Organizations depend on applications to support business operations and drive revenue. At the same time, users are demanding more from those applications, including faster load times and access across a wide variety of devices. Poor performing applications can result in reduced employee productivity, abandoned shopping carts, and missed recovery point objective and recovery time objective (RPO/RTO) targets.

F5® BIG-IP® Application Acceleration Manager™ (AAM) overcomes network, protocol, and application issues to help you meet application performance, data replication, and disaster recovery requirements presented by cloud, mobile applications, and video distribution. By offloading your network and servers, BIG-IP AAM decreases the need for additional bandwidth and hardware. Users get fast access to applications, and you gain greater revenue and free up IT resources for other strategic projects.

Key benefits

**Improve the user experience**
Improve end user experience through multiple optimization technologies applied at all layers of the application delivery chain.

**Optimize data center efficiency**
Consolidate devices and services to deliver optimized apps. Reduce the application load from servers and the network by offloading CPU-intensive processing tasks.

**Streamline Application Delivery Optimization**
Quickly support and optimize legacy and emerging protocols/standards (SPDY, HTTP 2.0, FTP, UDP, HLS). Optimize delivery of any application content to any device without recoding apps.

**Track the benefits of optimization**
Review a detailed breakdown of the improvements realized from the various optimizations you implement. You can schedule multiple reports to be generated on a regular basis.
Integrated Application Delivery Optimization

BIG-IP Application Acceleration Manager is built natively on the F5 TMOS® unified architecture, enabling the integration of application delivery with web performance and WAN optimization technologies. This enables traditional acceleration technologies like SSL offloading, compression, caching, and traffic prioritizing to combine with technologies like image optimization, video delivery optimization, and byte-level data deduplication, thereby reducing complexity in your data center.

BIG-IP AAM makes use of the F5 iControl® API and F5 iRules® scripting language capabilities, giving you unprecedented flexibility and control in scaling, managing, and optimizing your BIG-IP system.

BIG-IP AAM can optimize a wide variety of protocols delivered to a client browser, a desktop application, or another BIG-IP device, depending on the deployment. Optimizations are divided into data center optimizations, including server and network optimizations, transport optimizations, and application delivery optimizations, including application protocol and web performance optimizations.

Data Center Optimizations

BIG-IP Application Acceleration Manager optimizes the data center to help with the ever-changing demands on IT infrastructure, such as large amounts of data, including videos, and the use of mobile devices. Data center optimization can help to reduce application load from servers by offloading CPU-intensive tasks like encryption, caching, and compression, and it can reduce bandwidth by sending less data over the network. The end result is a more efficient infrastructure.

BIG-IP Application Acceleration Manager optimizes the data center.
BIG-IP AAM can improve the performance of WAN application traffic by optimizing application protocols, prioritizing traffic, optimizing TCP from clients to servers, and reducing the amount of data sent over the WAN, helping to prevent costly bandwidth upgrades. Quality of service (QoS) technologies ensure that critical or time-sensitive applications receive priority over others to maximize performance over the WAN. They provide granular control of traffic based on enterprise needs, enabling you to manage and prioritize bandwidth per application and improve QoS for critical applications over the WAN.

**Symmetric data deduplication**

With symmetric data deduplication, BIG-IP AAM delivers a highly advanced level of WAN optimization. This provides significantly more bandwidth for applications and effectively expands WAN capacity to improve response times and increase throughput. Redundant data is no longer transferred across the network through the use of pattern matching and byte caching technologies. Symmetric data deduplication ensures high-speed application performance and reduces the amount of data transferred over the WAN by up to 99 percent.

**Solid state drives deduplication**

Data duplication can be done in memory or hard drive disks. Typically, memory-based deduplication is recommended due to the slow I/O performance of standard hard drives. However, for large volumes of data, deduplication using solid state drives (SSDs) can have up to a three time improvement in replication time over memory-based deduplication.

**SSL acceleration**

BIG-IP AAM offloads compute-intensive SSL encryption and decryption, reducing server processor utilization by up to 50 percent. It consolidates private key creation and storage, SSL certificate management, and FIPS SSL support. BIG-IP AAM standalone devices run on the F5 TMOS operating system and include the maximum available TPS for that specific hardware platform.

