



UNLOCK 5G

THE PROMISE OF

5G

THREE IMPERATIVES TO GUIDE YOUR JOURNEY

5G IS HERE TODAY

After years of talking about 5G, telecom's most influential players are starting to roll out 5G services. According to Fierce Wireless, analyst firm CCS Insights now expects that 5G connections will approach 280 million by 2021—a 25% rise from their October 2017 forecast.¹

KEY MARKET TRENDS THAT ARE DRIVING 5G TECHNOLOGY ADOPTION:

- Demand for gigabyte-per-second mobile device performance that will dramatically change how people work and interact in the cloud.
- Self-driving cars and mission-critical virtual healthcare services that require ultra-reliable, high-bandwidth, and low-latency communications.
- IoT and machine communications for smart factories, smart homes, and smart communities that will exponentially increase the number of internet connections.
- Emergent technologies such as artificial intelligence, virtual reality (VR), augmented reality (AR), and drones that change the way humans interact with machines and with each other.
- Continued massive growth in video traffic requiring increased network efficiency, faster scalability, and improved network management.

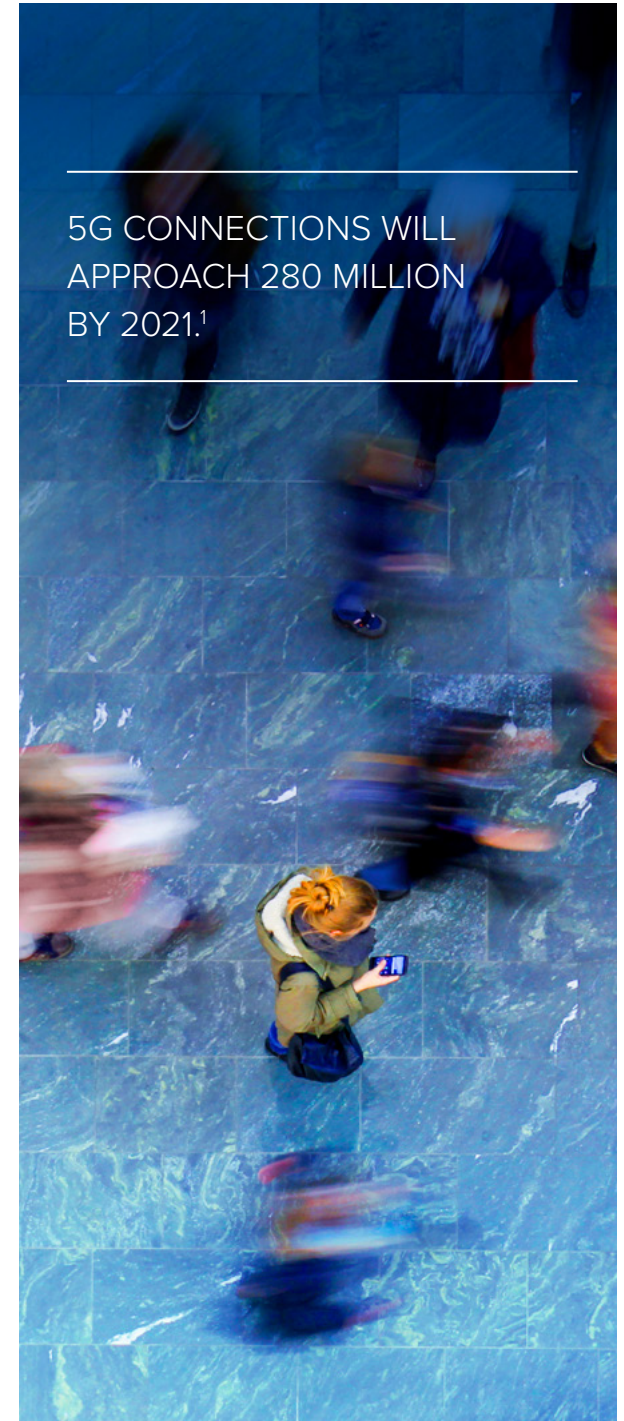
ENSURING A SUCCESSFUL MOVE TO 5G

It will be critical to follow three key imperatives to succeed in your complex and expensive transition to 5G:

- 01 Optimize Your Network** – Simplify and scale your existing 4G LTE network while transitioning to 5G, leveraging automation, protocol fluency, and high-performance virtualized software solutions.
- 02 Monetize New Solutions** – Accelerate the time-to-market of new, compelling, and differentiated 5G services to your enterprise customers and consumer base.
- 03 Secure Your Platform** – Protect your 5G network at massive scale at every layer and for multiple threats.

