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OCTOBER 11-14

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**2021 Fall
Technical Forum**
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Cloud & Virtualization

Distributed Multi-layer Infrastructure Management for Multi-Access Edge Computing Services: Using Kubernetes to implement a MEC architecture

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Enterprise Infrastructure Rapidly Evolving to Improve Performance and Security while Reducing Complexity and Cost



Growing number and diversity of remote sites



Profusion and diversity of business applications



Shift towards cloud-native



More data and intelligence residing at the edge

Manufacturing & Field Service

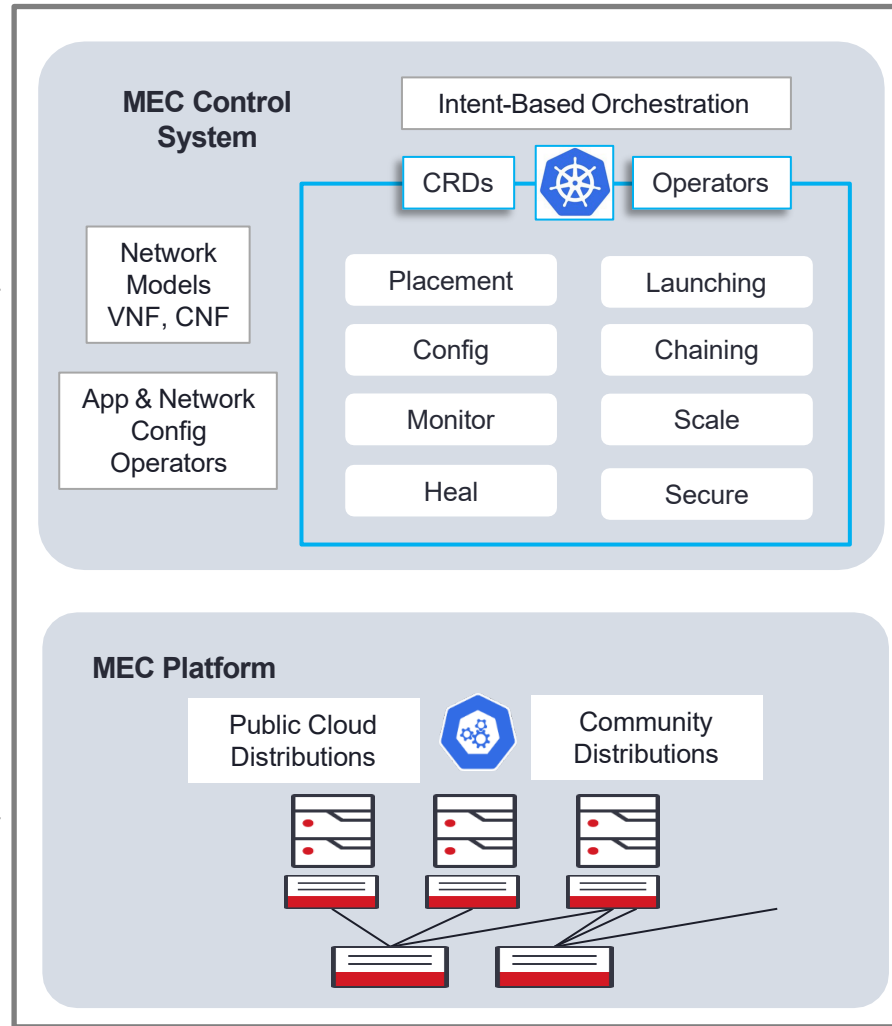


Low Latency Mixed Reality Tools
 On-Prem & in Public MEC

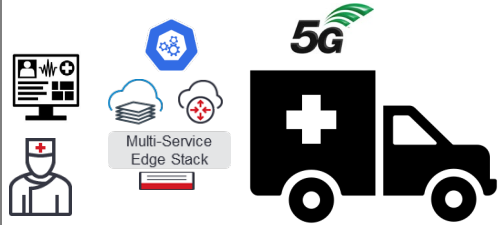
SW Defined Store



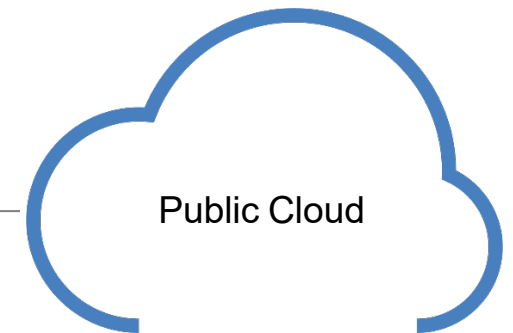
Multi-Service Edge Stack



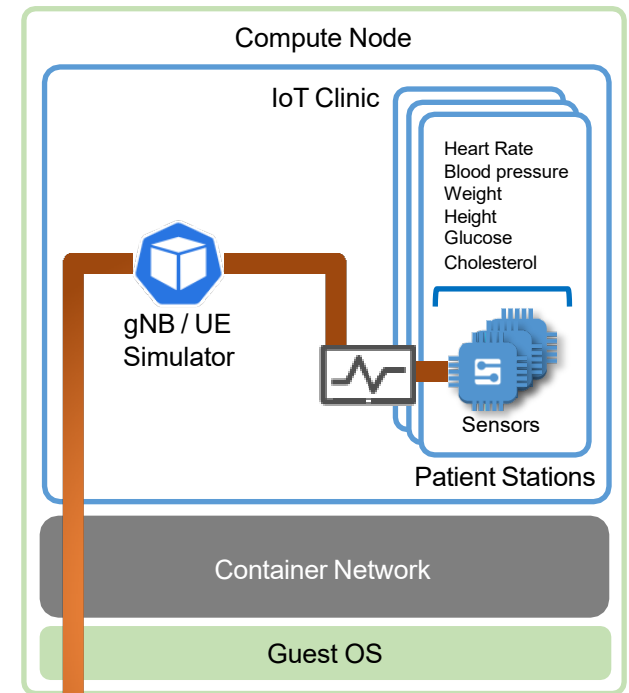
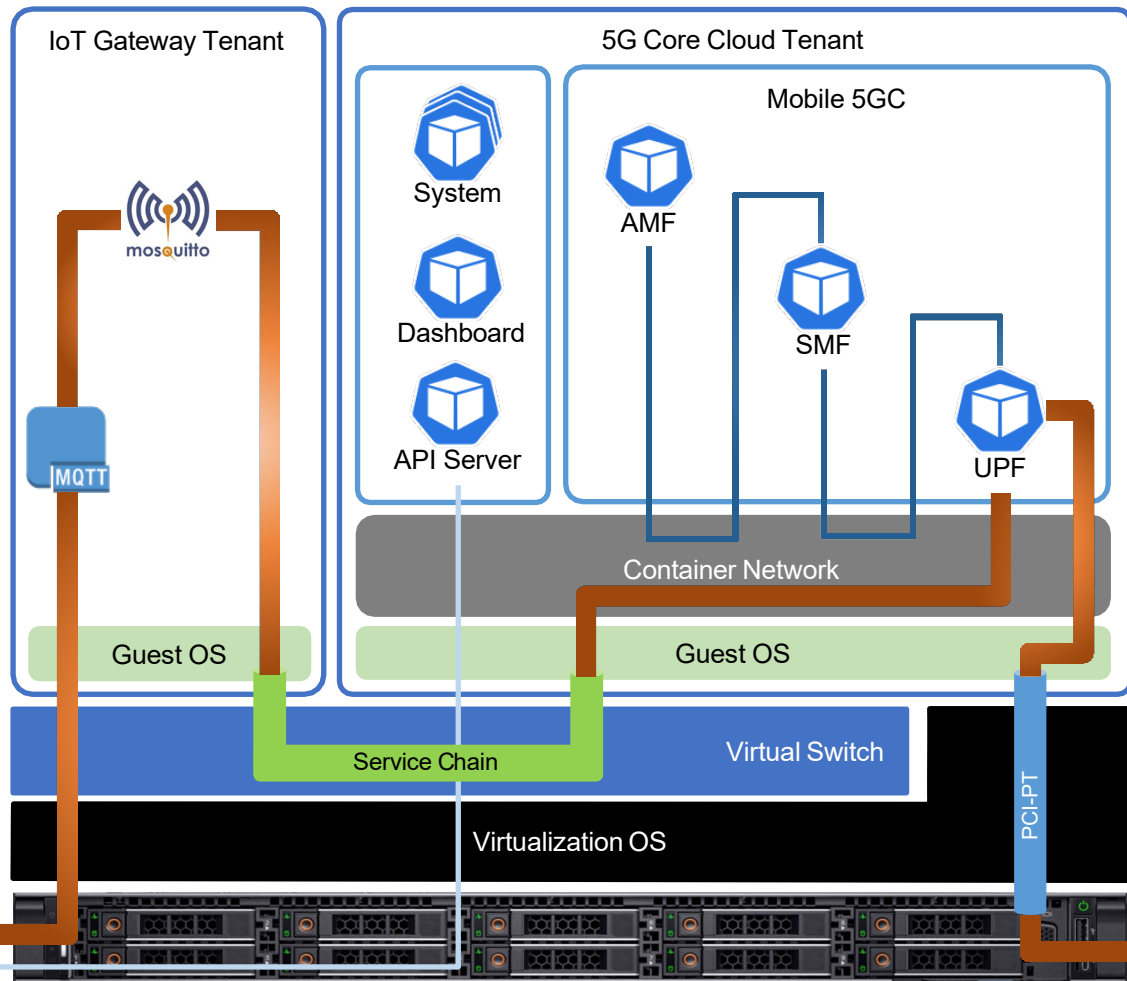
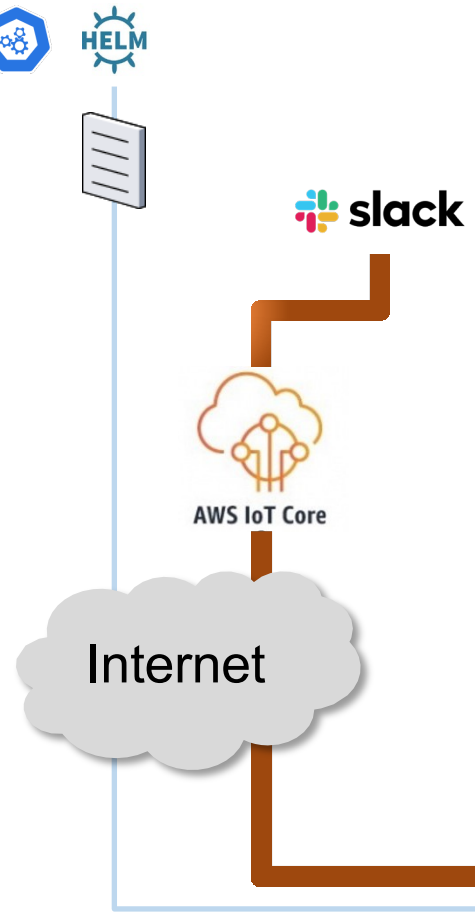
Mobile Health Clinic



