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Solution Paper

Intelligent Routing for Policy Control

Background

Service providers deploy multiple Policy and Charging Rules Function (PCRF) elements in their network to control exponential growth in data traffic of 4G LTE networks, fueled by increasing number of data intensive devices and bandwidth demanding applications. Operators use several policies and charging procedures to manage data traffic and orchestrate avenues for revenue generation by managing bandwidths, data traffic sessions based on settings as time of day, rating, quota, QoS, tier-ing and specific service access.

Challenges

With undaunted and increasing demand of data traffic related to several policy and charging attributes, PCRF nodes are generally deployed on multiple computing nodes (blades or servers). Greater control and flexibilities using advanced policy and charging management brings in increasing challenges in network deployments and routing of signaling traffic to these PCRF nodes for its multi-node based architecture. Major challenges include:

- **SERVICE SCALABILITY**

In order to provide seamless scalability, even an introduction of a single new computing element brings in additional and expensive operational overhead of upgrading all communicating nodes like PDN Gateways, MMEs across entire network to provision routing and connectivity information of this new node, which will only worsen exponentially as the network expands with multitude of other network elements and related services.

- **LOAD DISTRIBUTION**

For optimal functioning of multi-node based PCRF solution, signaling traffic towards PCRF solution must be distributed based on handling capacity of each participating computing node. This enables better control and network stability.

- **SERVICE AVAILABILITY**

To confirm network and service stability with multi node solution, architecture must guarantee resiliency against any outage of single or subset of the participating nodes. This error condition should be handled seamlessly not only at the time of fault(s) but also during resumption of service at the affected node.

- **SESSION BASED ROUTING**

PCRF service requires that all signaling traffic related to any specific session must be handled by same instance which has processed the initial requests for that session. This session is identified by the association between IP address of the requesting device to its identity (like IMSI) and also known as IP-CAN (IP Connectivity Access Network) session. Challenge is that within the network IP-CAN session information is only known to PCRF functional nodes, and thus it makes difficult for other communicating network elements to route traffic based on this IP-CAN session towards specific PCRF nodes. To address this 3GPP has introduced a functional element, termed as Diameter Routing Agent (DRA), which ensures all Diameter signaling session established across multiple network reference points for a certain session should reach the same functional instance when multiple and separately addressable functionalities of same type have been deployed.

- **CONGESTION AND OVERLOAD CONTROL**

In addition to challenges related to load distribution of signaling traffic based on engineered capacity of the computing nodes of a PCRF solution, dynamic adaptation of this distribution algorithm is necessary to protect against network congestion and overload situations of any specific instance.

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- **INTEROPERABILITY**

Fast introduction of 4G LTE services brings in deployment of several network elements from different vendors across all carrier networks. As standards are still evolving, vendor implementations for DIAMETER signaling are varying because of difference in interpretation of established standards as well as for introducing new features to gain a competitive edge. This brings in tremendous challenges for interoperability of those network elements which communicate with service providers PCRF solution.

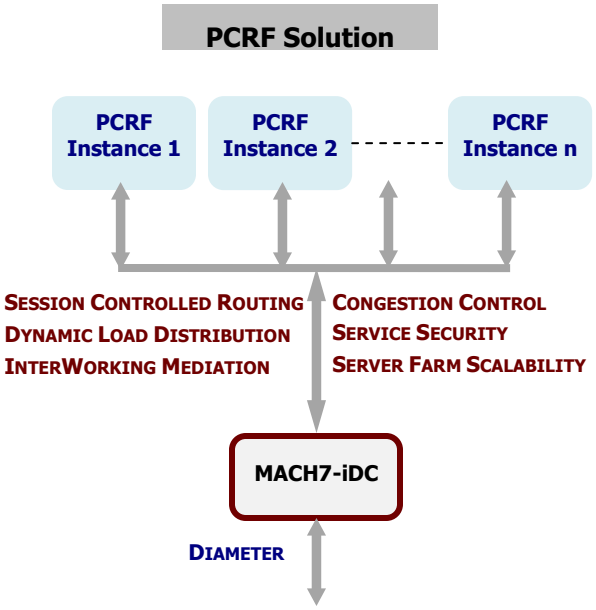
- **SERVICE UPGRADE OVERHEADS**

Along with normal operations and control, upgrades of those already installed PCRF nodes for introducing new features or fault repair, demands significant operational overhead as part of maintenance activity. These activities not only impact affected PCRF node(s), but also other communicating network elements. All those network elements need to be controlled with routing updates, so that traffic can be only forwarded to available nodes.

Solution

All those above mentioned challenges can be successfully addressed by deploying MACH7-iDC, the DIAMETER Signaling Controller operating as a Diameter Routing Agent (DRA) conforming to 3GPP Specification, while supporting all required reference interfaces as described for PCRF operations.

In this solution MACH7-iDC delivers a state-of-the-art network access solution to the PCRF nodes, while concentrating all DIAMETER signaling connections from and to those nodes. This carrier-grade high-available solution facilitates server-farm type deployment option to PCRF nodes, by front-ending them as a signaling controller, while enabling multiple routing and interworking benefits which includes:



- Centralizes routing, traffic management and load-balancing tasks for all connected nodes.
- Efficient signaling control for PCRF nodes facilitating non-disruptive service migration, expansion and upgrade.
- Allows seamless scaling of service with multiple PCRF elements deployment confirming IP-CAN session stickiness routing.
- Enhances service availability by enabling signaling overload control and protection against denial-of-service (DoS) attack.
- Provides DIAMETER signaling normalization capability between vendors, elements and networks, to mitigate interoperability challenges.
- Reduces network operation complexities, simplifies routing and inter-operability allowing flexible growth.

teleSys Software, Inc.

teleSys is the premier provider of advanced Telecommunications solutions for the next generation LTE Signaling Networks, providing open systems hardware and software.

teleSys Software, Inc. 1900 South Norfolk., Suite 320, San Mateo, CA, USA,94403, Tel: +1-650.522.9922, Fax: +1-650.522.9929 - www.telesys.com