

A close-up photograph of fiber optic cables, showing numerous small, glowing blue and green light sources at the ends of the fibers, set against a dark background.

NXTWORK 2017
JUNIPER CUSTOMER SUMMIT

JUNIPER
NETWORKS

A series of white-outlined cloud icons of varying sizes are arranged horizontally, positioned above a dense field of glowing blue and green dots that resemble fiber optic light sources.

**Evolvable Multi Cloud:
ARCHITECTURE WITHOUT LOCK-IN**

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PRESENTERS



James Kelly
Lead Cloud Architect
Juniper Networks

- Engineer
- Marketer
- Continual Learner (Kaizen Jedi)



AGENDA

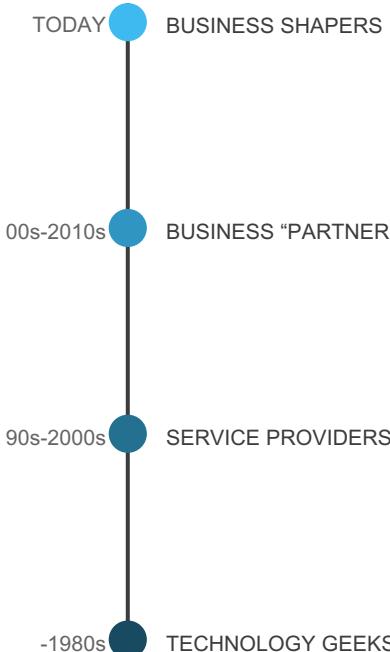
- The future belongs to the fast
- Multicloud 101
- Avoiding lock-in of SaaS
- Multicloud interconnect
- Multicloud-native cluster analytics & ops management
- Multicloud-native cluster SDN



CLOUD:
HERE & NOW

IT Today

A brief history of highly effective IT



THE STATE OF IT TODAY

LINES BLUR BETWEEN IT AND BUSINESS

- IT leaders shape the future of the business innovation
- IT owns most of the customer experience

INNOVATION IS AN IMPERATIVE

- As disruption impacts every industry: The choice is in between predator or prey.
- Focus is on technology that is differentiating. Drab tech is kicked to SaaS

SECURITY IS A MUST

- More threatening than competitors, breaches are devastating
- Must be pervasive in culture, processes, applications and infrastructure

AI IS HIGHLY ANTICIPATED, AND NEEDS PLANNING

- Business plans for AI are well defined: 23%, Technology plans for AI: 20%*
- New levels of market, business, and operations awareness

* State of the IT 2017

FIRST...

FORGET THE CLOUD



CLOUD IS JUST THE VEHICLE, NOT THE DESTINATION



SMART CLOUD IS THE WAY TO...

CLOUD IS THE WAY TO...



EFFECTIVE

EFFICIENT

RESILIENT

CLOUD IS THE WAY TO...

SCALE

AGILITY

REACH



Big
Data
& AI

TCO
&
Open

Secure
SRE

EFFECTIVE

EFFICIENT

RESILIENT

CLOUD IS THE WAY TO...



Orch.
&
Arch.

DevOps



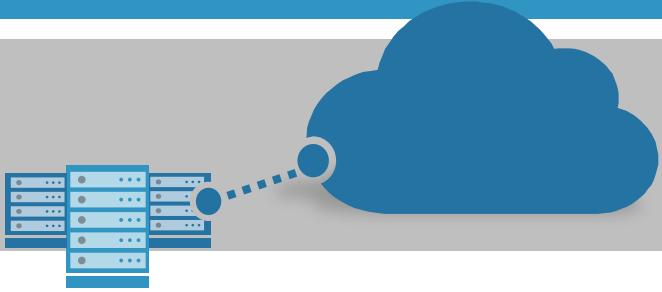
Public
Cloud
& IOT

SCALE

AGILITY

REACH

BIMODAL IT



STANDARDIZE & CONSOLIDATE THE OLD

(and anything not business differentiated or advantageous)

+

CLOUD-FIRST & CLOUD-NATIVE THE NEW

(and refactor anything business differentiated or advantageous)



it's not about here or there... it is about

An at-scale computing platform for

- DevOps
- Digital Ops
- Internet of Things
- Big Data- and AI-driven Research and Insights

A wide-angle aerial photograph of a city skyline at sunset. The sky is a gradient of orange, yellow, and blue. In the foreground, there are dense clusters of buildings, some with illuminated windows. Overlaid on the image is a network of thin, glowing blue lines forming a grid and several curved paths that converge towards the center of the city, symbolizing connectivity and data flow.

MULTICLOUD
IS THE PLATFORM

MULTICLOUD: REALITY, NOT A STRATEGY

MULTIPLE AZs



MULTIPLE ACCOUNTS



MULTIPLE REGIONS



MULTIPLE VENDORS



85% of enterprises

AIMING FOR MULTI-CLOUD
AS THE INFRASTRUCTURE IDEAL

State of the Cloud Survey '17



THE STRATEGY: HOW TO CHOOSE & CONSUME WISELY

MULTICLOUD OVERVIEW

3

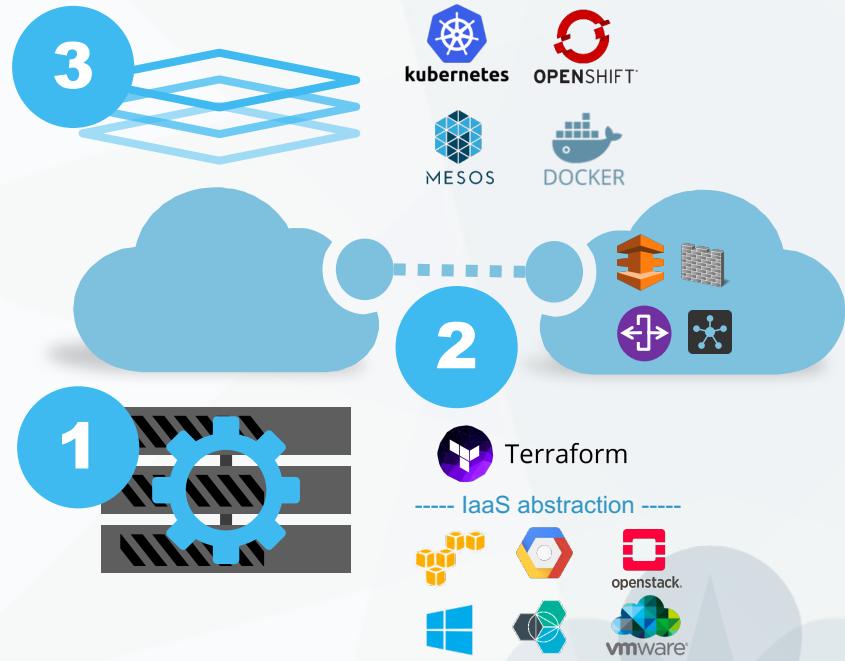
Clouds run cloud-native app stacks

2

Clouds are inter-connected

1

Clouds provide services and IaaS
(elastic programmable infrastructure)



WHAT ABOUT HYBRID CLOUD



WHAT IS IT?

I NEED YOU TO
EXPLAIN THE CONCEPT
OF THE HYBRID CLOUD
IN SIMPLE TERMS.

A HYBRID CLOUD IS
A TECHNOLOGY YOU
DON'T UNDERSTAND
COMBINED WITH
ANOTHER ONE.

© Scott Adams, Inc.



