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Diameter Signalling Control to the Rescue

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As operators move toward service-oriented, all-IP networks, they must expand their focus beyond data traffic and RAN signaling to also now include Diameter signaling.

The Diameter protocol is the language that IP resources in the LTE network rely on for exchanging information. Whether gateways, policy and charging systems, subscriber databases or application servers--they all rely on Diameter messages to communicate information that is vital to managing and monetizing mobile data services

In other words, Diameter communicates, "Every who, what, where, when and why question in the network," as stated by Yankee Group's Brian Partridge in his report, "Policy Exchange Controllers: Enriching Diameter Signaling for LTE and IMS."

For that reason, network designers need to go beyond just understanding new patterns of smart phone usage and the pace at which devices connect to networks. They must now look to Diameter as the nucleus of dynamic and resilient networks.

This represents a different mindset for operators, in that an increase in Diameter messages correlates with an increase in revenue-generating applications. Diameter enables, for example, personalized mobile data services, including tiers, loyalty programs, application-specific quality of service (QoS), and value add for over-the-top (OTT) and machine-to-machine (M2M) services. Simply put, as service providers monetize their IP networks, the volume of Diameter signaling will increase. They must manage that increase intelligently and embrace Diameter as an indicator of something positive: more sophisticated services and more revenue opportunities.

The link between Diameter & customer experience

Harbor Research predicts the number of M2M devices shipped per year will reach 430 million units by 2013, and IDC predicts 1 billion mobile devices will go online by 2013. With so many devices connecting to networks, Diameter signaling will increase exponentially.

Eros Spadotto, executive vice president of technology strategy with Telus, summed up the state of the network by saying, "The concept of 'busy hour' is obsolete, as devices are connecting all the time, and social network applications run all day and all night." He cites the fact that approximately 82 percent of Telus customer smartphones are "always" connected to the Telus network. "Not only are they connected, they're always doing something," he added.

Doing "something" translates into dozens of Diameter messages per subscriber--and millions upon millions across a Tier 1 network. Without proper management of this unprecedented Diameter traffic, congestion and "signaling storms" in the core are possible, which could mean dropped data sessions, service degradation and outages if not managed proactively.

Though it is a challenge, it is one that can be resolved readily if network engineers build out the core for Diameter growth in a manner similar to that in which they built out their Radio infrastructures for device traffic.

A closer look at the challenge: lack of intelligent congestion control?

The problem today is that only a subset of the functionality required for addressing issues that emerge at the core of the Diameter network have been defined by the 3GPP. More has to be defined for the Evolved Packet Core (EPC) in terms of central traffic control for all-IP and LTE networks. In the meantime, certain vendors have implementations that are evolving ahead of the standards.

That means network architects and engineers do not have to wait; they can work with equipment specifically developed for intelligent congestion control, meaning Diameter signaling routers (DSRs) built to automatically recognize and act when nodes become congested. They can move ahead with forecasting Diameter traffic growth and predicting usage patterns of data-heavy devices to mitigate the risk of signaling surges from congested nodes. For example, the rise of connected devices combined with growth in usage-based service plans will increase Diameter messages among policy servers, charging systems and subscriber databases.

A closer look at the solution: Diameter traffic planning & intelligent DSRs

There's no question that the extraordinary growth in smartphone-based signaling traffic plus the growing number of usage-based service plans that generate more signaling will demand new engineering and software requirements. Diameter Signaling Routers (DSRs) have attracted substantial attention thanks to their abilities around throttling traffic to specific destinations, and for preventing Diameter flooding, which can cripple downstream elements.

The DSR creates a standards-based Diameter signaling core in networks. It sits in the center of the New Diameter Network, which manages communication among all essential elements of compelling services, including:

- Offline Charging
- Policy Servers (PCRF)
- Online Charging (OCS)

Network architects need to increase their focus on Diameter signaling traffic growth.

- User Data Repositories
- Mobility Management Entities (MMEs)
- Policy Control Enforcement Points (PCEFs)
- Session Management, like a Call Session Control Function (CSCF)
- Home Subscriber Service (HSS)

It is the DSR that relieves LTE and IMS endpoints of routing, traffic management and load balancing tasks by creating a Diameter signaling core. It also provides a single interconnect point to other networks, providing the first point of contact at the network's edge for LTE roaming or partnership with over-the-top (OTT) application providers, which makes it the ideal vantage point from which to defend a network against potential overloads or attacks.

Because of its utility, Exact Ventures this summer forecasted that DSR market revenue would grow an average of 56 percent per year over the next five years, with predictions that the DSR market would reach $1 billion in cumulative product revenues by 2016.

The analyst firm said operators face, "an urgent need for a new signaling infrastructure" and "are becoming more cognizant of how much of their future network plans depend on Diameter signaling." Exact Ventures identified scalability to meet higher transaction requirements as one of the key buying criteria.

In fact, we estimate that networks need to be built from the start with the ability to support:

- Hundreds of thousands of messages per minute;
- Tens of millions on concurrent sessions; and

• Hundreds of millions of subscribers and devices

Further, we believe this can only be accomplished with a standalone DSR. In addition, a full-scale DSR allows for more effective signaling traffic management and gives operators more return on their investment in comparison to adding incremental features to other products.

Why a stand alone DSR?

Some vendors, however, try to incorporate Diameter routing functions onto other network elements, like MMEs. But this is impractical, because as the network traffic grows, it often becomes cost-prohibitive to add routing capacity to the MME. Additionally, managing multiple implementations of load balancing, congestion control, and message throttling becomes arduous and does not foster scalability. Incorporating routing into any individual endpoint node is by definition only a partial solution.

For all of these reasons, an independent DSR with the ability to centralize the implementation of functions like protocol mediation, message throttling, congestion control and load balancing becomes essential to building and growing all-IP networks. A standalone DSR helps prepare operators for rapid and unpredictable Diameter traffic growth, and provides protocol mediation and interworking functions that help manage 2G/3G-to-LTE and LTE-to-LTE roaming.

If not managed intelligently, congestion will impact the customer experience, the transition to LTE and operator brands.

Ultimately, it is the DSR that mitigates signaling storms and hence preserves a positive customer experience. Because the DSR acts as the network's central nervous system, it sees all Diameter traffic and makes decisions regarding load balancing and congestion control based on its knowledge of the entire network, as opposed to a specific segment of the network. As new services, devices and usage patterns place higher demands on networks, the DSR will remain essential for anytime, anywhere services to become a reality.