



F5 White Paper

Controlling Migration to IPv6: A Gateway to Tomorrow

While organizations worldwide are beginning to acknowledge their need to adopt IPv6, most are still struggling to define a workable strategy around it. F5 solutions provide the flexibility organizations need to devise gradual migration plans that minimize disruption and downtime.

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Introduction

Organizations of all types are feeling increasing pressure to migrate from the well-known and universal Internet Protocol version 4 (IPv4) standard to the newer IPv6 standard. There are many reasons for this, not the least of which are the limited number of addresses available in the IPv4 system and the increasing number of devices that require access to the “new” Internet: coffee pots, TVs, alarm clocks, cars, and the majority of smartphones sold after 2010. Although the IPv6 standard includes many important new features, such as increased security and reliability, the world at large runs on IPv4. With the exception of Internet2, which is not open to commercial access, the Internet most people use and are familiar with is currently available only as IPv4. To achieve IPv6 compliance, many governmental organizations have received mandates to migrate their systems and help drive the worldwide adoption of IPv6.

The Migration Challenge

The problem is that the entire world will not switch to IPv6 at the same time, nor will many organizations be able to simply flip a switch and decide that all applications and all equipment will suddenly be IPv6 instead of IPv4. What organizations need is a smart migration plan and tools to help provide an orderly transition between the two standards. These tools should be able to seamlessly operate in both the IPv4 and IPv6 networks and give the organization the freedom to test, move, and migrate its existing infrastructure at a controlled and manageable pace. These tools are F5® BIG-IP® Local Traffic Manager™ (LTM) and BIG-IP Global Traffic Manager™ (GTM).

A Gateway for Transition

BIG-IP LTM is best known for its load balancing, high availability, and SSL processing capabilities. Lesser known are its compression, caching, and rate-shaping capabilities, as well as its ability to function as an IPv4 to IPv6 gateway—operating identically in either environment and within mixed environments. This last capability is ideal for organizations that are either actively planning for or anticipating an IPv4 to IPv6 transition.

In a typical BIG-IP deployment, the BIG-IP device is situated between the clients and the servers to provide the applications the clients use. In this position, the BIG-IP device



can provide virtualization and high availability functions, making several physical servers (with private IP addresses) look like a single entity behind the BIG-IP device (with a virtual IP address). This virtualization capability provides an opportunity to start migrating either clients or servers to IPv6 networks without having to change everything all at once.

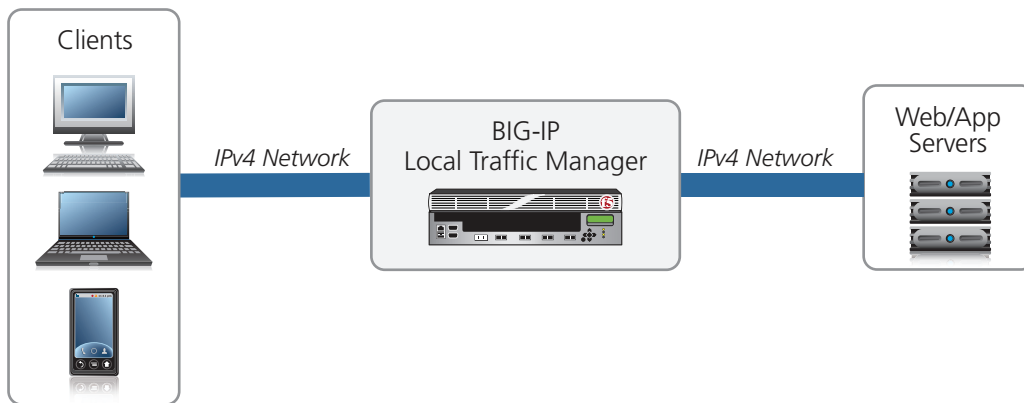


Figure 1: IPv4 clients connect to a standard IPv4 network

Migration Strategies: Scenarios

There are two possible scenarios for a smooth, controlled migration strategy. An organization can either migrate clients to IPv6 while keeping the servers on IPv4, or it can migrate the servers to IPv6 while leaving the clients in an IPv4 environment.

