Solution Paper

Effective Utilization and Scalability of DIAMETER Network Resources

Background

Extreme growth in service demands within 4G LTE networks, triggered from numerous of always-on data intensive devices and bandwidth-demanding applications, necessitates deployment of a cost-effective and scalable solution architecture for busy network nodes handling DIAMETER traffic at the network control plane. Considering subscriber data centric service delivery framework of 4G LTE and IMS networks fragmentation of the control plane into a growing number of network functions hosting subscription information, resulted in defining following network elements:

- Home Subscriber Services (HSS)
- Policy and Charging Rules Function (PCRF), and
- Online / Offline Charging Services (OCS / OFCS)

Challenges

Despite of fragmenting network control plane into service specific functionalities, operators still need to address further scalability within the subscription data hosted network elements to meet impending service demands and availability requirements. As a consequence those network elements are further partitioned into multiple instances and deployed across the networks to confirm service availability with geographic distribution. In order to implement a cost-effective scalable framework, network operators encounter traffic regulation challenges which include:

- **STEERING TRAFFIC TO CORRECT INSTANCE**

For PCRF operations, 3GPP specified Diameter Routing Agent (**DRA**) entity to confirm session stickiness routing across multiple instances. Similarly 3GPP has defined Subscriber Location Function (**SLF**) entity which needs to be queried to identify correct HSS instance. Also charging related traffic should be properly distributed across instances of OCS / OFCS nodes, which may require database query for identification of relevant instance(s). Each one of the above solution demands external routing functionality to achieve required scalability.

- **PROPER UTILIZATION OF NETWORK RESOURCES**

Even with access to a centralized database for HSS or OCS/OFCS or any other application, traffic should be evenly distributed across available computing elements to ensure network stability. Distribution of traffic across multiple instances must also consider the processing capability of the specific instances to maximize utilization of network resources for cost-effective growth.

- **SERVICE SCALABILITY & UPGRADES**

Introduction of any new elements for horizontal scalability of services, or maintenance activity on installed nodes brings in additional and expensive operational overhead of upgrading all communicating nodes across entire network to provision routing and connectivity information to route traffic to available nodes, which will only worsen as the service and network expands with multitude of other network elements.

- **SERVICE AVAILABILITY**

To confirm network and service stability with multi node solution, service 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 once condition is corrected.

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- **CONGESTION AND OVERLOAD CONTROL**

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

- **SECURITY**

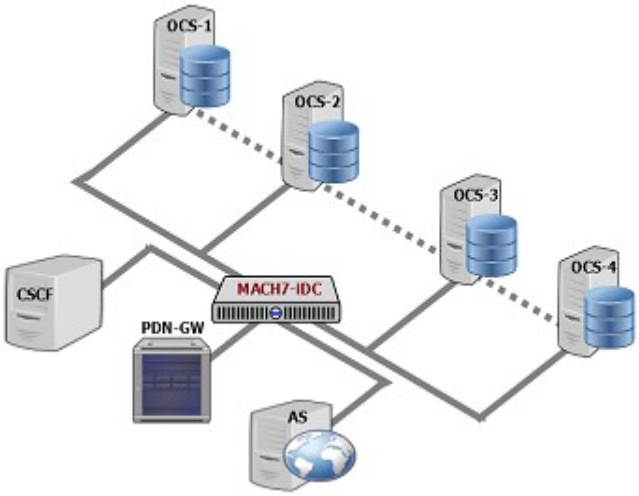
Lack of common control of a horizontally scaled multi-node solution, introduces high security risks for the traffic from un-trusted sources and external networks. Topology hiding and protection against denial-of-service (DoS) attacks are one of the topmost priority element of the network operators for both operational and security reasons.

- **INTEROPERABILITY**

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 for the network elements.

Solution

All those above mentioned challenges can be successfully addressed by deploying MACH7-iDC, the DIAMETER Signaling Controller operating as a Diameter Load Balancer while conforming to 3GPP Specification.



In this solution MACH7-iDC delivers a state-of-the-art network access solution to the Applications 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 application 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 application nodes.
- Efficient signaling control for application nodes facilitating non-disruptive service migration, expansion and upgrade.
- Simplified network management with optimum load distribution algorithms.
- Allows seamless scaling of service with multiple application node deployment confirming 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.

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

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