**Parking Lot**

The Parking Lot feature in BIG-IP AAM queues multiple requests for the same new or expired cached object, and then sends only one request to origin web server. When the object is retrieved, BIG-IP AAM responds to all the requests. This reduces the load on the servers when a flood of requests come in at once.

**Transport Optimizations**

BIG-IP Application Acceleration Manager improves the capacity of application servers and the efficiency of network protocols by offloading intensive processing tasks such as SSL encryption, optimizing application, and network protocols. Optimization features include the following.

**Symmetric adaptive compression**

Symmetric adaptive compression ensures the fastest data reduction for any traffic between BIG-IP systems. Symmetric adaptive compression automatically selects and uses the appropriate deflate, bzip2, or LZO compression algorithms (or no compression if the data cannot be compressed) to maximize bandwidth usage and throughput. In addition,
symmetric adaptive compression can use BIG-IP hardware compression where available to provide unprecedented scalability.

**Forward error correction (FEC)**

Forward error correction (FEC) is a method for controlling errors in transmitted data over high packet loss communication channels. Data is sent in a redundant manner, enabling the receiving end to correct any potential errors or corrupted data without requiring a retransmission. FEC can be enabled between two BIG-IP devices or from a BIG-IP device to an edge client, significantly improving application performance on high packet loss networks.

**HTTP protocol optimizations**

BIG-IP AAM maintains high user performance levels by optimally tuning each HTTP and TCP session for each user’s connection conditions. Optimizations for Microsoft NTLM authentication protocol enhance access to protected resources.

**Bandwidth Controller**

Bandwidth Controller enables you to manage the amount of bandwidth a device, subscriber, or application receives. Traffic can either be enforced or marked, identifying and flagging packets that are exceeding bandwidth.

**TCP optimization**

When application performance suffers, IT managers often assume that adding bandwidth will solve the problem. But TCP throughput degrades significantly on the WAN and mobile networks, particularly on high-latency, intercontinental links, so adding bandwidth is often ineffective.

To overcome inherent protocol limitations, BIG-IP AAM uses adaptive TCP optimization, which combines session-level application awareness, rate pacing, congestion control algorithms, error correction, and optimized TCP windows. This enables BIG-IP AAM to adapt, in real time, to the latency, packet loss, and congestion characteristics of WAN links and mobile networks, fully utilizing available bandwidth and accelerating application traffic (for up to 20 Gbps LAN-side, TCP optimized throughput).

**Multipath TCP (MPTCP)**

Multipath TCP (RFC 6824) provides the ability for a device to use multiple paths during a regular TCP session. This is ideal in mobile devices where a system can communicate over WiFi or the mobile network. MPTCP allows multiple client-side flows to connect to a single server-side flow, resulting in fewer connections being dropped as a device switches from WiFi to 3G/4G. When one path fails, MPTCP can continue to work over an alternative path.

**Application Delivery Optimization**

Application Delivery Optimization is a holistic way of looking at all the pieces in the delivery chain that need to be optimized from the transport mechanism to the application protocol. BIG-IP Application Acceleration Manager solves application delivery issues by optimizing the TCP stack and the application protocol and ensuring the best use of bandwidth.

Application performance on the WAN is affected by a large number of factors that can’t be solved by adding bandwidth alone. Performance is limited by factors such as the
natural behavior of application protocols that were not designed for WAN conditions, application protocols that engage in excessive handshaking, and the serialization of the applications themselves.

**HLS delivery optimization**

HTTP Live Streaming (HLS) is the protocol used by a number of devices to view both live and on-demand video. HLS breaks the video down into segments that can be cached for multiple users. HLS can be optimized by caching the individual segments or by controlling the bitrate that is made available to end users.

**HTTP 2.0 and SPDY gateways**

The IETF adopted SPDY as the starting point of HTTP 2.0 to improve the inefficiencies related to connection management and data transfer. Multiple streams are supported within a single TCP connection, HTTP headers are compressed, and requests are prioritized.

