

Automation & Orchestration

F5 Automation Toolchain

PRESENTED BY:

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Agenda

- Introduction
- Challenges in DoD
- F5 Automation Toolchain
 - Declarative Onboarding (DO)
 - Application Services 3 Extension (AS3)
 - Telemetry Streaming (TS)
- Ecosystem Integrations
- Demo

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Software is a Critical Component of the DoD mission

- Need for updating software rapidly (agile)
 - ...in a secure fashion
 - ...knowing things won't break
- Need to establish Secure Application Development Capabilities
- Bake-in & enforce cybersecurity from inception through operations
- Enhance enterprise visibility



Challenges in DoD

Lack of test automation

Legacy Systems

App Complexity

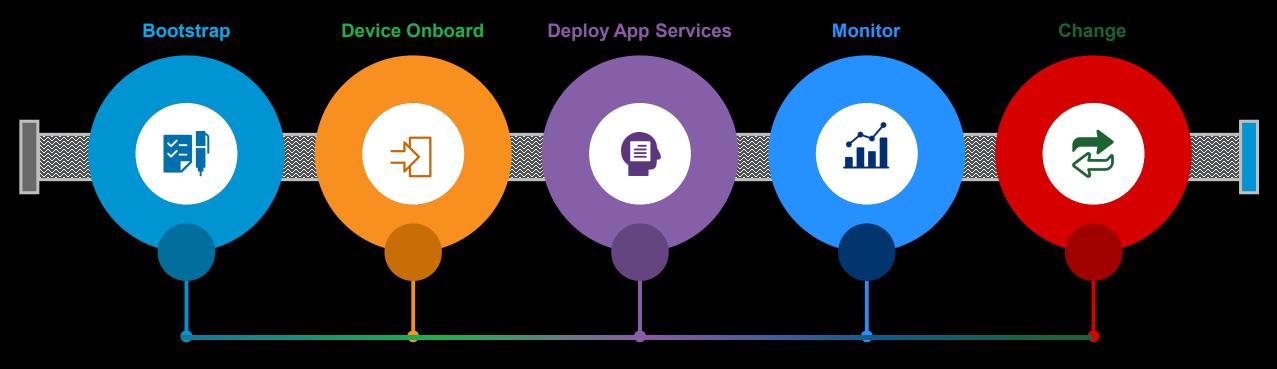
Tool Sprawl

 Managing Environments (disconnected, classified, etc...)

 Skillset / Self-service training

Culture

F5 Automation Toolchain



Cloud Templates

Configure and deploy F5 BIG-IP VEs into public and private clouds.

Declarative Onboarding

Provision initial configuration of BIG-IP devices through a declarative API.

Application Services 3 Extension

Configuration of L4-L7 via declarative APIs.

Telemetry Streaming

Stream BIG-IP telemetry for analytics and automation.

Telemetry Streaming is an iControl LX extension and will send client/server stats from the BIG-IP via HTTP(S), Statsd or Kafka formats.

Change

Use telemetry data to track health, security and performance of applications

Use thresholds and triggers to scale app services

Imperative vs Declarative

Imperative

Tell the system **HOW** to do something - every step of the way

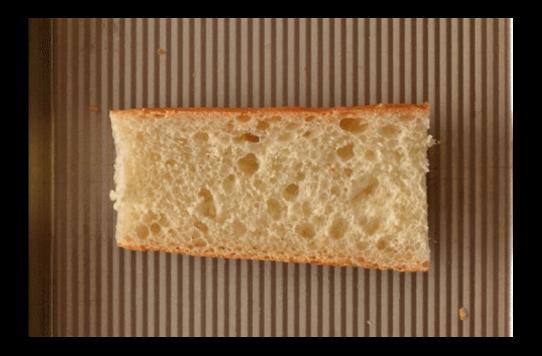
Declarative

Tell the system **WHAT** you want, and let it figure out **HOW** to do it

Declarative API - you define the desired end-state

- it fills in the details on "how to get there"

