



How 5G Success Starts With Your Infrastructure

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Agenda

Introduction

- Why is 5G different?

BIG-IP Service Proxy for Kubernetes (SPK)

- The need for non-HTTP based traffic management

Carrier-Grade Aspen Mesh (CGAM)

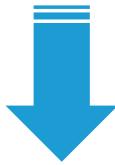
- How a service mesh simplifies operations

The Promise of 5G

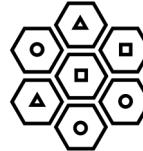
eMBB
(Enhanced Mobile Broadband)



> 10 Gbps
peak data rates



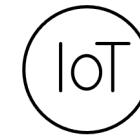
mMTC
(Massive Machine Type Communication)



1,000,000
devices per km²



uRLLC
(Ultra Reliable and Low Latency Communication)



< 1 ms
radio latency



Deploying 5G infrastructure will be the most transformative technology transition to date, unlocking new opportunities and enabling digital transformation across all industries.

Media & Entertainment

Healthcare

Transportation & Logistics

Smart Cities

5G Service Based Architecture Characteristics

Application Service Availability



application centric
service availability



Application Performance

a network optimized for
apps running on top

Application Service Quality



application centric
quality treatment



Application Insight

application centric visibility
and analytics

5G Success Starts with the Infrastructure

NEW DEMANDS ON THE INFRASTRUCTURE

- Service Based Architecture (SBA) supporting cloud-native applications
- Hosting vRAN, 5G Core, and new enterprise and consumer use cases enabled by 5G
- Support transition from 4G to 5G

TAKE CONTROL OF THE INFRASTRUCTURE

- Control, security and visibility of the cloud-native infrastructure is key to delivering the promise of 5G
- Google, AWS, Facebook and Apple all view the infrastructure central to their success and are focused on control, security and visibility of their infrastructure

F5 has solutions from far edge to core

Application and Managed Services



WAF, Secure Access, DDoS

Load Balancer, Ingress Controller, API Gateway, App/Web Server

5G Network

5G Core

UPF

vRAN

Infrastructure Services



N6-LAN and Security Services: CGNAT, DDoS, Firewall, TCP Optimization, Video Optimization, DPI, LDNS, AWAFF, SmartNIC Integration

Cloud-Native Infrastructure



SPK &
Aspen Mesh
for Telco/5G
workloads

Nginx Ingress
Controller & Service
Mesh for IT workloads

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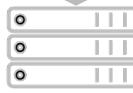
SPK &
Aspen Mesh
for Telco/5G
workloads

Nginx Ingress
Controller & Service
Mesh for IT workloads

Virtualization (VNF) / Containerization (CNF)



Far Edge
(MEC)



Local DC
(MEC)



Regional DC
(MEC)



Central DC

Telco Cloud



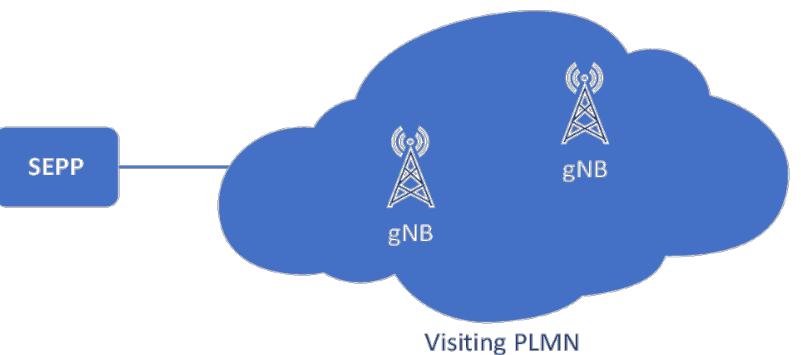
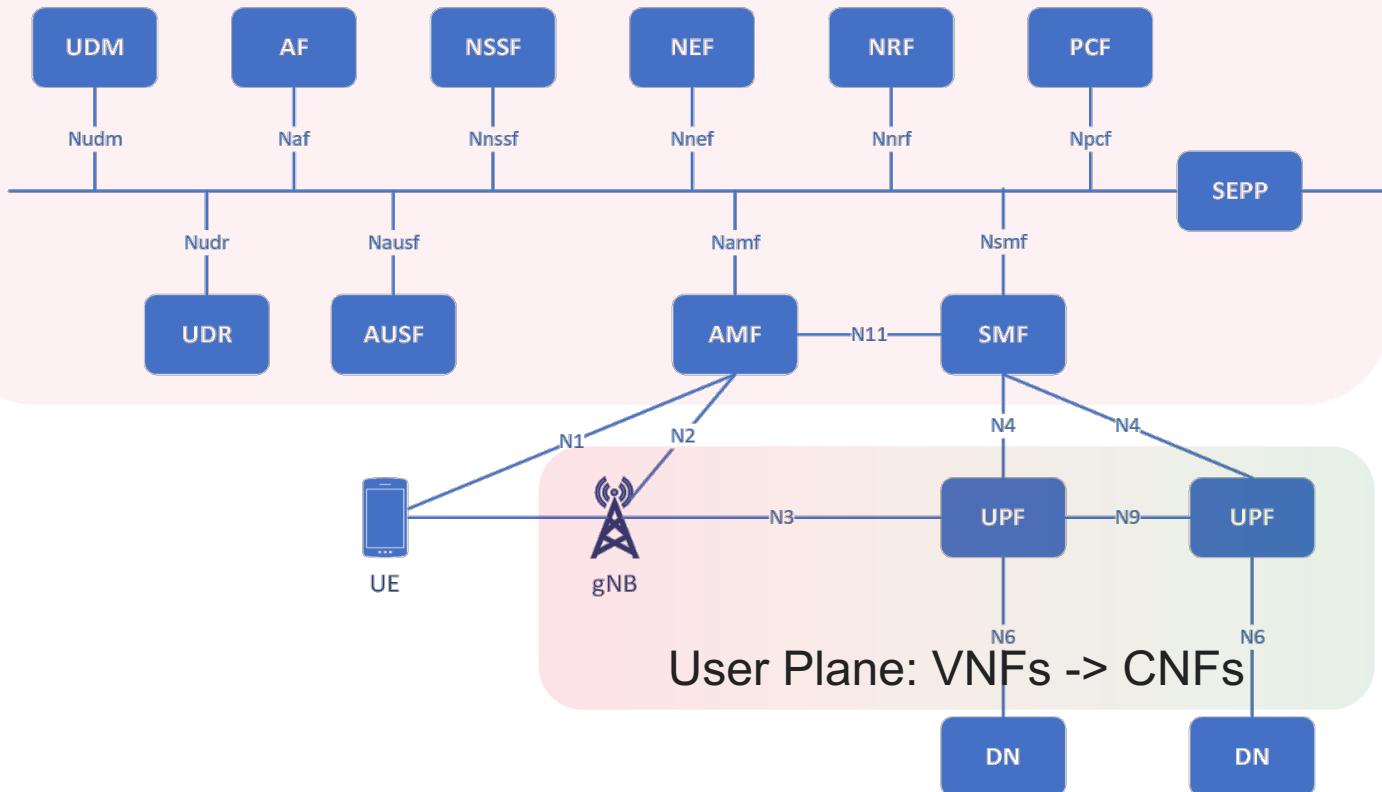
Service Proxy for Kubernetes (SPK)

