Red Hat

OVS impact and future thoughts

Chris Wright, CTO

December 2019

2015...

VIRTUALIZATION

Linux bridge

VLANs

virtio

EMERGING

SR-IOV

VEPA

VM-FEX

OpenFlow

OVS

programmable multi-layer switch

using openflow and ovsdb

often used in an overlay

out-of-tree

tc vs ovs

4

YEARS AGO...

OVS IN THE DATACENTER

OpenStack Neutron adoption rates growing
Neutron typically deployed with OVS
OVS typically deployed as overlay (GRE or VXLAN)
Users want security groups
Users want load balancers
Operators want scale

4

YEARS AGO...

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OVS IN TELCO

Virtualizing the telco network
PNF -> VNF
performance is paramount
DPDK
service chaining

4 YEARS AGO...

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OVS PLUS HARDWARE OFFLOAD

hardware VTEP
SR-IOV
dedicated ASIC
NPU

OVS FUTURE THOUGHTS...

2015 KEYNOTE

Complexity slows adoption

Extensibility

Forks

Governance

tc, eBPF, and P4

L3 and up

Overlays

Edge

ovn

OVS FUTURE THOUGHTS...ARE NEARER

2015 KEYNOTE	MON
Complexity slows adoption	Complexity **still** slows adoption
Extensibility	Extensibility **still critical**
Forks	Forks **still bad**
Governance	Governance **still important**
tc, eBPF, and P4	tc, eBPF, and P4
L3 and up	L3 and up
Overlays	Overlays
Edge	**Telco Edge/5G**
ovn	**OVN!**

DEVELOPMENTS

JANUARY 2017

Decided: OpenStack will pursue OVN as a networking backend.

DECEMBER 2017

OVN released as Tech Preview in OSP 12.

JULY 2018

OVN released as Full Support in OSP 13.

JANUARY 2019

Red Hat OpenStack OVN Engineering team increased.

Half of Red Hat Neutron Engineering team moved to OpenStack OVN Engineering, with the other half maintaining ML2/OVS (default OpenStack Neutron backend used by over 90% of our customers)

First production customers adopting OpenStack 13 OVN:

- *GE*
- *Atos*
- *OneWeb*

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FUTURE PLANS

JANUARY 2020

OpenStack 16 to be released; first long-term release to use OVN as default backend.

FALL 2020

Featured parity met for telco use cases (primarily SRIOV / telco-grade testing).

Most customers expected to be using OVN.

PORTFOLIO DECISIONS

RED HAT® OPENSHIFT

RED HAT® OPENSTACK® PLATFORM

RED HAT® ENTERPRISE VIRTUALIZATION

KEEP EVOLVING

HW

Hybrid cloud

Applications

Operations

LESSONS LEARNED

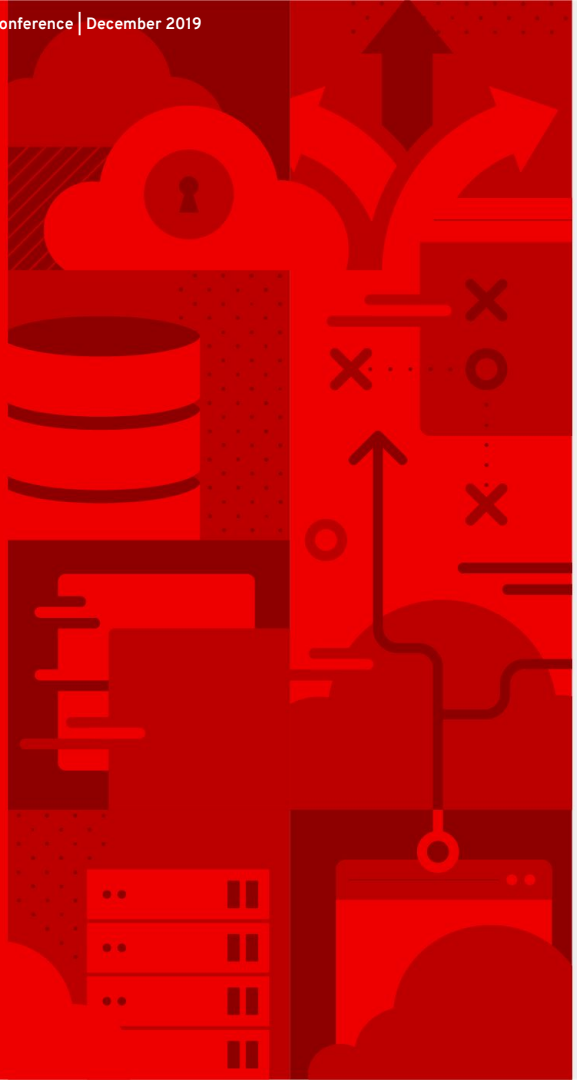
Fragmentation

Consolidation

Adoption

Meet users where they are

OPTIONAL SECTION MARKER OR TITLE



Thank you

Red Hat is the world's leading provider of enterprise open source software solutions. Award-winning support, training, and consulting services make Red Hat a trusted adviser to the Fortune 500.

