Optimize and Monetize Networks with Context-Aware Policy Enforcement

The growth in device usage and the explosion of data traffic from resource-intensive
content like streaming video and high-bandwidth, over-the-top applications is forcing fixed-
line and mobile service providers to push their networks to the limit. The challenge is to
find ways to efficiently deliver customized services with best-in-class customer experience,
while also optimizing network utilization and managing radio access network congestion.

F5® BIG-IP® Policy Enforcement Manager™ (PEM) delivers the insight you need to
understand subscriber behavior and effectively manage network traffic with a wide
range of policy enforcement capabilities. BIG-IP PEM provides intelligent Layer 4–7
traffic steering, network intelligence, and dynamic control of network resources through
subscriber- and context-aware solutions. It also provides deep reporting, which you can
capitalize on to build tailored services and packages based on subscribers’ app usage
and traffic classification and patterns to increase ARPU.

Key benefits

Enable new business models and services
Base your business models and services on
insights gathered through comprehensive
analytics and subscriber awareness capabilities,
for better quality of experience (QoE) and higher
ARPU and profitability.

Optimize network performance
Reduce network congestion and deliver better
performance to your subscribers with Layer 7
intelligent traffic steering capabilities and the
ability to implement bandwidth control policies.

Consolidate services and reduce costs
Combine core elements in your network
infrastructure—including policy enforcement,
intelligent traffic steering, carrier-grade NAT,
and network firewall—as well as integrated
VAS capabilities, such as URL filtering and TCP
optimization, within an easy-to-manage unified
platform. Lower CapEx and OpEx, and gain
energy efficiency for a greener environment.

Achieve carrier-grade performance
and scalability
Manage traffic with fewer servers—and without
sacrificing performance. Take advantage of
best-in-class performance and scalability for
total concurrent sessions, traffic throughput,
and transactions per second with BIG-IP PEM,
a NEBS-compliant platform.

Roll out new services faster
Simplify your network and gain greater visibility
into subscriber usage patterns to create
customized services and get them to market
quickly—and boost subscriber satisfaction and
loyalty.
Traffic Detection

BIG-IP PEM offers service providers a comprehensive set of traffic classification capabilities to help you accurately identify the specific applications and services your subscribers are using, and how they’re using them. You can use this information to create service plans that meet the needs of your subscribers, while also using it to regulate network usage. The combination of differentiated services and network usage control leads to increased profitability.

Traffic classification

Understanding the types of applications and services, as well as the protocols being used in the network, is key to determining how to manage subscribers’ bandwidth consumption for optimal network performance. It’s also key to developing and monetizing innovative services while ensuring optimal network efficiency and utilization monitoring.

For example, as your subscriber is watching a TV show on YouTube, you can prompt the subscriber to purchase a “turbo button” feature which, when activated, delivers a burst of bandwidth to the subscriber’s device. The result is a better experience for the subscriber, and incremental revenue for you.

BIG-IP PEM gives you the ability to classify traffic into several categories of applications and protocols. These are some examples of the types of apps and protocols BIG-IP PEM supports:

- P2P: BitTorrent, Gnutella
- VoIP: SIP, Skype, Yahoo!, Jabber
- Web: HTTP, HTTPS, FTP, YouTube, Facebook
- Streaming: HTTP Streaming, RTSP, HTTP Audio
- Non-TCP/UDP: IPSec, GRE, IPinIP, ICMP

As the number of apps and services being used in the network grows, you need to continually update your signature libraries to ensure that protocol classifications and subscriber plans are accurate, based on subscribers’ usage patterns. To this end, BIG-IP PEM supports dynamic and hitless signature upgrades, so you can seamlessly receive new signatures for new or existing applications—without having to perform a software release upgrade.

Other types of traffic classification employed on BIG-IP PEM include behavior and heuristics analysis, and deep packet inspection.

Subscriber awareness

BIG-IP PEM performs subscriber discovery via RADIUS and/or DHCP and provides information such as IP address, IMSI, and user name, which, when correlated with application flows, allows for deeper understanding of the type of applications and services subscribers are using and how they are using them. In addition, BIG-IP PEM can retrieve info on RAT type (Radio Access Technology) via RADIUS messages and can apply different policies based on subscriber use of 3G or 4G LTE networks. BIG-IP PEM can also function as a RADIUS client for authentication and accounting for subscribers.
Policy Enforcement

Intelligent traffic steering

With BIG-IP PEM, service providers can perform Layer 7 advanced steering of application and subscriber traffic to multiple, value-added services including web caching, video optimization, and parental control. For example, BIG-IP PEM detects if a subscriber’s mobile device is consuming video. If so, it can direct traffic from that device to your video optimization server. By steering traffic only to relevant servers, you can reduce the burden on other servers thereby reducing CapEx and OpEx.