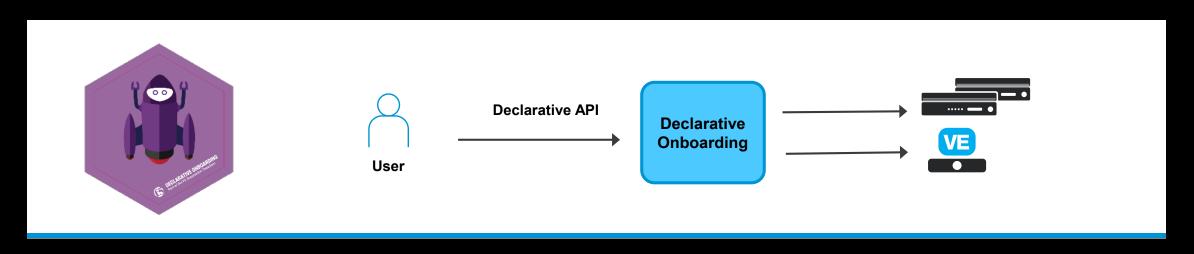
Imperative



Declarative



Automate Device Onboarding with Declarative Onboarding (DO)



- What is it?
- F5 BIG-IP API Extension (Node.js)
- Provides declarative interface for L1-L3 device onboarding
- Deployments via a single REST API endpoint
- JSON-based document



What are the Benefits?

- Minimizes need for BIG-IP domain specific knowledge
- Minimizes onboarding errors
- Maximizes onboarding consistency
- TMOS-independent RPM package

Standalone Declaration – Declarative Onboarding

```
"schemaVersion": "1.9.0",
"class": "Device".
"async": true,
"label": "Declarative Onboarding Simple Standalone Example
"Common": {
    "class": "Tenant",
   "hostname": "bigip01.f5gov.com",
   "myLicense": {
       "class": "License",
       "licenseType": "regKey",
       "regKey": "RXUGL-HOTFC-WCICJ-NZGWY-PXZTNTQ",
       "overwrite": false
    "myDns": {
       "class": "DNS",
        "nameServers": [
            "8.8.8.8",
            "2001:4860:4860::8844"
        "search": [
            "f5.com"
    "myNtp": {
       "class": "NTP",
       "servers": [
            "0.pool.ntp.org",
           "1.pool.ntp.org",
            "2.pool.ntp.org"
        "timezone": "UTC"
    },
```

```
"questUser": {
   "class": "User",
    "userType": "regular",
   "password": "mrpurple123!",
    "partitionAccess": {
        "Common": {
            "role": "guest"
"anotherUser": {
   "class": "User",
   "userType": "regular",
   "password": "mrpurple123!",
   "shell": "none",
   "partitionAccess": {
        "all-partitions": {
            "role": "quest"
"myProvisioning": {
   "class": "Provision",
   "ltm": "nominal",
   "gtm": "minimum",
   "asm": "nominal"
```

```
"internal": {
    "class": "VLAN",
    "tag": 4093,
    "mtu": 1500,
    "interfaces": [
            "name": "1.1",
            "tagged": false
"internal-self": {
    "class": "SelfIp",
    "address": "10.1.10.100/24",
    "vlan": "internal",
    "allowService": "default",
    "trafficGroup": "traffic-group-local-only"
"internal-floating": {
    "class": "SelfIp",
    "address": "10.1.10.120/24",
    "vlan": "internal",
    "allowService": "default",
    "trafficGroup": "traffic-group-1"
},
"external": {
    "class": "VLAN",
    "tag": 4094,
    "mtu": 1500,
    "interfaces": [
            "name": "1.2",
            "tagged": false
```

Standalone Declaration via BIG-IQ - Declarative Onboarding

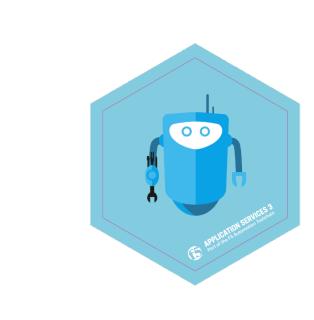
```
"class": "DO",
"declaration": {
    "schemaVersion": "1.5.0",
    "class": "Device".
   "async": true,
    "Common": {
        "class": "Tenant",
        "hostname": "bigip01.f5gov.com",
        "myLicense": {
            "class": "License",
            "licensePool": "demo-licenses",
            "licenseType": "licensePool",
            "bigIpUsername": "admin",
            "bigIpPassword": "{{bigippassword}}"
        "myProvisioning": {
            "class": "Provision",
            "ltm": "nominal",
            "qtm": "minimum",
            "afm": "nominal",
            "asm": "nominal"
```

```
"myDns": {
   "class": "DNS",
    "nameServers": [
       "8.8.8.8".
       "2001:4860:4860::8844"
   "search": [
        "f5.com"
"mvNtp": {
   "class": "NTP",
    "servers":
        "0.pool.ntp.org",
       "1.pool.ntp.org",
       "2.pool.ntp.org"
    "timezone": "UTC"
"external": {
   "class": "VLAN",
    "interfaces": [
            "name": "1.1",
            "tagged": false
"internal": {
   "class": "VLAN",
    "interfaces": [
            "name": "1.2",
            "tagged": false
```

```
"external-floating": {
          "vlan": "external",
          "class": "SelfIp",
          "address": "10.1.10.240/24",
          "trafficGroup": "traffic-group-1"
      "internal-floating": {
          "vlan": "internal",
          "class": "SelfIp",
          "address": "10.1.20.240/24",
          "trafficGroup": "traffic-group-1"
      "external-self": {
          "vlan": "external".
          "class": "SelfIp",
          "address": "10.1.10.241/24",
          "allowService": "none"
      "internal-self": {
          "vlan": "internal",
          "class": "SelfIp",
          "address": "10.1.20.241/24"
     },
      "defualt": {
          "gw": "10.1.10.1",
          "class": "Route"
"targetUsername": "admin",
"targetHost": "10.1.1.8",
"targetPort": 443,
"targetPassphrase": "{{bigippassword}}",
```