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OpenStack Upstream Direction

Neutron upstream is embracing OVN as the default networking backend. Discussed in the last PTG at Shanghai, and the one before that, accepted by the community and supported by former PTL (now with Verizon) and the current PTL (with Red Hat). There's an ongoing effort to move the networking-ovn code into Neutron tree [0] in the coming weeks, as a precursor step to move the default backend upstream in the next development cycle.

[0] https://review.opendev.org/#/q/topic:bp/neutron-ovn-merge+(status:open+OR+status:merged)

Core OVN Contributors, External Contributions

Until recently, OVN lived in the OpenvSwitch repository. Now, the code has been split and has its own repository [0] and independent packaging.

Red Hat has two new core members (commiters) while the core member team is now composed by people from Red Hat (3), VMWare (3) and eBay (1), who are the top contributors.

In the networking-ovn OpenStack repository we're finding more contributions from other companies such as Chinamobile, Canonical or stackHPC. We learnt from a person with stackHPC that their main reason to choose OVN is its active community. They're contributing into kolla/kolla-ansible to add support for OVN based deployments [1].
Canonical, as well, are integrating OVN into OpenStack charm (Canonical's OpenStack installer) as we can see from Frode Nordahl's contributions in Gerrit [2] (he's also contributing to core OVN).

- Chris: 4 years ago and said “this” and in those 4 years XYZ has happened -- looking forward, we need to be able to evolve the community to meet XYZ
  - Xyz = hw support for accelerating encapsulations associated with network connectivity
- How has the context changed?
  - The public cloud is a critical part of the picture; we’re not just talking about nw connectivity and data-center centric connectivity; its broader
  - [HW]
  - With Kube evolving as an orchestrator that spans off and on premise use cases, the need to support containers becomes critical; the ability to connect containers with a higher-level connectivity and security policy is also very important (example: service mesh, competitive to what these guys are doing)
  - Useability and de-buggability cannot be substituted with functional completeness
    - Just because you have 4 wheels / engine doesn’t mean you have a car; you need additional functionality as well
      - No.1 issue -- we need to make it useable (common issue w open source bits)
  - Rashid points: product portfolio is leveraging these projects
- Redeliver the same slide deck….update it with

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VIRTUALIZATION CHANGED THE DATACENTER

VMs directly connected to the network

focus on L2 adjacency

dynamic placement

live migration

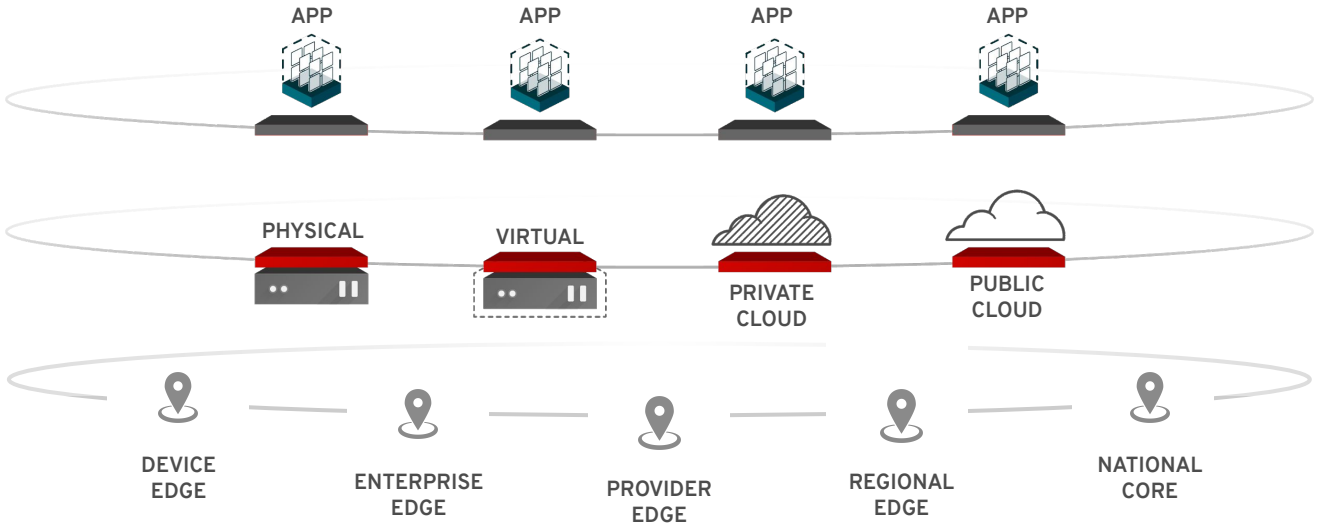
increase in east-west

inconsistent policy

virtual I/O performance

Our Vision

Fully Automatable, Fully Distributed Open Hybrid Cloud (OHC)



Any Workload, Any Footprint, Any Location.

