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# Performance and Reliability of Hardware—Agility and Scale of a Modern Architecture—Meet F5's Powerful Next-Generation Chassis System

Traffic continues to skyrocket as enterprises and service providers accelerate their digital transformation, resulting in more apps, users, and usage than ever. Meanwhile, the existing hardware platforms in place are rapidly aging. While some customers are “sweating their assets,” many others are at the breaking point due to high operating costs, appliance sprawl owing to so many point products, burdensome manual processes, and increasing support and maintenance issues.

What's undisputed is that we are living in a cloud-first, software-first world. Yet, many apps still benefit from the predictability, high scalability, performance, and operational simplicity of an integrated and engineered hardware system. With existing hardware platforms, however, customers cannot leverage modern architectures for their new apps that unlock the benefits of being built with DevOps-friendly microservices—not without forcing operations teams to perform all the systems engineering and manage the resulting complexity.

The VELOS platform is the next generation of F5's industry-leading chassis-based systems, which deliver unprecedented performance and scalability in a single Application Delivery Controller (ADC). As with VIPRION, F5's existing chassis-based system that has been in the market for more than 10 years, customers can seamlessly scale capacity by adding modular blades in a chassis, without disrupting users or applications, rather than having to install and configure new appliances. Now, VELOS can bridge traditional and modern application architectures by supporting a mix of traditional BIG-IP tenants as well as next-generation tenants with F5® BIG-IP Next, which will unleash the true power of running on a microservices-based architecture.

## KEY BENEFITS

### Get More Done with Automation

Reduce your current deployment time from weeks to minutes and improve operational agility with an API-first architecture that powers automation.

### Unmatched Performance for Improved ROI

Manage and protect demanding apps with industry-leading Layer 4 and Layer 7 performance and SSL processing power.

### Infrastructure Reliability and Business Continuity

Achieve business continuity with fully isolated traffic using multiple layers of tenancy and ensure our apps are always available and secure with enterprise-grade platform redundancy.

### Lower Operating Costs

Slash your total cost of ownership up to 3X with far greater price/performance, device consolidation, and multi-tenant scale.

## MODERN PLATFORM SOFTWARE EASES YOUR TRANSITION

VELOS relies on a Kubernetes-based platform layer (F5OS) that is tightly integrated with F5's Traffic Management Operating System (TMOS) software, aligning with your modern architecture plans. This new microservices platform layer powers the next-generation of BIG-IP software, BIG-IP Next, that's built to offer greater automatability, scalability, and ease-of-use for organizations running applications on-premises, in the cloud, or at the edge.

Administrators won't have to worry about learning Kubernetes or microservices concepts to leverage VELOS or next-gen BIG-IP software. You only need to know that it powers the new platform and that it's abstracted, so an administrator familiar with CLI, GUI, and API interfaces can manage it. This means you can simultaneously run tenants with the current generation of BIG-IP software with the more modern microservice-based BIG-IP Next software. In addition, as you shift workloads among on-premises and cloud environments, you won't need to perform time-consuming migrations with heavily refactored apps.

VELOS is a flexible system that allows you to plug in both current versions of BIG-IP and BIG-IP Next, making it easier to use multiple versions of BIG-IP. VELOS is more aligned to modern architectures, allowing you to future-proof your deployments and environments. With VELOS, you can leverage F5OS to manage BIG-IP tenants and app services for containerized apps.

## INTRODUCING BIG-IP NEXT: MODERN APPLICATION DELIVERY ON VELOS

F5's next-gen software, BIG-IP Next, leverages powerful declarative APIs to make it faster and easier for DevOps, NetOps, and other BIG-IP-reliant teams to manage and automate their BIG-IP deployments. The completely rearchitected software layer and modern framework provides the basis for significantly improved control plane scale and performance, reduced cloud footprint for lower operational costs, and rapid instance upgrades.

Carrying forward the comprehensive suite of advanced BIG-IP functionality developed over the past 20 years, BIG-IP Next will continue to deliver everything from application security and access controls to local and global traffic management—and will be available across the same breadth of deployment and consumption models as its predecessor.

When fully mature, BIG-IP Next will offer the following benefits on VELOS:

- **Accelerate time-to-market** using a highly automatable, API-first design that enables automation-driven device onboarding and seamless application services configuration via declarative APIs.



