

# Policy Control & Charging System

## 1. Introduction:

Mobile broadband is the fastest growing telecommunication market; however, mobile broadband revenue is lagging behind traffic growth and creating a profitability squeeze. This is caused by new billing models combined with new devices and new technologies.

Policy management addresses this challenge of traffic growth while enabling real-time charging rules to implement differentiated pricing strategies that precisely match service delivery to the subscriber's willingness to pay. Fair usage policies help manage network infrastructure costs and ensure balanced performance at any given time. Differentiated pricing strategies also regulate network usage and simultaneously increase revenue by providing individual subscribers with financial incentives to use only the services that they value

The Policy and Charging Rules Function (PCRF) acts as a policy decision point for policy and charging control of service data flows and IP bearer resources. The PCRF selects and provides the applicable policy and charging control decision to the PCEF.

Policy and Charging Control (PCC) will be used with 3GPP2/CDMA and 4G/LTE architectures provide a vehicle for delivering the needed policy management functions. It supports three forms of policy management: network resource management, personalization and new revenue creation.

Network resource management prioritizes and controls traffic through network based traffic optimization. Personalization services support service offerings that meet the individual needs of subscribers while maximizing the value of network assets. New revenue creation can be achieved, for example, by offering an upgrade option to the quality of service for an individual subscriber based on the application they are running. Where operators are subjected to network neutrality or equal access regulations, Policy and Charging Control enables them to offer these types of tiered services packages to help regulate network usage and increase revenue.

## **2. PCC Solution(General Requirements):**

The PCC solution is required to:

- Align business requirements with PCRF functionalities.
- Create policy-based services based on usage, application, location, device, network type etc.
- Integrate the PCRF with billing and CRM systems.
- Integrate with the current DPI platform.
- Implement the possible scenarios of network and service convergence.
- Maximize the functionality of Ericsson OCS (Online Charging Systems).
- Centralize rating, charging and bundle functionalities on the Ericsson OCS.
- Pave the way for possibilities of implementing E2E policy management.
- Migrate the current subscribers and policies to the new solution.

### **2.1 Provisioning of policy-based services:**

The proposed solution should support provisioning of policy-based services based on the combination of various parameters, including:

- Time Based
- Data Volume Based
- Subscriber's location Based
- Device Type Based
- Network Resource Availability Based
- Subscriber Roaming Based
- Network Type Based
- Protocol/Application used by the subscriber Based
- Content Type Based
- Service Based
- Web Address (URL-based) Based
- Location-based Based
- Subscriber's Profile Based

- QoS Based
- Tariff plan Based
- Amount of used traffic (per hour, day, month) Based
- Time of service usage (day/night, period of time) Based
- Equipment type Based
- ANY combination of the parameters mentioned above.

**Note:** Policies should be applied both individually for each subscriber and for the group of subscribers.

## 2.2 Networks:

The proposed solution will be bearer network agnostic, being able to fully interface with any type of carrier network, including but not limited to:

- CDMA,
- LTE,
- eHRPD,
- WiFi

## 2.3 Customer self-care

The proposed solution shall support self-care APIs that support web service such as SOAP.

- Self-registration
- Account Maintenance
- Change account details, such as address and other contact information
- Quota usage
- Usage History
- Parental Control configuration
- Ability to purchase other services
- Other invoice details.
- User dashboards
- Subscriber notification over SMS and/or Web Page redirect

- Solution should support the notification of the subscriber on the cost of access to services in case of excess of various threshold values (80 %, 90 % etc.) before using service.

#### **2.4 Management and Performance:**

The proposed solution should provide an administration and monitoring system by generating system alarms and alerts. This can be using technologies such as SNMP agents and SNMP traps.

The proposed solution should provide a full-functional report-design environment enabling the easy creation of tabular and graphical reports fed by the operational data of the solution.

- Export to external files such as text, CSV, Excel, XML and PDF
- Reports generation based on multiple criteria
- Ability to design and generate reports
- Ability to schedule of sending report to multiple recipients by email
- Repository of readily available, off-the-shelf report templates designed in advance to cover the most frequently addressed reporting needs.

The proposed solution should support collection of statistics based on the below attributes:

- Network protocols
- Amount of the used traffic (per hour, day, and month) according to the type of network protocols.
- Tariff plans and services
- Subscriber's location

#### **2.5 CDR Management**

The proposed solution should generate CDR files which should include: MSISDN, IMSI, source IP, Destination IP, APN, duration, charging information and other data, received as a result of the analysis and an estimation of the traffic.

## 2.6 Security hierarchy

The proposed solution should support granular and advanced security access model. In other words, all unauthorized menu item, reports, dashboard items, views, etc will be hidden from the user.

- Ability to define very granular privileges
- Support of built-in user groups or roles based on best practices
- Ability for users to change their passwords and profile
- All user profiles and passwords are encrypted in the database
- Ability to generate audit trail logs of all actions performed including the administrator role

## 3. Technical Requirements

### 3.1 PCC Rule Definition :

The purpose of the PCC rule is to:

- Detect a packet belonging to a service data flow.
- The service data flow filters within the PCC rule are used for the selection of downlink IP CAN bearers.
- The service data flow filters within the PCC rule are used for the enforcement that uplink IP flows are transported in the correct IP CAN bearer.
- Identify the service the service data flow contributes to.
- Provide applicable charging parameters for a service data flow.
- Provide policy control for a service data flow.

The PCEF shall select a PCC rule for each received packet by evaluating received packets against service data flow filters of PCC rules in the order of the precedence of the PCC rules. When a packet matches a service data

flow filter, the packet matching process for that packet is completed, and the PCC rule for that filter shall be applied.