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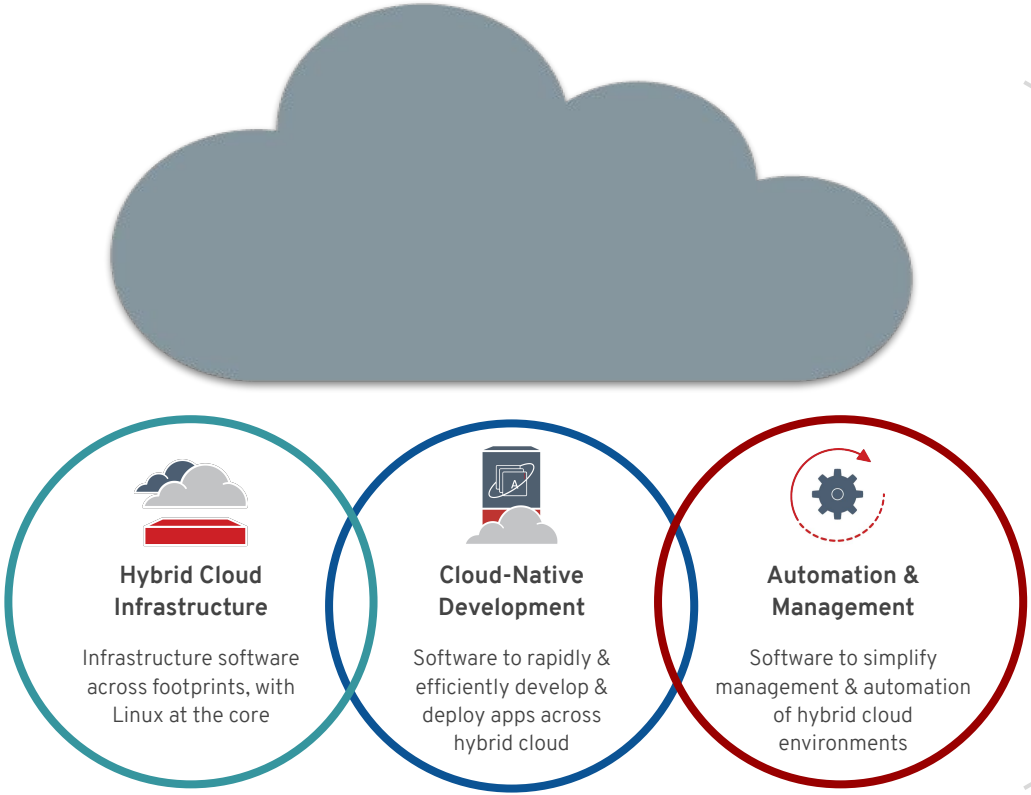
The Hybrid Cloud Is Reality



Enterprises with a hybrid strategy grew to **58 percent** in 2019 from 51 percent in 2018.

RightScale 2019 State of the Cloud Report

Red Hat

Today's Network

hardware centric

provisioned for peak capacity

relatively static configuration

Tomorrow's Network

software centric

elastic provisioning

highly dynamic configuration

Today's Network

hardware centric

provisioned for peak capacity

relatively static configuration

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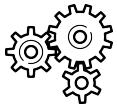
elastic provisioning