HYBRID CLOUD IS THE NEW IT – WHY?



Defⁿ. HYBRID CLOUD:

Hybrid cloud spans at least one public and one private cloud

Better modern use: A unified platform that spans multiple clouds

BUSINESS MOTIVATIONS FOR CLOUD CHOICE

VENUE:

- Geography for reach, migration, compliance or sovereignty
- Cost advantages
- Feature advantages

RESILIENCE:

- Disaster recovery and avoidance site
- Active-active setups for high availability

AGILITY:

- Speed of abstracting away infrastructure for developers
- Circumvent challenges: budget, staff, experience
- Hardware & software innovation pace of hyper-scale clouds

FLEXIBILITY:

- Design split-tier applications for best of both worlds
- Lifecycle / environment for dev, test, staging, production
- Bursting (seasonal, occasional etc. spiky usage vs. steady usage)

HYBRID CLOUD IS THE NEW IT – WHY?



LUCK FAVORS THE PREPARED

Hybrid cloud prepares enterprise IT by design for infinite scale and choice

PRIVATE CLOUD

THE GOOD:

- Control and compliance over location and systems
- Data sovereignty and locality
- Custom SLAs, platforms and hardware
- Trust for mission-critical workloads and security

THE BAD:

- Time and skill to build/maintain/scale the platform
- Reserves and CapEx beyond current needs
- Aspects of inflexibility

PUBLIC CLOUD

THE GOOD:

- Global infrastructure platform
- Ecosystem: Big Data, Machine Learning, IoT Platforms
- Economic flexibility and alignment with value
- Instant and elastic scale and failover possibilities
- YES! Security – expert SecOps in large clouds

THE BAD:

- No end of amortization – A perpetual investment
- Platform and data locality lock-in
- Aspects of unpredictability

HYBRID CLOUD IS THE NEW IT – HOW?



LUCK FAVORS THE PREPARED

Hybrid cloud prepares enterprise IT by design for infinite scale and choice

PRIVATE CLOUD

THE GOOD:

- Confidentiality
- Consistency
- Control
- Reliability

PUBLIC CLOUD

THE GOOD:

- Scalability
- Cost efficiency
- Innovation

A HYBRID CLOUD UNIFIED **PLATFORM** REQUIRES SOME **PARITY...**

- **Functionally compatible:** APIs, infrastructure and platform primitives, config behavior
- **Non-functionally compatible:** availability, performance, QoS
- **Economically compatible:** no prohibitively drastic cost differences

- Platform and data locality lock-in
- Unpredictable

HYBRID CLOUD PLATFORM

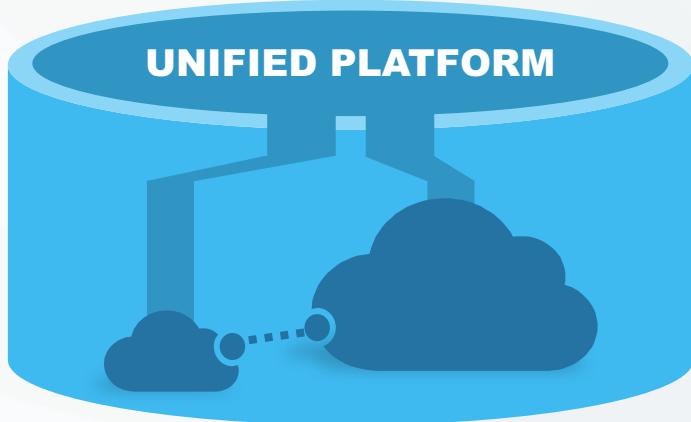


DISPARATE PRIVATE + PUBLIC CLOUD

Doing everything, all at once!

- Context switching efficiency loses
- Poor portability of DevOps automations and apps
- Cloud data and services lock-in
- Long-term management and cost control nightmare

VS.



HYBRID CLOUD PLATFORM

Unified Cloud Platform

- Application and DevOps pipeline portability and mobility
- Multi-cloud I&O management and orchestration
- Consistency and parity of core experience
- Economic optimization with flexibility

CLOUD LOCK-IN



LOCK-IN RISKS

- Variable reliability: e.g. AWS Feb 2017 S3 outage
- Rising costs: vendor has you over a barrel
- Services gap: cannot use other vendors' innovations
- Business slowdown: Wasted time to re-implement
- Partner and talent pool: narrower selection pool

EXAMPLES OF LOCK-IN

Data Gravity

- Data is expensive and slow to move out or port

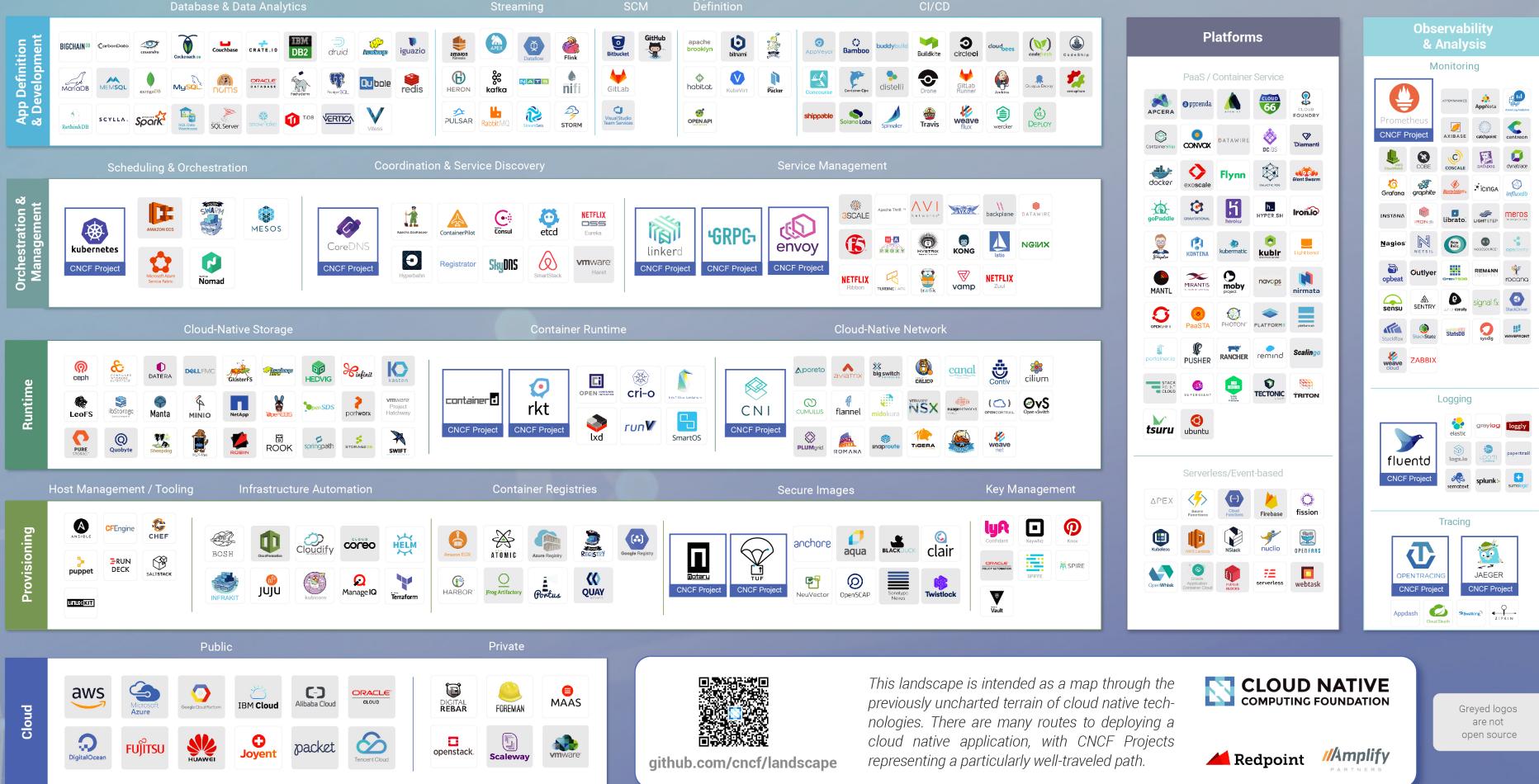
Developer / Application SaaS Lock-in

- Application services coupled to cloud service APIs

Infrastructure / IaaS Lock-in

- VM / security / networking / storage coupled to IaaS

Cloud Native Landscape



MITIGATING DEVELOPER LOCK-IN

APPLICATION CONSIDERATIONS

SaaS is sticky!