There are two different types of PCC rules as defined in 3GPP TS 23.203:

- Dynamic PCC rules: Dynamically provisioned by the PCRF to the PCEF via the Gx interface. These PCC rules may be either predefined or dynamically generated in the PCRF. Dynamic PCC rules can be installed, modified and removed at any time.
- Predefined PCC rules: Preconfigured in the PCEF. Predefined PCC rules can be activated or deactivated by the PCRF at any time. Predefined PCC rules within the PCEF may be grouped allowing the PCRF to dynamically activate a set of PCC rules over the Gx reference point.

NOTE: The operator may define a predefined PCC rule, to be activated by the PCEF. Such a predefined rule is not explicitly known in the PCRF.

A PCC rule consists of:

- A rule name;
- Service identifier;
- Service data flow filter(s);
- Precedence;
- Gate status;
- QoS parameters;
- Indication for PS to CS session continuity;
- charging key (i.e. rating group);
- Other charging parameters;
- Monitoring key;
- Sponsor identity;
- Application service provider identity;
- Indication of access network information reporting.

### **3.2 Interfaces and Protocols:**

Proposer shall indicate the compliance with the following interfaces and protocols:

- SOAP/SMPP/JMS/SMTP/HTTP/WAP interface between Notification Middleware and PCRF in convergent architecture.
- Gxa interface between CDMA PDSN BBERF and PCRF in convergent architecture.
- Gxx interface between HSGW and PCRF in convergent architecture
- Gx interface between PCEF and PCRF in convergent architecture.
- Gx interface between DPI Box and PCRF in convergent architecture.
- Gx interface between P-GW and PCRF in convergent architecture.
- Gxx interface between S-GW and PCRF in convergent architecture.
- Proposer shall provide the IP addressing scheme for all logical interfaces. Please state how many IPs are required and if the numbers of IPs need to grow based on HW dimensioning
- For all interfaces it shall be possible to configure more than one destination. In each case the operator may configure whether a load sharing and/or primary/secondary mechanism is used to distribute the traffic over these destinations.
- Static (at context start, default bearer establishment) and dynamic (mid-session, additional bearer establishment) Charging Control per Bearer/Flow.
- Static and dynamic Policy Control per Bearer/Flow.
- S9 interface and Policy Peering between home- and visited PCRF.
- The PCRF shall support the establishment of Voice and non-Voice Bearers and the control of the core-network and radio network regarding required QoS and bandwidth
- The PCRF shall support logical/physical separation between service delivery (e.g. tariffs, applications, communication with AFs) and network control functionalities (e.g. admission control, QoS, RAN and bearer control) in the PCRF to enable alignment between different responsibilities. Proposer shall describe if and how the split and the necessary interfaces between the two entities of the PCRF can be set-up.
- Diameter based Sy interface to connect with online charging. And also PCRF shall support offline charging too, The CDRs produced by the PDSN shall be transferred to the Charging Gateway Function (CGF) via the Ga/Gz reference point.
- Reference point that allows communication with the AF, including all optional features. Please specify how many Rx points the proposed PCRF supports. Proposer shall describe how their solution supports the Rx interface.
- Establishment and maintenance of connections between PCRF and AF Diameter nodes.

- The PCRF shall support sending different policy to many PCEFs. Proposer shall describe how many PCEFs that solution support.
- The PCRF shall support sending one policy to PCEF, but this policy shall be cooperated by multi-PCEFs, such as, PDSN HSGW, PGW and DPI.
- The PCRF shall support an interface for SPR communication to retrieve subscriber information (e.g. contract information). Proposer shall describe the interface, protocol and the transported information elements and their configuration. PCRF shall be able to cache information received from SPR.
- The PCRF shall support the push of a Session/Bearer initiation notification to an external AF (e.g. with Rx, SNMP). This information push may not delay the Session/Bearer initiation. A failure of the information push shall not lead to a failure/delay of the Session/bearer initiation.
- Udr reference point for communication between UDR and PCRF.
- Sp interface shall provide security with the methods specified in 3GPP TS 33.210
- Proposer' solution shall support event reporting mechanism as described in TS 23.203.
- Proposer' solution shall support QoS control mechanism as described in TS 23.203.
- If all IP-CAN sessions of a user to the same APN are terminated, the PCRF shall store the remaining allowed usage, i.e. the information about the remaining overall amount of resources, in the SPR.
- The PCRF shall be able to use the used APN as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
- The PCRF shall be able to use service and subscriber information from different interfaces (e.g. charging rule base names, user profiles) as an input for the policy decision by combining them with mapping tables and programmable logic.
- The service level quota installation from PCRF to PCEF shall be supported.
- The service level of multi-quota installation from PCRF to PCEF shall be supported.
- The session level quota installation from PCRF to PCEF shall be supported.
- The service level usage reporting from PCEF to PCRF shall be supported.
- The session level usage reporting from PCEF to PCRF shall be supported.
- The QoS shall be adjusted with the change of usage.



### 3.3 Interworking with CBS

Yemen Mobile has a convergent billing subsystem (CBS) that provides from Huawei. The proposer shall describe requirements, capabilities, and interfaces to connect to the current CBS.

Proposer shall describe offline and online charging procedures and the interfaces and requirements to connect to CBS.

#### **Sy interface (PCRF to Online Charging System)**

Protocols for the Sy interface are defined by 3GPP. The interface is based on Diameter. The Sy reference point allows the interaction between the Online Charging System and Policy and Charging Rules Function (PCRF) for obtaining information from the Online Charging System for policy decision purposes.