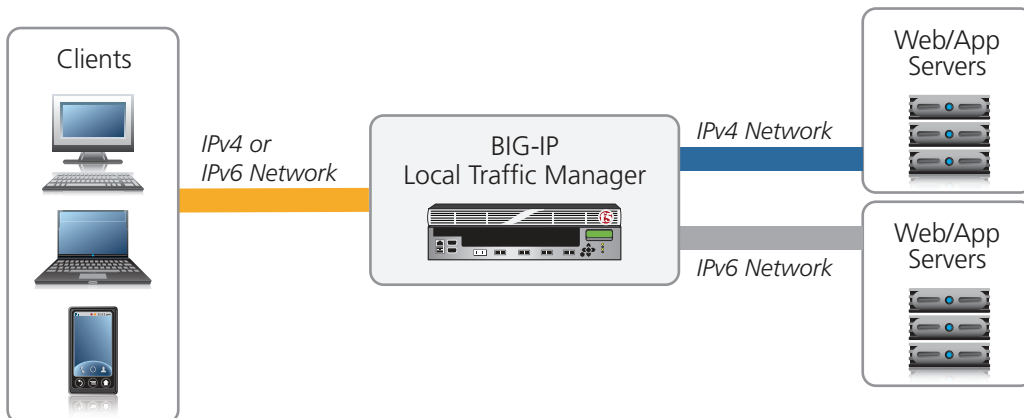


Figure 2: When both IPv4 and IPv6 networks exist, both client types can connect to any server



In the first scenario, moving the clients to IPv6 requires that all the clients be able to attach to the network via IPv6-enabled pathways. This scenario also involves touching potentially every client device and incorporating new Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) services.

In the second scenario, it is likely that moving the servers to IPv6 will reveal some application dependencies that potentially affect all users simultaneously if something goes wrong. Even so, most organizations will find it much easier to begin migrating their applications before their clients, simply because the servers are completely under their control whereas client devices often are not. In addition, clients will continue, for some time, to exhibit a need to use IPv4 communication for public resources.

Moving Servers First

BIG-IP LTM and BIG-IP GTM provide flexibility regardless of how an organization proceeds, but assume it chooses to migrate servers first. Assuming the organization already has a BIG-IP appliance between its servers and clients, administrators can simply add a new “server” network to the BIG-IP device—one that is an IPv6-capable network. The result is that the network will have IPv4 on the front (client) side of the BIG-IP device and both an IPv4 and IPv6 network behind it.

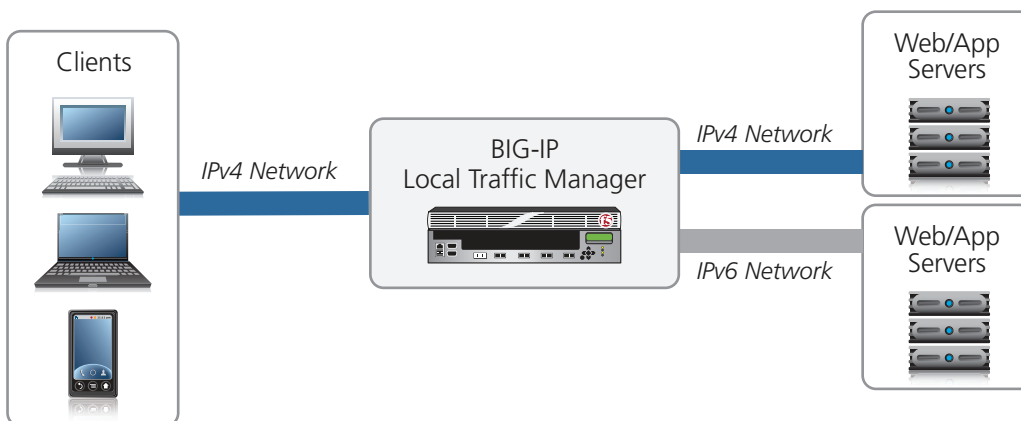


Figure 3: BIG-IP LTM enables organizations to gradually migrate servers to IPv6

Once the IPv6 network is established, the organization can start moving its servers there from the IPv4 network. For example, if it has several back-end servers providing



service for an application, it can simply take one IPv4 server offline and switch it to IPv6. BIG-IP LTM will handle load balancing requests among the remaining servers and continue to provide an IPv4 virtual address to the clients. The clients themselves won't realize any difference because they are still contacting and using the IPv4 virtual server being serviced by BIG-IP LTM to access their applications.