- Don't use custom cloud services when you can BYO (e.g. API gateway, auth, DB, message queue, etc.)
- Easily run open source tools and vendors supporting multiple clouds with package managers like K8s Helm
- Find multi-cloud shims like Minio for S3-like obj. storage
- Avoid API lock-in with OSS-based managed service offerings if you cannot BYO

Developer strategy

- CNCF is a good source of many cloud-native OSS tools
- Lock-in carefully for advantages of unique offerings
- See ThoughtWorks principles of Evolvable Architecture

FOR DEVOPS

BYO App/DevOps Stack

- Portable tools like Jenkins, Spinnaker, etc.
- Minimize DSL lock-ins like AWS CodeStar
- Enable CD/CR flows like blue / green across cloud vendors or at least regions to minimize MTTR



MITIGATING INFRASTRUCTURE LOCK-IN

INFRASTRUCTURE CONSIDERATIONS

Portable infrastructure as code

- Use IaC/CfgMgmt like Digital Rebar, Terraform, Docker
- Minimize DSL lock-ins like AWS CloudFormations
- CI/CD & chaos engineering: do it... with portable tooling

Software-defined networking, security, storage

- Portable across any cloud, any IP network underlay
- Overlays to provide addressing/naming portability
- Collapsible overlays to improve performance & mgmt
- Scales in software and optional hardware variants

Operations

- Harmonized policy as code across tools
- Unified policy can widen blast radius of bad changes
- Portable management/monitoring for infrastructure/apps
- It should all integrate with a portable DevOps stack

UNIVERSAL TOOLS

Prefer tools that aren't single-minded

- Bimodal tools that work with legacy AND cloud are best
- One tool that can do / integrate a few related things is simpler than many narrowly focused tools
- A tool that integrates with multiple vendors / clouds and uses open APIs / interoperability standards is best



MITIGATING MANAGEMENT LOCK-IN

FOR HYBRID CLOUD MANAGEMENT

A cloud management platform can provide

- ITaaS workflows for infrastructure self-service
- Single pane of glass high-level monitoring and policy
- Easier economic comparison
- Better to focus on passive monitoring, not active control

Examples:

- RightScale
- Scalr
- Red Hat CloudForms
- Google Stackdriver
- CloudHelm
- Platform9

FOR PRIVATE CLOUD

Use OpenStack as an IaaS base

- Parity with AWS and most new cloud IaaS vendors
- Multiple vendors to support you
- VMware can serve the same purpose but is less portable, less open, more expensive, and HA-feature overkill



SUMMARY: AVOIDING CLOUD LOCK-IN



ONLY LOCK-IN CONSIOSLY

Embrace IaaS as a base, but cloud services sparingly

- Bring your own IaaS automation (IaC)
- Lock in to cloud services by choice when they are differentiated and necessary for business advantage
- For services that have open source equivalents, bring your own or use a managed service

PLAN FOR A DIFFERENT FUTURE

Start with 2 clouds instead of one...

- Hedge bet on a partner for cloud innovation & economics
- Force the application cluster / stack to be portable
- Force the DevOps workflows to be portable
- Force designing for resiliency and scale early on

A wide-angle aerial photograph of a city skyline at sunset. The sky is a gradient of orange, yellow, and blue. In the foreground, there are dense clusters of buildings, some with illuminated windows. Overlaid on the image is a network of thin, glowing blue lines forming a grid and several curved paths that converge towards the center of the city, symbolizing connectivity and data flow.

HYBRID / MULTI
CLOUD
with JUNIPER

JUNIPER'S SOFTWARE SIDE OF CLOUD



SDN automation platform for OpenStack IaaS, OpenShift PaaS, Kubernetes CaaS & VMware.



High-performance, next-generation firewall for securing virtualized and cloud environments. Now available in container technology as cSRX!



Virtualized, full-featured, carrier-grade router. Ideal for NFV environments, rapid service introduction and cost-effective scale-out.



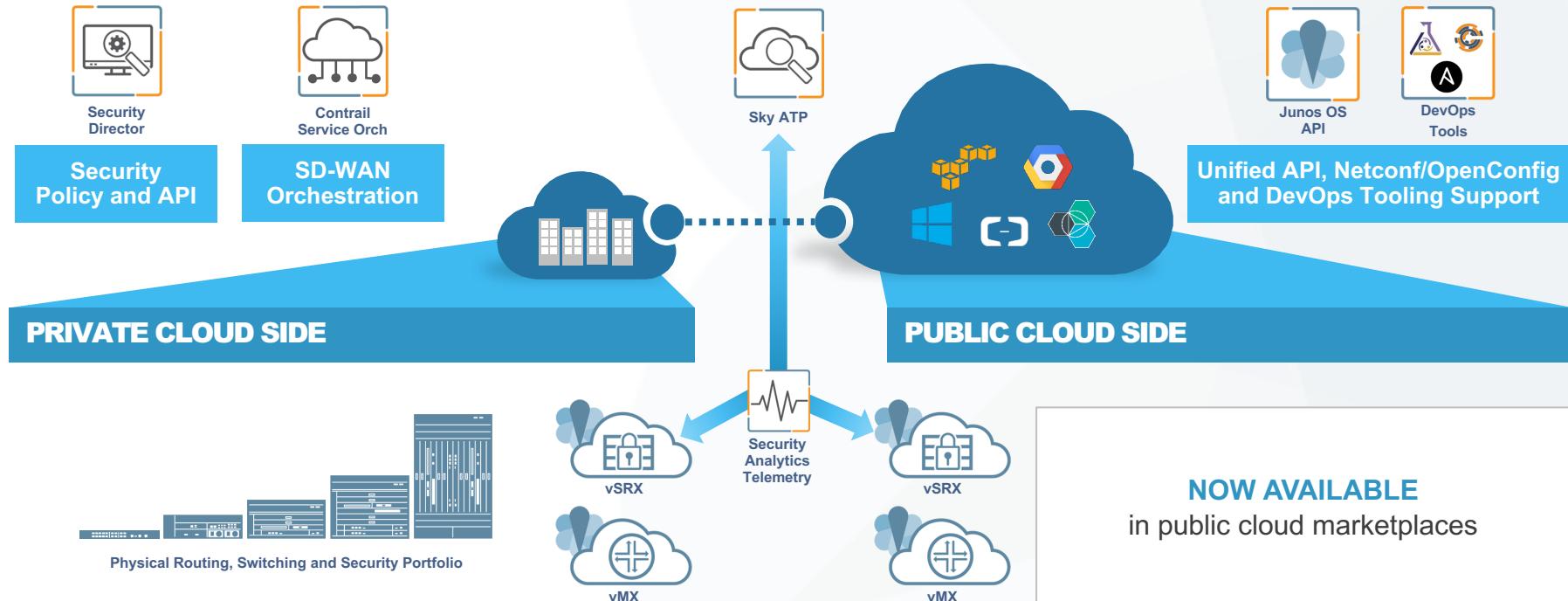
Operations automation and AI platform for monitoring, analytics, and intent-driven infrastructure real-time optimizations