- A PCRF/DPI shall be suggested during the tender to be able to prioritize or to throttle certain traffic in the LTE network based on online charging System.
- The Proposer is requested to show a pathway for a self-service environment for the user to manage his/her own account and services.

### 3.4 PCRF Management

- The policy design shall base on mode: When received a Trigger, then compare Condition, if Condition matched, then perform Action.
- The PCRF shall support backup of system configuration data to local disk.
- The PCRF shall support backup of policy rule data to local disk.
- The PCRF shall support backup of system configuration data and transfer backup file to backup system via FTP interface.
- The PCRF shall support backup of policy rule data and transfer backup file to backup system via FTP interface.
- The PCRF shall support backup of system configuration data and transfer backup file to backup system via SFTP interface.
- The PCRF shall support backup of policy rule data and transfer backup file to backup system via SFTP interface.
- The PCRF shall support backup of policy rule data, operator can configure system to backup all data automatically.

- The PCRF shall support automatic backup. The backup can be triggered every day.
- The PCRF shall support automatic backup. The backup can be triggered every week.
- The PCRF shall support automatic backup. The backup can be triggered every month.
- The PCRF shall support importing policy rule data via FTP interface.
- The PCRF shall support batch process.
- The batch file shall be one document file consists of MML command or other commands. The batch process shall be automatic.
- The PCRF shall define a time schedule, and then execute the batch file on pre-scheduled time.

### 3.5 Software and Hardware Capacities and Capabilities:

Software Capacities	Description
Number of IP-CAN Sessions with all policy-based services and features mentioned above	300,000
Number Of Subscriber Profile and Provisioning	1,000,000

Hardware Capacities	Description
Number of IP-CAN Sessions with all policy-based services and features mentioned above	<ul style="list-style-type: none"> <li>-HW Capacity must handle the minimum number of IP-CAN Sessions.</li> <li>-HW Capability must support not less than 3 million.</li> </ul>
Number Of Subscriber Profile and Provisioning	<ul style="list-style-type: none"> <li>- HW Capacity must handle the minimum number of Subscriber Profile and Provisioning.</li> <li>- HW Capability must support not less than 3 million.</li> </ul>
The main processing unit	Should be N+1 and working as load sharing .Processing units should meet all required capacities and features mentioned.
Network Equipments	HW should include all network equipments to connect and protect the system internally and externally.

<b>Boards and Interfaces</b>	Should support 10G optical interfaces scalable up to 40G and 100G traffic
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### 3.6 Spare Parts:

HW should include all the spare parts necessary for the main units in the system.

### 3.7 Project Management

The solution should include project management and professional services to implement the project.

The Applicant should provide a project schedule plan for the project implementation.

### 3.8 Technical support and maintenance

The proposed solution should include the staffing details for normal operations of the system. In addition to define roles based on best practices and standards.

The solution should include technical support and maintenance with 24x7 hot line and online ticketing system. The first 2 year technical support will need to be part of the solution or the commercial proposal.

### 3.9 Training:

The advanced training course must focus on the following Objectives (for 4 persons).The training course is advanced course with these main topics but not limited to:

- **PCC functions including:**
  - PCRf (policy and charging rules function), PCEf (policy and charging enforcement function), OCS (online charging system), OFCS (off-line charging system), PCC rules and its purposes, Policy rules between applications and policy enforcement points, Gx: Policy decisions-related information between PCEf and PCRf, Gy: Online flow based bearer charging PCEf and OCS , Sy: Policy rules between PCRf and OCS (Online Charging System)
- **General Topics**

- Overall PCC Logical Architecture, PCC Functional entities, AF (Application Function), BBERF (Bearer Binding and Event Reporting Function), OFCS (Offline Charging System), OCS (Online Charging System), PCEF (Policy and Charging Enforcement Function), PCRF (Policy and Charging Rules Function), SPR (Subscription Profile Repository), User Data Repository (UDR), Traffic Detection Function (TDF)
- **Policy and charging control architecture**
  - Charging models, examples of Service Data Flow Charging, policy control requirements, QoS control, Subscriber Spending Limits, Usage Monitoring Control and Application Detection and Control
- **PCRF Architecture model and reference points:** Rx, Gx, Sp, Ud, Gy, Gz, S9, Gxx, Sd and Sy.
- **PCC Functional description:** Binding mechanism, Reporting, Credit management, Event Triggers , Service (data flow) Prioritization and Conflict Handling Policy Control, Standardized QoS characteristics, Termination Action, Handling of packet filters provided to the UE by PCEF/BBERF, IMS Emergency Session Support and Multimedia Priority Service Support.
- **Policy and charging control rule:** Policy and charging control rule operations, IP CAN bearer and IP CAN session related policy information, Quality of Service Control rule, Usage Monitoring Control specific information, IP flow mobility Routing rule, Application Detection and Control Rule, Policy decisions based on spending limits.
- **PCC Procedures and flows:** IP CAN Session Establishment, IP CAN Session Termination, IP CAN Session Modification, Update of the subscription information in the PCRF, PCRF Discovery and Selection, Gateway Control Session Procedures, Change in subscription for MPS priority services, Procedures over Sy reference point.
- **All Policy Controller Supported Protocols.**

- **Protocol Support for Rx and Gx Interfaces in details.**
- **Supported Gx Commands in details.**
- **Gy interface (OCS and PCEF) in details.**

**CRQ - Critical Requirement**

Critical requirements are the most important requirements regarding the functionality of the solution or the qualification of the Proposer and are essential for the proper functioning of the target network and a future proof development path. Compliance is a must and no alternatives are permitted.