Multi-Service Edge Stack



Declarative Orchestration



DISTRIBUTION

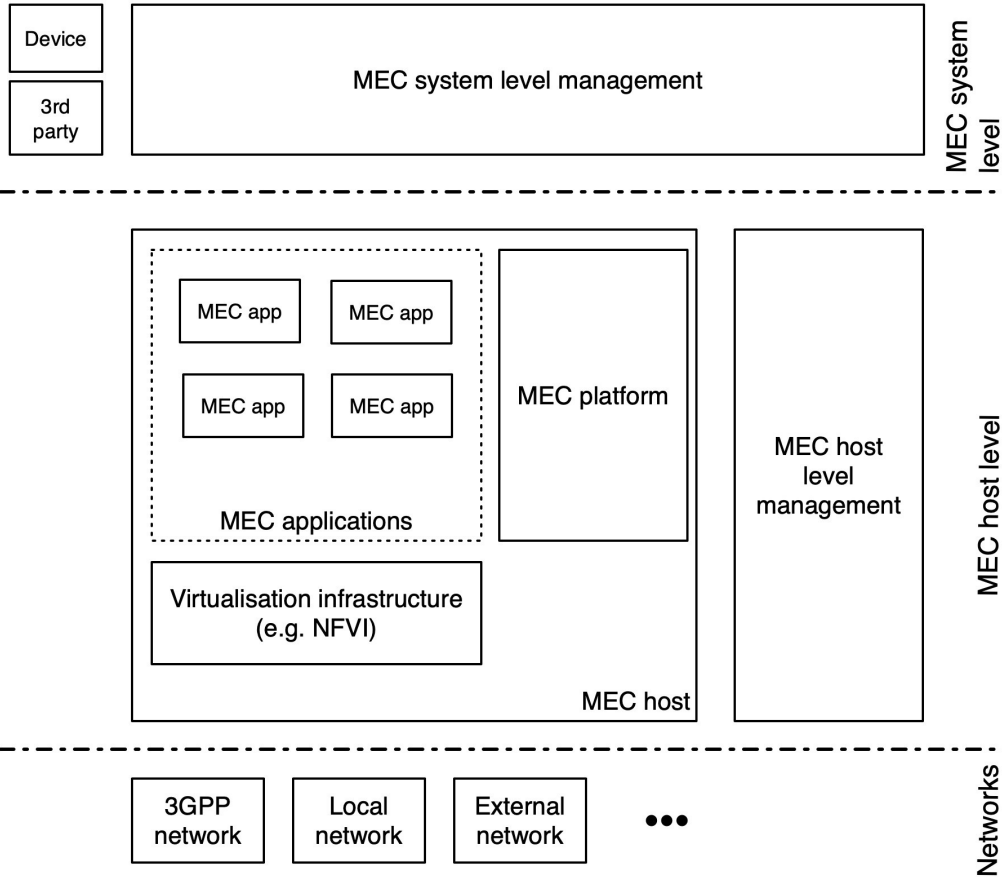
DELEGATION	PRESCRIPTIVE	CONSTRAIN
	OPEN LOOP	CLOSE LOOP
	<p>T Operator determines distribution of resources from a central control point that are then independently managed by the delegate cluster</p>	<p>Operator specifies resource constraints that determine distribution of resources that are then independently managed by the delegate cluster</p>
	<p>Operator determines distribution of resources from a central control point but distributed resources are remotely monitored with actions potentially taken on state changes</p>	<p>Operator specifies resource constraints that determine distribution of resources, the resources and constraints are remotely monitored with actions taken on constraint violations</p>

True adaptive environments require a shift from prescriptive, open loop to descriptive constraint, closed loop operational models leveraging telemetry, automation, and intelligence