VELOS CX410



VELOS BX110

WITH ITS API-FIRST ARCHITECTURE, VELOS PROVIDES A FULLY AUTOMATABLE SYSTEM THAT CAN DELIVER THE AGILITY YOU NEED TODAY.

- **Reduce cloud total cost of ownership** with optimized, right-sized instances that reduce annual spend and a containerized core that splits feature-modules into individual units, permitting teams to select, choose, and deploy only the functions required.
- **Handle extensive application portfolios and complex, resource-intensive app configurations** thanks to a highly scalable control plane.
- **Reduce application downtime with rapid, hitless upgrades** that can be performed while maintaining all existing operations and without disrupting traffic flows or diminishing application availability.
- **Maintain a cutting-edge security posture** with accelerated and incremental feature delivery software releases every three months—twice as often as BIG-IP TMOS feature releases.
- **Continue using the advanced suite of app services** and modules you know and trust as the majority of capabilities are carried forward with BIG-IP Next.

## PREDICTABLE PERFORMANCE AND MAXIMUM SCALE FOR DEMANDING APPLICATIONS

F5 has always provided the highest performance ADCs with chassis-based systems since the introduction of VIPRION more than a decade ago. As the next-generation chassis, VELOS continues this industry leadership for Layer 4–7 throughput, connection processing, and SSL TPS (RSA / ECC) performance, letting you more efficiently manage and secure your most demanding applications, offload web and app servers, and consolidate infrastructure within the same VIPRION footprint. VELOS delivers the highest performance per rack unit as well as multi-Tbps L4–7 throughput with a fully non-blocking backplane.

In addition, as a fully integrated and tested system, VELOS enables you to gain predictable performance for your applications. As a result, you no longer have to engineer your own application stack with different combinations of server hardware and operating software, hypervisors, ADC software, and so on.

## MAKE AUTOMATION STANDARD PRACTICE

With the demands of your business, you are under pressure to move faster to deploy and scale applications. Now, you don't need to implement software-only infrastructure to take advantage of CI/CD toolset integration, declarative APIs, and telemetry-based implementations. With its API-first architecture, VELOS provides a fully automatable system that can deliver the agility you need today.

With VELOS, you can take advantage of F5's Automation Toolchain. Automation Toolchain offers a way to simplify and streamline your F5 portfolio with simple, yet powerful declarative interfaces that minimize F5 knowledge requirements, reduce errors, increase deployment velocity, and make workflows more repeatable. Automation Toolchain is comprised of a unified set of REST API endpoints that are built using human-readable JSON source of truth documents installed on BIG-IP or on BIG-IQ in any environment where those solutions are supported. The Automation Toolchain makes it faster, easier, and more programmatic to configure and deploy F5 application delivery and security services.

In addition, BIG-IP Next on VELOS completes the transition away from imperative APIs (iControl REST)—where individual commands must be arduously sequenced together to automate simple tasks—to an entirely declarative model where desired end-state declarations built around use cases are all that is required to automatically stand-up or configure instances. This shift not only makes it faster to deploy and configure applications, but also replaces the need for extensive domain knowledge—making it easier to automate tasks.

## **GAIN BIG-IP MANAGEMENT AND VISIBILITY WITH BIG-IQ AND BIG-IP NEXT CENTRAL MANAGER**

F5 BIG-IQ® allows you to take an application-centric approach to core IT—networking, development, and deployment—with a unified tool for managing your F5 application delivery and security portfolio, including VELOS. BIG-IQ extends the operability and value of your F5 investment with the ability to create, configure, deploy, analyze, orchestrate, troubleshoot, upgrade, and patch the entire F5 security and application delivery services portfolio. BIG-IQ supports management of F5 BIG-IP physical and virtual devices, both locally and in the cloud, including third-party certificate management. From per-app virtual editions to traditional hardware appliances, BIG-IQ makes it possible to gain deep visibility into F5 services and devices, build native and third-party integrated automation workflows, simplify configuration and deployment tasks, assign role-and-user-specific permissions, and ensure every tea—and every app—has the resources required for optimal performance.