This eBook examines ways service providers can address these three imperatives, and successfully transition to 5G.

5G CONNECTIONS WILL
APPROACH 280 MILLION
BY 2021.¹





THE PROMISE OF 5G | BENEFITS AND OPPORTUNITIES

Enhanced Performance

5G is expected to deliver significantly enhanced performance compared to 4G LTE. This includes infinite connectivity, higher bandwidth, lower latency, increased reliability, and faster mobility.



Infinite connectivity



High bandwidth



Low latency



Ultra reliability



Fast mobility

New Service Opportunities

Service providers will be able to quickly monetize new 5G services in areas such as consumer-based media and entertainment, self-driving cars, smart cities, healthcare, and automated factories.



Media & entertainment



Autonomous transportation



Smart cities



Health



Industry 4.0

Leverage Available Technologies

Many of the technologies that support 5G capabilities are already well defined and in use by IT organizations around the globe. These include multi-edge computing, network slicing, virtualization, automation and orchestration, and protocol translation.



Multi-access Edge Computing (MEC)



Network slicing



Virtualization



Automation & orchestration



Protocol translation

01

IMPERATIVE #1: OPTIMIZE YOUR NETWORK

LAUNCH 5G WHILE STILL RUNNING YOUR CURRENT 4G LTE NETWORK

Deploying your 5G infrastructure will be the most challenging “next-gen” network rollout ever. Service providers will need to meet extreme end-to-end bandwidth and concurrent connection requirements, and deliver highly responsive, low-latency connections to a multitude of devices and device types.

DEPLOYING YOUR 5G INFRASTRUCTURE WILL BE THE MOST CHALLENGING “NEXT-GEN” NETWORK ROLLOUT EVER.

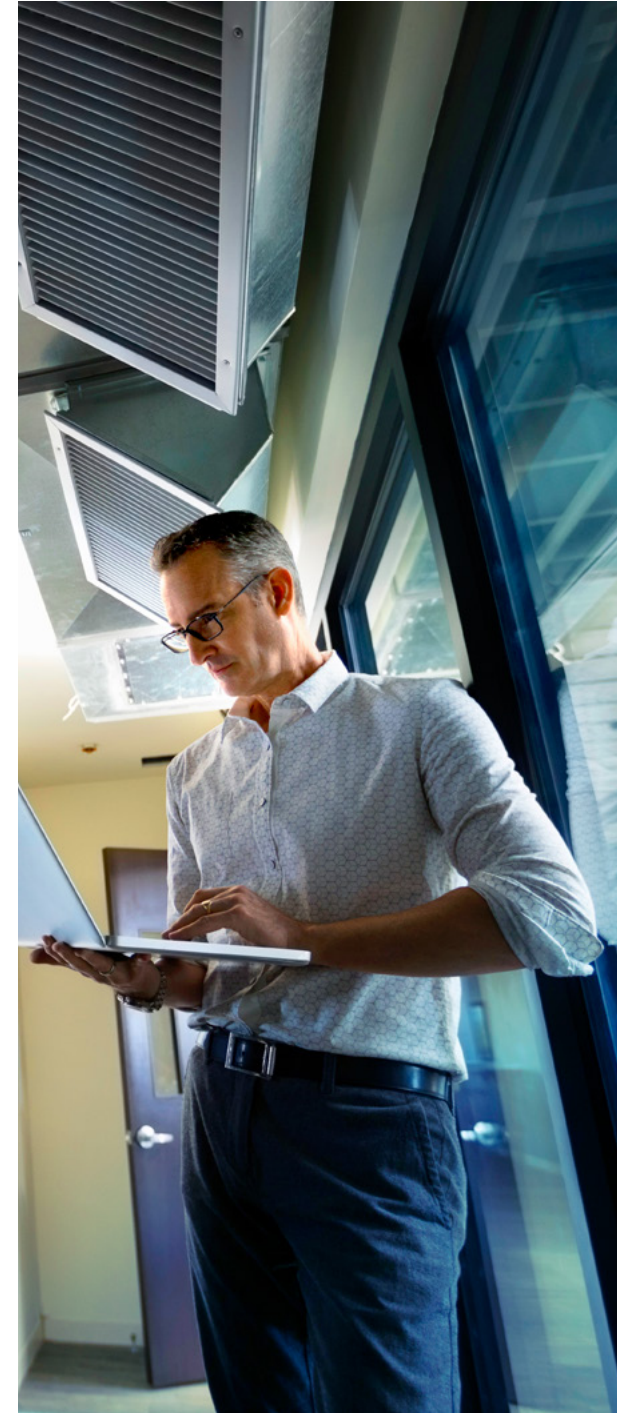
A new 5G infrastructure will be dauntingly expensive. It will require new spectrum, new RANs/antennas, far greater bandwidth, and massively scalable network equipment. There will also be significant competitive pressure to deploy widespread 5G coverage as quickly as possible.