Automate Application Deployments with AS3

- Application Services 3 Extension BIG-IP API extension that accepts a declarative API call
- Configures BIG-IP L4-7 services
- Minimizes need for BIG-IP domain specific knowledge
- Minimizes deployment errors
 - Makes it easy to integrate F5 automation into orchestration systems
- Runs on BIG-IP & BIG-IQ
- Create application dashboards for monitoring & alerts when used with BIG-IQ



HTTP Example Declaration – AS3

```
"class":"AS3",
"action": "deploy",
"persist":true,
"declaration":{
   "class":"ADC",
   "schemaVersion":"3.7.0",
   "id":"http-example-declaration",
   "label":"Task1",
   "remark": "Task 1 - HTTP Application Service",
   "http_tenant":{
      "class":"Tenant",
      "http app 1":{
         "class": "Application",
         "template": "generic",
         "http_vs_1":{
```

```
"http_vs_1":{
   "class": "Service_Generic",
   "virtualPort":80,
   "virtualAddresses":[
      "10.1.10.111"
   "pool":"http_pool",
   "profileHTTP":{
      "use":"http"
"http_pool":{
   "class": "Pool",
   "monitors":[
      "tcp"
   "members":
         "servicePort":80,
         "serverAddresses":
            "10.1.20.110",
            "10.1.20.111"
```

```
"class": "AS3",
"action": "deploy",
"persist":true,
"declaration":{
   "class": "ADC",
   "schemaVersion":"3.7.0",
   "id": "http-example-declaration",
   "label":"Task2",
   "remark": "Task 2 - Add-111P Application Service",
   "http_tenant":{
      "class": "Tenant",
      "http_app_1":{
         "class": "Application",
         "template": "generic",
         "http_vs_1":{
            "class": "Service Generic",
            "virtualPort":80,
            "virtualAddresses":[
               "10.1.10.111"
            "pool": "http_pool",
            "profileHTTP":{
               "use":"http"
         "http_pool":{
            "class": "Pool",
            "monitors":[
               "tcp"
            "members":[
                  "servicePort":80,
                  "serverAddresses":[
                      "10.1.20.110",
                      "10.1.20.111"
```

```
"http_app_2":{
   "class": "Application",
   "template":"generic",
   "http vs 2":{
      "class": "Service Generic",
      "virtualPort":80,
      "virtualAddresses":[
         "10.1.10.113"
      "pool":"http_pool_2",
      "profileHTTP":{
         "use":"http"
   "http_pool_2":{
      "class": "Pool",
      "monitors":
         "tcp"
      "members":[
            "servicePort":8082,
            "serverAddresses": [
               "10.1.20.112",
               "10.1.20.113"
```

```
1 11
                                                                                                                       "web_pool":{
"class": "AS3",
                                                    },
                                                                                                                           "class": "Pool",
"action": "deploy",
                                                    "waf_https":{
"persist":true,
                                                                                                                           "monitors":[
                                                       "class":"Tenant",
"declaration":{
                                                                                                                              "http"
                                                       "waf_app":{ 4
  "class": "ADC",
                                                          "class": "Application",
  "schemaVersion":"3.7.0",
  "id": "http-example-declaration",
                                                                                                                           "members":[
                                                           "template":"https",
  "label": "Task2",
                                                          "statsProfile":{
  "remark": "Task 2 - Add TTP Application Service",
                                                                                                                                  "servicePort":80,
                                                              "class": "Analytics_Profile",
  "http_tenant":{
                                                                                                                                  "serverAddresses":
                                                              "collectClientSideStatistics":true,
     "class":"Tenant",
                                                              "collectOsAndBrowser":false,
                                                                                                                                     "10.1.20.122",
     "http_app_1":{
        "class": "Application",
                                                              "collectMethod":false
                                                                                                                                     "10.1.20.123"
        "template": "generic",
        "http_vs_1":{
                                                                                                                           13,
                                                           "serviceMain":{
          "class": "Service_Generic",
                                                              "class": "Service HTTPS",
          "virtualPort":80,
                                                                                                                        "webtls":{
           "virtualAddresses":[
                                                              "virtualAddresses":[
                                                                                                                           "class": "TLS Server",
             "10.1.10.111"
                                                                 "10.1.10.129"
                                                                                                                           "certificates":
          "pool": "http_pool",
                                                              "pool": "web_pool",
                                                                                                                                  "certificate": "webcert"
          "profileHTTP":{
             "use":"http"
                                                              "profileAnalytics":{
                                                                 "use": "statsProfile"
                                                                                                                           1 }.
                                                                                                                        "webcert":{
        "http_pool":{
                                                              "serverTLS": "webtls".
          "class": "Pool",
                                                                                                                           "class":"Certificate",
                                                              "policyWAF":{
           "monitors":[
                                                                                                                           "certificate":{
             "tcp"
                                                                 "bigip":"/Common/templates-default"
                                                                                                                              "bigip":"/Common/default.crt"
                                                                                                                           },
           "members":[
                                                              "securityLogProfiles":[
                                                                                                                           "privateKey":{
                "servicePort":80,
                                                                                                                              "bigip":"/Common/default.key"
                "serverAddresses":[
                                                                    "bigip":"/Common/templates-default"
                  "10.1.20.110",
                   "10.1.20.111"
```

