



# Diameter Policy and Charging Control

Service providers want to deliver dynamic control of policy and charging—on both a subscriber and an IP flow basis. Including a Policy and Charging Control (PCC) architecture in the LTE Evolved Packet Core enables application servers to dynamically control the quality of service and charging requirements of the services they deliver. This paper explores the use cases and deployment options of advanced PCC functions using Diameter.



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### Diameter Policy and Charging Control

## Introduction

Each time we use our mobile devices, we generate multiple signaling events within the mobile core. As a result, signaling traffic has risen at a faster clip than traditional mobile network traffic. Industry leaders estimate worldwide LTE Diameter signaling traffic at about 12 million messages per second, and project that this volume will increase to 99 million messages per second by 2017. By that time, policy will account for 62 percent of signaling volumes, surpassing centralized routing and roaming. Policy is becoming the biggest source of signaling traffic, but it is not the fastest-growing traffic source. That distinction goes to online charging, which will grow at a compound average annual growth rate of 180 percent through 2017.<sup>1</sup>

Throttling, flow, and congestion control are key for Diameter signaling controllers, the network appliances that route Diameter messages. Service providers need a central point that allows them to manage the signaling flood yet deploy services quickly and easily. These services must be easy to maintain and offer high performance, scalability, and flexibility.

Service providers will use enhanced policy control to differentiate service delivery and personalization, and offer better self-service controls at the individual device level to families or enterprise IT managers. This type of differentiation increases customer loyalty and reduces churn, and delivers more user-friendly service models that gain market share and enhance mobile operator revenues.

The F5 Policy and Charging Control solution integrates F5's proven solutions for Diameter messaging into one platform. This enables optimal management of policy and charging—allowing operators to deliver personalized services quickly and easily.

## Diameter PCC Use Cases

The number of network entities is constantly increasing as networks become more complex, given that each entity will represent a Diameter node. The growing quantity of signaling with the surge of mobile data (combined with new policy and charging models), has resulted in service providers struggling to manage their control plane and Diameter signaling.

With LTE, the goal is to offer premium LTE customers the same quality experience while traveling as they enjoy at home. Home-network Policy and Charging Rules Functions (PCRFs) need to communicate with visited-network PCRFs based on any given external service providers and from any potential vendor.



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### Diameter Policy and Charging Control

Interoperability issues may be expected between home- and visited-PCRF vendors. These issues involve roaming of incoming and outgoing messages—including stickiness and redundancy to maintain the same route for incoming/outgoing messages, handle long-term open sessions, and enable redundancy and scalability.

Service providers must normalize with visited PCRF Diameter messages to ensure they follow the home network Diameter signaling format.

## Personalized Service Tiers

Subscribers demand flexible data plans and a range of personalized pricing packages. Revenues must directly relate to subscriber consumption. As a service provider, you need to offer personalized packages based on multiple parameters: application, location, home-zone, access speed, download/upload quotas, quality of service (QoS), devices, time of day/week, and zero-rated (free) apps such as Wikipedia and Twitter.

## Cross Promotions

Cross promotion of services can be used to create incentives for subscribers to sign up for premium services. For example, you could offer vouchers for dedicated bandwidth for subscribers who buy a video game in a retail store. You could then refund data consumed for premium services (e.g., gaming or VoIP) for regular Internet usage or issue credits for premium service subscriptions (e.g., private cloud or video).

## Control Roaming Costs

Self-controlled data usage plans define usage thresholds, alert subscribers on usage, and define rules when maximum usage has been reached. Data usage plans offer a range of options to resolve the immediate issues associated with data usage while roaming.

## Shared Data Plans and Multi-Device Policy

Shared data plans create a one-to-many relationship between a data plan and multiple devices. Each user device has an associated quota that allows users to track the amount of data consumed by each device. Reports allow you to offer low-cost data plans for underused devices. Usage-based packages can be based on time, bandwidth, or application per device or per person. Packages can be geared toward multiple users for family and small businesses—with blocks of shared data and talk (or text) for a flat rate.



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### Diameter Policy and Charging Control

## Sponsored Data Models

In sponsored data models, data charges for specific usage are billed directly to the sponsoring company rather than the user. Your subscribers can access sponsored content without affecting their data plan. Zero-rated data services aren't counted toward the user's monthly quota. Like dialing a toll-free number, the service provider pays the bill for the consumed data.