At the same time, you will need to simultaneously support and optimize your existing 4G LTE network that most end users will continue to use for the near term. Much of this existing network is on old technology platforms that cannot easily scale, and can’t support newer 5G technologies.

LEVERAGE VIRTUALIZED/CLOUD-BASED TECHNOLOGIES TO MEET 5G NETWORK DEMANDS

With the rapid transition to virtualized/cloud-based edge, core, and data networks, service providers are able to scale and simplify their existing 4G LTE network, and evolve to 5G with automation, protocol fluency, and high-performance virtualized software. These solutions will help you to:

- Simplify your core network architecture and operations, and reduce costs with the integration of SGI-LAN/N6 services into a single platform, deployable as hardware and virtual appliances.
- Migrate seamlessly to a NFV (Network Functions Virtualization) infrastructure using a broad range of Virtual Network Functions (VNFs) and a VNF Manager.
- Meet 5G’s latency and high throughput requirements with Multi-access Edge Computing (MEC) solutions.
- Support transition from 4G to 5G and services migration through protocol fluency and comprehensive interworking capabilities such as HTTP/2 and Diameter.
- Leverage automation and orchestration tools to simplify operations and improve efficiency.
- Transition from CapEx to OpEx consumption models with subscription-based licensing models.



F5 SOLUTIONS FOR NETWORK OPTIMIZATION

Network Functions Virtualization — F5 delivers one of the industry's broadest portfolios of VNFs, allowing you to seamlessly transition your networks to high performance VEs (virtual editions) in the data center or the network edge. Our NFV Packaged Solutions provide automated, ready-to-install NFVs with an integrated VNF Manager.¹

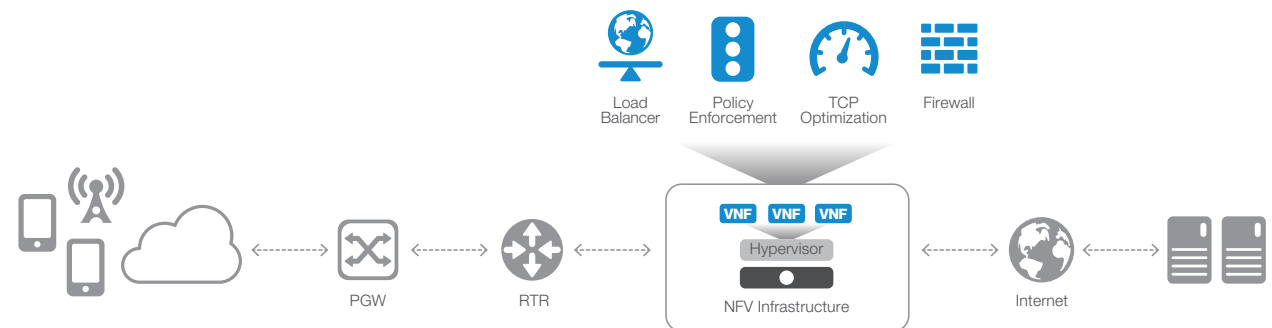
SGI-LAN/N6 Consolidation in the Access Network — F5 consolidates multiple layer 4 through layer 7 functions into a single, cost-effective, simplified solution. Our SGI-LAN/N6 solution can enable secure, high performance policy enforcement, traffic optimization, DNS, load balancing, CG NAT and firewall services in the datacenter or SGI-LAN/N6 network edge.²