Deleting Configuration Objects with AS3

```
"class": "AS3",
"action": "deploy",
"declaration":{
   "class":"ADC",
   "schemaVersion":"3.12.0",
   "waf_https":{
      "class":"Tenant"
   },
   "http_tenant":{
      "class":"Tenant"
```

Real-Time Analytics with Telemetry Streaming



- Provides stats on: Device, LTM, tenants and apps, TLS Cert Inventory, and event log (all sources)
- Declarative
- Streams from BIG-IP to a data store
- Validated 3rd party consumers: Splunk, Azure Log Analytics, AWS CloudWatch, AWS S3, Graphite, ElasticSearch and more

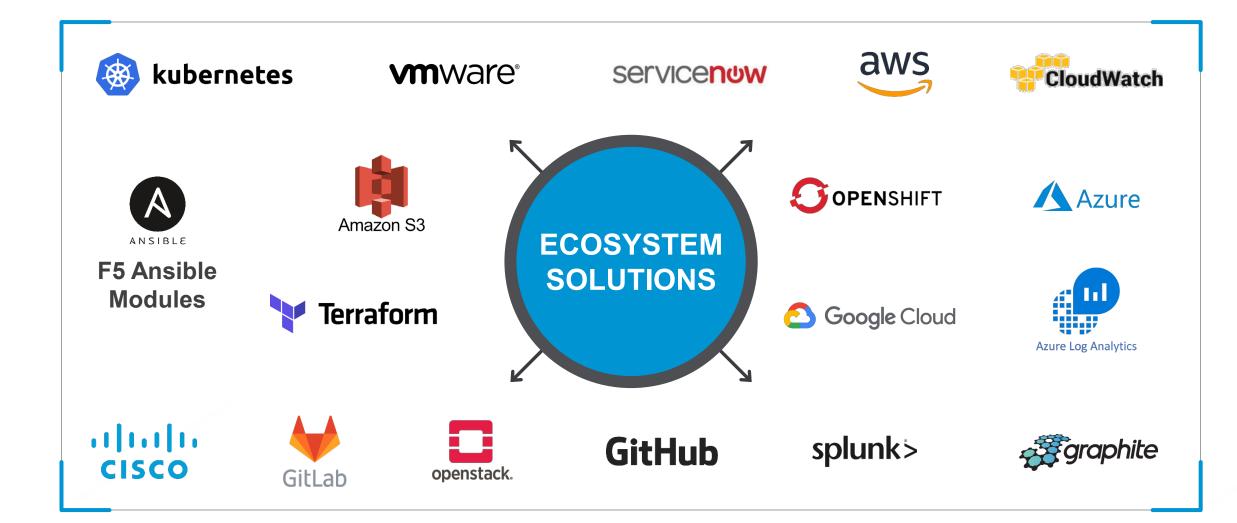
AWS CloudWatch Example Declaration – Telemetry Streaming

```
"class": "Telemetry",
"My_System": {
   "class": "Telemetry_System",
    "systemPoller": {
        "interval": 60
"My_Listener": {
   "class": "Telemetry_Listener",
    "port": 6514
"My_Consumer": {
    "class": "Telemetry_Consumer",
    "type": "AWS_CloudWatch",
    "region": "us-east-1",
    "logGroup": "test_group",
    "logStream": "automation_demo",
    "username": "{{AWS_ACCESS_KEY}}",
    "passphrase": {
        "cipherText": "{{AWS_SECRET_KEY}}"
```