With the launch of BIG-IP Next, customers gain centralized control and visibility with F5® BIG-IP Next Central Manager. Designed to simplify management, monitoring, and visualization of BIG-IP Next infrastructure and services through an intuitive user interface, BIG-IP Next Central Manager reduces the complexity, and therefore time, needed to perform critical tasks and workloads. BIG-IP Next Central Manager is your single source of truth for managing workflows, ensuring consistency, and enforcing compliance.

Built on a highly scalable, microservices architecture, Central Manager can run on vSphere, KVM, or OpenStack on an x86 server to most cost-effectively manage all your BIG-IP Next instances. Key functionality includes:

- Full instance lifecycle management
- Policy, compliance management, and security enforcement
- GUI and API-driven service provisioning and troubleshooting
- Detailed visibility and analytics
- Automation leveraging Application Services Extension (AS3) and F5 Application Services Template (FAST)

## **INCREASED PERFORMANCE AND GREATER AGILITY WITH PROGRAMMABLE SYSTEM RESOURCES**

VELOS offers even more hardware-accelerated performance than previous generations with blades, with double the field-programmable gate array (FPGA) chipsets, and with FPGA technology tightly integrated with the F5 TMOS® technology and software. This means that, for specific use cases, you can avoid CPU-exhaustion scenarios and gain performance that you cannot replicate on any other system with similar resources.

VELOS uses a new generation of hardware with the latest Intel processing for CPUs. VELOS uses two FPGAs, the Application Traffic Services Engine (ATSE) and the VELOS Queuing FPGA (VQF). The newer generation Intel chipsets provide more modern SSL cipher support and can offload elliptical curve cryptography (ECC)-based ciphers in hardware. F5 embedded Packet Velocity® Acceleration (ePVA) is used to offload varying workloads from FASTL4 to DDoS mitigation. FPGA technology enables high-performance capabilities tightly integrated with the F5OS technology and software.

They include:

- SSL and compression offload
- L4 offload, enabling leading throughput rates and reduced loads on software.
- Hardware-accelerated SYN flood protection.
- Hardware detection and mitigation of more than 100 types of denial-of-service (DoS) and DDoS attacks.
- Support for F5 IP Intelligence Services, with denylist, allowlist, and temporary-rejection capabilities.

## MULTI-TENANCY SECURITY WITH FULL ISOLATION

Virtualization and multi-tenant architectures are often implemented to address business and topological requirements, such as being able to consolidate services or acquire or merge existing networks. Organizations need to know that significant security mechanisms are built into these architectures. Enterprises seeking the CapEx gains that virtualization offers often run applications that have differing security requirements.

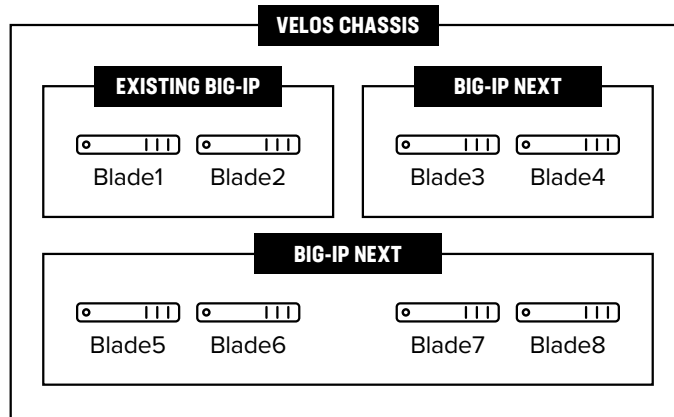
F5 DUPLICATES SYSTEM RESOURCES TO AVOID THE TYPE OF CATASTROPHIC FAILURES THAT ARE POSSIBLE WITH OTHER CHASSIS-BASED DESIGNS.

Essentially a dedicated hypervisor for F5 hardware platforms, F5's Virtual Clustered Multiprocessing (vCMP) technology gives organizations a virtualization strategy for application delivery and isolating multi-tenant environments. Chief information security officers, on the other hand, want to know how secure the vCMP technology is. Managed service providers need to be able to completely assure their downstream customers that their network traffic cannot be seen or manipulated by other customers hosted on the same physical device.

F5 developed the vCMP technology originally for VIPRION with these requirements in mind, while preserving the high availability, speed, and performance that are the hallmarks of all F5 products. VELOS continues to support—and improve on—the vCMP technology that is such a benefit to many customers.