Non-compliance to a CRQ of the tender can result in an exclusion from further evaluation.

**REQ - Normal Requirement**

These requirements are requested to meet the certain functionality depending on the methods and approach approach to be utilized by the Proposer. The Proposer has to provide a compliance statement for each REQ requirement in the compliance list.

**IRQ - Information Request**

The Proposer is called to explain and describe their own approach or methodology for this purpose.

The Proposer is requested to use the response template "Statement of Compliance Template" it as "Annex Statement of Compliance".

No.	Clause Type	Requirement
<b>1</b>		<b>General Features</b>
<b>1.1</b>	CRQ	The proposed PCRF shall be compliant with PCC logical architecture as proposed in attached Technical Specification and described in 3GPP2 and 3GPP Releases
<b>1.2</b>	CRQ	The PCRF shall support a Gx reference point that allows communication with the PCEFas indicated in TS 29.212.
<b>1.3</b>	CRQ	Proposer shall state their compliancy of all Gx interfaces.
<b>1.4</b>	CRQ	The PCRF shall support all Gx Specific Diameter AVPs. Proposer shall state any limitation to support all AVPs.
<b>1.5</b>	IRQ	Proposer shall provide the roadmap for the solution proposed, including every aspect: architecture, functionalities, interfaces, protocols, parameters, standardized specifications compliance, etc.
<b>1.6</b>	REQ	Proposer shall have the abundant interoperability tests (IOT) experience with other Proposers to guarantee the stable and reliable IOT performance. Proposer shall provide reference/report with other Proposers in CDMA2000 and LTE commercial network to guarantee IOT quality.
<b>1.7</b>	REQ	Proposer shall indicate the compliance to SOAP and XML interface between SPR and Provisioning in commercial architecture.
<b>1.8</b>	IRQ	Proposer shall indicate the compliance to SOAP/SMPP/JMS/SMTP/HTTP/WAP interface between Notification Middleware and PCRF in convergent architecture.
<b>1.9</b>	REQ	Proposer shall indicate the compliance to Gxa interface between CDMA PDSN BBERF and PCRF in convergent architecture.
<b>1.10</b>	REQ	Proposer shall indicate the compliance to Gxx interface between HSGW and PCRF in convergent architecture.

<b>1.11</b>	REQ	Proposer shall indicate the compliance to Gx interface between PCEF and PCRF in convergent architecture.
<b>1.12</b>	REQ	Proposer shall indicate the compliance to Gx interface between DPI Box and PCRF in convergent architecture.
<b>1.13</b>	REQ	Proposer shall indicate the compliance to Gx interface between P-GW and PCRF in convergent architecture.
<b>1.14</b>	REQ	Proposer shall indicate the compliance to Gxx interface between S-GW and PCRF in convergent architecture.
<b>1.15</b>	REQ	Proposer shall provide the IP addressing scheme for all logical interfaces. Please state how many IPs are required and if the numbers of IPs need to grow based on HW dimensioning
<b>1.16</b>	REQ	For all interfaces it shall be possible to configure more than one destination. In each case the operator may configure whether a load sharing and/or primary/secondary mechanism is used to distribute the traffic over these destinations.
<b>1.17</b>	REQ	The PCRF shall support static (at context start, default bearer establishment) and dynamic (mid-session, additional bearer establishment) Charging Control per Bearer/Flow.
<b>1.18</b>	REQ	The PCRF shall support static and dynamic Policy Control per Bearer/Flow.
<b>1.19</b>	REQ	The PCRF shall support S9 interface and Policy Peering between home- and visited PCRF.
<b>1.20</b>	REQ	The PCRF shall support the establishment of Voice and non-Voice Bearers and the control of the core-network and radio network regarding required QoS and bandwidth
<b>1.21</b>	REQ	The PCRF shall support logical/physical separation between service delivery (e.g. tariffs, applications, communication with AFs) and network control functionalities (e.g. admission control, QoS, RAN and bearer control) in the PCRF to enable alignment between different responsibilities. Proposer shall describe if and how the split and the necessary interfaces between the two entities of the PCRF can be set-up.
<b>1.22</b>	REQ	The PCRF shall support the Diameter based Sy interface to connect with online charging, and also PCRF shall support offline charging too, The CDRs produced by the PDSN shall be transferred to the Charging Gateway Function (CGF) via the Ga/Gz reference point.
<b>1.23</b>	REQ	The PCRF shall supports an Rx reference point that allows communication with the AF, including all optional features. Please specify how many Rx points the proposed PCRF supports.
<b>1.24</b>	IRQ	Proposer shall describe how their solution supports the Rx interface.