F5 provides both an experimental HTTP 2.0 gateway based on the IETF’s draft of the specification, as well as a SPDY gateway. The gateway converts client requests via HTTP 2.0 or SPDY to HTTP on the back end, allowing you to take advantage of the optimizations without disruptive and costly upgrades to application infrastructure.

**Web performance optimization**

BIG-IP AAM solves web content delivery issues by modifying the data and reducing the number of round trips required to fully display a web page. The result is significantly decreased download times, reduced bandwidth usage, and lower costs for using enterprise web applications in remote office and mobile deployments.

Mobile users face additional challenges due to the proliferation of different types of mobile devices, from smartphones to tablets, which have different operating systems and browsers. The additional latencies due to the extra hop from cell towers and WiFi hotspots make matters worse. Users end up with a range of page download times, all of which are typically worse than what users get at the office or home.

To resolve these performance issues, BIG-IP AAM uses a number of techniques to improve the end user experience. These optimizations do not require any server side installations, client side software, or changes to users’ browsers.

**Before F5**

![Before F5 Diagram]

**With F5**

![With F5 Diagram]

Application Delivery Optimization reduces the number of round trips required to deliver a web application.
Dynamic Content Control (DCC) is a group of capabilities in BIG-IP AAM that control users’ browser behavior to improve end user experience, ensure the best use of bandwidth, and prevent repetitive or duplicate data from being downloaded. By reducing the amount of conditional requests and data transmitted between the browser and the web application, DCC reduces the effects of WAN latency and errors.

DCC includes these main features:

- **DNS prefetch**—This HTML5 feature enables the browser to fire off external DNS requests while page content is being downloaded, eliminating the blocking behavior that would otherwise occur.

- **Intelligent Client Cache**—Uses the local storage functionality of HTML5 to provide a dedicated cache for an application, giving more control over browser cache evictions and reducing HTTP chattiness. The dedicated cache also addresses the challenges of limited shared cache sizes on mobile devices.

- **Intelligent Browser Referencing™**—Reduces the number of requests and speeds page rendering times by managing object expiration dates and storing frequently requested objects in the browser cache. Ensures that the browser only downloads truly dynamic and unique content by eliminating the download of repetitive data and browser conditional requests for static data that is incorrectly considered dynamic.

- **Concatenation**—Combines multiple external files of the same content type into a single file to reduce round trips and speed up page load times.

- **Content reordering**—Optimizes the order of when JavaScripts and Cascading Style Sheets (CSS) are loaded to speed up the appearance of page rendering.

- **Content inlining**—Reduces the number of requests by inlining JavaScripts, CSS, and images directly into HTML, eliminating the need to perform additional GET requests. This optimization is beneficial for content that will be viewed only once or for mobile devices that have limited cache sizes.

Dynamic Data Reduction (DDR) reduces bandwidth utilization and improves page load times by reducing the amount of data that needs to traverse the WAN or Internet. F5 BIG-IP AAM offers the following DDR functions:

- **Image optimization**—Reduces size of images by lowering the quality, stripping out unnecessary metadata, and converting the image format (including the new WebP and JPEG-XR formats). For mobile devices, this optimization can be more beneficial given the smaller screen sizes and slower mobile connections.

- **Minification**—Removes white space and comments from JavaScripts and CSS, reducing the size of the files. Useful for situations where compression cannot be performed.

- **Dynamic caching**—Caches data that may seem dynamic (contains query parameters, cookies, or session IDs) but is actually static data or changes in an identifiable pattern. By fully inspecting every aspect of HTTP requests, controlling caching behavior, and invalidating cached data, BIG-IP AAM caches a high percentage of data from dynamic web applications while maintaining proper application behavior.

- **Dynamic compression**—Compresses dynamic data from web applications and ensures that compression is used only when it will improve performance. Dynamic compression is different from standard compression implementations because of its high efficiency and its ability to avoid widespread browser compression bugs. Even dynamic content requiring unique session IDs within every link on the page can be delivered and compressed, often with zero compression overhead.
Detailed reporting is available for each optimization applied, providing insight into the benefit of individual features. You can view reports in real time, or generate them on a weekly or monthly basis. Statistics collected vary based on what is relevant for a given feature, for example, bytes saved, requests served from cache, or number of links that were optimized.