## Bandwidth on-Demand—Turbo Boost

For a fee, QoS can change on demand to speed delivery. The bandwidth on-demand turbo boost allows you to upgrade performance and increase download bandwidth instantaneously for a pre-set quota or period of time. The turbo boost can give subscribers access to particular games, or video replay/broadcasts in crowded environments such as stadiums.

## Fair Usage Policy

When particular subscribers exceed or abuse data plans, you can throttle or slow the speed of your services so that all can enjoy quality access to the Internet.

## Try and Buy

Subscribers can be allowed to test content and premium services by purchasing an initial quota for a trial period. Once the trial quota is depleted, you can trigger an offer to buy the premium service or upgrade the data plan.

## Wi-Fi Offload

Wi-Fi offload consists of offloading video only and leaving voice services on the LTE network. You may offer incentives (such as additional free megabytes) for customers who move certain traffic to Wi-Fi (video, music, gaming, etc.). You can also charge lower per-transport layer rates for Wi-Fi or mobile data.

## Forecasted Use Cases

A recent survey asked service providers what use cases they expected to add to their policy management platforms. Responses suggested much more service innovation planned for the future.



## Percentage of Use Case Deployment

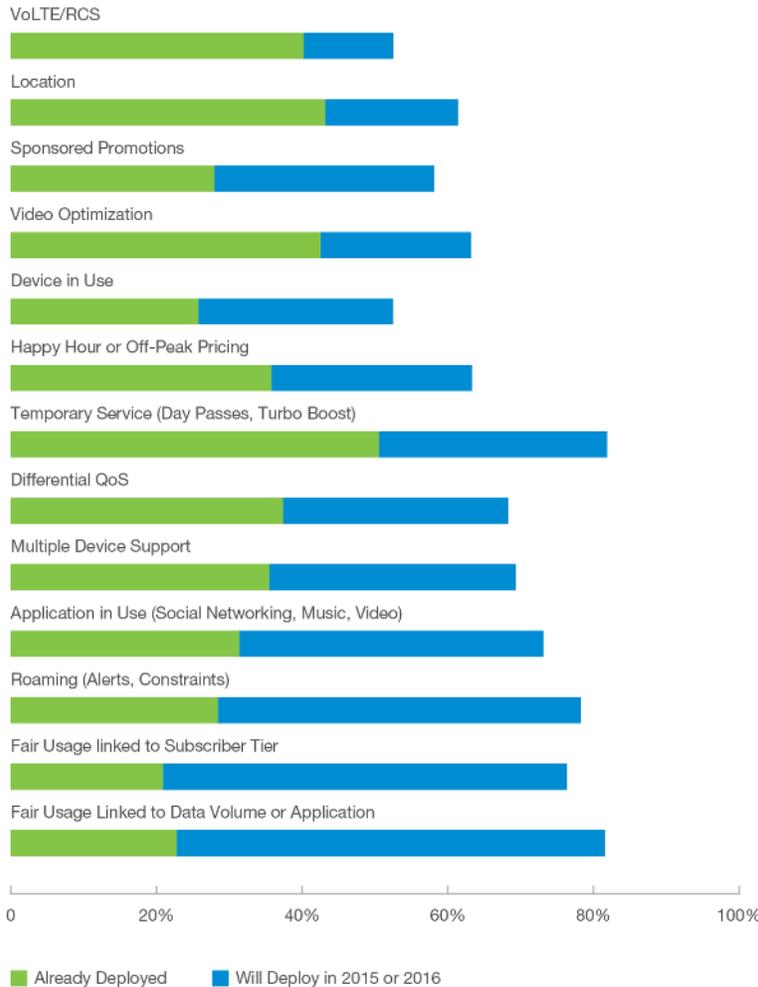


Figure 1: Heavy Reading survey of 71 service provider executives—August 2014.

## Enable Use Cases with Diameter Routing

Service providers want the network PCRFs to communicate—and maintain that communication—with any Policy Control Enforcement Function (PCEF). With the rapid adoption of policy and charging control, service providers find themselves with dozens of PCRF and PCEF functionalities spread across different sites that introduce an unprecedented quantity of signaling. These new usage patterns introduce multi-attachment technologies and services that are always on, always connected, and challenge service providers to maintain a high QoS for subscribers.