CREATING INFRASTRUCTURE FOR A SERVICE PROVIDER'S FUTURE

5G Packet Cores – Cloud Native Transition

MOST SERVICE PROVIDERS ARE DEPLOYING 5G CONTROL PLANES ON KUBERNETES

Cloud-Native Control Plane (KUBERNETES)



Ingress Controller for Service Provider workloads

F5 CORE STRENGTHS APPLIED TO KUBERNETES INGRESS

Kubernetes provides flexibility, scalability, and efficiency that will be key for Service Providers

- 5G Packet Cores
- Edge Computing / Edge Sites
- Digital Transformation



However Kubernetes was not designed for Service Providers

Traditional Kubernetes ingress is only HTTP load balancing. This causes several significant problems:

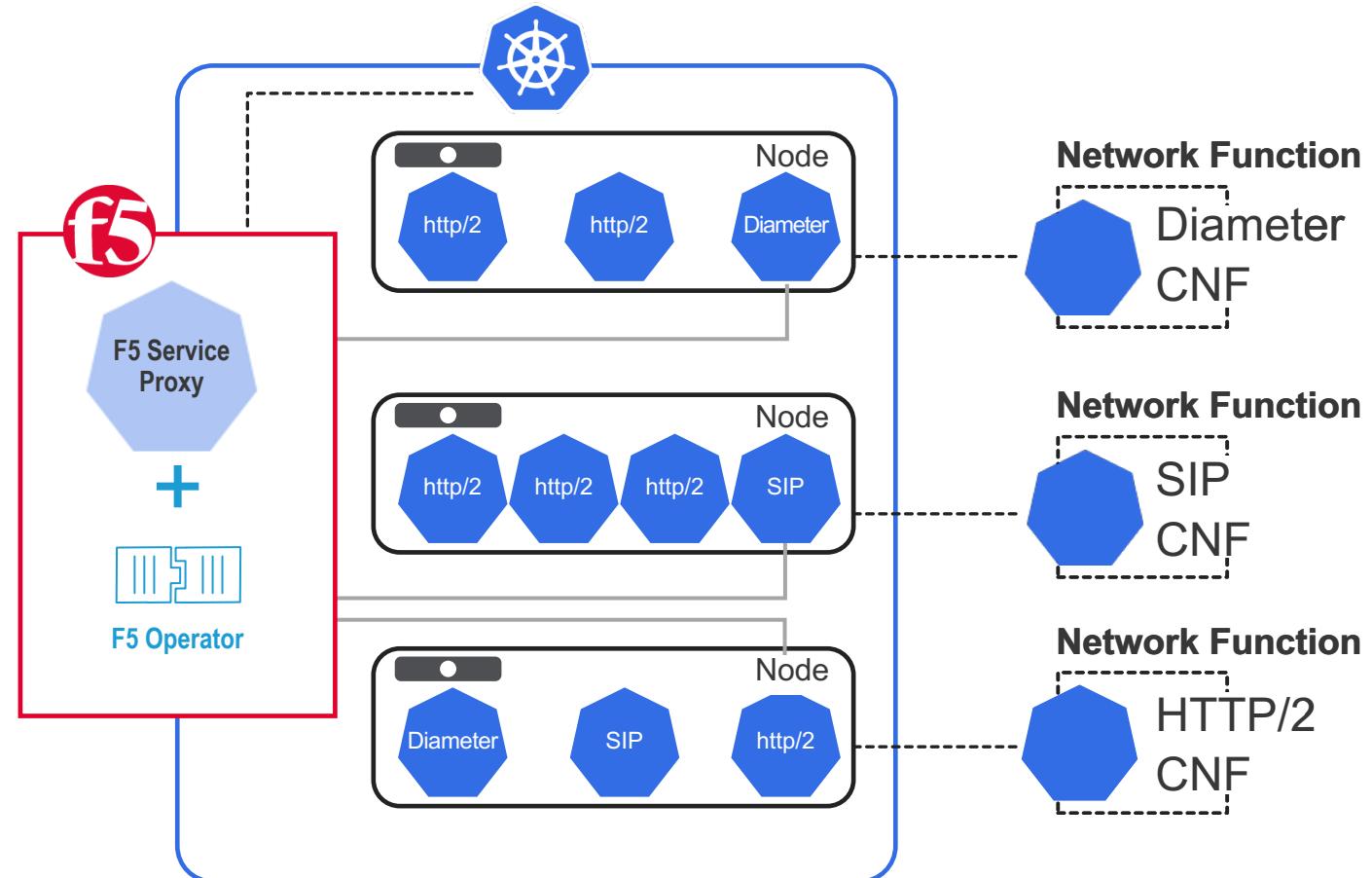
- Difficulty managing service provider protocols (including 5G use of HTTP/2)
- Limited egress capabilities
- Lack of security controls
- Lack of visibility and revenue controls (a particular issue for SPs)
- No redirection for multi-cloud