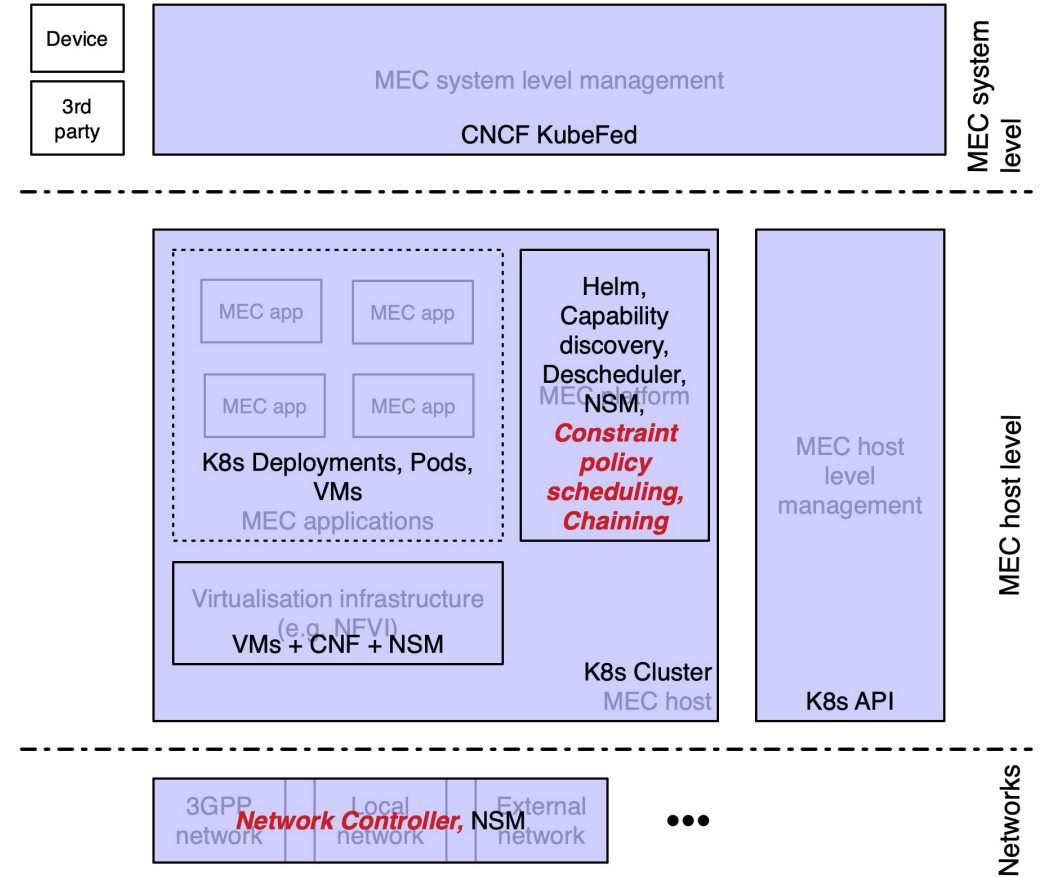
Industry is moving in the towards truly adaptive operational models and technologies like Kubernetes is a helping in the shift

A mesh of inter-working controllers operating on common declarative and operational telemetry to drive automation