AUTOMATION CONNECTING CLOUDS

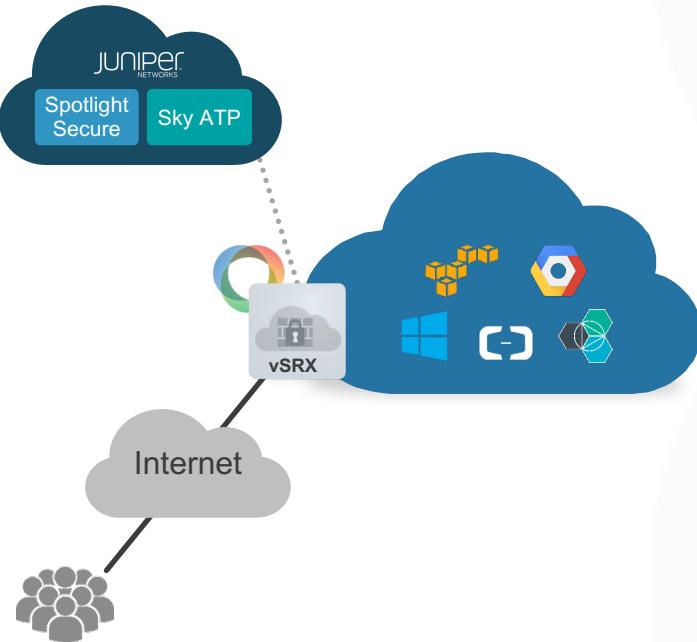


HYBRID CLOUD SECURITY & ROUTING

SINGLE PANE OF GLASS: UNIFIED POLICY AND MANAGEMENT



USE CASE: SECURE INTERNET GATEWAY



AUTOMATION

Network & Security as Code DevNetOps / DevSecOps

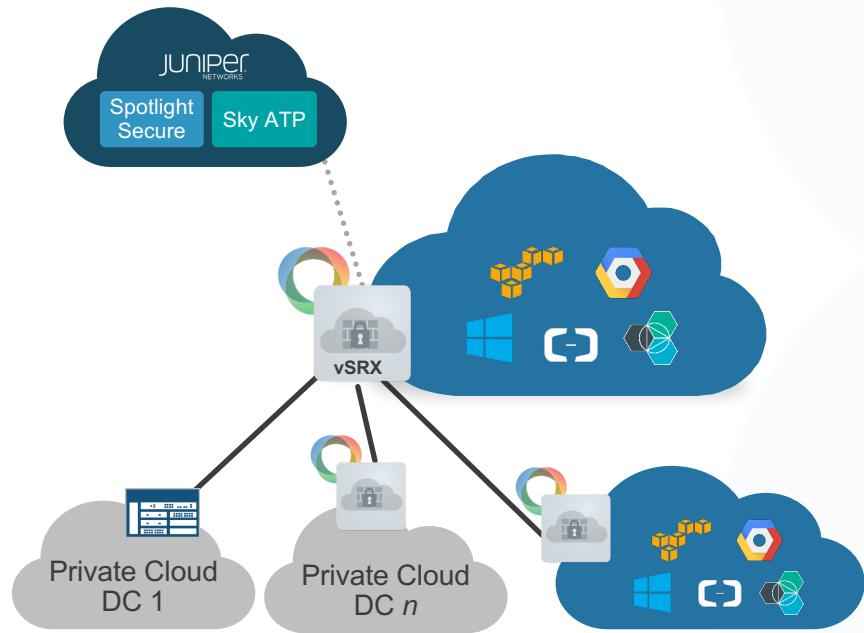
- Unified multi-cloud view (provisioning too): Security Director GUI
- BYO tools avoids cloud-vendor lock-in with portability
- Supports Ansible and aforesaid tooling
- Ecosystem of automation code: Terraform or domain-specific languages:
 - AWS CloudFormation, Azure Resource Manager, GCP Deployment Manager

vSRX AT A GLANCE

Same Advanced Stateful Firewall as Physical SRX

- Unified threat management
- Intrusion and Advanced threat prevention (ATP)
- App secure
- IPsec VPN termination
- Same battle-tested Junos OS
- Up to 18Gbps throughput

USE CASE: HYBRID MULTICLOUD



AUTOMATION

Network & Security as Code DevNetOps / DevSecOps

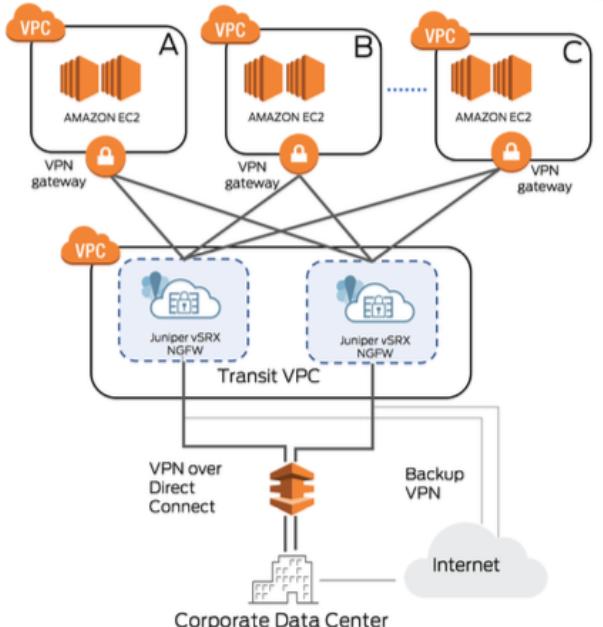
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vSRX + SRX

Same Advanced Stateful Firewall as Physical SRX

- Bookended hybrid cloud security and connectivity

USE CASE: TRANSIT VPC



CASE STUDY

Ellie Mae[®]
Compliance.
Quality.
Efficiency.

aws
JUNIPER
NETWORKS

AUTOMATION

Network & Security as Code DevNetOps / DevSecOps

- Unified multi-cloud view (provisioning too): Security Director GUI
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TRANSIT VPC OVERVIEW

Transit VPC is common at AWS and Azure

- Use either vSRX or vMX
- Connects VPCs across AZs, regions, accounts

Additional automation:

- Automated day-1 setup and day-2 VPC CRUD operations
- Juniper professional services specialty

A wide-angle photograph of a modern industrial facility. The foreground is dominated by a large, articulated robotic arm with a grey and blue protective cover. Behind it, another robotic arm with a yellow and orange protective cover is visible, mounted on a dark metal frame. The background shows a massive, multi-story building with a complex steel truss roof and various industrial equipment and structures. The overall atmosphere is one of a high-tech manufacturing or assembly plant.