highly dynamic configuration

5G: The Next Generation Network

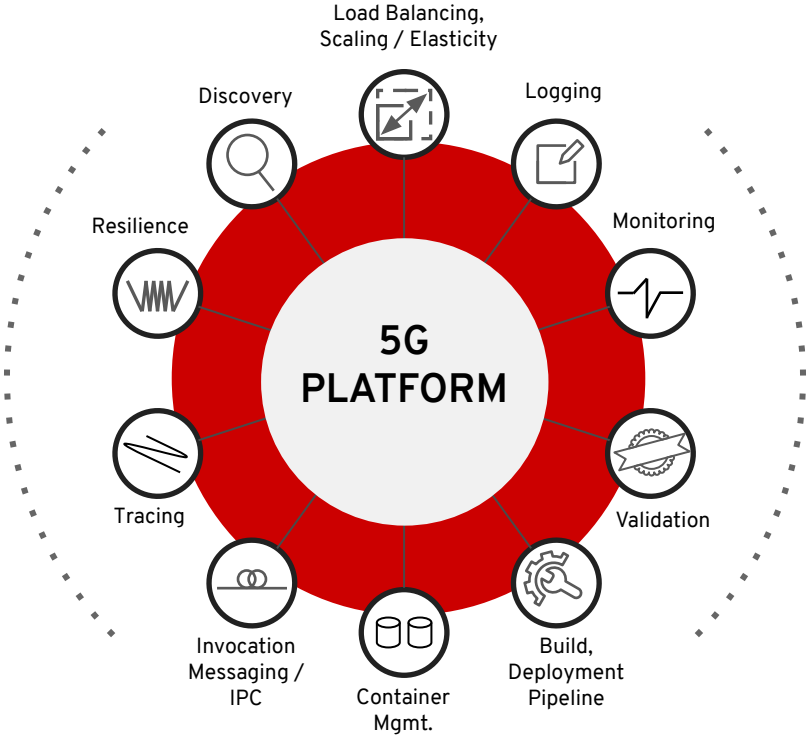
IMPERATIVES

Cloud-Native



Edge Compute

Application Lifecycle Management



REQUIREMENTS

- Scale
- Real time data streaming
- Hybrid compute models
- Deployment flexibility
- Efficient UPF redirection
- Modular network design
- Stateless functions

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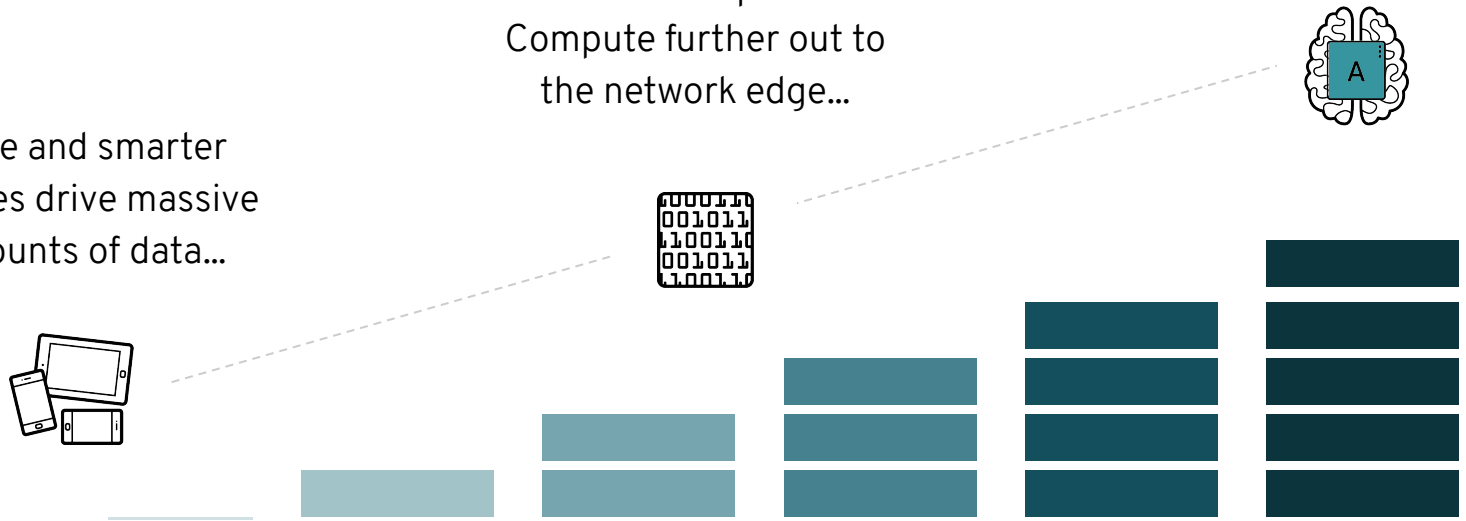
Devices And Data Are Driving 5G Technologies

More and smarter devices drive massive amounts of data...

...More data pushes Compute further out to the network edge...

...Requiring robust, non-centralized data production & processing.



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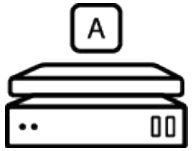
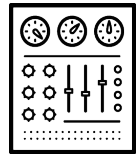
Challenge: Enabling Next-Gen Use Cases And Developers

Allowing IT To Create Business Value with Less Wasted Time and Effort.