Ingress examples

Security (SNIC, DDOS)
Encrypt/Decrypt
Traffic steering
4G/5G signaling

Containerized Network Function (CNF) pods are deployed in a K8s cluster, with different signaling interfaces

KUBERNETES CLUSTER

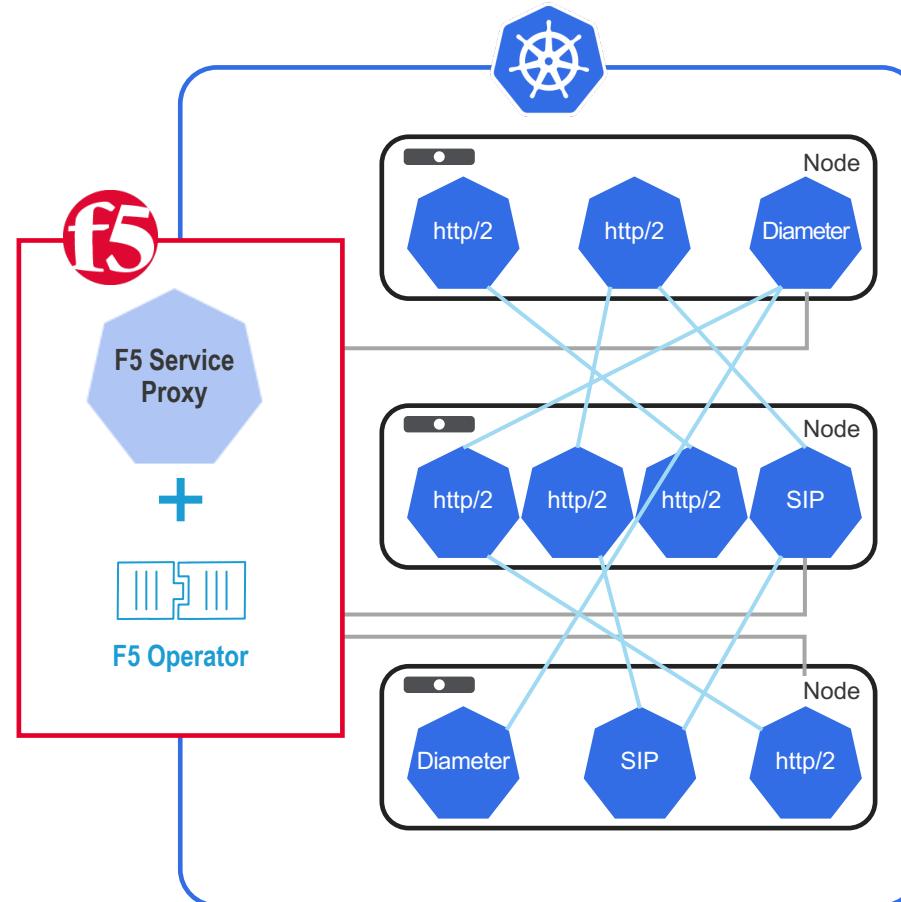


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KUBERNETES CLUSTER



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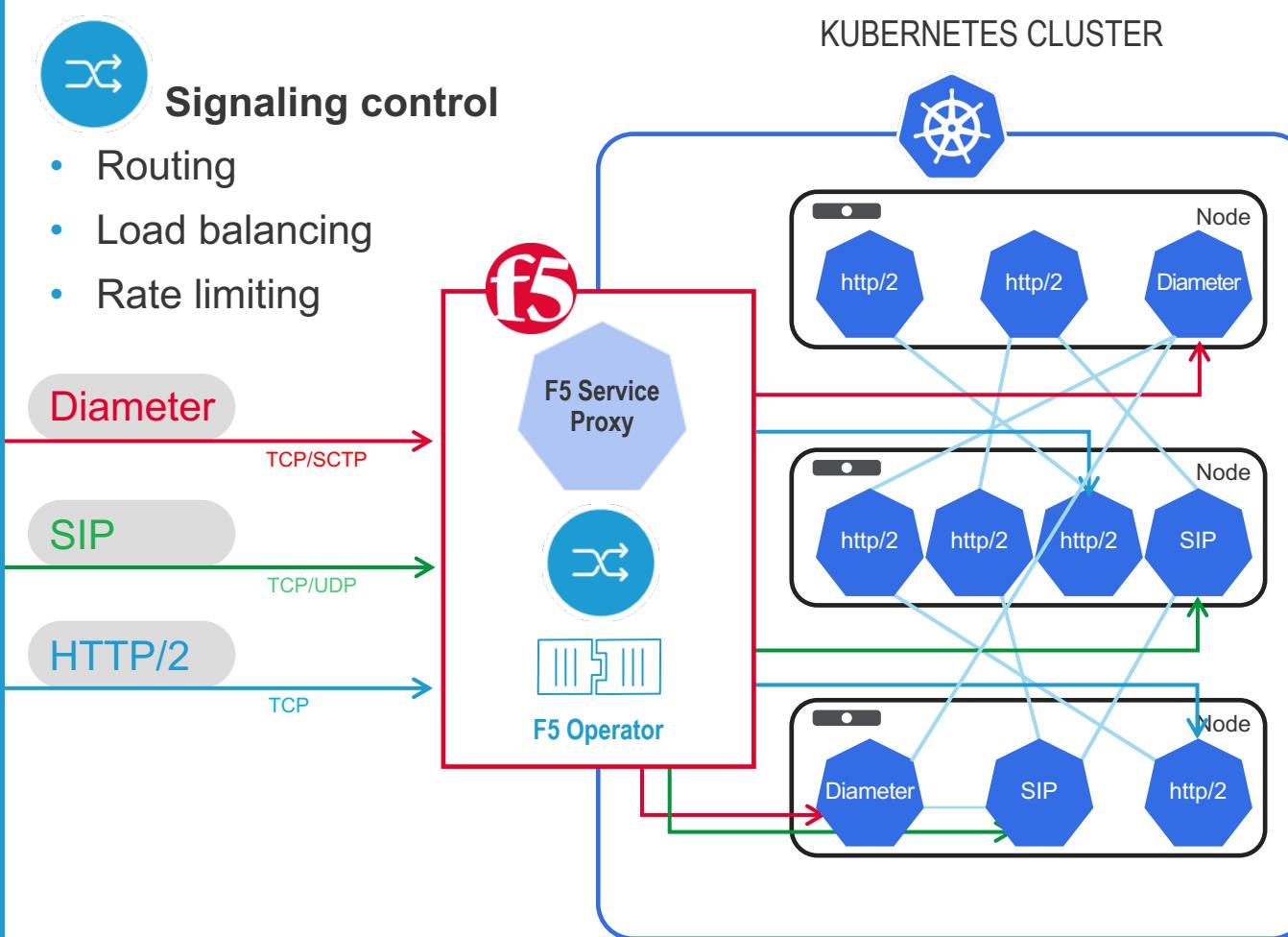
Security (SNIC, DDOS)