<b>1.25</b>	REQ	Establishment and maintenance of connections between PCRF and AF Diameter nodes.
<b>1.26</b>	REQ	The PCRF shall support sending different policy to many PCEFs. Proposer shall describe how many PCEFs that solution support.
<b>1.27</b>	REQ	The PCRF shall support sending one policy to PCEF, but this policy shall be cooperated by multi-PCEFs, such as, PDSN HSGW, PGW and DPI.
<b>1.28</b>	REQ	The PCRF shall support an interface for SPR communication to retrieve subscriber information (e.g. contract information). Proposer shall describe the interface, protocol and the transported information elements and their configuration.
<b>1.29</b>	REQ	PCRF shall be able to cache information received from SPR.
<b>1.30</b>	REQ	The PCRF shall support the push of a Session/Bearer initiation notification to an external AF (e.g. with Rx, SNMP). This information push may not delay the Session/Bearer initiation. A failure of the information push shall not lead to a failure/delay of the Session/bearer initiation.
<b>1.31</b>	REQ	PCRF shall support Ud reference point for communication between UDR and PCRF.
<b>1.32</b>	REQ	Sp interface shall provide security with the methods specified in 3GPP TS 33.210
<b>1.33</b>	REQ	Proposer' solution shall support Binding mechanism as described in TS 23.203.
<b>1.34</b>	REQ	Proposer' solution shall support Gating control mechanism as described in TS 23.203.
<b>1.35</b>	REQ	Proposer' solution shall support event reporting mechanism as described in TS 23.203.
<b>1.36</b>	REQ	Proposer' solution shall support QoS control mechanism as described in TS 23.203.
<b>1.37</b>	REQ	Proposer' solution shall support IP-CAN bearer establishment mechanism as described in TS 23.203.
<b>1.38</b>	REQ	Proposer' solution shall support establishment and maintenance of connections between Diameter nodes as described in RFC 3588.
<b>1.39</b>	REQ	The PCRF shall support connecting with multi-PCEFs simultaneously, such as P-GW, HSGW, DPI and so on.
<b>1.40</b>	REQ	The PCRF shall support TLS on Diameter connections (Gx and Rx interface) according to RFC3588. The use of TLS (Transport Layer Security) shall be configurable per Diameter connections (Gx and Rx interface).
<b>1.41</b>	REQ	Diameter protocol shall be supported on both TCP and SCTP. It shall be configurable which transport protocol to be used per diameter peer.
<b>1.42</b>	IRQ	Please provide a Statement of Compliance to 3GPP 29.213 Policy and charging control signaling flows and Quality of



		Service (QoS) parameter mapping.
<b>1.43</b>	REQ	Once enabled, the PCRF shall explicitly disable usage monitoring as a result of receiving a CCR from the PCEF which is not related to reporting usage, other external triggers (e.g., receiving an AF request, subscriber profile update), or a PCRF internal trigger.
<b>1.44</b>	REQ	If all IP-CAN sessions of a user to the same APN are terminated, the PCRF shall store the remaining allowed usage, i.e. the information about the remaining overall amount of resources, in the SPR.
<b>1.45</b>	REQ	The PCRF shall support all Rx Specific Diameter AVPs as described in 3GPP TS 29.214. Proposer shall state any limitation to support all AVPs.
<b>1.46</b>	REQ	The PCRF shall take the information described in 3GPP TS 23.203 chapter 6.2.1.1 as an input for policy decision. Proposer shall describe which interface/protocol/information element (e.g. Gx/Diameter/AVP; Sp/LDAP/Class/Attribute) is used to transport the information.
<b>1.47</b>	REQ	The protocols/information elements of the input/output interfaces shall be configurable e.g. by dictionaries/maps and shall not be hard-coded. Proposer shall supply documentation of the flexible configuration of protocols/information elements.
<b>1.48</b>	REQ	Proposer shall provide information for the other generic input entities that the PCRF can use for logic decision.
<b>1.49</b>	REQ	The proposed solution shall be able to use provisioning of policy-based services based on the combination of various parameters, including: <ul style="list-style-type: none"> <li>• Time</li> <li>• Data Volume,</li> <li>• Subscriber's location,</li> <li>• Device Type,</li> <li>• Network Resource Availability,</li> <li>• Subscriber Roaming,</li> <li>• Network Type,</li> <li>• Protocol/Application used by the subscriber,</li> <li>• Content Type,</li> <li>• Service,</li> <li>• Web Address (URL-based),</li> <li>• Location-based,</li> <li>• Subscriber's Profile,</li> <li>• QoS.</li> <li>• Tariff plan</li> <li>• Amount of used traffic (per hour, day, month)</li> <li>• Time of service usage (day/night, period of time)</li> <li>• Equipment type</li> </ul>

<b>1.50</b>	REQ	The PCRF shall be able to use the Source IP of the bearer as an input for the policy decision. Proposer shall describe which interface/protocol/information element is used to transport the information.
<b>1.51</b>	REQ	The PCRF shall be able to use the MSISDN of the subscriber as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.52</b>	REQ	The PCRF shall be able to use the IMSI of the subscriber as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.53</b>	REQ	The PCRF shall be able to use the IMEISV of the subscriber device as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.54</b>	REQ	The PCRF shall be able to use the user category / Subscriber Tier (e.g. Gold, Silver, Bronze) as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.55</b>	REQ	The PCRF may be able to use the User-Time-Zone as an input for the policy decision. Proposer shall describe possible solutions. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.56</b>	REQ	The PCRF shall be able to use User Location / Roaming Status (MNC, MCC, RAC, LAC, Cell Id) as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.57</b>	REQ	The PCRF shall be able to use Network Technology Information (RAT-Type (UTRAN, GERAN, WLAN,CDMA) , requested QoS, Bit rate) as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.58</b>	REQ	The PCRF shall be able to use session information transported over Rx as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.59</b>	REQ	The PCRF shall be able to use user information transported over Sp as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.