Ease Developer Adoption



Improve Operations Efficiency



DEVELOPMENT

Business value as code

PLATFORM

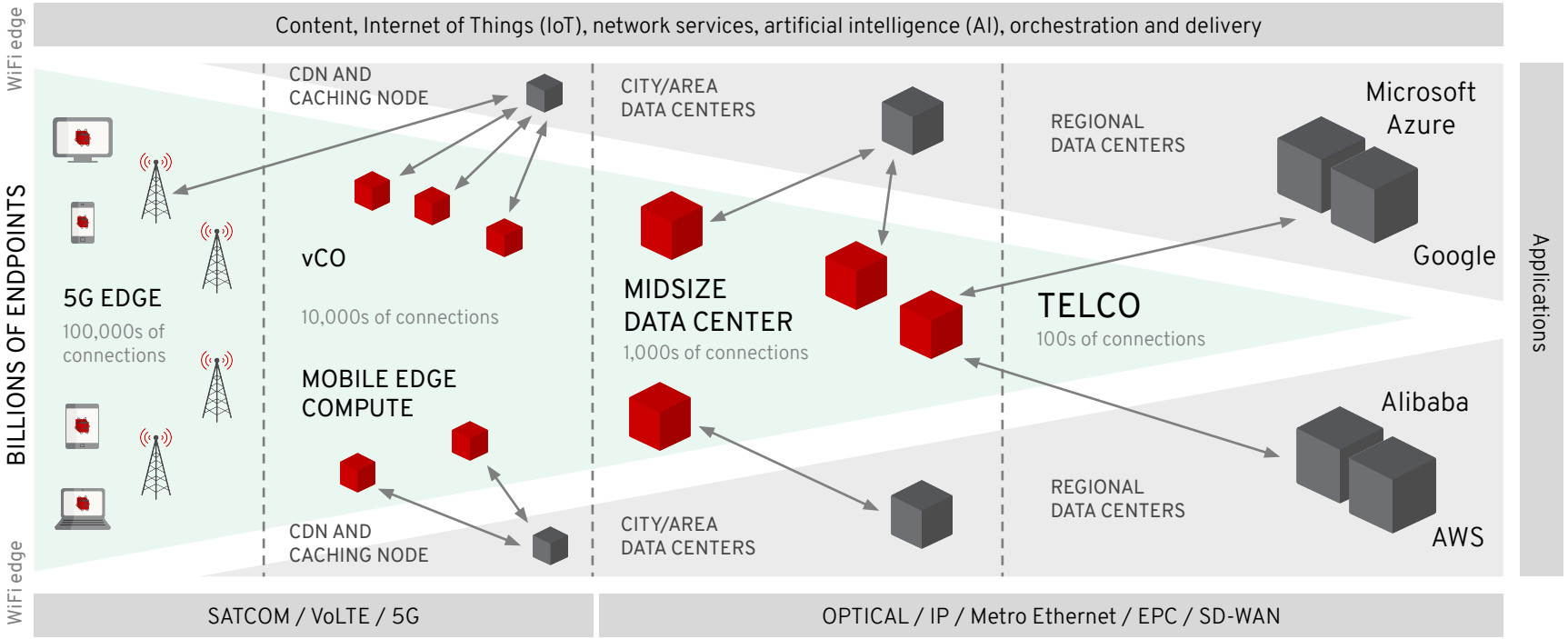
Any application, anywhere

MANAGEMENT

Operations by policy

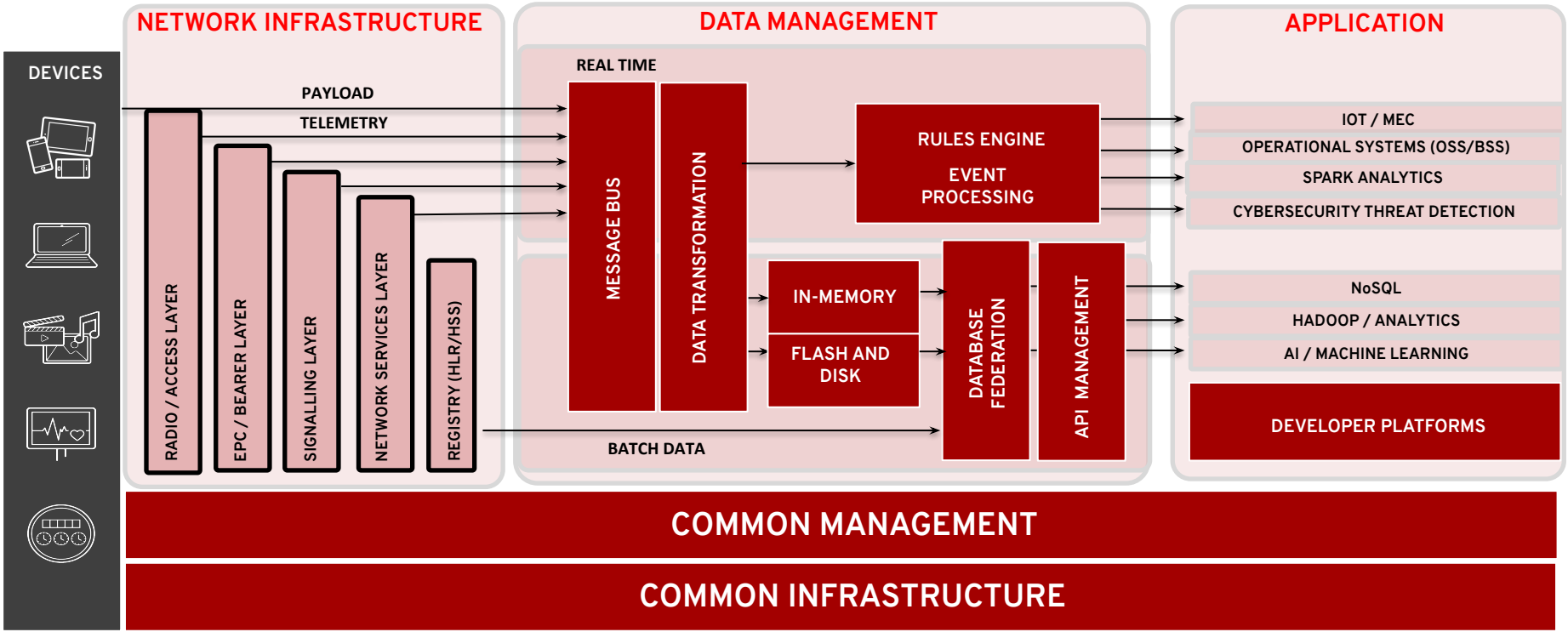
Red Hat

An Open Platform Is Critical



Red Hat

Open Platform Demands A Common Infrastructure



For Mobile Edge Computing and 5G/C-RAN, a common horizontal infrastructure approach can be autonomously distributed and scaled to hundreds of sites at the edge

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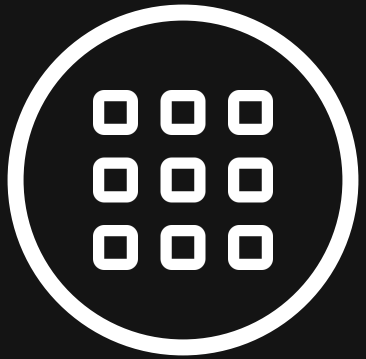
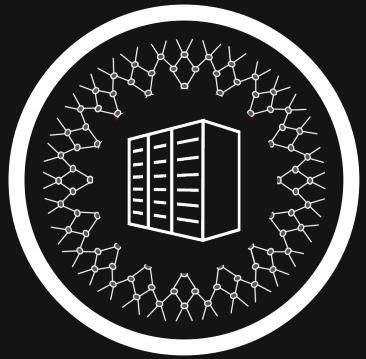
OpenStack Networking Evolution

Red Hat

The Hybrid Cloud Is Being Driven by Mega Trends

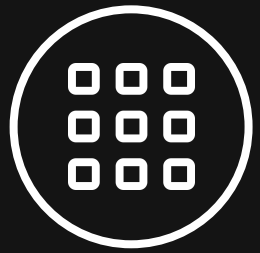


The Economics Of Modern Apps



The Changing, Distributed Datacenter

Modern Applications Cause Infrastructure Concerns



The Economics Of Modern Applications

TRADITIONAL COMPANIES

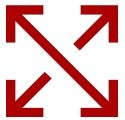
Manage their own datacenters...

...Struggle to migrate legacy workloads to the cloud.

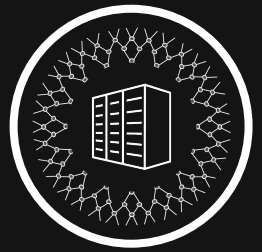
CLOUD-NATIVE COMPANIES

Minimal initial capex costs...

...Struggle to manage cost & complexity with scale.



The Concept of a Datacenter Is Changing



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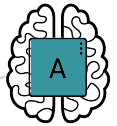