Multi-access Edge Computing — Multi-access edge computing (MEC) allows you to deploy applications and network functions much closer to end users. This helps reduce application latency and the volume of data traversing the transport network between the core and servers. F5 provides virtual edition software for all layer 4 through layer 7 networking functions that support MEC implementations.

Automation and Orchestration — F5 provides for programmatic deployment, configuration and management of F5 devices and the services they support. Available on GitHub and based on declarative APIs, the F5 Automation Toolchain provides the tools necessary to automate F5 services, and to integrate F5 solutions into third party automation, analytics, and orchestration tools.³



NFV DEPLOYMENT OF SERVICE FUNCTIONS IN SGI-LAN/N6



¹ www.f5.com/solutions/service-providers/network-functions-virtualization-nfv • ² www.f5.com/services/resources/use-cases/virtual-gi-lan • ³ www.f5.com/solutions/automation-and-orchestration

02

IMPERATIVE #2: MONETIZE NEW 5G SOLUTIONS

SPEED UP DELIVERY OF NEW, COMPELLING,
AND DIFFERENTIATED 5G SERVICES

Successful launch of new 5G services depends on getting the right 5G network solutions in place. Lack of equipment automation can slow the pace and dramatically increase the cost of new service implementation. It's also important to be able to fail quickly with a low upfront investment.

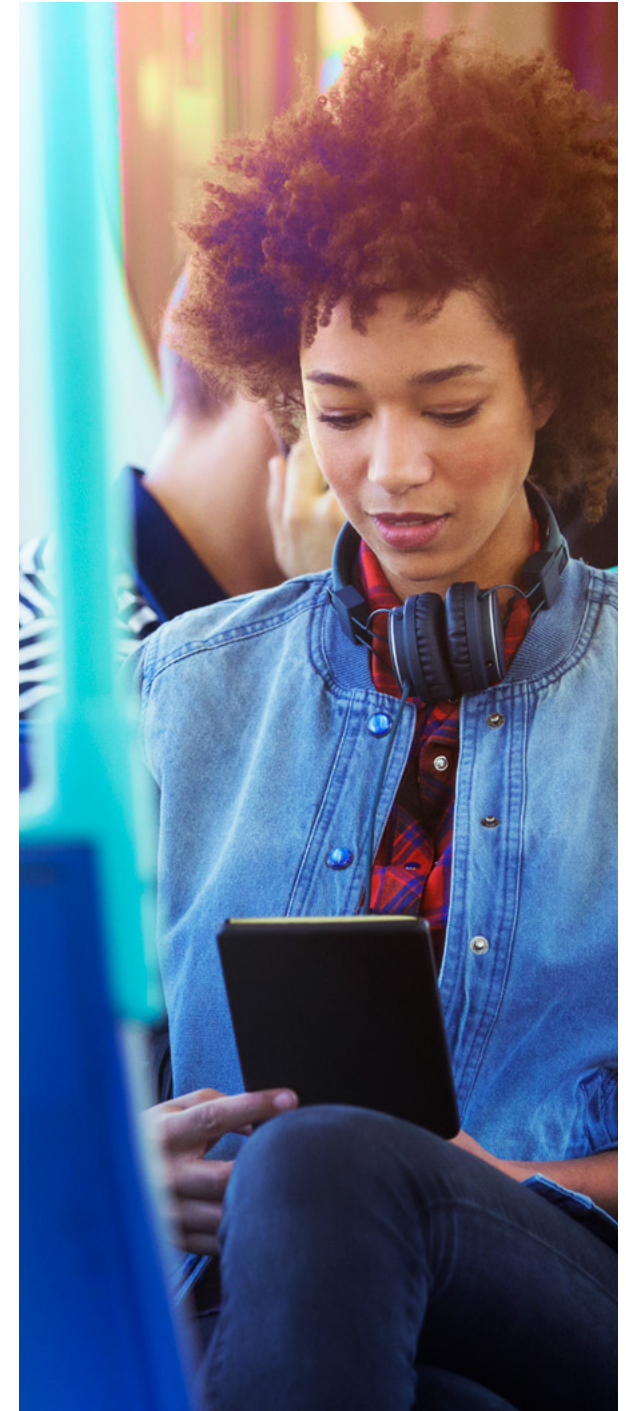
LACK OF EQUIPMENT AUTOMATION
CAN SLOW THE PACE AND
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IMPLEMENTATION.

