

Chapter-6

EMI/EMC Requirements

6.1 Electromagnetic Interference

The equipment shall conform to the following EMC requirements for Class A:

Electromagnetic Compatibility(EMC) Requirements:

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report shall be furnished from an accredited test laboratory.

a) Conducted and radiated emission (applicable to telecom equipment):

Name of EMC Standard: "CISPR 22 {2005} with amendment 1 (2005) & amendment 2 (2006) - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment".

Limits:-

i) To comply with Class A of CISPR 22 {2006}
ii) The values of limits shall be as per TEC Standard No. TEC/EMI/TEL-001/01/FEB-09**.**

b) Immunity to Electrostatic discharge:

Name of EMC Standard: IEC 61000-4-2 {2001) "Testing and measurement techniques of Electrostatic discharge immunity test".

Limits: -

a. Contact discharge level 2 {± 4 kV} or higher voltage;
b. Air discharge level 3 {± 8 kV} or higher voltage;

c) Immunity to radiated RF:

Name of EMC Standard: IEC 61000-4-3 (2006) "Testing and measurement techniques-Radiated RF Electromagnetic Field Immunity test"

Limits:

i) Under Test level 2 {Test field strength of 3 V/m} for general purposes in frequency range 80 MHz to 1000 MHz and
ii) Under test level 3 (10 V/m) for protection against digital radio telephones and other RF devices in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 6.0 GHz.

d) Immunity to fast transients (burst):

Name of EMC Standard: IEC 61000-4-4 {2004) "Testing and measurement techniques of electrical fast transients/burst immunity test"

Limits:-

Test Level 2 i.e. a) 1 kV for AC/DC power lines; b) 0. 5 kV for signal / control / data / telecom lines;

e) Immunity to surges:
Name of EMC Standard: IEC 61000-4-5 (2005) “Testing & Measurement techniques for Surge immunity test"

Limits:-

i) For mains power input ports : (a)1.0 kV peak open circuit voltage for line to ground coupling (b) 0.5 kV peak open circuit voltage for line to line coupling
ii) For telecom ports : (a) 0.5 kV peak open circuit voltage for line to ground (b) 0.5 KV peak open circuit voltage for line to line coupling.

f) Immunity to conducted disturbance induced by Radio frequency fields:
Name of EMC Standard: IEC 61000-4-6 (2003) with amendment 1 (2004) & amendment. 2 (2006) "Testing & measurement techniques-Immunity to conducted disturbances induced by radio- frequency fields"

Limits:-

Under the test level 2 {3 V r.m.s.} in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines.

g) Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any):

Name of EMC Standard: IEC 61000-4-11 (2004) “Testing & measurement techniques- voltage dips, short interruptions and voltage variations immunity tests”

Limits:-

i) a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500 ms)

ii) a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) and

iii) a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s.

Note: For checking compliance with the above EMC requirements, the method of measurements shall be in accordance with TEC Standard No. TEC/EMI/TEL-001/01/FEB-09 and the references mentioned therein unless otherwise

specified specifically. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (g) and TEC Standard No. TEC/EMI/TEL-001/01/FEB-09.The details of IEC/CISPR and their corresponding Euro Norms are as follows:

IEC/CISPR	**Euro Norm**
CISPR 11	EN 55011
CISPR 22	EN 55022
IEC 61000-4-2	EN 61000-4-2
IEC 61000-4-3	EN 61000-4-3
IEC 61000-4-4	EN 61000-4-4
IEC 61000-4-5	EN 61000-4-5
IEC 61000-4-6	EN 61000-4-6
IEC 61000-4-11	EN 61000-4-11

Chapter – 7

Safety Requirements

7.1 Safety Requirements

(i) The operating personnel shall be protected against shock hazards as per IS 8437(1993)-“Guide on the effects of current passing through the human body” [equivalent to IEC publication 60479-1(1984)]. The manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.

(ii) The equipment shall conform to IS 13252 (2003)-“Safety of information technology equipment including electrical business equipment” [equivalent to IEC publication 60950{2001}] and IS 10437 {1986}(if applicable) “Safety requirements of radio transmitting equipments” [equivalent to IEC publication 60215]. The manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.

Chapter – 8

Security Requirements

8.1 PCRF shall Support multiple connections to a peer Components of policy solution (Policy Engine, DRA, Management Platform, and SPR) provide several levels of security to prevent unauthorized access to the system. The solution will provide a web based or MML based GUI that will permit multiplier users to access it simultaneously to extract performance statistics. GUI should include (but not necessarily be limited to) a thin web client that is not a java application. It shall also be possible to access the system using remote provisioning interface but remote computer connections are allowed only using a secure shell (ssh) or secure HTTP connection.

8.2 PCRF shall enable all user initiated logins are captured in the audit logs. The logs provide information about the access and duration of the sessions on the system.

8.3 The PCRF shall supports user account security configuration for terminal activity timeout and password restrictions (minimum length, minimum lifetime, maximum lifetime and warning age). PCRF could be configured to restrict the number of login warning before the password is disabled.

8.4 PCRF Server shall support security in the following basis:

(a) Network Security – Protocol level security: TLS/SSL/HTTPS, IPSec, SNMPv3

(b) Operating System Level Security - Security configuration (SSH, SFTP), security patching

(c) User Management Security-3 layers (role, user, permission),User authorization ,User authentication

Chapter – 9

Other Mandatory Requirements

9.1 Operations & Maintenance

a. The PCRF OAM shall require user id and password for GUI access
b. The solution shall have the capability to export performance statistics to a external system
c. The PCRF solution shall provide Measurement Reports. This must include all possible traffic information on the PCRFs and other relevant metrics.
d. The PCRF Solution shall have the capability of producing SNMP trap alarms and forward to a SNMP manager.
e. The PCRF solution must have the ability to log all the events, alarms, and failures
f. The PCRF solution will provide the following system health statistics: % memory usage average and peak; % cpu usage average and peak disk usage
g. The PCRF solution shall provide capability for software upgrade and back out. Procedures and MOP documents shall be provided for operational staffs to perform software upgrade and back out.
h. Complete vendor documentation for the process of adding a PCRF node(s) to the production environment must be provided.
i. The PCRF Solution measurement interval must be configurable. The PCRF should have the ability to either push or have the measurement reports pulled by external network element.
j. The PCRF shall support tracing and OA&M activities.