Once the offline server is switched to IPv6, administrators can bring it back online and add it back to the original load balancing pool with its IPv6 address instead of the old IPv4 address. BIG-IP LTM will include the server in future load balancing operations, but clients will still use the old IPv4 virtual address to connect to it. Client requests will now be load balanced across all the IPv4 and IPv6 servers.

Administrators can continue this process, bringing down the remaining IPv4 servers one at a time and moving them to a new IPv6 network. The clients will continue to use the remaining IPv4 servers and the newly migrated IPv6 servers. With this strategy, the organization can complete the entire server migration with no effect on clients and no downtime.

Migrating IPv6-Capable Clients

Organizations can use a similar strategy to move their clients to IPv6 without changing the servers. In this case, along with their IPv4 virtual address that points to their IPv4 servers, the organization creates a client-facing IPv6 interface with a new IPv6 virtual address that points to those same IPv4 servers. Then, as it moves clients to the new IPv6 client network, BIG-IP GTM, which provides IPv6 DNS resolution services, will "hand out" the new IPv6 address of the virtual server, using the

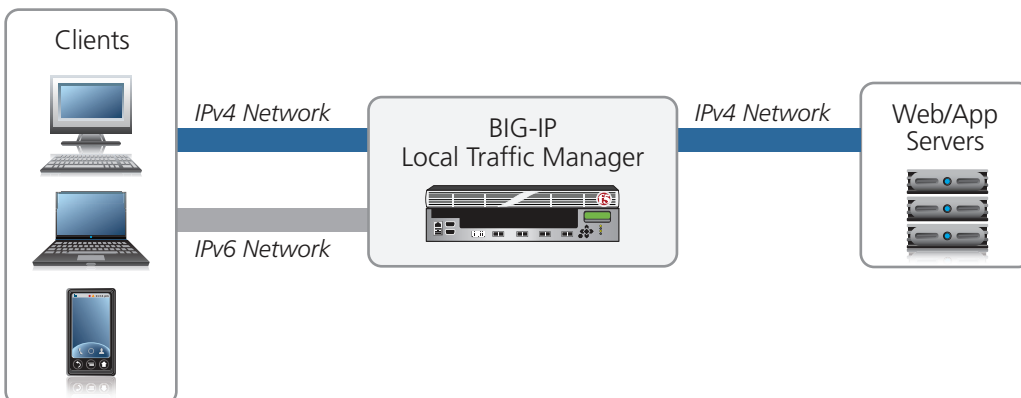


Figure 4: BIG-IP LTM enables IPv6 clients to connect to the IPv4 network

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same DNS name that previously pointed to the IPv4 address. By using the same host name and back-end servers, in most cases the clients will be able to start using their old applications as if nothing has changed. If an organization is using BIG-IP LTM without BIG-IP GTM or another DNS service that handles both IPv4 and IPv6, its IPv6 clients won't be fully migrated, but they will still have access to the IPv4 servers via BIG-IP LTM.

Conclusion

Of course, these scenarios are simplified; but BIG-IP LTM provides the flexibility to migrate services and clients at an organization's own pace. If some applications can't be moved or don't support IPv6, they can be left on IPv4 until they are replaced (assuming the organization will be required to use all IPv6) or retired. In the same manner, clients that still need to maintain their IPv4 identity can either be dual-stacked (IPv4 and IPv6) or can simply access the organization's IPv6 network via the BIG-IP LTM IPv4 interface. The virtualization capabilities of BIG-IP LTM make this possible.

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