<b>1.60</b>	REQ	The PCRF shall be able to use Application type/priority information coming from an AF as an input for the policy decision. Proposer shall describe the supported interfaces/protocols/information elements provided.
<b>1.61</b>	REQ	The PCRF shall be able to use Service Provider Information as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.62</b>	REQ	It shall be possible to set/reset internal timers with an external message/trigger event. Proposer shall describe the interface/protocol/information element to set/reset an internal timer.
<b>1.63</b>	REQ	The PCRF shall be able to use Online Volume consumption triggers as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.64</b>	REQ	The PCRF shall be able to use Online Time consumption triggers as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.65</b>	REQ	The PCRF may be able to use Signaling of Cell congestions / overloads (static/dynamic, per configured subscriber) as an input for the policy decision. Proposer shall describe how the information about congested cells is transported to the PCRF, and how the congested cell can be relieved from overload.
<b>1.66</b>	REQ	The PCRF shall be able to use the used APN as an input for the policy decision. Proposer shall describe which interface/protocol/information is used to transport the information.
<b>1.67</b>	REQ	The PCRF shall be able to use service and subscriber information from different interfaces (e.g. charging rule base names, user profiles) as an input for the policy decision by combining them with mapping tables and programmable logic.
<b>1.68</b>	REQ	The PCRF shall be able to use internal Timers (start and expiry) as an input for the policy decision.
<b>1.69</b>	REQ	The PCRF shall be able to use the Time of Day, Day of Week/Month, Weekday, Workday, Weekend as an input for the policy decision.
<b>1.70</b>	REQ	The PCRF shall be able to use the connection status, established/failed, (e.g. TCP, Diameter Watchdog, LDAP session) of a policy-push interface (see Policy Engine Output) as an input for the policy decision.
<b>1.71</b>	REQ	The PCRF shall provide a roaming network identification, using an internal mapping table between the PDSN / S-GW IP address (IPv4 / IPv6) and the visited network.

<b>1.72</b>	REQ	The PCRF shall support the allocation of a pre-defined default policy in the event of unavailability of adjunct systems (such as SPR).
<b>1.73</b>	REQ	Volume counting involves using data from traffic counters in the PCEF. All the relevant traffic that shall be counted must pass through the counting device (one or several) and the device must be able to distinguish/classify the traffic. There shall be enough counters in the device to cover the considered scenario.
<b>1.74</b>	REQ	The PCRF shall be able to configure total volume quota value for every subscriber.
<b>1.75</b>	REQ	The PCRF shall have ability to tell PCEF to measure all traffic of subscriber.
<b>1.76</b>	REQ	The PCRF shall have ability to install Monitoring-Key to PCEF to tell PCEF only measure some specific service's traffic of subscriber.
<b>1.77</b>	REQ	The PCRF shall have ability to reset quota including Time quota and volume quota on a daily, weekly, or monthly basis, or every multiple days.
<b>1.78</b>	REQ	To avoid signal flood, different subscriber shall have different reset date time even they have the same policy and quota.
<b>1.79</b>	REQ	The PCRF shall be able to define quota status based on volume consumption and total volume value. For example, if 100% quota is consumed, the quota status is exhaust.
<b>1.80</b>	REQ	The percentage of quota status shall be configurable.
<b>1.81</b>	REQ	The PCRF shall be able to provide at least 5 different quota statuses for every subscriber.
<b>1.82</b>	REQ	The PCRF shall be able to distinguish between different types of traffic in order to throttle or prioritize between individual traffic streams.
<b>1.83</b>	REQ	It shall be possible to apply more than one volume limit per subscriber with corresponding data rate limit. For example, the initial downlink bandwidth is 2Mbps; the bandwidth will be throttled to 1Mbps in case of the usage accumulated to 80%, 512kbps in case of the usage accumulated to 95%.
<b>1.84</b>	REQ	The PCRF shall support roll-over of a percentage of the remaining fair usage balance from one billing cycle to the next billing cycle for subscribers who didn't fully consume their fair usage. And the action of "roll over" or "reset" shall be configurable.
<b>1.85</b>	REQ	The PCRF shall support to set the throttling periods independent of calendar weeks and months.
<b>1.86</b>	REQ	The PCRF shall be able to be informed for purchasing extra data volume packages, alternatively notify the subscriber that the limit has been reached and guide the subscriber to a site where extra data volume packages can be bought.

<b>1.87</b>	REQ	The PCRF shall support volume counting based policy decision through standard Gx interface for quota installation from PCRF to PCEF and volume reporting from PCEF to PCRF.
<b>1.88</b>	REQ	The service level quota installation from PCRF to PCEF shall be supported.
<b>1.89</b>	REQ	The service level of multi-quota installation from PCRF to PCEF shall be supported.
<b>1.90</b>	REQ	The session level quota installation from PCRF to PCEF shall be supported.
<b>1.91</b>	REQ	The service level usage reporting from PCEF to PCRF shall be supported.
<b>1.92</b>	REQ	The session level usage reporting from PCEF to PCRF shall be supported.
<b>1.93</b>	REQ	The QoS shall be adjusted with the change of usage.
<b>1.94</b>	REQ	The PCRF shall be able to configure total duration quota value for every subscriber.
<b>1.95</b>	REQ	The PCRF shall support calculating the duration for the subscriber.
<b>1.96</b>	REQ	The PCRF shall support calculating the duration on the PCRF side, when some threshold reach, the PCRF send RAR message to PCEF to update policy.
<b>1.97</b>	REQ	The PCRF shall support Online Charging System Selection (OCS Host Load Sharing, pri/sec event-charging-function-name) in the policy output, together with: (see next Req)
<b>1.98</b>	REQ	The PCRF shall support primary/secondary event charging function name (OCS Host Name) in the policy output.
<b>1.99</b>	REQ	The PCRF shall support HTTP redirection control on Gx/Gx+ in the policy output in compliance with R8 standardisation.
<b>1.100</b>	REQ	The PCRF shall support Context/Bearer control (setup, termination, QoS, Bandwidth, QCI) based on service data flows in the policy output
<b>1.101</b>	REQ	The PCRF shall support several sets of charging rules, (charging-rule-base-name AVP) in the policy output
<b>1.102</b>	REQ	The PCRF shall support several charging rules, (charging-rule AVP) in the policy output
<b>1.103</b>	REQ	The PCRF shall support several dynamic charging rules (Charging-Rule-Definition AVP) in the policy output
<b>1.104</b>	REQ	The PCRF shall support timestamp for policy and charging rule enforcement in the policy output
<b>1.105</b>	REQ	The PCRF shall support policy validity time in the policy output
<b>1.106</b>	REQ	In case of policy validity time, the PCRF shall support the information which policy to use after expiry of the validity time in the policy output.