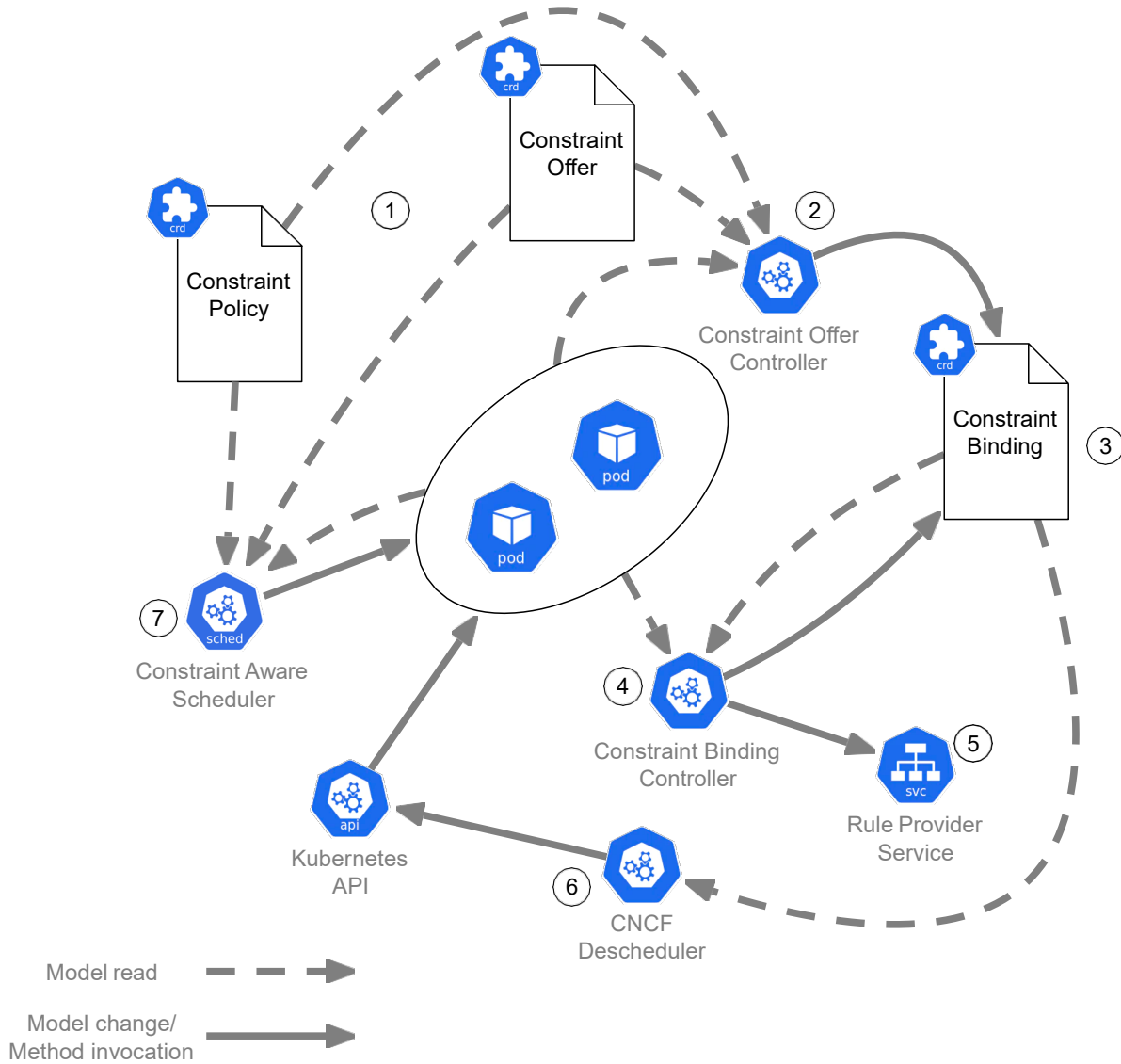
* Custom components and extensions added by implementation highlighted in **bold red**