Automation Orchestration Toolchain Benefits

- Minimizes
 - Need for BIG-IP domain specific knowledge
 - Onboarding errors & deployment errors
- Maximizes
 - Onboarding & deployment consistency
 - Reusability
- Easy Integration
 - Enables developers to extend F5 app services & integrate with CI/CD toolchains, orchestration systems & 3rd-party ecosystems
- Helps drive an organizations' adoption of Infrastructure as Code (IaC) & DevOps

Ecosystem Integrations



Automate BIG-IP with Ansible





Simple

- Agentless solution: No new software to install on BIG-IP
- Use Ansible to license a BIG-IP for application deployment



- Ansible integrates to make use of the native APIs of BIG-IP
- Ansible F5 modules follow best practice and enable compliance



- Automate the initial configurations on BIG-IP and deploy HTTP(S) apps
- Automate to Network the BIG-IP (VLANS, Self-IPs)

F5 Ansible BIG-IP Modules Now Available (Release 2.9.x)

bigip_monitor_udp - Manages F5 bigip_ssl_certificate rtificates from BIG-IP bigip_appsvcs_extension - Manage ap bigip_gtm_monitor_bigip - N bigip_monitor_udp - Manage ap bigip_gtm_monitor_bigip - N bigip_monitor_bigip - N bigip_monitor_bigi bigip_node - Manages F5 BIG-IP I bigip ssl key -- I m BIG-IP bigip_node - Manages F! bigip_asm_policy - Manage BIG-IP AS bigip gtm monitor external bigip_partition - Manage BIG-IP p bigip_state on a BIG-IP bigip_cli_alias - Manage CLI aliases on bigip_gtm_monitor_firepass bigip_partition - Manage bigip_policy - Manage general pol high variables bigip_cli_script - Manage CLI scripts o bigip_gtm_monitor_http - M bigip_policy - Manage ge bigip policy rule - Manage LTM bigip_command - Run arbitrary comm bigip_gtm_monitor_https - N bigip_policy_rule - Mana bigip_pool - Manages F5 Bt bigip_config - Manage BIG-IP configui bigip_gtm_monitor_tcp - Ma a BIG-IP bigip_pool - Manages F5 bigip_pool_member bigip_configsync_action - Perform diff bigip_gtm_monitor_tcp_half_ ups on BIG-IP bigip pool member - Ma bigip_profile_clic bigip_data_group - Manage data grou_l bigip_gtm_pool - Manages F bigip profile client ssl bigip_device_auth - Manage system a bigip_gtm_pool_member - M bigip_device_connectivity - Manages | bigip_gtm_server - Manages bigip_profile_dns - Mana pload, installation and removal of UCS files bigip_device_dns - Manage BIG-IP de bigip_gtm_virtual_server - M bigip_profile_http - Mar Fetches a UCS file from remote nodes bigip_device_facts - Collect facts from bigip_gtm_wide_ip - Manage bigip_profile_http per - Manage user accounts and user attributes on a BIG-IP bigip_device_group - Manage device bigip_hostname - Manage th bigip_profile rgip_vcmp_guest - Manages vCMP guests on a BIG-IP bigip_device_group_member - Manage bigip_iapp_service - Manage bigip_pr P | bigip virtual address - Manage LTM virtual addresses on a BIG-IP bigip_device_httpd - Manage HTTPD bigip iapp template - Manas big BIG-IP | bigip_virtual_server - Manage LTM virtual servers on a BIG-IP bigip_device_license - Manage license hage qkviews c bigip_vlan - Manage VLANs on a BIG-IP system bigip_iapplx_package - Mar bigip device ntp - Manage NTP serve role - Manage reme bigip wait - Wait for a BIG-IP condition before continuing bigip_irule - Manage in bigip device sshd - Manage the SSHI note_syslog - Manipulate bigiq_application_fasthttp - Manages BIG-IQ FastHTTP applications bigip_log_destip bigip device trust - Manage the trust ര routedomain - Manage rout bigip_facts - Collect facts from F5 BIC bigip_log_p bigig application fastl4 tcp - Manages BIG-IQ FastL4 TCP applications bigip selfip - Manage Self-IPs on bigip_firewall_address_list - Manage a bigip bigiq application_fastI4_udp - Manages BIG-IQ FastL4 UDP applications pigip service policy - Manages se bigiq_application_http - Manages BIG-IQ HTTP applications bigip_firewall_dos_profile - Manage A bigip_smtp - Manages SMTP setti bigip firewall policy - Manage AF bigiq_application_https_offload - Manages BIG-IQ HTTPS offload applications Manage Se bigip_snat_pool - Manage SNAT r bigip_firewall_port_list - Manage po. bigiq_application_https_waf - Manages BIG-IQ HTTPS WAF applications service_policv - M; bigip_snmp - Manipulate general bigip_firewall_rule - Manage AFM Fire bigip_snmp_community - Manage bigiq_regkey_license - Manages licenses in a BIG-IQ registration key pool pigip_smtp - Manages SI bigip firewall rule list - Manage AFM b bigip_snmp_trap - Manipulate SN bigiq_regkey_license_assignment - Manage regkey license assignment on BIG-IPs from a BIG-IQ anage bigip_snat_pool - Manag bigip gtm datacenter - Manage Datac bigi bigip software image - Manage s bigiq_regkey_pool - Manages registration key pools on BIG-IQ echo - M. bigip_snmp - Manipulate bigip gtm facts - Collect facts from F. bigip_ bigip software install - Install soft bigig utility license - Manage utility licenses on a BIG-IQ or_tcp_half_oper_bigip_snmp_community bigip gtm global - Manages global GT bigip me bigip_software_update - Manage bigiq_utility_license_assignment - Manage utility license assignment on BIG-IPs from a BIG-IQ