VELOS supports flexible multi-tenancy options across system resources with its vCMP technology and enables even more multi-tenancy density than was previously achievable with VIPRION. This allows customers to achieve greater ROI on its new F5 hardware investments, because system resources can be allocated more effectively.

Multi-tenancy enables many other benefits. For example, customers gain the ability to host many different BIG-IP tenants on the same chassis, which may vary in terms of supported versions and licensed software modules, depending on the needs of the particular applications or business requirements. Each tenant can be independently upgraded or patched without impacting other tenants. In addition, multi-tenancy and administrative partitions deliver full tenant isolation and failure independence of traffic, data, and administrative access for unmatched tenant isolation.



**Figure 1:** VELOS enables customers to host different BIG-IP software tenants on the same chassis.

## EDGE COMPUTING SOLUTIONS FOR SERVICE PROVIDERS

Globally, service providers are investing heavily in 5G networks and in trying to win the battle for both the consumer and business markets. Increased throughput and reduced latency are the key drivers for the network edge, particularly for video applications for example that are straining today’s networks. Combined with this, service providers also need to develop new consumption models and revenue generating services to stay competitive. A flexible, secure, high-performance solution is required.

VELOS provides hardware assisted L4 offload, native, high-performance security services to protect public-facing websites and data center applications from distributed, multi-layer cyberattacks through AFM, and hardware assisted DDoS mitigation of DDoS vectors, per endpoint DoS protection and wildcard VS SYN cookie protection. BIG-IP CGNAT eases IPv6 migration and improve network scalability with IPv4 address management. Combine CGNAT and other functions for a secure, subscriber-aware network firewall that masks subscriber addresses, or as part of an optimized N6 / S/Gi-LAN solution.

BIG-IP Policy Enforcement Manager (PEM) can create differentiated services and manage traffic by leveraging subscriber and application awareness and implement policies to enforce them. Furthermore, the solution is Network Equipment Building Systems (NEBS) compliant. A requirement in the USA, NEBS standards are used all over the world for commercial, utility, and defense applications. The standards are designed to ensure that the equipment continues to work at extreme temperatures, or after an extreme event, such as an earthquake or a severe thunderstorm.

## MAXIMUM RELIABILITY

The reliability of your application infrastructure has never been as important as it is today. VELOS was designed from the ground up to provide maximum system reliability for your apps. VELOS uses two redundant system controllers, which can be paired in active-active or active-standby modes for fast failover. All common system components, such as power supplies and fans, also were designed with redundancy in mind. If one triggers an event, the other one keeps going. Administrators can swap out a failed module without disrupting systems. They can also add or remove chassis blades without disrupting users or apps, and configure blades for N+N failover scenarios or failover to another VELOS chassis.

F5 duplicates system resources to avoid the catastrophic failures that are possible with other chassis-based designs. Every blade has two interfaces that are connected to separate system controllers via the backplane interface. This forms an active-active type connectivity on the backplane while the control/management plane is still active-standby, providing redundancy across the system controllers. When a customer starts configuring and accessing the chassis, the floating point management IP lands on the primary controller. Without the customer having to duplicate the configuration, the second controller automatically syncs the configurations, licenses, orchestration info, logging, and so on with the primary controller, allowing the customer to manage just one device, not both.

## CONSOLIDATED PLATFORM WITH BIG-IP APPLICATION AND SECURITY SERVICES

The VELOS platform offers the full BIG-IP portfolio of comprehensive and industry-leading application delivery and security services. These solutions can be consolidated onto a single chassis-based VELOS platform, reducing management complexity and overhead while offering superior performance and scalability.

F5's solutions for application delivery and security services are made up of the following modules:

- **F5® BIG-IP® Traffic Manager™ (LTM):** Provides advanced traffic management, load balancing, and application delivery.
- **F5® BIG-IP® DNS:** Hyperscales and secures the DNS infrastructure during distributed denial of service (DDoS) attacks and keeps global applications online.
- **F5® BIG-IP® Advanced Firewall Manager™ (AFM):** Forms the core of the F5 application protection solution. It provides full SSL visibility at scale as well as network-layer and session-layer DDoS mitigation.