AUTOMATION ATOP THE CLOUD with JUNIPER

INTENT-DRIVEN OPERATIONS

APPFORMiX

holistic
full-stack ops management

ANY APPS & SERVICES



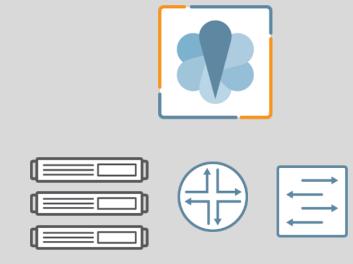
CLOUD INFRASTRUCTURE



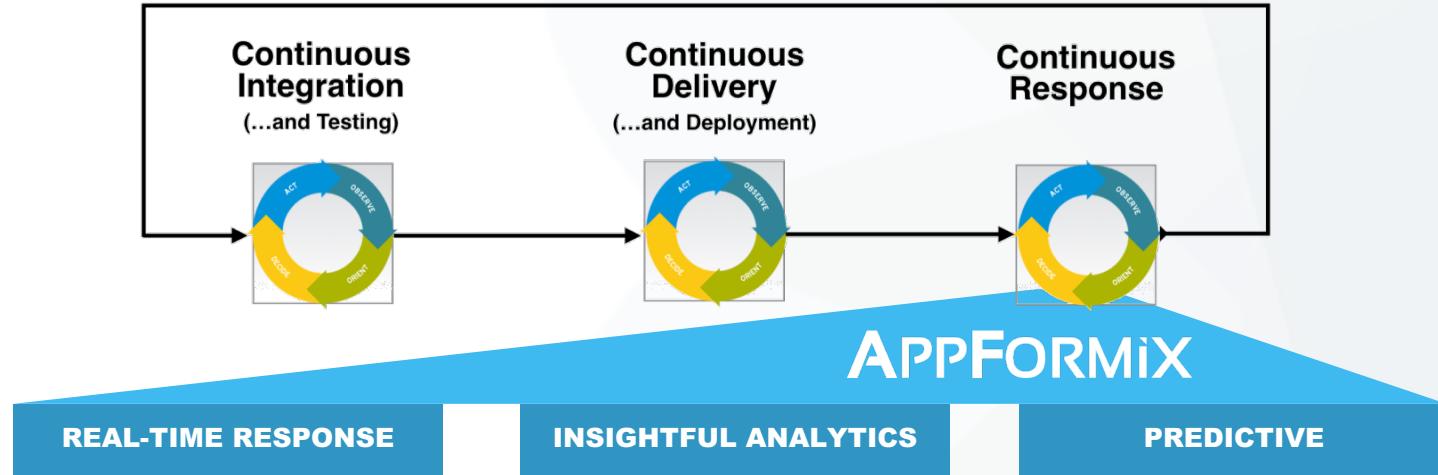
SOFTWARE-DEFINED INFRASTRUCTURE



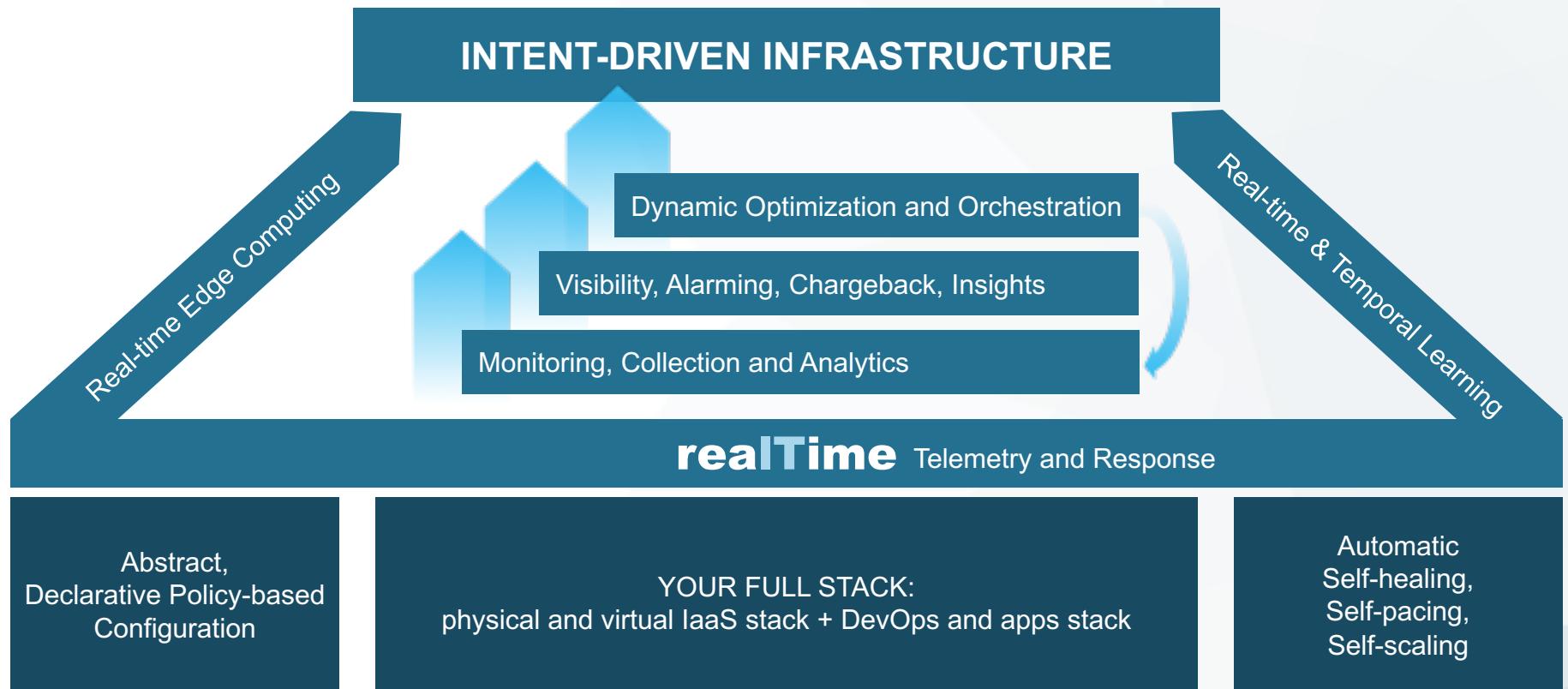
PHYSICAL INFRASTRUCTURE



MISSING LINK IN DEVOPS



SMART OPS: APPFORMiX



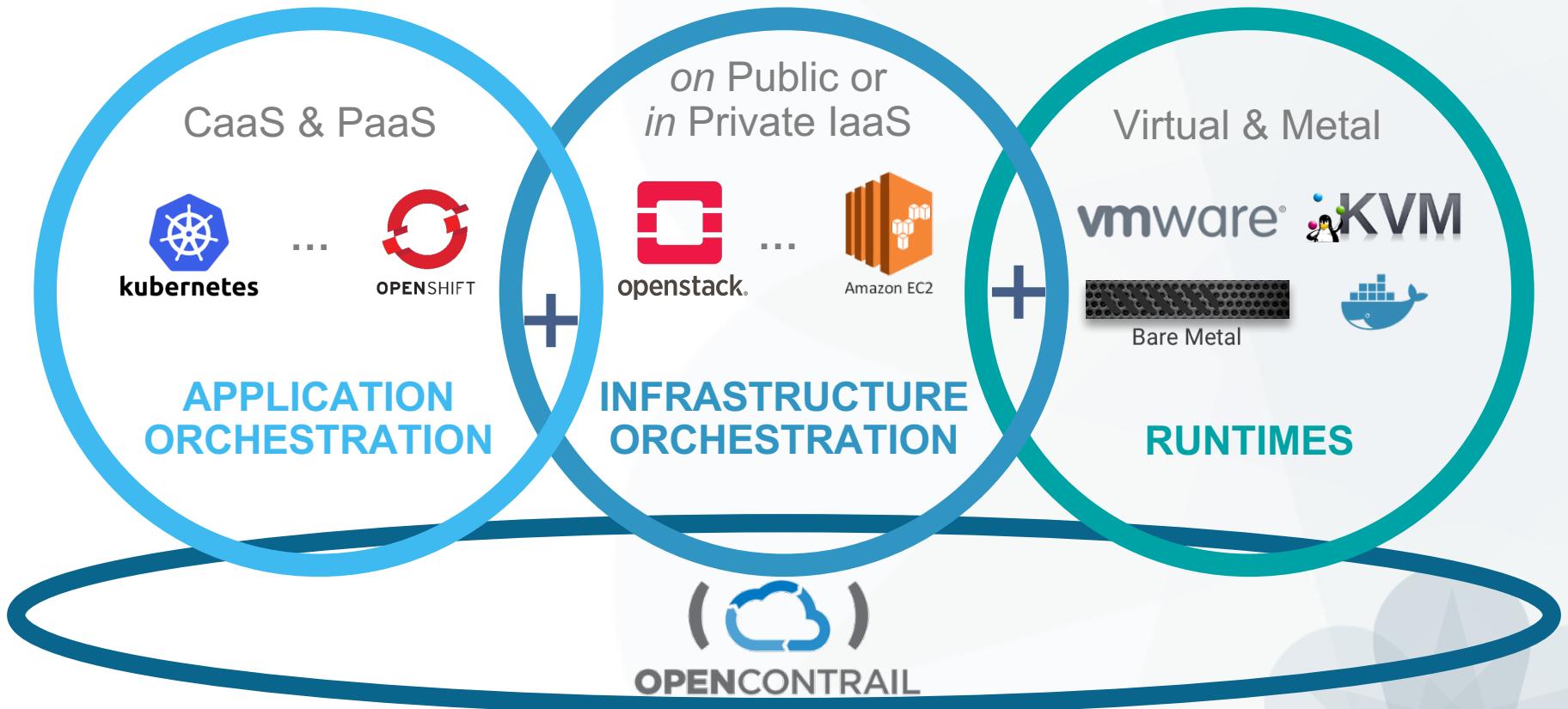
A large window with a grid overlay showing a cityscape and greenery.