Encrypt/Decrypt

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4G/5G signaling

Service Proxy provides multi-protocol ingress



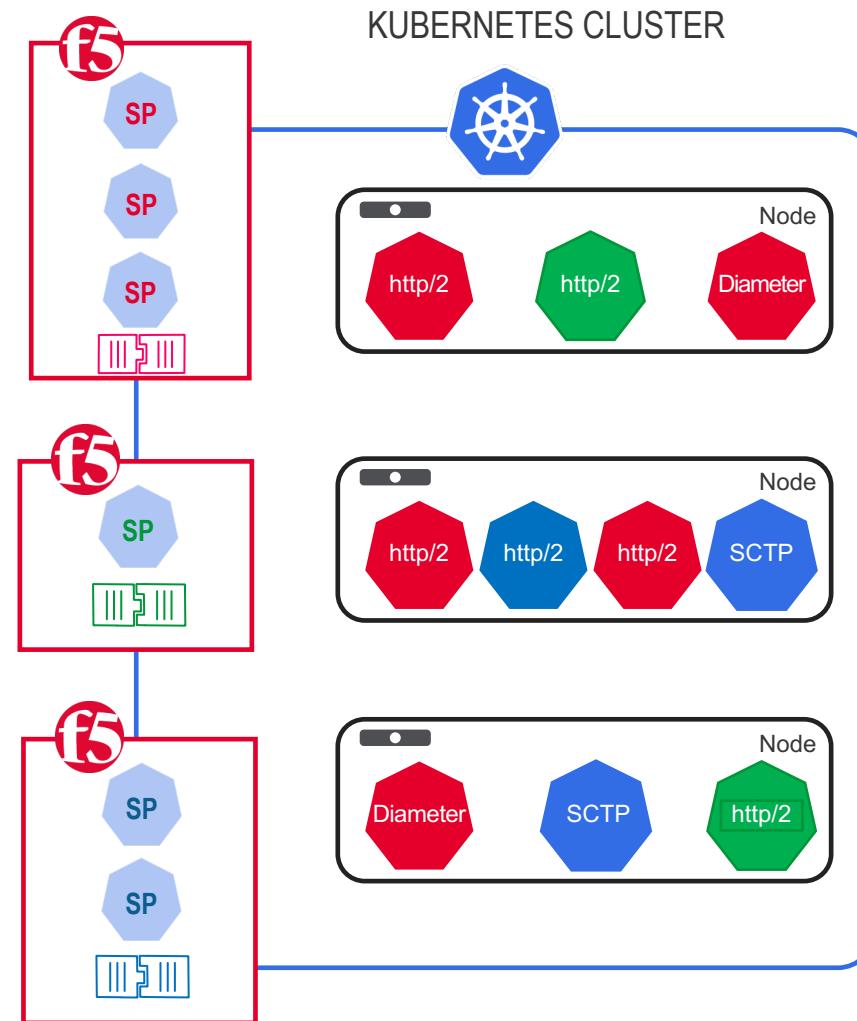
Signaling control

- Routing
- Load balancing
- Rate limiting

Ingress examples

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Service Proxy deployed as part of stack for each CNF



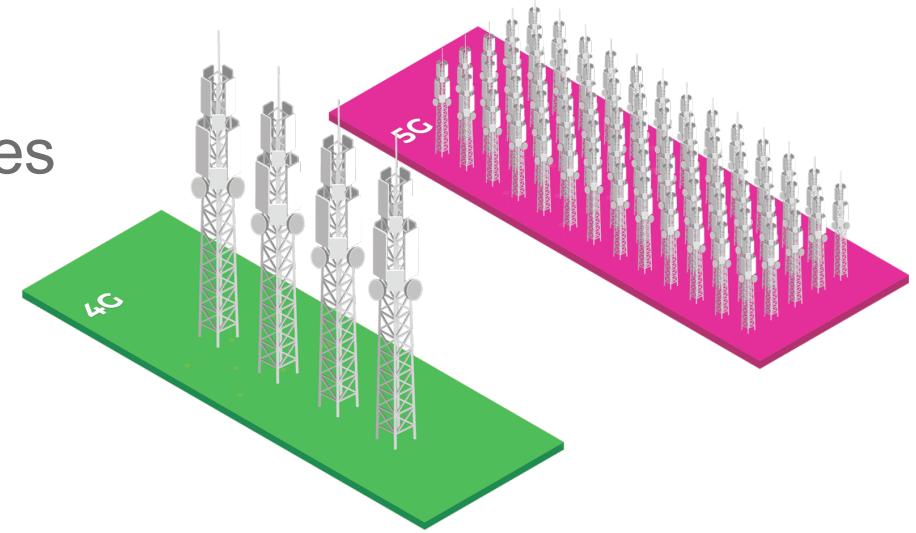
Carrier-Grade Aspen Mesh (CGAM)