Lack of visibility and control at the subscriber and application level will make it difficult to capitalize on opportunities, provide service differentiation, and respond to competitors' new services initiatives. This lack of visibility also makes it difficult to forecast network requirements accurately, which can result in high overprovisioning costs.

SPEED TIME TO MARKET WITH AUTOMATION, VISIBILITY, AND CONTROLS

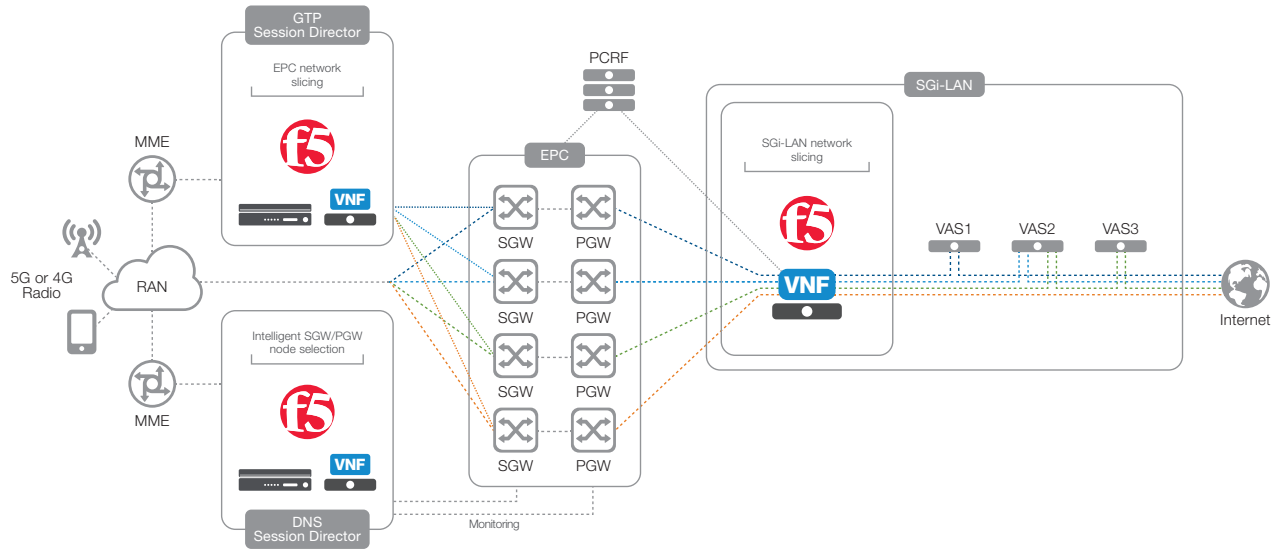
Service providers can leverage 5G technology upgrades to speed up time-to-market of new, compelling, and differentiated 5G services. These technology solutions help you:

- Create new and differentiated 5G services offerings via network segmentation within the SGI-LAN/N6 network by leveraging network slicing paired with dynamic service chaining.
- Reduce the cost and risk of new service delivery failure by leveraging a broad portfolio of NFV solutions.
- Minimize your up-front costs while preparing for the future with use-before-buy business models on our packaged NFV solutions.
- Leverage enhanced analytics to increase network visibility and drive increased performance.
- Provide custom integrations with value-added service (VAS) platforms based on granular application and subscriber-awareness.