Dynamic service chaining

Dynamic service chaining capabilities within BIG-IP PEM enable service providers to send traffic to multiple services within a single flow and to dynamically add or remove different services of the chain depending on subscriber requirements. For example, BIG-IP PEM can send subscribers who want to watch a specific video clip to a URL filtering/parental control service first. This service ensures the subscriber is allowed to view the specific content before sending it to a video optimization server. With dynamic service chaining, service providers can create differentiated services and provide opportunities to increase ARPU.

Bandwidth control

BIG-IP PEM provides significant flexibility in controlling bandwidth—via rate limiting, DSCP marking, and Layer 2 quality of service marking. Limits can be applied to a group of subscribers, to all subscribers, or at the application level. This flexibility enables you to establish tiered services to create and manage incremental revenue-generating plans based on subscribers’ actual data usage patterns. Bandwidth control can also be used to implement fair-usage policies to allow your subscribers to consume a fair amount of bandwidth while distributing it more proportionally across the subscriber base.

Video analytics

Video traffic is a major source of congestion in a service provider’s network—causing significant degradation in subscriber QoE if not managed carefully. With the BIG-IP PEM video analytics capability, service providers can get enhanced visibility into media traffic including reporting on video type, encoding rate, resolution, and video mean opinion score (MOS). Leveraging this information, service providers can apply specific policies based on video type per subscriber. For example, premium subscribers will be able to stream HD video, while non-premium subscribers will only be able to stream SD video for that specific application (while streaming HD video for all other applications).

Reporting Data

Granular reports provide information about subscriber and application flows. For instance, BIG-IP PEM provides data about activity at the per-session and per-application level, as well as event-driven, flow-based records. These reports are generated within the BIG-IP PEM platform at periodic intervals over high-speed logging interfaces as well as via IPFIX, which provides an efficient and powerful way to collect and stream large amounts of data. BIG-IP PEM also provides quick and easy on-box reporting capabilities at an aggregate or
application level. With this data, you can truly understand how your subscribers are using your services and take advantage of this information to define new service plans.

**Charging**

BIG-IP PEM supports the Gy interface and integrates with multiple online charging subsystems to enable you to implement real-time credit control and quota management, such as time-based quotas, quota replenishment, and quota breach, for subscriber sessions. Online credit control can be used for both prepaid and postpaid subscribers.

**URL Filtering**

Service providers have the option to integrate URL filtering services within BIG-IP PEM. Through URL filtering, service providers can implement parental control services, which block traffic to specific websites based on certain URL categories or based on specific URLs you define. Parental control services extend service providers’ offerings with new revenue-generating services that provide subscribers with a higher quality QoE.

BIG-IP PEM is placed inline between the edge router and the network gateway (GGSN/PGW) in a mobile network or a BRAS/BNG in a fixed-line network. It offloads data traffic services from the PGW/BNG and many of the traffic classification capabilities from the packet gateway/broadband network gateway, and provides intelligent Layer 7 traffic steering capabilities.

**Architecture**

The advanced architecture of the BIG-IP system gives you total flexibility to control application delivery without creating traffic bottlenecks.
TMOS
At the heart of BIG-IP PEM is the TMOS® operating system. TMOS understands the intricacies between the application, the network, and your subscribers to give you intelligent control over application delivery, as well as total visibility, flexibility, and control across all services. TMOS also enables integration between BIG-IP PEM and other F5 products so that BIG-IP PEM can intelligently adapt to the diverse and evolving requirements of applications and networks.

iRules
F5® iRules® is a TCL-based scripting language used with BIG-IP devices to give you greater flexibility in handling application traffic within the application transaction or flow. With complete payload inspection and transformation capabilities, the ability to take advantage of event-driven iRules, and session-aware switching, the BIG-IP system offers the most intelligent control point from which to address diverse application delivery issues—at network speed.

iControl
The F5® iControl® API helps automate communications between third-party applications and BIG-IP PEM, removing the need for manual intervention. iControl supports a true publish/subscribe model, which reduces network overhead and improves the performance of services that integrate with BIG-IP PEM through the iControl interface. For most network services, this can reduce network bandwidth and processing time.

System management
BIG-IP PEM provides insight into the system for debugging and troubleshooting purposes. You can view system status, as well as view and modify specific configuration items. These include subscriber-specific information and certain system information, such as Radius, Gx, and Gy. The system management features in BIG-IP PEM give you greater control and monitoring capabilities and the ability to ensure that BIG-IP PEM is performing optimally.