Conclusion

- Software is a Critical Component of every aspect of the DoD mission
- Challenges in DoD
- F5 Automation Toolchain
 - DO, AS3, TS
- Ecosystem Integrations
 - Ansible F5 Modules
- F5 Automation Toolchain + Ansible Demo
 - Near real-time insights w/ Telemetry Streaming
 - Grafana Dashboard (visualization tool)

Getting Started Resources

- Declarative Onboarding (DO)
- •https://clouddocs.f5.com/products/extensions/f5declarative-onboarding/latest/
- Application Services Extension (AS3)
- •https://clouddocs.f5.com/products/extensions/f5appsvcs-extension/latest/
- Telemetry Streaming (TS)
- •https://clouddocs.f5.com/products/extensions/f5telemetry-streaming/latest/
- •F5 Ansible Modules & Integration
- •https://clouddocs.f5.com/products/orchestration/ansible/devel/

- BIG-IQ API
- •https://clouddocs.f5.com/products/big-iq/mgmt-api/v7.0.0/
- F5 Container Connector (OpenShift)
- •https://clouddocs.f5.com/containers/v2/openshift/
- •F5 Container Ingress Services (Kubernetes)
- https://clouddocs.f5.com/containers/v2/kubernetes/
- General Cloud Docs
- •https://clouddocs.f5.com/

F5 DoD Account Team



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Thank You

F5 DoD Virtual User Group (DoDVUG) Schedule

Date	Title	F5 DoDVUG Topic
Apr 9th Thursday@ 1500	F5 DoD Virtual User Group #1	F5 Access Policy Manager with remote access, network tunneling, and CAC/PIV Authentication.
April 23rd Thursday@ 1500	F5 DoD Virtual User Group #2	Get Your SaaS in Gear Enterprise Application Strategy
May 7th Thursday@ 1500	F5 DoD Virtual User Group #3	Ghastly Wealth Compliance using F5 ASM
May 21st Thursday@ 1500	F5 DoD Virtual User Group #4	Automation/Orchestration - F5 A/O Toolchain
June 4th Thursday@ 1500	F5 DoD Virtual User Group #5	SCCA / SACA
June 18th Thursday@ 1500	F5 DoD Virtual User Group #6	SSLO Orchestrator