MEC Architecture



MEC Architecture with Kubernetes Overlay

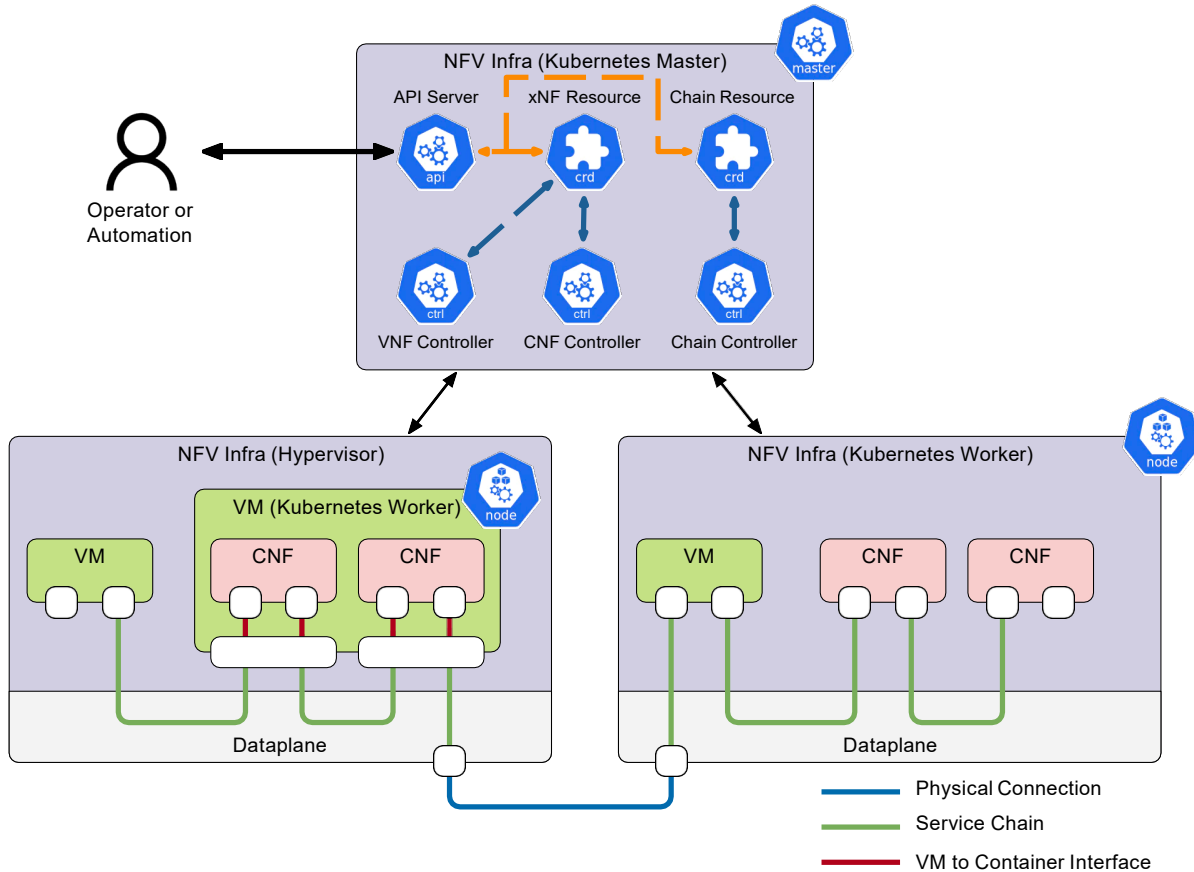


Enables scheduling of applications with consideration of network connectivity as a declarative resource constraint

Expression of constraints, including those that relate to network connectivity, such as bandwidth, latency, and jitter

Constraints consulted when scheduling pods to nodes, including invocations to a network controller when required connections don't currently exist

Constraints monitored to ensure they remain compliant, and reconciliation taken if there is a violation