Contrail
& Kubernetes
& OpenShift

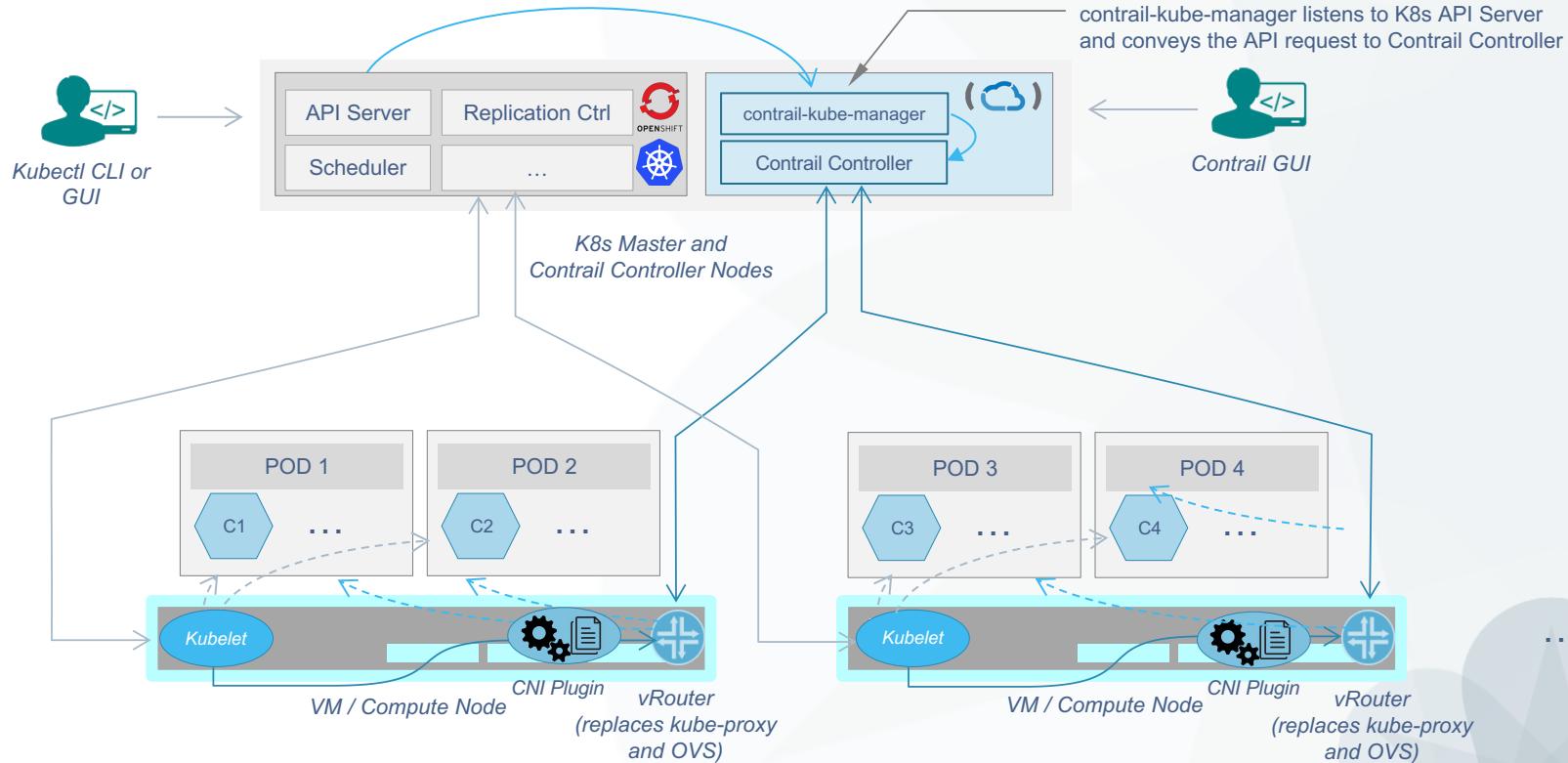
CONTRAIL OVERVIEW



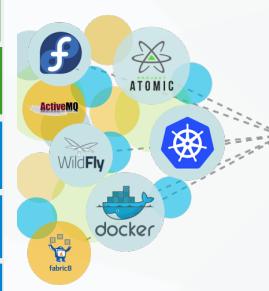
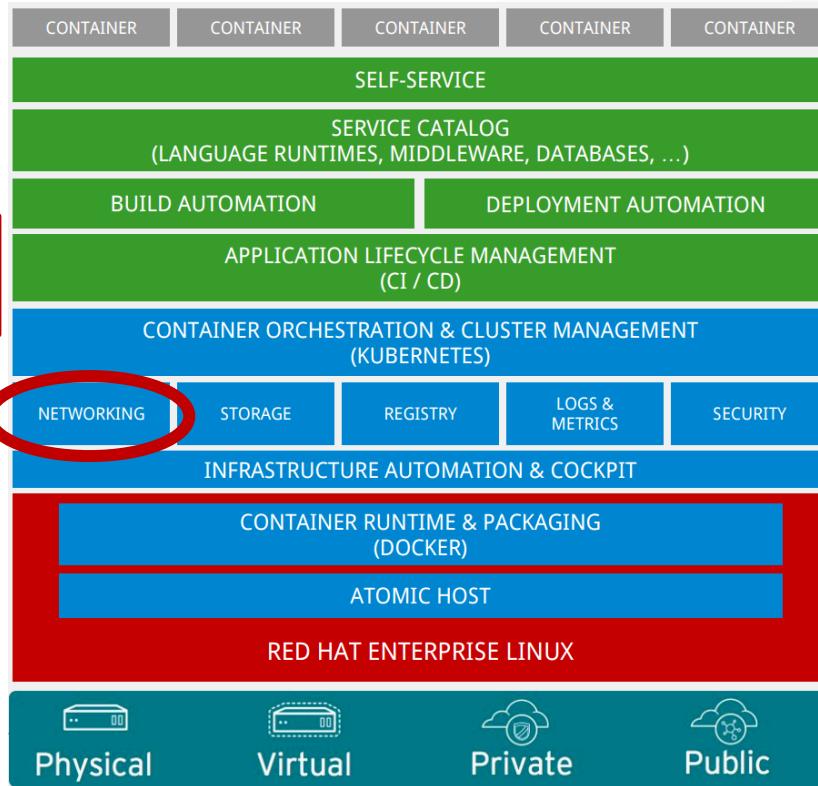
1 SDN TO RULE THEM ALL



INTEGRATION WITH K8S & OPENSHIFT



INTEGRATION WITH OPENSHIFT



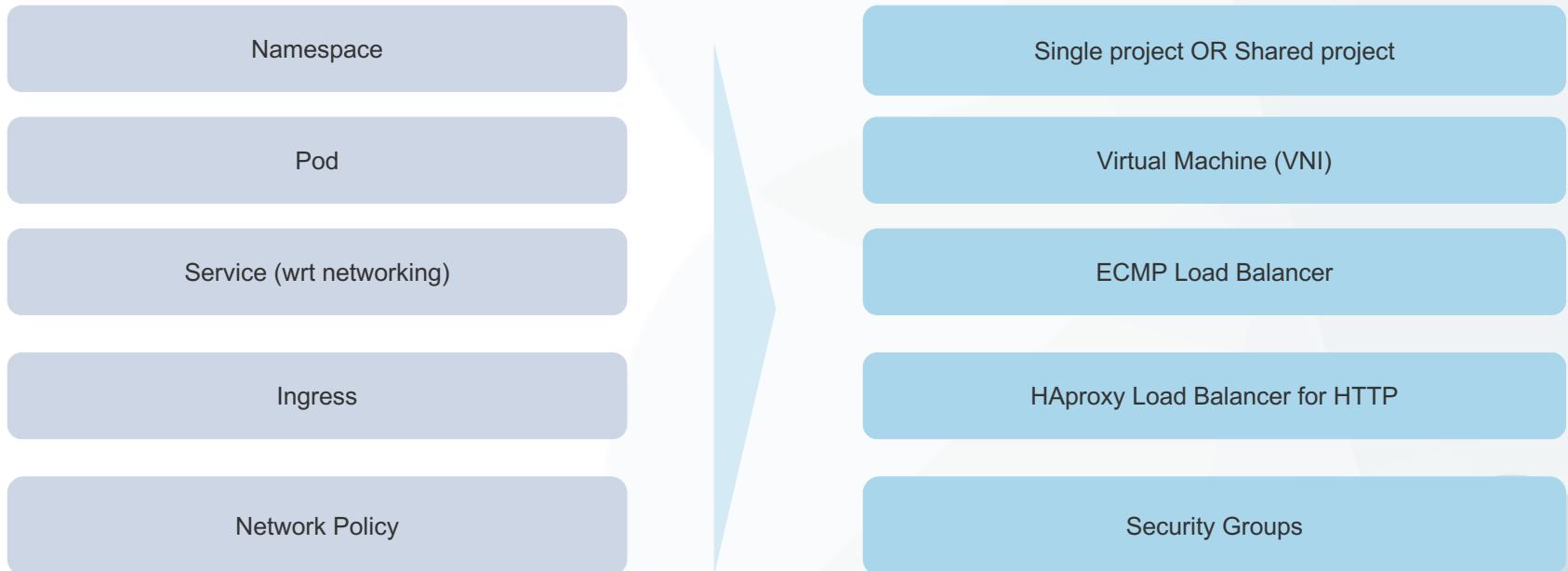
OPENSHIFT
origin

OPENSHIFT
ENTERPRISE
by Red Hat®

OPENSHIFT
ONLINE
by Red Hat®

CONCEPT MAPPING