***MONITORING, SECURING AND CONTROLLING 5G TRAFFIC FROM THE
CORE TO THE EDGE***

5G Is All About the Edge

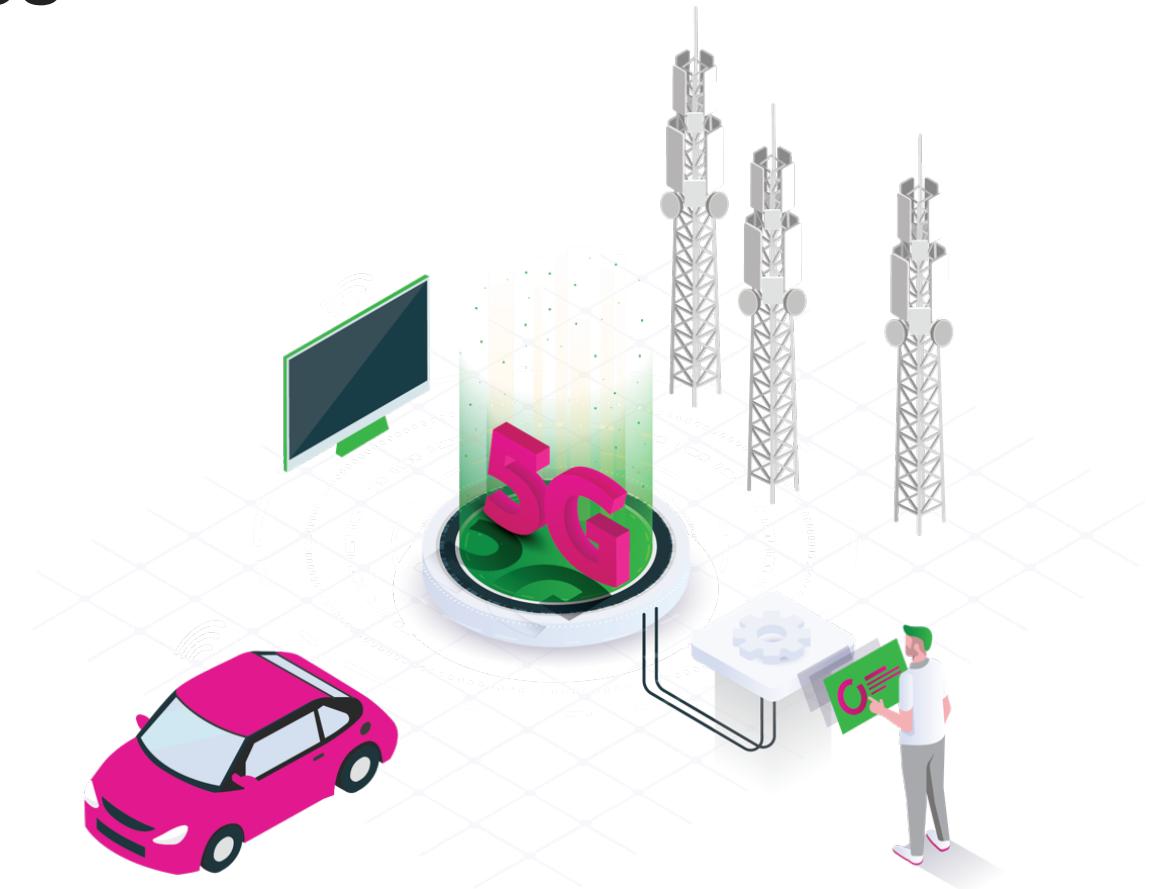
IT'S NOT ENOUGH TO BUY MORE SPECTRUM AND POWERFUL RADIOS

- Cell sites are disaggregating
- Economics are driving flexible, scalable architectures
- Common platforms from core to far-edge
- Specialization driven by software
- Hardware is a commodity and can be re-purposed



The Edge Requires Kubernetes

- Speed, flexibility, scalability
- Granularly provision capacity
- Prevent vendor lock-in
- Unified API from core to far-edge
- Adaptable, cloud-native solution



Move around grains of sand rather than bricks!

Kubernetes Has Unsolved Runtime Challenges...

What NFs are running in my cluster?

Is my traffic secure?

How can I debug during an outage?

Are my call-flows working?

How do I make sense of all these metrics?

Am I meeting our SLAs?

How do I meet my compliance regulations?

How do I transition from legacy protocols?



Service Mesh Solves These Challenges

ASPEN MESH IS A TRANSPARENT INFRASTRUCTURE LAYER BETWEEN APPLICATION AND THE NETWORK

Observability

SEE WHAT'S HAPPENING

- Cross-cluster visibility
- Network function health
- Call flow performance
- Metrics & L7 Tracing
- Configuration events
- Packet capture

Security

AUTH & ENCRYPTION

- Mutual TLS between NFs
- Mutual TLS across clusters
- Certificate Management
- One roadmap for security
- Single SSL stack