NETWORK SLICING ACCELERATES NEW SERVICE DELIVERY



F5 SOLUTIONS FOR NEW SERVICE MONETIZATION

Network slicing — F5 lets you “slice” your network into different segments for current-generation 4G LTE networks in a way that conceptually mirrors 5G network slicing. This allows you to dedicate resources to different use cases today, providing you with a mechanism to optimize your infrastructure and create new service offerings. Functions such as capacity, connectivity, coverage, and speed can be allocated to meet specific use case-requirements, while functional components can be shared across different network slices.

NFV Solutions — F5’s NFV Packaged Solutions deliver an automated NFV solution with full lifecycle management providing you with greater business agility and accelerated new service deployment. These packages help you simplify network planning, sizing, and deployments with a unique capacity-based consumption model, and our use-before-buy model simplifies purchasing and reduces costs.

03

IMPERATIVE #3: ENSURE WORLD-CLASS SECURITY

PROTECT YOUR 5G NETWORK AT MASSIVE SCALE—
AT EVERY LAYER AND FOR MULTIPLE THREATS

The 5G infrastructure exposes both mobile operators and subscribers to significant security threats due to the number and type of connected devices. The number of IoT devices, which already presents risks for today's 4G LTE networks, is estimated to grow from 8.4 billion devices online in 2017 to more than 20 billion IoT devices online by 2020.¹ IoT devices can be weaponized for massive-volume DDoS attacks on the network, disrupting services and exposing customer data.

In addition, 5G's high bandwidth capabilities combined with new software-driven network elements can significantly increase security vulnerabilities. These 5G security vulnerabilities will have an impact on service revenues as well as subscriber performance.