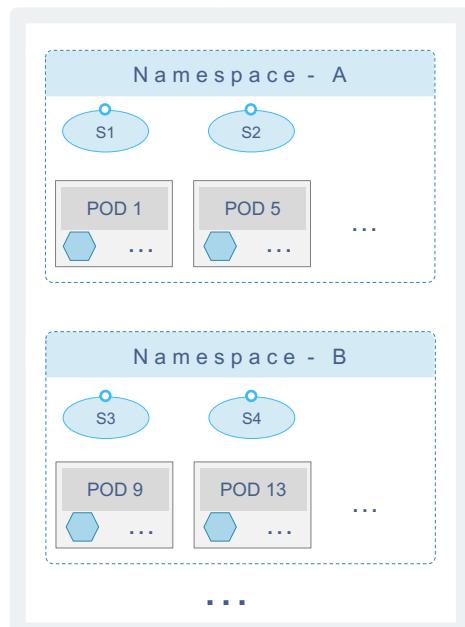
Kubernetes to Contrail Networking



ISOLATION TYPES

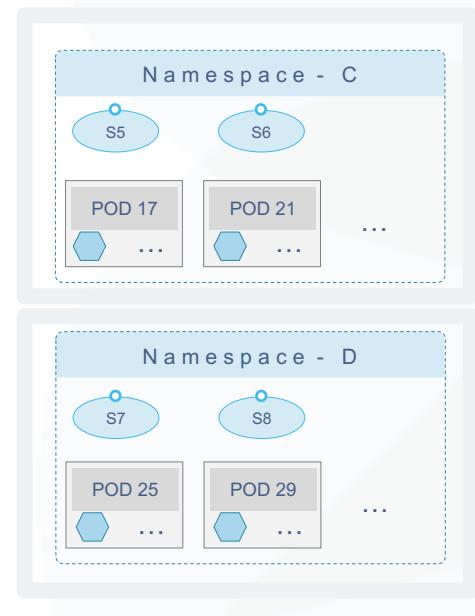
DEFAULT CLUSTER MODE

- This is how K8s networking works today
- Flat subnet where -- Any workload can talk to any other workload



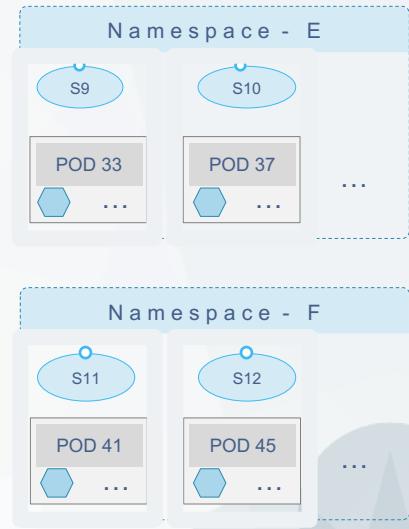
NAMESPACE ISOLATION

- In addition to default cluster, operator can add isolation to different namespaces transparent to the developer