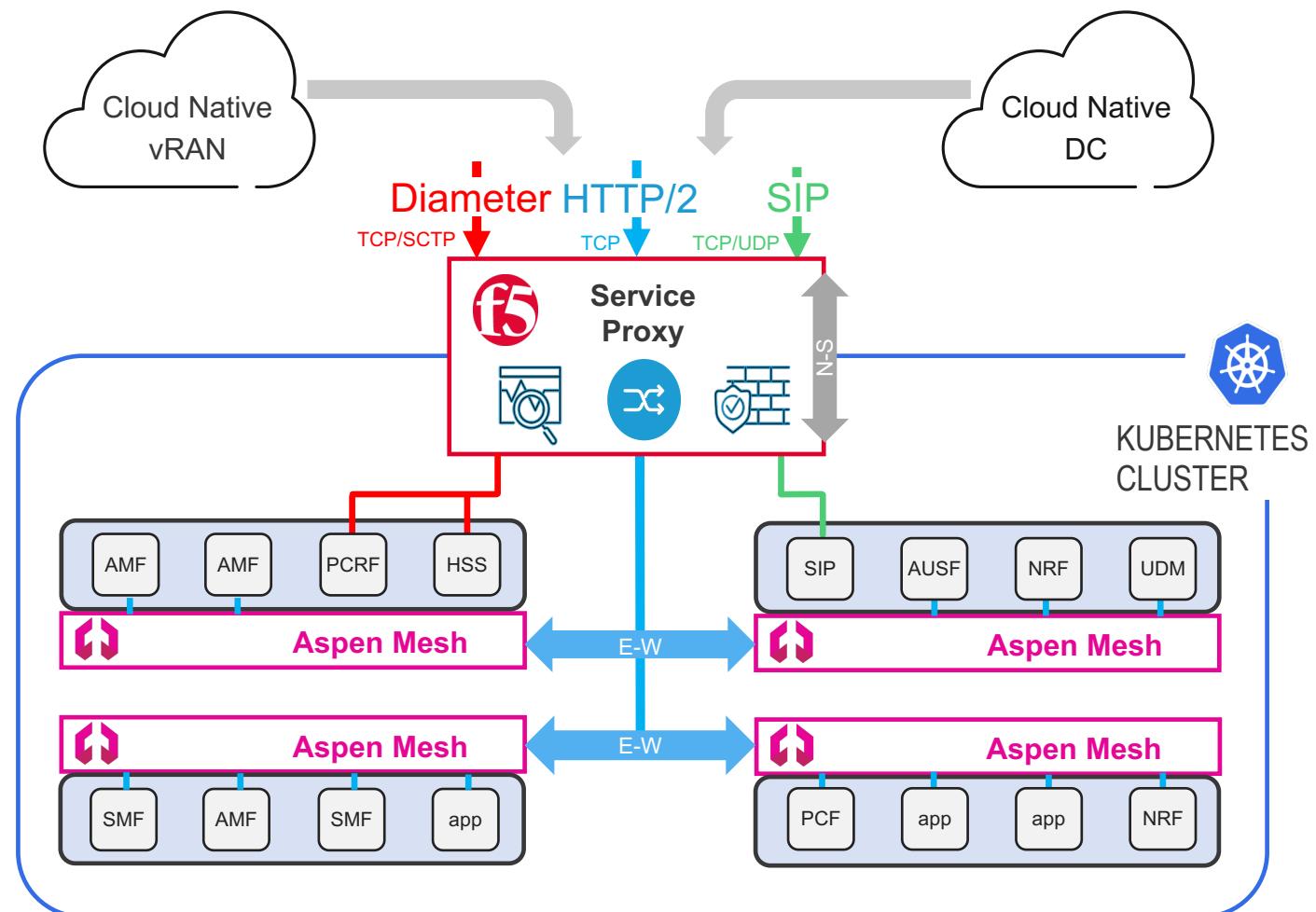
Control

MANAGE FROM ONE PLACE

- Maintain platform stability
- Application independence
- Workload mobility
- Inter-vendor integration
- Phased deployments (canary)
- Test plans

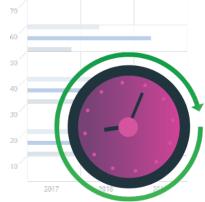
Key 5G Platform Use Cases

1. Unified architecture from core to far edge
2. Best of breed network functions
3. Reducing MTTR to meet SLAs*
4. Encryption and authentication of traffic*
5. Single point of control for application policy
6. Common telemetry and metrics
7. Meeting lawful intercept requirements*



5G Use Case: Reducing MTTR to Meet SLAs

LEVERAGE ASPEN MESH RAPID RESOLVE TO ACHIEVE LOWEST MTTR OF ANY PROVIDER



Restore failures quickly by machine assisted root cause analysis