Chapter – 10
Desirable Requirements (Operator Specific)

10.1 Hardware Requirement:

(a) Power Supply

Option 1:

Nominal power supply is -48 volts DC with a variation over the range –40 V to –60 V. D C . The equipment should operate over this range without any degradation in performance.

Switching mode Power Supply (SMPS) and VRLA battery to be used shall be as per TEC Generic Requirements No. GR/SMP –01 and GR/BAT-01 Respectively. Power supply and battery shall be modular and expendable to support the ultimate equipment configuration.

Option 2:

AC Mains supply of 230 Volts with a variation of -15% to + 10% at 50 Hz +- 2 Hz. UPS and other power requirements are to be specified by the system developer.

Purchase may specify the power requirement as per option1 or 2.

(b) In the event that one of the power sources is unavailable, the equipment shall continue to operate from the remaining power source without manual intervention and without interruption of service or functionality (including all LED's, alarms, and indications).

(c) The architecture should be modular and the capacity can be upgraded by addition of Blades.

(d) The platform should have redundancy mechanism with the cabinet & across geographical sites and should be able to synchronize data across different PCRF/SPR sites.

(e) There shall be a 1:1 system backup redundancy for data.

(f) Dimensioning of hardware & Physical Interfaces shall be decided by the purchaser

(g) As the OS represents the largest portion of the total attack surface in an application, special attention is to be given and ensure continuous efforts are made in hardening of the OS and reduction of its overall attack surface. This shall include in part, regular security updates from OS, custom security patching from upstream providers, kernel hardening, restrictive user access and permissions, log management and removal of unnecessary services, ports and software.

(h) Measurement Reports must be provided. This must include traffic information on the PCRFs and other relevant metrics. The fields in the reports must be stated clearly.

10.2 Dimensioning Criteria (operator specific)

The Policy Management Solution should be rated in terms of transactions per second (TPS) and Simultaneous sessions/Concurrent Sessions. To determine the number of TPS required, which relates the number of transactions to an average number of operations associated with each active subscriber during a busy hour. This traffic model considers session establishments, terminations, and updates such as quota usage. It also specifies the average number of sessions per active subscriber per busy hour. Finally, the model specifies the number of new subscribers attaching to and leaving the network during the busy hour. Once the model is established, the number of blades to handle the PCC traffic is calculated.

10.2.1 Design parameters for PCRF shall be specified by the Purchaser. Typical parameters & their values are given below :

S. No.	Parameter	Requirement
1	**Population of subscriber using PCRF**	**100% of data customers in 2G, 3G**
2	**Population of subscriber using PCRF in busy hour(SAU) attached**	**50% of data customers in 2G, 3G**
3	**Frequency Per Sub Busy Hour Transactions**	**0.5**
4	**PDP supported [Busy Hour]**	**As per packet data requirement**
5	**Average PDP Duration**	**30 min**
6	**Subscriber using QoS Control, Service aware charging**	**100%**
7	**Average number of private policy definitions per subscriber**	**5**
8	**ToD (Time of the day) to be enabled for**	**20 % Subs**
9	**CPU utilization**	**70% max**
10	**User end notifications to be considered**	**Reporting and Notifications Enabled**
11	**GE interfaces for all the logical interfaces**	**4+4 minimum**

10.2.2 Additionally following parameters can also be used for dimensioning of PCRF.

(i) Subscriber/session using Rx interface
(ii) Subscriber/session using Sy interface
(iii) Subscriber/session using Gxx interface
(iv) Subscriber/session using Gx interface
(v) Number of Concurrent Session
(vi) Number of Bearers per Sub/Session (Default & Dedicated)
(vii) Number of subscriber to be provisioned in Policy SPR

GLOSSARY

3GPP : 3rd Generation Partnership Project
AVP : Attribute Value Pair
AF : Application Function
ATCA : Advanced Telecommunications Computing Architecture
BBERF : Bearer Binding and event reporting function
B/OSS : Business/Operations Support System
COTS :Commercial off the shelf
DCCA : Diameter Credit Control Application
DPI : Deep Packet Inspection
DSC : Diameter Signalling Controller
GGSN : Gateway GPRS Serving Node
IMS : IP Multimedia Subsystem
LDAP : Lightweight Directory Access Protocol
LTE : Long Term Evolution
OCS : Online Charging System
OFCS : Offline Charging System
OMC : Operation & Maintenance Center
OTT : Over the Top Platform
PCC : Policy & Charging Control
P-CSCF :Proxy Call Session Control Function
PCEF : Policy and Charging enforcement function
PCRF : Policy & Charging Rule Function
PDF : Policy Decision Function
PGW : Packet Gate way
QoS : Quality of Service
Radius COA : Radius Change of Authorisation
SDN : Software Defined Network
SMS : Short Message Service
SMTP : Simple Mail Transfer Protocol
SMPP : Short Message Peer to Peer
SNMP : Simple Network Management Protocol
SOAP : Simple Object Access Protocol
SPR :Subscriber Profile Repository
TEC : Telecom Engineering Centre
TDF : Traffic Detection Function
UDR : User Data Repository

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