POD / SERVICE ISOLATION

- In this mode, each pod is isolated from one another



Note that all three modes can co-exist

INGRESS

A way to expose services to the external world

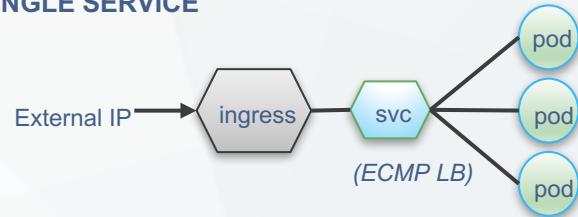
Possibility to do L4 & L7 load-balancing

3 types of ingress:

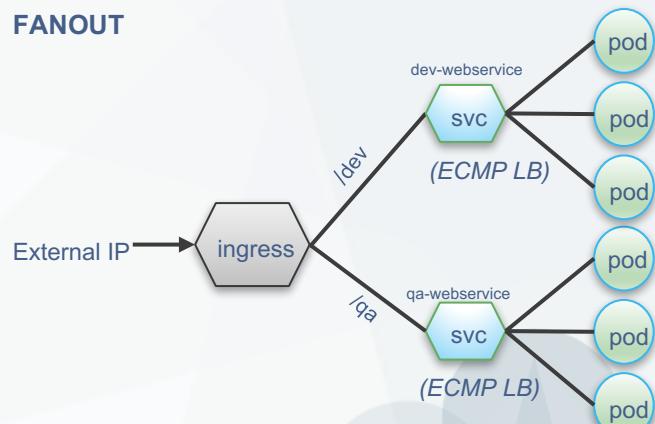
- single service
 - standard load balancing
- simple fanout
 - routing to destination based on the URL
- name based
 - routing to destination based on the host name

Configured through a load balancer object (HA Proxy) in Contrail

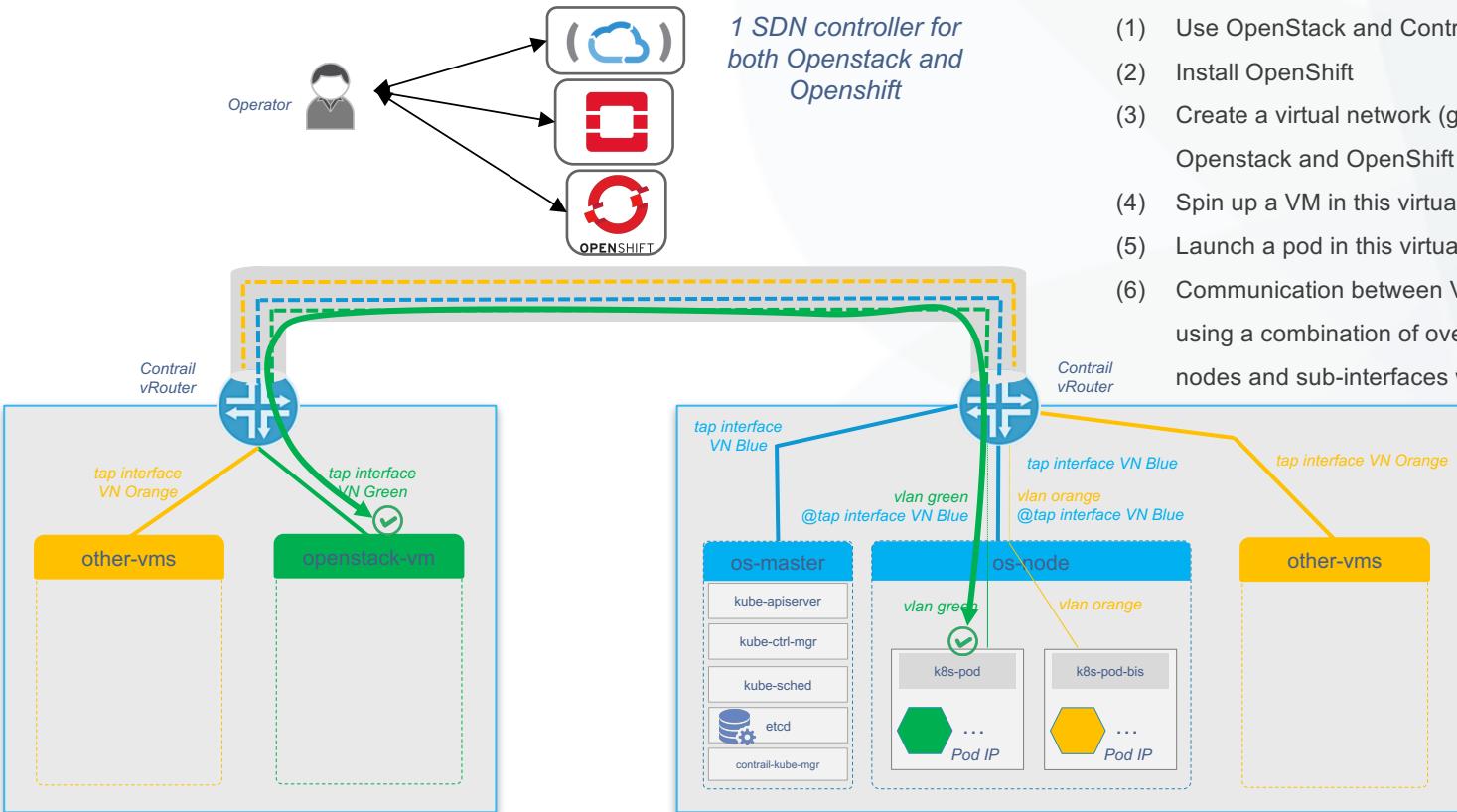
SINGLE SERVICE



FANOUT



NESTED INSTALLATION ON OPENSTACK



- (1) Use OpenStack and Contrail to provide VMs for OpenShift
- (2) Install OpenShift
- (3) Create a virtual network (green) in Contrail in order to connect Openstack and OpenShift workloads
- (4) Spin up a VM in this virtual network (green)
- (5) Launch a pod in this virtual network (green)
- (6) Communication between VM and pods is powered by Contrail using a combination of overlay networks between compute nodes and sub-interfaces with macvlan on the OpenShift nodes

INSTALLATION



OPENShift

Work in progress for the OpenShift certification, then directly integrated with openshift-ansible



ANSIBLE

Ansible playbook to deploy contrail



Helm charts will be officially supported in future releases



Work in progress to get container images directly out of OpenContrail CI

TAKEAWAYS

- Multicloud is not a strategy. How to choose and consume is a strategy
- Plan for portability because organic growth leads to lock-in
- We got you!
 - Juniper's portfolio is designed for multicloud portability
 - Cloud-grade networking—at scale infrastructure—is our jam

Resources:

- OpenShift and OpenContrail Webinar/Demo: <https://www.youtube.com/watch?v=wglZigNuY6s>
- Watch AppFormix Demos: https://www.youtube.com/results?search_query=appformix
- Juniper portfolio and free trial on AWS: <https://aws.amazon.com/mp/sellers/juniper/>
- AWS transit VPC overview and demo: <https://www.youtube.com/watch?v=XcW1zGs67x8>

Thank you