Replay current and past state of your 5G control-plane to understand and diagnose cascading failures



Report outages, root cause and corrective actions in an organizationally appropriate and meaningful way



Predict future events that increase risk of application failures or performance impacts to ensure SLAs are met



5G Use Case: Traffic Encryption and Authentication

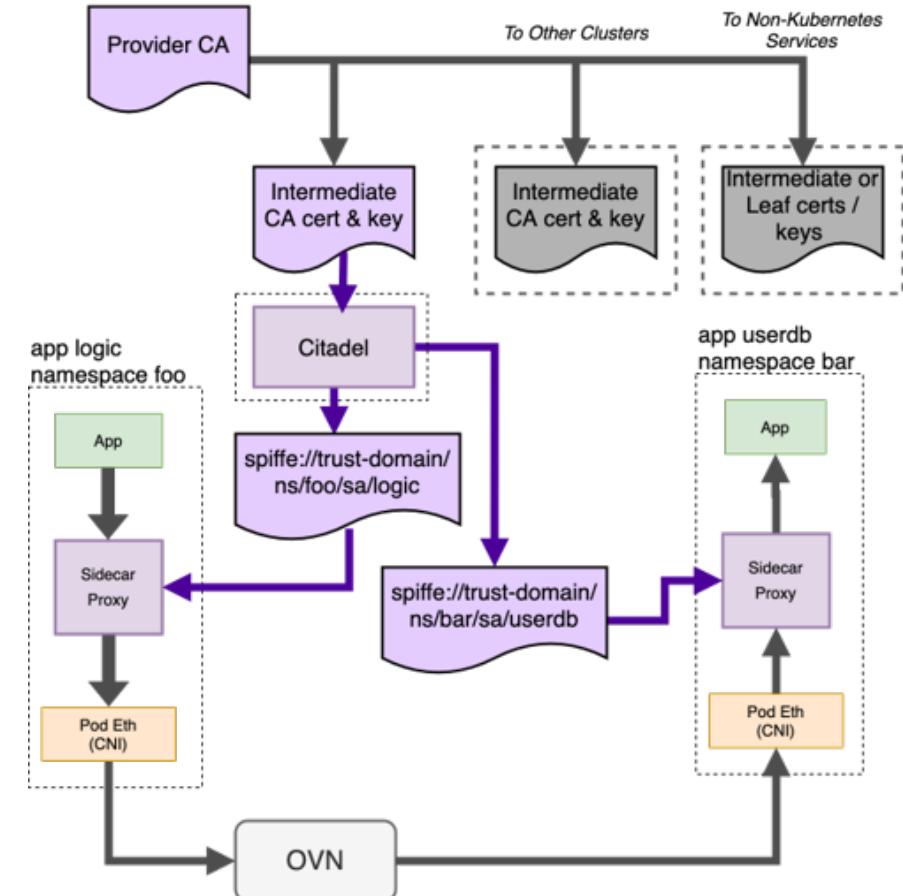
MUTUAL TLS WITH 3GPP COMPATIBLE CERTIFICATE MANAGEMENT

Challenges

- Integration with provider owned certificate authority
- Non-Kubernetes services
- Legacy NF support
- DNS SAN based certificates

Solution: Aspen Mesh CA Service

- Extensibility to support custom certificate CA root
- Mesh-extension for non-container NFs
- DNS identities in SAN
- Custom certificate fields
- Kubernetes secrets & Secret Discovery Mode