**F5 Application Ready Solutions**

F5 works with some of the world’s largest software vendors to bring you F5 Application Ready Solutions, a complete set of resources that simplifies the design, deployment, and management of your applications across the network. F5 Application Ready Solutions are designed, engineered, tested, and documented with BIG-IP Application Acceleration Manager—along with F5’s integrated product line—in a variety of real-world environments.

F5 Application Ready Solutions reduce the time, money, and errors associated with deploying and managing mission-critical enterprise applications. Only F5 offers this comprehensive set of essential, application-specific tools.

**Application acceleration policies**

Pre-defined, validated web acceleration policies enable you to quickly configure and deploy BIG-IP AAM to optimize your application acceleration right from the start. These policies can be used as built-in templates to enable you to customize BIG-IP AAM for your specific web applications.

Validated web application acceleration policies that ship with BIG-IP AAM include Microsoft SharePoint, Oracle Portal, SAP Portal, Microsoft Office Outlook Web Access, Oracle E-business Suite 11 and 12, Oracle Siebel CRM, and many more. Generic policies are also available for custom and less common applications that do not have a pre-defined policy. BIG-IP AAM configurations and policies can also be managed and updated using F5 iApps® templates.

**Application Ready Solution guides**

Each specific Application Ready Solution guide provides a comprehensive overview, details how to ease your application deployment, and shows you the specific results you can achieve with your BIG-IP AAM implementation.

**Deployment guides**

Detailed, step-by-step procedures walk you through deployment from day one. Every procedure has been thoroughly tested and optimized in real-world environments to achieve top performance. Each deployment guide contains a comprehensive set of configuration scenarios to cover your specific needs.

**Active user community**

An active, collaborative community on F5 DevCentral™ offers feedback, documents, and tips for a successful deployment. Dedicated Application Ready Solution pages provide application-specific content, including downloads, help and forum discussions, links to related podcasts, and more.
Flexible Deployment Options

BIG-IP AAM can be deployed in multiple modes to suit your existing infrastructure and network topology, and to simplify deployment.

Core and advanced acceleration options

BIG-IP AAM Core offers acceleration as a core component of BIG-IP® Local Traffic Manager™ (LTM). Compression, Bandwidth Controller, F5 iSession® network tunneling, and HTTP 2.0 and SPDY gateway capabilities are available as part of every BIG-IP LTM platform. The full BIG-IP Application Acceleration Manager product provides advanced application protocol optimizations.

Cost-effective asymmetric deployment

BIG-IP AAM can be deployed asymmetrically in the data center to achieve performance improvements of two to five times. In addition, deploying in a remote site for caching offload can speed up local requests for specific recurring high-volume data and applications. Unique to BIG-IP AAM, asymmetric web acceleration offers immediate, significant return on investment (ROI) for a moderate investment.

Asymmetric topologies can be either inline or one-armed. When deploying in an inline topology, BIG-IP AAM is installed in the data path behind the WAN router, in either a routed or bridged configuration.

With one-arm mode using policy-based routing (PBR), BIG-IP AAM can be deployed to optimize traffic based on specific policies on the router, making this deployment method extremely flexible for application needs. One-arm mode using the Cisco-developed Web Cache Control Protocol v2 (WCCP) and other methods can be used to deploy BIG-IP devices with a single connection to a switch or router. With WCCP support there is no need to change network topology.

Symmetric deployment for maximum acceleration

Symmetric deployments can provide acceleration of up to 10 times over unaccelerated applications. In a symmetric implementation, BIG-IP AAM is deployed at the data center and at one or more key remote locations or data centers. By serving unchanged content directly from the remote device, symmetric acceleration further eliminates the effects of high latency connections. The result is maximum performance acceleration and additional decreases in bandwidth usage. The role of the device whether it is fronting an application or remote from an application can be configured on a per application basis not on a per device basis.