High-performance services fabric
The BIG-IP system consolidates multiple service functions into a single platform. Built on the modular TMOS architecture, it is a very fast, low latency, full proxy that supports firewall capabilities, advanced DDoS defense against more than 30 attack types, IP port scans and SYN floods, traffic load balancing, advanced network health monitoring, and traffic steering with preset policies based on server availability—resulting in improved service availability and reliability in the network.

Based on 3GPP standards, BIG-IP PEM as a policy enforcement platform is interoperable with many of the leading policy and charging rules function (PCRF) and online charging systems (OCS) platforms.

In addition to policy enforcement, BIG-IP PEM provides intelligent traffic steering capabilities so you can inspect and steer traffic to VAS servers and route it based on subscriber profiles. BIG-IP PEM also provides add-on modules for service providers who need a solution to transition networks from IPv4 to IPv6. One of these modules is BIG-IP CGNAT, which includes a wide range of solutions to help you migrate to IPv6—all on a single, high-performance, carrier-grade platform.
In addition, BIG-IP® Advanced Firewall Manager™ (AFM) coupled with BIG-IP PEM provides a high-performance network firewall designed to guard networks against incoming threats that enter the network on the most widely deployed protocols. BIG-IP AFM also provides network-layer and session-layer distributed denial-of-service (DDoS) mitigation to prevent sophisticated network target attacks.

**Network Performance**

**TCP Express**

TCP Express™, the highly optimized TCP/IP stack in BIG-IP PEM, provides leading edge TCP/IP techniques (which minimize the effects of congestion and packet loss for 3G/4G networks). TCP Express delivers up to 2x performance gains for subscribers and a 4x improvement in bandwidth efficiency.

**HTTP header enrichment**

HTTP header enrichment enables you to append the HTTP header with information such as MSISDN, IMSI, and IP address, which can be used to provide further subscriber awareness to the application or service. With this capability, BIG-IP PEM (located between the subscriber’s mobile device and the network) enables you to provide a more personalized and interactive experience—all while increasing ARPU.

**BIG-IP PEM Platforms**

BIG-IP PEM offers best-in-class performance and scalability for total concurrent sessions, traffic throughput, and transactions per-second on its systems. NEBS-compliant, BIG-IP PEM scales up to 320 Gbps of throughput at Layer 7 with more than 24 million concurrent subscribers. This high-availability platform also includes sophisticated health monitoring, fast system failovers, and comprehensive connection mirroring to ensure service uptime and at-peak performance.

Hardware includes BIG-IP appliances or the F5 VIPRION® modular chassis and blade system designed specifically for service delivery, security, and high performance. VIPRION uses ScaleN technologies to provide on-demand linear scalability by enabling you to add blades without reconfiguration. BIG-IP® virtual edition (VE) software runs on commodity servers and provides agility and fast deployment of services in virtual environments.

BIG-IP PEM provides a high degree of redundancy and resiliency with support for inter-chassis and intra-chassis redundancy. Both intra-chassis redundancy (which provides redundancy within a single system) and inter-chassis redundancy (which provides redundancy across multiple systems in the same location or different locations) enable you to adhere to service level agreements (SLAs) and avoid unplanned network outages, providing a greater QoE to your subscribers.

BIG-IP PEM is available on the VIPRION C2400, C4800, and C4480 chassis with the B4300 and B4340-96G blades. BIG-IP PEM is also available as a standalone appliance with BIG-IP 5000, 7000, and 10000 series appliances, as well as BIG-IP virtual editions, which offer the flexibility of a virtual BIG-IP system.
Performance Specifications

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<tbody>
<tr>
<td>Throughput L7</td>
<td>320 Gbps</td>
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<td>Concurrent connections</td>
<td>96 million</td>
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<td>New connections per second</td>
<td>1.4 million CPS</td>
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<tr>
<td>Concurrent subscribers</td>
<td>24 million</td>
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<tr>
<td>New subscribers per second</td>
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F5 Global Services

F5 Global Services offers world-class support, training, and consulting to help you get the most from your F5 investment. Whether it’s providing fast answers to questions, training internal teams, or handling entire implementations from design to deployment, F5 Global Services can help ensure your applications are always secure, fast, and reliable. For more information about F5 Global Services, contact consulting@f5.com or visit f5.com/services.
More Information

To learn more about BIG-IP PEM, visit f5.com to find these and other resources.

Product overview
BIG-IP Local Traffic Manager—Service Provider

White paper
Intelligent Traffic Management with the F5 BIG-IP Platform

Solution profile
Intelligent Traffic Management