<b>1.107</b>	REQ	The PCRF shall support provisioning of Event Triggers towards the PCEF as specified in TS 23.203.
<b>1.108</b>	REQ	The PCRF shall support operator-defined QCI.
<b>1.109</b>	REQ	The PCRF shall support the modification of a UE-requested standardized QCI to an operator-specific QCI.
<b>1.110</b>	REQ	The PCRF shall support modification of all default bearer parameters when a UE attaches to the network.
<b>1.111</b>	REQ	The PCRF shall support modification of all default bearer parameters when a UE requests additional PDN connectivity.
<b>1.112</b>	REQ	The PCRF shall support mid-session modification of all service data flow QoS parameters.
<b>1.113</b>	REQ	The PCRF shall support mid-session modification of APN-AMBR.
<b>1.114</b>	REQ	Subscriber Tier differentiation shall be based on operator defined QCIs in the policy output.
<b>1.115</b>	REQ	The PCRF shall support integration with SMSC for the delivery of SMS notification
<b>1.116</b>	REQ	The PCRF shall support sending notification to subscriber when subscriber a new service.
<b>1.117</b>	REQ	The PCRF shall support sending notification to subscriber when quota reset.
<b>1.118</b>	REQ	The PCRF shall support sending the notification to subscribers when service expires.
<b>1.119</b>	REQ	The PCRF shall support JMS interface for SMS notification SOAP/SMPP/JMS/SMTP
<b>1.120</b>	REQ	The PCRF shall support SOAP interface for SMS notification
<b>1.121</b>	REQ	The PCRF shall support SMPP interface for SMS notification
<b>1.122</b>	REQ	The PCRF shall support JMS interface for email notification
<b>1.123</b>	REQ	The PCRF shall support SOAP interface for email notification
<b>1.124</b>	REQ	The PCRF shall support SMTP interface for email notification
<b>1.125</b>	REQ	The content of SMS message shall be configurable.
<b>1.126</b>	REQ	The content of email shall be configurable.
<b>1.127</b>	REQ	The PCRF shall be able to fetch the MSISDN to use for SMS notification or an e-mail address that the subscriber has registered.
<b>1.128</b>	REQ	The solution shall be able to provide the subscriber with notification Captive Portal for all defined threshold values.
<b>1.129</b>	IRQ	The PCRF shall be able to install Redirection URL to PCEF.
<b>1.130</b>	IRQ	The PCRF shall be able to install Redirection IPv4 address to PCEF.
<b>1.131</b>	IRQ	The PCRF shall be able to install Redirection IPv6 address to PCEF.
<b>1.132</b>	IRQ	The PCRF shall be able to install times of Redirection to PCEF.

<b>1.133</b>	REQ	The PCRF shall support flexible business logic. The policy definition shall be provided in a flexible. Proposer shall describe the business logic detailed. The policy can be defined based on dynamic subscriber group. For example, the subscriber group can be defined based IP Address segment, Prefix of IMSI or MSISDN and so on. The subscriber belongs to the subscriber group in case of the match of attribute dynamically.
<b>1.134</b>	REQ	The PCRF shall support to extend AVP over Gx interface to integrate different type of PCEF dynamically without service interruption and hard-coded.
<b>1.135</b>	REQ	Proposer shall state the maximum number of PCC rules per subscriber in the offered PCRF product
<b>1.136</b>	REQ	Proposer shall state the average number of PCC rules per subscriber in the offered PCRF product
<b>1.137</b>	REQ	The PCRF may forward User Location Information to an external Home Location Database and receive Information from this server (e.g. Home zone Functionality) Proposer shall describe all interfaces/protocols/information elements supported for this purpose.
<b>1.138</b>	IRQ	Proposer shall inform if the PCRF supports S15 reference point towards LTE Home eNodeB Gateway and S15 procedures as specified in 3GPP TS 29.212 Rel.11
<b>1.139</b>	REQ	Proposer shall indicate the PCC Rule Information which the PCRF supports for the Dynamic PCC Rules provisioning procedure.
<b>1.140</b>	IRQ	Proposer shall inform if the PCRF supports IP Flow Mobility Routing Rules handling.
<b>1.141</b>	IRQ	Proposer shall inform if the PCRF supports IMS Emergency service as specified in 3GPP TS 23.203 and if it applies to all elements of a network which are responsible for the Emergency service
<b>1.142</b>	IRQ	Proposer shall inform if the PCRF supports ADC Rules as specified in 3GPP TS 29.212 Rel.11
<b>2</b>		<b>Performance and Availability</b>
<b>2.1</b>	IRQ	Proposer shall detail which redundancy models (1+1, n+1 preferred, 2n, 3n etc) are supported by Proposer' solution.
<b>2.2</b>	REQ	The proposed solution shall support of geographical redundancy and load sharing.(The proposer shall provide an optional Solution for geographical redundancy).
<b>2.3</b>	REQ	Proposer shall indicate any constraint such as link throughput, latency, and distance between sites that are necessary to achieve geographical stateful redundancy with automatic data synchronization.