As the foundation for site-to-site communication, the F5 iSession network tunneling feature secures and accelerates data traveling over the WAN. Any two BIG-IP devices can be deployed symmetrically to create a site-to-site secure connection to improve transfer rates, reduce bandwidth, and offload encryption for more efficient WAN communication. Through iSession, all data can be symmetrically encrypted between two BIG-IP devices using either SSL or IPsec, providing site-to-site data security. SSL throughput is based on the level of your BIG-IP hardware platform.

Clustering to scale

BIG-IP AAM devices can be clustered to create very large arrays to scale capacity as your web application acceleration needs grow.
Creating a private content delivery network (CDN)

Many organizations may choose not to use commercial content delivery network (CDN) providers because their content is internal, dynamic, and confidential or they do not want to pay the recurring costs. Deployed symmetrically in conjunction with other F5 solutions, BIG-IP AAM enables your organization to create its own private enterprise CDN. This provides your enterprise websites with high availability and performance, content control, and denial-of-service (DoS) attack protection. It can also help you reduce OpEx costs and meet regulatory compliance.

E-commerce stand-in capability

When e-commerce web servers go down, BIG-IP AAM can ensure high availability by “standing in” and continuing to serve static content that is already cached. BIG-IP AAM can help prevent lost or abandoned shopping carts and hand off to financial transaction servers for processing.

Product module or standalone solution

BIG-IP AAM is available as a product module on BIG-IP Local Traffic Manager or as a standalone solution on any of the hardware appliance platforms.

Acceleration and security in one

You can accelerate and secure web applications by running BIG-IP AAM, BIG-IP® Access Policy Manager® (APM), and BIG-IP® Application Security Manager™ (ASM) concurrently on the same BIG-IP device. This saves the cost of extra hardware, rack space, and energy consumption, while simplifying deployment through consolidated and centralized access to the management interface.

Dynamic discovery

BIG-IP AAM drastically reduces configuration time by discovering remote BIG-IP device peers and the networks that they serve. Once a remote BIG-IP device has been discovered and a secure connection is established, the BIG-IP device then updates available networks for WAN optimization. Servers and clients that communicate across the WAN can be added or removed, without having to reconfigure the BIG-IP devices.

The Power of the BIG-IP System

BIG-IP Application Acceleration Manager, as part of the BIG-IP family, includes the following features.

Performance dashboard

The performance dashboard offers a detailed “on-box” monitoring and reporting tool, giving administrators a quick look at real-time data, performance, and bandwidth gains for traffic optimized with BIG-IP AAM. The easy-to-use GUI provides a faster, intuitive way to find the information you need: historical statistics, log based alerts, remote peer status, health statistics, and more.
The performance dashboard provides real-time data for traffic optimized with BIG-IP Application Acceleration Manager.

**F5 TMOS plug-ins**

Native integration with TMOS plug-ins gives BIG-IP AAM faster performance and better stability under high load. This full compatibility with F5 Clustered Multiprocessing (CMP®) enables it to run on multi-core systems.

**iRules flexibility**

F5 iRules, a TCL-based scripting language that controls the behavior of BIG-IP devices, can be used with BIG-IP AAM. For example, you can use an iRule to eliminate round trips due to URL redirection. The iRule would detect URL redirects and serve the “final” URL content, reducing the additional round trips from browser to web server.

**NTLM authentication support**

The NTLM authentication protocol requires frequent re-authentication with the application server and can significantly affect web application performance. Native NTLM authentication optimization is now part of the F5 OneConnect™ feature, which enables greater performance scalability when accelerating NTLM-enabled web applications.

**Resource provisioning**

BIG-IP AAM resource provisioning automatically allocates CPU, memory, and disk space for the modules licensed on the BIG-IP system, based on the provisioning options chosen. This makes optimal system resource allocation easier, and an enhanced UI provides graphical representation of the allocations. Often BIG-IP modules can be enabled without requiring a system reboot.