- **F5® Advanced Web Application Firewall™ (Advanced WAF):** Delivers application security, web scraping and bot prevention, and HTTP DDoS mitigation.
- **F5® BIG-IP® Access Policy Manager™ (APM):** Delivers unified global access control for your users, devices, applications, and APIs.
- **F5® BIG-IP® IPS:** Protects infrastructure and protocols and compliance verification.
- **IP Intelligence and Geolocation:** Provide IP reputation and geolocation information for added context-aware security.

## BIG-IP NEXT APPLICATION DELIVERY SERVICES

The majority of existing BIG-IP software capabilities will migrate to the next generation BIG-IP software. The following product modules and ensuing use cases will be delivered with BIG-IP Next, providing next-generation replacements for existing BIG-IP offerings.

The following modules are currently available on VELOS with BIG-IP Next:

- **F5® BIG-IP® Next Local Traffic Manager (LTM):** Manages traffic and balances local loads intelligently, ensuring apps are highly performant and available.
- **F5® BIG-IP® Next WAF:** Defends applications against the latest OWASP Top 10, complex application layer attacks, and API attacks.

Beyond the continued availability of these key functions, critical features in use by many BIG-IP customers today such as iRules and telemetry streaming will also be maintained.

## MIGRATING TO VELOS

Developed to facilitate effortless shifts between BIG-IP solutions, the [F5 Journeys Migration Tool](#) can be used to simplify and accelerate migrations to VELOS. Journeys assists users in adopting newer platforms by providing a frictionless migration experience. It allows users to migrate from any source platform (F5 chassis, appliance, or VE) running any BIG-IP software version (on or above 11.x) to the platform of their choice. The tool assists in checking feature compatibility issues between different platforms and software versions, identifying and troubleshooting migration issues, and reducing overall complexity and time spent on migration.

F5's Journeys Migration Tool within BIG-IP Central Manager also drastically reduces the time and effort required to convert existing BIG-IP configurations into configurations that are compatible with BIG-IP Next. Using Application Services 3 Extension (AS3) as the foundation for this process, the tool transforms User Configuration Set (UCS) files or AS3 declarations describing some BIG-IP use case configurations into AS3 declarations that replicate these configurations on BIG-IP Next. This process can be performed on a per-app basis, allowing migrations to be performed at the user's pace. Work with your F5 account manager to determine when it's appropriate to transition to BIG-IP Next with F5 Journeys based on your use case.

## More Information

For more information about VELOS, visit [f5.com](https://f5.com) to contact us. For the latest product specifications, see the applicable platform guide on [askf5.com](https://askf5.com).

### Data sheets

[F5 VIPRION](#)

[BIG-IP Local Traffic Manager](#)

[BIG-IP DNS](#)

[BIG-IP Advanced Firewall Manager](#)

[BIG-IP Advanced Web Application Firewall](#)

[BIG-IP Access Policy Manager](#)