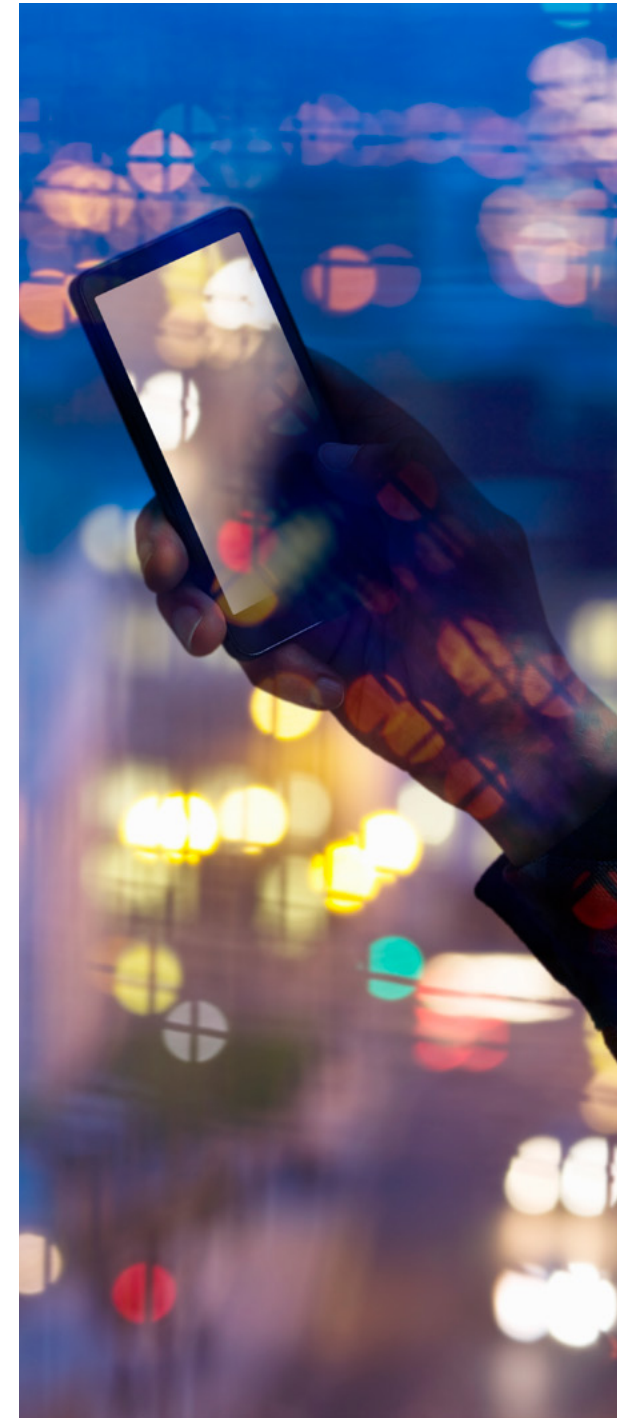
PROTECT YOUR NETWORK EVERYWHERE

It is critical to provide improved network security with the launch of your 5G network capabilities. You will need to implement a cohesive and comprehensive L2–L7 security strategy platform that delivers robust security at strategic control points including the SGI-LAN/N6 edge, the data center, and the roaming interconnect. Implementing per-subscriber and per-application security solutions, and leveraging visibility and control analytics will allow you to respond quickly and mitigate security issues.

IOT DEVICES CAN BE WEAPONIZED
FOR DDoS ATTACKS IN MASSIVE
VOLUME ON THE NETWORK,
DISRUPTING SERVICES AND
EXPOSING CUSTOMER DATA.

Protecting your 5G network at massive scale at every layer and for multiple threats requires you to:

- Defend your network infrastructure and mobile subscribers from attacks, regardless of their source.
- Secure your main strategic control points with the industry's best security products.
- Provide policy-based, programmable threat mitigation with "per subscriber" security solutions.
- Automate DDoS mitigation through machine learning and threat analysis.
- Mitigate zero-day threats and attacks with customizable, flexible, and programmable platforms.





F5 SOLUTIONS FOR SECURITY

GTP Security — F5 offers GTP security solutions that scale and protect both control and data plane traffic while implementing FS.20 protections on roaming traffic. Combined with class-leading flexibility and scalability, our GTP security solution can protect the most demanding roaming infrastructure.

Firewall Solutions for the Access Network and Data Center — Implement carrier scale ICSA Labs certified firewalls with all the protection benefits of a full-proxy firewall. This includes fully terminating and inspecting incoming connections before they can ever reach your secured network. (See items 1 and 3 in the diagram.)

IoT Solutions for the Access Network and Data Center — Gain IoT traffic management and security in both the network and data center. Solutions include subscriber-aware firewalls and protection against unmanaged IoT devices. (See items 1 and 3 in the diagram.)

DDoS Solutions in the Access Network, Data Center, and Cloud — F5 provides highly effective DDoS solutions which leverage machine learning and data science algorithms. It uses a packet-based analysis versus flow-only based analysis, and provides deeper protocol support for L4–L7 including http/s and DNS. This helps ensure that a customer has better visibility into attacks that can't be seen today.

Tier 1 — An out-of-path solution, aimed at mitigating volumetric attacks that occur inside a service provider network. When volumetric attacks are detected, the routers are instructed to drop traffic or redirect it to a scrubbing center featuring dedicated high-throughput hardware that will clean the traffic and reinject it into the data path. (See item 2 in the diagram.)

Tier 2 — An inline solution that is either deployed as a clean pipe service on the customer premises, or at the service provider data center, in front of application servers and control plane elements. (See item 3 in the diagram.)

Tier 3 — For off-net subscribers, F5® Silverline™ delivers a cloud-based DDoS mitigation service protecting against attacks aimed at saturating peering and/or transit links. No on-network solution can do this. (See item 4 in the diagram.)