5G Use Case: Packet Capture with Packet Inspector

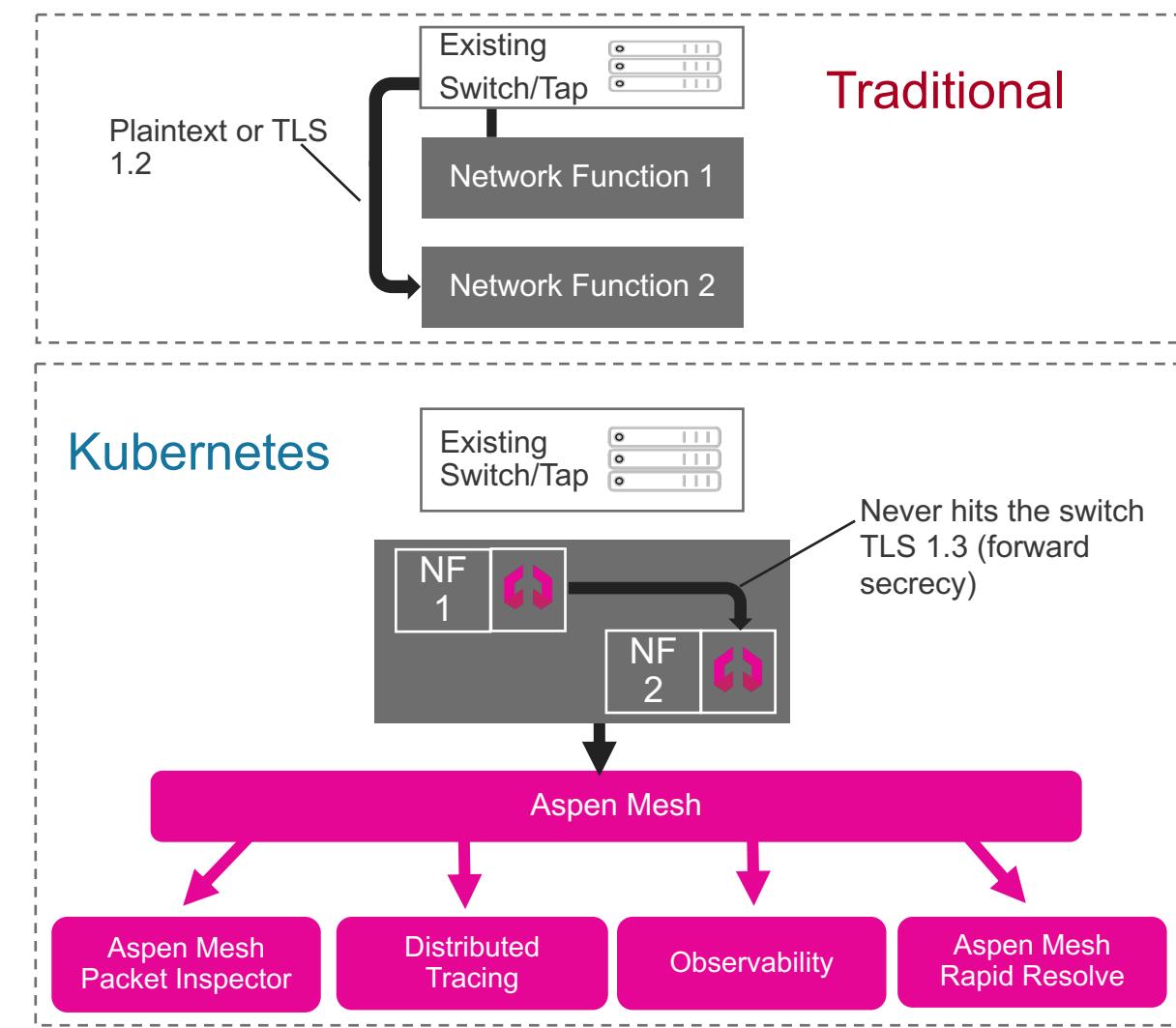
VISIBILITY FOR PACKETS THAT NO LONGER HIT THE WIRE AND ARE ENCRYPTED WITH PFS

Challenges

- Packet-level inspection of flows in container environment
- Key management and mTLS 1.3 PFS challenges
- Lawful intercept and compliance requirements
- Leverage existing packet broker investment
- Operations troubleshooting, knowledge and training

Solution: Aspen Mesh Packet Inspector

- Inter-service capture at sidecar
- Pre-encryption tapping
- Compatible with TLS 1.3 Forward Secrecy
- Integrates into existing infrastructure & automation
- Scalable and extensible



Carrier-Grade Aspen Mesh Provides Critical 5G Capabilities



Traffic Visibility

Visibility of east-west traffic within each 5G Kubernetes cluster allows revenue assurance and visibility into data needed to monetize 5G using existing billing and charging systems.



Policy Management

Configure and enforce business and security policies for your service mesh and network traffic.



3GPP Security

A consistent approach to encrypting and authenticating all traffic between multi-vendor and multi-site network functions, built on the strongest mTLS techniques that are tied back to a 3GPP-compatible certificate authority.



Traffic Management

Fine-grained traffic control needed to intelligently and efficiently route service communication inside Kubernetes.



Packet Capture

A unique solution that captures packets that current solutions never see, providing full packet visibility for troubleshooting and meeting lawful intercept requirements.



Container Observability

L7 metrics, logs and traces provide an end-to-end view of what's happening within every container so you can quickly troubleshoot and resolve problems from the edge to the core.

Learn more or schedule a demo:
aspenmesh.io/carrier-grade



ASPEN MESH

Typical F5 5G Core Deployment with SPK and CGAM

SPK and CGAM work independently of each other solving similar but separate problems

There is no integration between SPK and CGAM

Separate technology selection and buying decision