SPECIFICATIONS	VELOS CX410-N (DC-NEBS)	VELOS CX410
Dimensions:	H: 6.9 inches (17.5 cm) x W: 17.4 inches (44.2 cm) x D: 32.0 inches (81.3 cm) rack-mount chassis	H: 6.9 inches (17.5 cm) x W: 17.4 inches (44.2 cm) x D: 32.0 inches (81.3 cm) rack-mount chassis
Weight:	Empty chassis, as shipped (0 blades, 8 blanks, 2 power supplies, 1 fan tray, 2 system controllers, 2PSU controllers): 132 pounds (60 kg) DC power supply: 6.8 pounds (3.1 kg) Power supply blank: 0.2 pounds (0.09 kg) Blade blank: 0.1 pounds (0.05 kg) Fan tray: 12.0 pounds (5.4 kg) System controller: 10.5 pounds (4.8 kg) VELOS PSU Controller (VPC): 0.5 pounds (0.2 kg)	Empty chassis, as shipped (0 blades, 8 blanks, 2 power supplies, 1 fan tray, 2 system controllers, 2PSU controllers): 132 pounds (60 kg) AC power supply: 6.4 pounds (2.9 kg) Power supply blank: 0.2 pounds (0.09 kg) Blade blank: 0.1 pounds (0.05 kg) Fan tray: 12.0 pounds (5.4 kg) System controller: 10.5 pounds (4.8 kg) VELOS PSU Controller (VPC): 0.5 pounds (0.2 kg)
Power Supply:	Two (default) to four 3000W, -48 to -60 VDC input, 85A per cord (max, 170A total)	Two (default) to four 3000W, 200-240 VAC input, 17A per cord (max, 34A total)
Operating Temperature:	23° to 131°F (-5° to 55°C) as per NEBS GR-63-CORE standard	32° to 104°F (0° to 40°C)
Relative Humidity:	5% to 85% (40°C) non-condensing Up to 93% (40°C) non-condensing for a maximum of 96 hours	5% to 85% (40°C) non-condensing Up to 93% (40°C) non-condensing for a maximum of 96 hours
Safety Agency/Approval:	Harmonised standards: IEC 62368-1:2014 (second edition) EN 62368-1:2014+A11:2017 CSA C22.2 No. 62368-1-14, UL 62368-1, 2nd edition ETSI EN 300 386 V1.6.1 (2012) Class A EN 55032:2012/AC:2013 Class A EN 55024:2010 Class A IEC 63000:2018	Harmonised standards: IEC 62368-1:2014 (second edition) EN 62368-1:2014+A11:2017 CSA C22.2 No. 62368-1-14, UL 62368-1, 2nd edition ETSI EN 300 386 V1.6.1 (2012) Class A EN 55032:2012/AC:2013 Class A EN 55024:2010 Class A IEC 63000:2018
Redundancy (Power):	Supports N+1 or N+N redundancy	Supports N+1 or N+N redundancy
System Controller SX410:	Two (default) SX410 System Controller included 1x 10GBase-T 1x USB 3.0 1x serial console 960GB NVMe SSD 8-Core Intel SoC 32 GB DDR4 memory	Two (default) SX410 System Controller included 1x 10GBase-T 1x USB 3.0 1x serial console 960GB NVMe SSD 8-Core Intel SoC 32 GB DDR4 memory
Hardware Certification Model:	CX410-N	CX410
Trusted Platform Module (TPM):	TPM 2.0	TPM 2.0

Notes: Please refer to the [Platform Guide](#) for more information.



SPECIFICATIONS	VELOS BX110
Intelligent Traffic Processing:	L4/L7 throughput 95/95 Gbps 3.0M L7 (inf-inf) requests per second 1.2M L4 connections per second Max hardware compression 65 Gbps SSL bulk throughput 50G Maximum SSL TPS 100,000 (RSA 2K Keys) 70,000 (ECDHE P-256-ECDSA) 55,000 (ECDHE P-256-RSA-2K)
Virtualization (vCPUs):	14-core 28 vCPU Multitenancy support: upto 22vCPU available to user. Supported Tenant Deployment options ( 1,2,4,6,8,10,12,14,16,18,20,22 vCPU's)
Processors:	Single Intel 14-core Xeon processor (total 28 hyperthreaded logical processor cores)
Memory:	128GB (DDR4)
Hard Drive Capacity:	1x 960GB M.2 NVMe SSD (over provisioned 30%, 700 GB user capacity)
Network Interfaces:	2x QSFP28 (backward compatible to QSFP+) ports supporting: 100G QSFP28 LR4, SR4, and PSM4 (Breakout cable supports 4x SFP28 25G LR or 4x SFP28 25G SR) 40G QSFP+ LR4, SR4, and PSM4 (Breakout cable supports 4x SFP+ 10G LR or 4x SFP+ 10G SR)
Power Consumption and Heat Output:	Please refer to Platform Guide: <a href="#">VELOS CX Series</a> for the latest specific power ratings
Weight:	7.3 pounds (3.3 kg)
Width:	Quarter-width
Hardware Compression and SSL:	Integrated Intel Quick Assist
Front Panel and Backplane Data Path:	100% FPGA
Management Interfaces:	1x USB3.0
AOM:	F5 LOP (Lights-Out Processor)
Trusted Platform Module (TPM):	TPM 2.0
NEBS:	Yes (with DC NEBS chassis)
Field Serviceable Components:	None

Notes: Please refer to the [Platform Guide](#) for more information. PRELIMINARY RELEASE NUMBERS. SUBJECT TO CHANGE.