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### Diameter Policy and Charging Control

The F5 Traffix™ Signaling Delivery Controller™ (SDC) is a Diameter router that helps you achieve a high QoS by:

- Maintaining configurable, real-time and policy-based routing across PCRF/PCEF domains. You can segment and manage the network while defining and controlling backup and redundancy procedures.
- Enabling PCRF/PCEF geo-redundancy by maintaining session state across PCRFs and websites.
- Using advanced mechanisms to reduce the amount of Diameter signaling created and sent across the network.

Bi-directional load balancing of stateful sessions can be based on static, dynamic, and custom policies. The load balancer can read the status of the destination and maintain full-session stickiness. IP-CAN session binding, Gx, and Rx can then relay the Diameter messages to the appropriate PCRF cluster holding the subscriber information. Within each cluster, traffic will be load balanced across the servers.

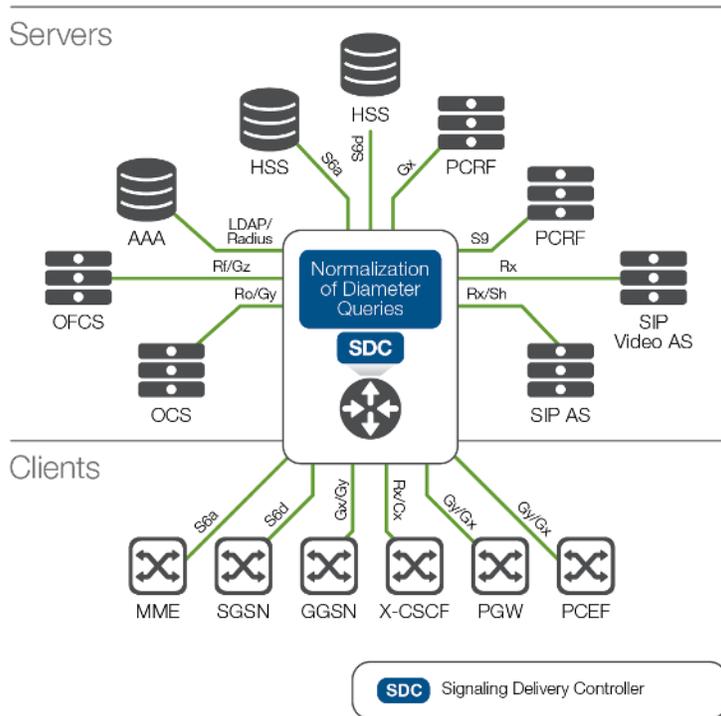
## Simplify the Control Plane

The SDC is the field-proven, single platform for Diameter routing (DRA/DEA), load balancing, and interworking functionality (IWF). It includes key features that enable you to simplify control plane management:

- Industry-leading Diameter routing optimization capabilities.
- Compliance with IETF Diameter RFPs, 3GPP DRA, and GSMA DEA specifications.
- A native Diameter entity to support contextual routing based on any combination of Diameter messages, AVPs, or content.
- Routing resilience to cope with Diameter server and client failover.
- Dynamic service monitoring technology to bypass bottlenecks and enhance performance.
- Support for over 50 Diameter interfaces (3GPP [Rel. 7, 6, 9], TISPAN) including non-standard attribute value pairs from leading industry vendors.



## PCC Architecture



**Figure 2:** The SDC speaks many “dialects” of Diameter.

The SDC is a fully compliant Diameter agent, following the IETF Diameter RFP’s 3GPP Diameter Routing Agent (DRA) specifications and GSMA Diameter Edge Agent (DEA) guidelines.

An important part of any control plane architecture, Diameter routing technology supports the introduction of scalable and efficient Diameter-based services and networks.

## Conclusion

With the growing number of PCRFs communicating in home networks and visited domains—and with virtually any cross-network PCRF connectivity—a Diameter router is no longer a consideration, but an essential central architecture node. The F5 Policy and Charging Control solution enables the SDC to normalize visited PCRF Diameter messages, ensuring they follow the home network Diameter signaling format.



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### Diameter Policy and Charging Control

Supporting hundreds of thousands of concurrent Diameter sessions, the SDC routes across different networks and domains—satisfying any service provider redundancy and backup requirement.

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<sup>1</sup> <http://www.lightreading.com/spit-%28service-provider-it%29/diameter-routing-signaling/lte-diameter-signaling-growth/d/d-id/705858>

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