2.4	REQ	In normal situation, the data synchronization mechanism shall base on message and must ensure that the data in the mated NE is completely consistent. The solution shall synchronize data immediately when the data changed.
2.5	REQ	The solution shall support Data Consistency Check mechanism.
2.6	REQ	The proposed solution shall support PCRF overload control. Proposer shall describe overload mechanisms and PCRF behavior during overload.
2.7	REQ	The proposed solution must offer mechanisms in order to measure the In Service Performance and the Quality of service. Proposer shall describe the available performance indicators and counters in the solution per component.
<b>3</b>		<b>Universal platform framework</b>
3.1	REQ	The hardware shall be universal and shall be modular extendable according to capacity demand (preferable extension via HW-card).
3.2	IRQ	Proposer shall provide details information of the PCRF, including but not limited to: model, dimension, capacity per hardware unit, number of module slots per chassis, interface module (I/O), internal communication concept, operating system, middleware and application software design concept.
3.3	IRQ	Proposer shall specify how internal traffic separation is implemented to ensure internal traffic management (e.g. Media-, Signaling-, O&M traffic, etc. Please explain in detail: - VPN separation of services and management
3.4	REQ	It shall be possible to extend the HW capacity of the universal platform within a chassis. Please explain the HW concept and how the capacity in particular CPU, Storage, packet forwarding instance can be extended per application.
3.5	REQ	Proposer shall provide for each single unit (Fan, Power Unit...) and each single board/card type the minimum number of required and the maximum number of possible boards.
3.6	REQ	Proposer shall provide the maximum number of transactions per second, which can be handled per functional unit.
3.7	REQ	The solution shall be scalable. Proposer shall describe the scalability concept with example to how the system can be scale from small capacity to medium and maximum capacity.
<b>4</b>		<b>PCRF Management</b>
4.1	REQ	The policy design shall base on mode: When received a Trigger, then compare Condition, if Condition matched, then perform Action.
4.2	REQ	The PCRF shall support backup of system configuration data to local disk.
4.3	REQ	The PCRF shall support backup of policy rule data to local disk.



4.4	REQ	The PCRF shall support backup of system configuration data and transfer backup file to backup system via FTP interface.
4.5	REQ	The PCRF shall support backup of policy rule data and transfer backup file to backup system via FTP interface.
4.6	REQ	The PCRF shall support backup of system configuration data and transfer backup file to backup system via SFTP interface.
4.7	REQ	The PCRF shall support backup of policy rule data and transfer backup file to backup system via SFTP interface.
4.8	REQ	The PCRF shall support backup of policy rule data, operator can configure system to backup all data automatically.
4.9	REQ	The PCRF shall support automatic backup. The backup can be triggered every day.
4.10	REQ	The PCRF shall support automatic backup. The backup can be triggered every week.
4.11	REQ	The PCRF shall support automatic backup. The backup can be triggered every month.
4.12	REQ	The PCRF shall support importing policy rule data via FTP interface.
4.13	REQ	The PCRF shall support batch process.
4.14	REQ	The batch file shall be one document file consists of MML command or other commands. The batch process shall be automatic.
4.15	REQ	The PCRF shall define a time schedule, and then execute the batch file on pre-scheduled time.
<b>5</b>		<b>PCRF Configuration</b>
5.1	REQ	The PCRF shall incorporate a flexible programmable logic language to combine external and internal information/triggers and calculate the policy engine output. Proposer shall describe the capabilities of the used flexible programmable logic language.
5.2	REQ	The PCRF may incorporate a GUI to enable a drag-and-drop, visual program style (draw connections between logical blocks on a drawing canvas). If applicable, Proposer shall describe the capabilities of the GUI.
5.3	REQ	The operator shall be able to define develop the rules and/or rule service blocks for the GUI without going back to Proposer.
5.4	REQ	The PCRF shall comprise editable mapping tables / rules to combine internal/external information in a flexible way with the programmable logic. Proposer shall describe, how mapping tables/rules can be configured/edited
5.5	REQ	Configuration settings and programmable logic shall be pre-checked (Syntax, constancy) prior to enforcement on the PCRF.
5.6	REQ	Proposer shall describe how the flexibility of the service rules are provided, i.e. the programming tools available to the

		operator.
5.7	REQ	Proposer shall provide examples of the timescale/efforts/costs to provide new rules.
5.8	REQ	It may be possible to check the consistency of pre configured Charging-Rule-Base-Name and Charging-Rule-Name between PCRF and PCEF.
5.9	REQ	XML/SOAP interface for provisioning shall be supported.
5.10	REQ	Upgrading of provisioning XML/SOAP interface (i.e. modify parameter) shall be possible without software upgrade
<b>6</b>		<b>Software and hardware capacities</b>
6.1	'REQ	SW Number of IP-CAN Sessions 300,000 with all policy - based services features mentioned above.
6.2	'REQ	SW Number of subscriber Profile and provisioning 1,000,000 sub.
6.3	'REQ	HW Capacity must handle the minimum number of IP-CAN Sessions 300,000.
6.4	'REQ	HW Capability must support not less than 3 million of IP-CAN Sessions.
6.5	'REQ	HW Capacity must handle the minimum number of subscriber Profile and provisioning 1,000,000 sub.
6.6	'REQ	HW Capability must support not less than 3 million subscriber Profile and provisioning.
6.7	'REQ	Should be N+1 and working as load sharing. Processing units should meet all required capacities and features mentioned .
6.8	'REQ	HW should include all network equipments to connect and protect the system internally and externally.
6.9	"REQ	Should support 10G optical interfaces scalab up to 40G and 100G traffic.