**Evaluation licensing**

For existing BIG-IP customers, this feature enables customers to evaluate BIG-IP AAM and other BIG-IP product modules without needing to re-license the BIG-IP device.
Logical Volume Manager (LVM)

Unlike normal disk storage, Logical Volume Manager (LVM) virtualizes physical disks into logical volumes that allow disk partitions to be resized as needed without having to reinstall TMOS or requiring system downtime in order to migrate data to a larger disk partition. The result is increased flexibility and improved performance for BIG-IP AAM disk-based caching.

The BIG-IP Application Acceleration Manager Architecture

Running as a module on BIG-IP Local Traffic Manager or as a standalone appliance, BIG-IP Application Acceleration Manager uses F5’s unique, purpose-built TMOS operating system. TMOS is an intelligent, modular, and high-performing full proxy operating system that optimizes, secures, and accelerates your web applications.

<table>
<thead>
<tr>
<th>BIG-IP Application Acceleration Manager</th>
<th>Features include:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core features include:</td>
<td>Symmetric adaptive compression</td>
</tr>
<tr>
<td></td>
<td>HTTP 2.0 and SPDY gateways</td>
</tr>
<tr>
<td></td>
<td>Bandwidth Controller</td>
</tr>
<tr>
<td></td>
<td>Dynamic compression</td>
</tr>
<tr>
<td></td>
<td>Caching</td>
</tr>
<tr>
<td></td>
<td>Compression</td>
</tr>
<tr>
<td></td>
<td>TCP Express</td>
</tr>
<tr>
<td></td>
<td>OneConnect</td>
</tr>
<tr>
<td></td>
<td>Multipath TCP (MPTCP)</td>
</tr>
<tr>
<td></td>
<td>TCP rate pacing</td>
</tr>
<tr>
<td>Image optimization</td>
<td>Content reordering</td>
</tr>
<tr>
<td>Dynamic caching/deduplication</td>
<td>Multi-protocol optimizations (HTTP, FTP, MAPI, UDP)</td>
</tr>
<tr>
<td>Forward error correction</td>
<td>Parking Lot (GET request queuing)</td>
</tr>
<tr>
<td>MultiConnect</td>
<td>MultiConnect</td>
</tr>
<tr>
<td>PDF Dynamic Linearization</td>
<td>Performance dashboard</td>
</tr>
<tr>
<td>Pre-defined and generic acceleration policies for ease of configuration</td>
<td>Flexible deployment (symmetric and asymmetric)</td>
</tr>
<tr>
<td>Scalable clustering</td>
<td>E-commerce stand-in capability</td>
</tr>
<tr>
<td>BIG-IP APM, ASM, and AAM layering</td>
<td>iApps support</td>
</tr>
</tbody>
</table>

BIG-IP Application Acceleration Manager Platforms

BIG-IP Application Acceleration Manager is available on hardware appliances or the F5 VIPRION® modular chassis and blade system designed specifically for application delivery. F5 enables simple on-demand scalability as your Application Delivery Network grows. See the BIG-IP System Hardware and VIPRION datasheets for specifications and details.

Virtual Platform

BIG-IP Application Acceleration Manager Virtual Edition (VE) offers the flexibility of a virtual software solution for web performance optimization. Running on your choice of hypervisor and hardware, BIG-IP AAM VE can help you meet the needs of your virtualized environment in the data center or at remote sites.
**Simplified Licensing**

Meeting your applications’ needs in a dynamic environment has never been easier. F5’s **Good-Better-Best** licensing options provide you with the flexibility to provision advanced modules on demand, at the best value.

- Decide what solutions are right for your application’s environment with F5’s reference architectures.
- Provision the modules needed to run your applications with Good-Better-Best.
- Implement complete application flexibility with the ability to deploy your modules on a virtual or physical platform.

**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 Application Acceleration Manager, use the search function on f5.com to find these and other resources.

**White papers**

- Application Delivery Optimization
- A Simplified Application Acceleration Architecture

**Blogs**

- Programmable Cache-Control: One Size Does Not Fit All
- Random Acts of Optimization
- Faster Applications Are Better
- Caching FAQs