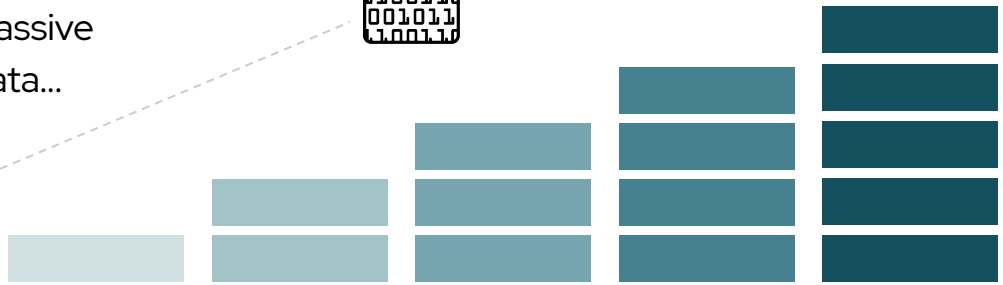

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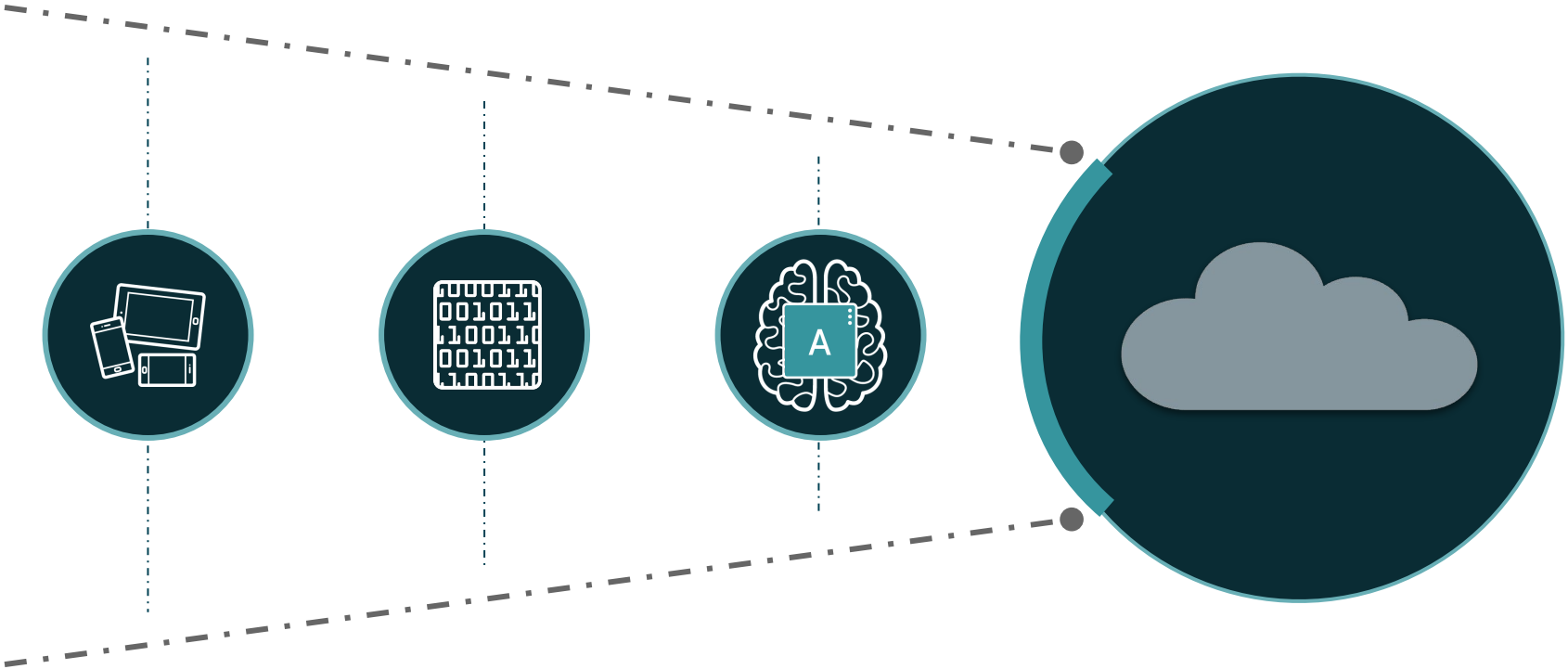
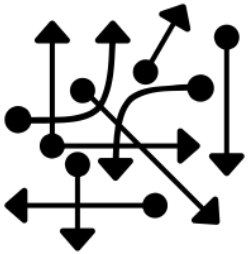
Result: Hybrid Cloud Is Becoming Increasingly Distributed



OSS Promotes Industry-Agnostic De Facto Standards



Standards
=
Marginally Effective

Standards intended to minimize custom solutions, but bespoke integrations / interoperability testing dulled benefits.

Open Source
=
Best Practices

Rather than“standardizing” all problems / solutions, open source empowers developers to define best-practices, enabling code bases to become de-facto standards.