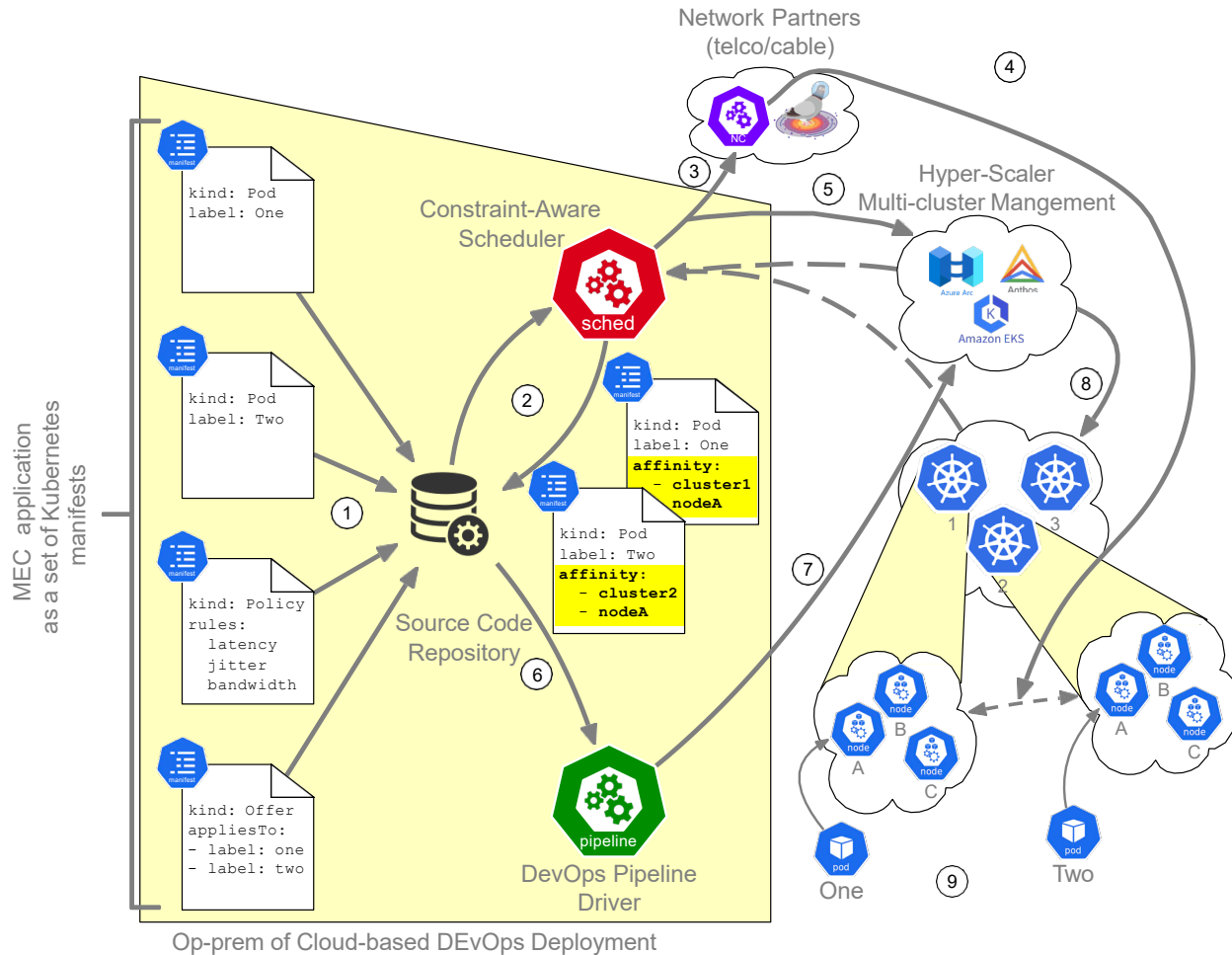
Workloads will be based on VMs, containers, serverless and “future technologies”

Separate abstracted workload specification from underlying technology

Leverage specialized hardware when and where it exists

Declare network chains between workloads regardless of underlying technologies

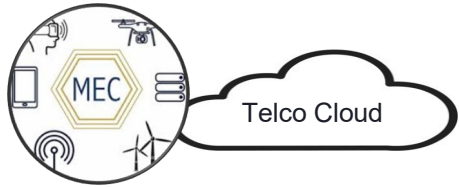
Span chains across single or multiple physical hosts



Industry solutions will include public and private clouds, must be able to support cross cloud deployments and automation in a consistent way

Cannot always deploy custom schedulers / controllers when integrating with clouds outside your administrative control

Leveraging process pipelines, like GitOps, in conjunction with custom “controllers” and standard Kubernetes constructs provides a route to capability



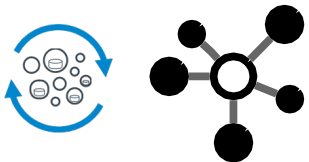
Communications Service Providers need strategies to monetize the growth of containerized applications & multi-cloud technology services on the network edge



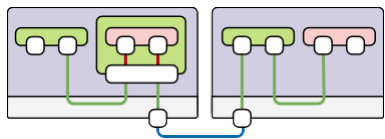
CNCF projects and the Kubernetes eco-system can be leveraged to build MEC service deployments compatible with cloud technologies while enabling application portability



Kubernetes is an intent-based closed loop automation system that can support declarative specifications of virtualized and containerized service function chains



Extensions to Kubernetes scheduling with connect-based constraints is a powerful tool to enable optimal deployment of workloads across a distributed edge compute network



Extending Kubernetes to support a common abstraction over ubiquitous workload technologies, declarative application chaining, and supporting diverse hardware capabilities is essential to enabling MEC applications



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Thank You!

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