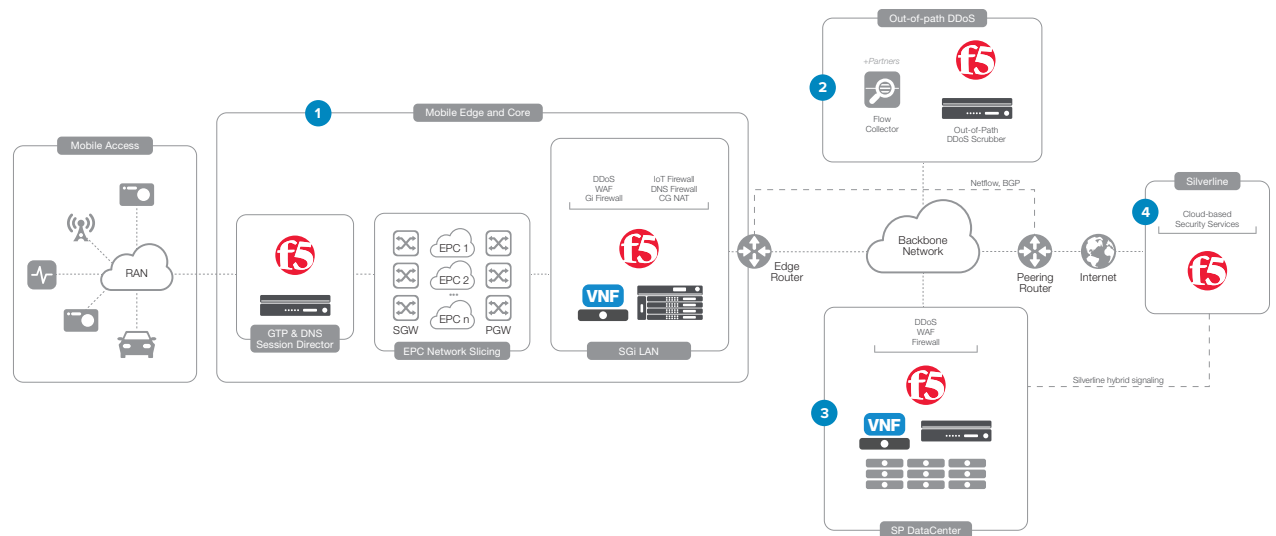
Intrusion Prevention System (IPS) and Web Application Firewalls — IPS is a network security/threat prevention technology that examines network traffic flows to detect and prevent vulnerability exploits. WAF applies controls at the application layer (HTTP/S) and protects HTTP conversations and critical infrastructure servers. These controls defend against the most common attacks, cross-site scripting (XSS)

and SQL injection, as well as sophisticated, and harder to detect, application attacks. (See items 1 and 3 in the diagram.)

Often the target of attacks, service provider applications and services need to be safeguarded against both outages and exploits. Examples are critical charging and revenue management systems and systems that provide API access to the 5G infrastructure. WAF, DDoS, and IPS all work together to help secure these critical pieces of their infrastructure.

Furthermore, these security tools need to be adapted to 5G in areas such as support for HTTP2, Diameter—which ensures backward compatibility with 4G, and robust API security.

SERVICE PROVIDER DDoS SOLUTIONS FOR MULTI-LAYER SECURITY





EVOLVING TO 5G APPLY NEXT-GEN THINKING TODAY

5G is finally here. Getting your 5G capabilities up and running as quickly as possible will help you maintain your competitive edge and secure new 5G service revenues. At the same time, you must maintain and optimize your existing 4G LTE network and customer base.

Many of the 5G technologies can be used to optimize and help secure your existing 4G LTE networks. This includes:

- Network Functions Virtualization (NFV)
- SGi-LAN/N6 Consolidation
- Multi-access Edge Computing
- Automation and Orchestration
- Network Slicing
- GTP Security
- IoT Solutions for the Access Network and Data Center
- DDoS Solutions in the Access Network, Data Center, and Cloud
- Intrusion Prevention Systems (IPS)
- Web Application Firewalls (WAF)

MANY OF THE 5G TECHNOLOGIES
CAN BE USED TO OPTIMIZE AND
HELP SECURE YOUR EXISTING 4G
LTE NETWORKS.

F5 has the expertise and experience to help you execute a smooth transition to 5G. Our proven carrier-grade solutions help you optimize your networks, monetize new 5G solutions and applications, and ensure world-class security for your network and subscribers.

To learn more, visit us at www.f5.com/solutions/service-providers/5g.