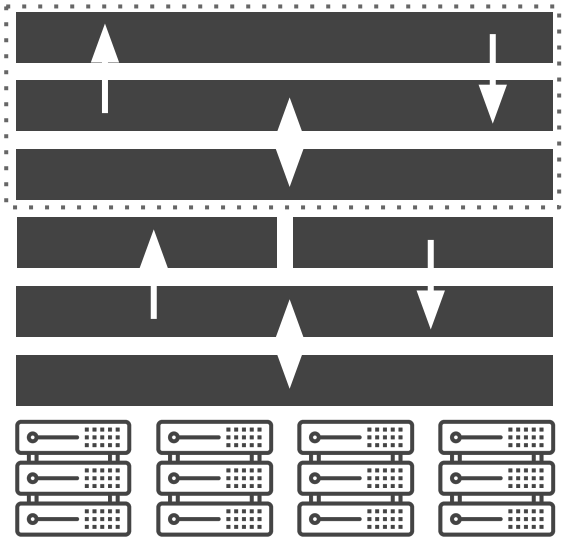
Developers Define Winning Innovations

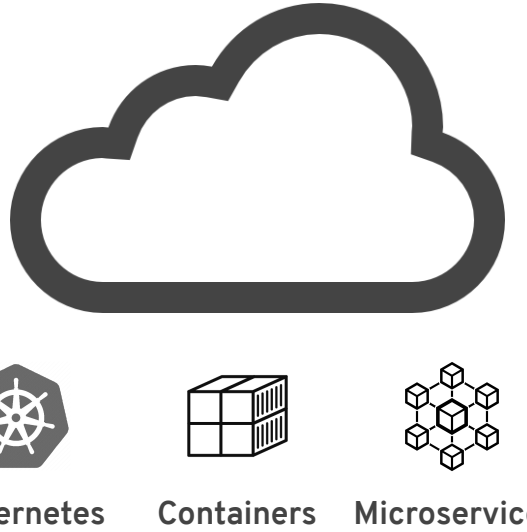
Community-developed solutions provide opportunity to build from and participate in most successful industry-wide technology movements.

Red Hat

Benefiting Entails Move From Inflexible To The Dynamic

Moving from HW to SW-based promotes open source benefits like flexibility, dependability, and reach.





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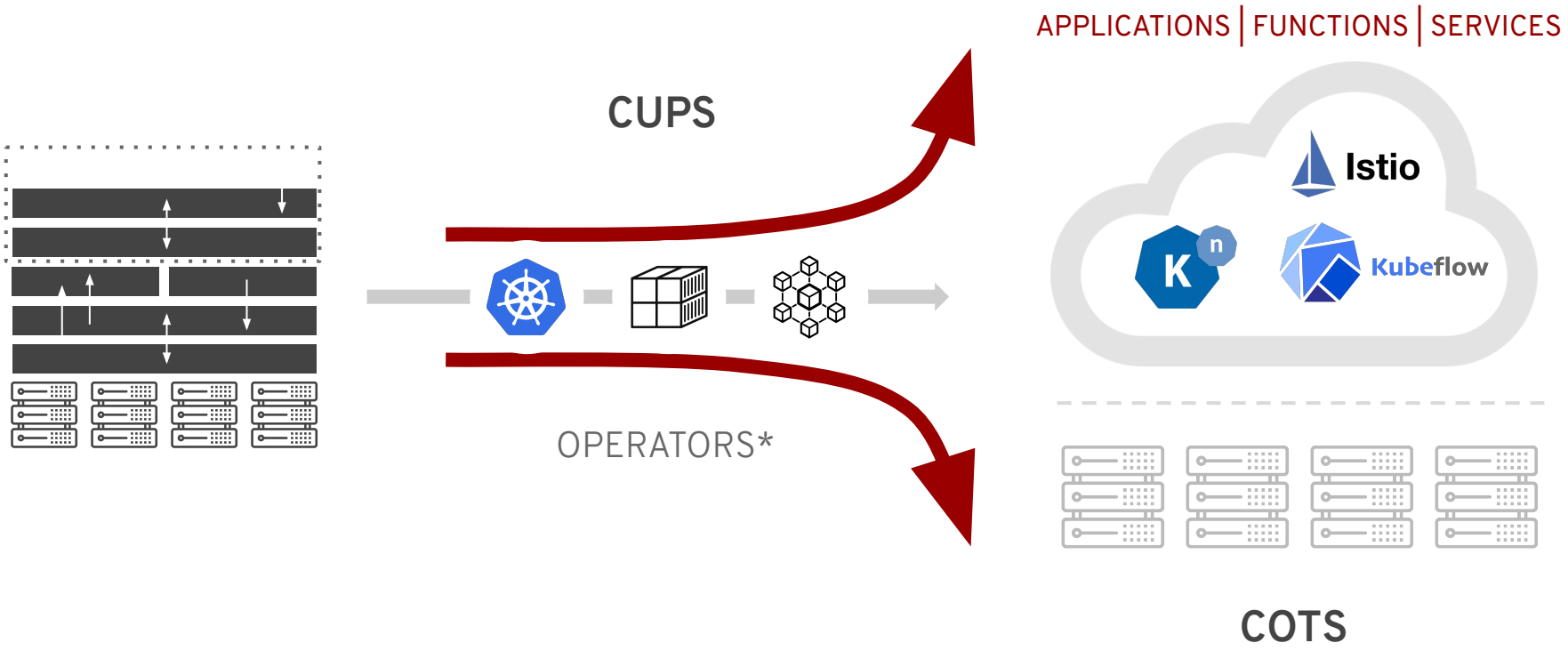
OSS Flexibility Enables Hardware Disaggregation



* **Operators** are Kubernetes controllers applied to applications. The Operator Framework and Kubernetes drive de facto standardization of application on-boarding and lifecycle.

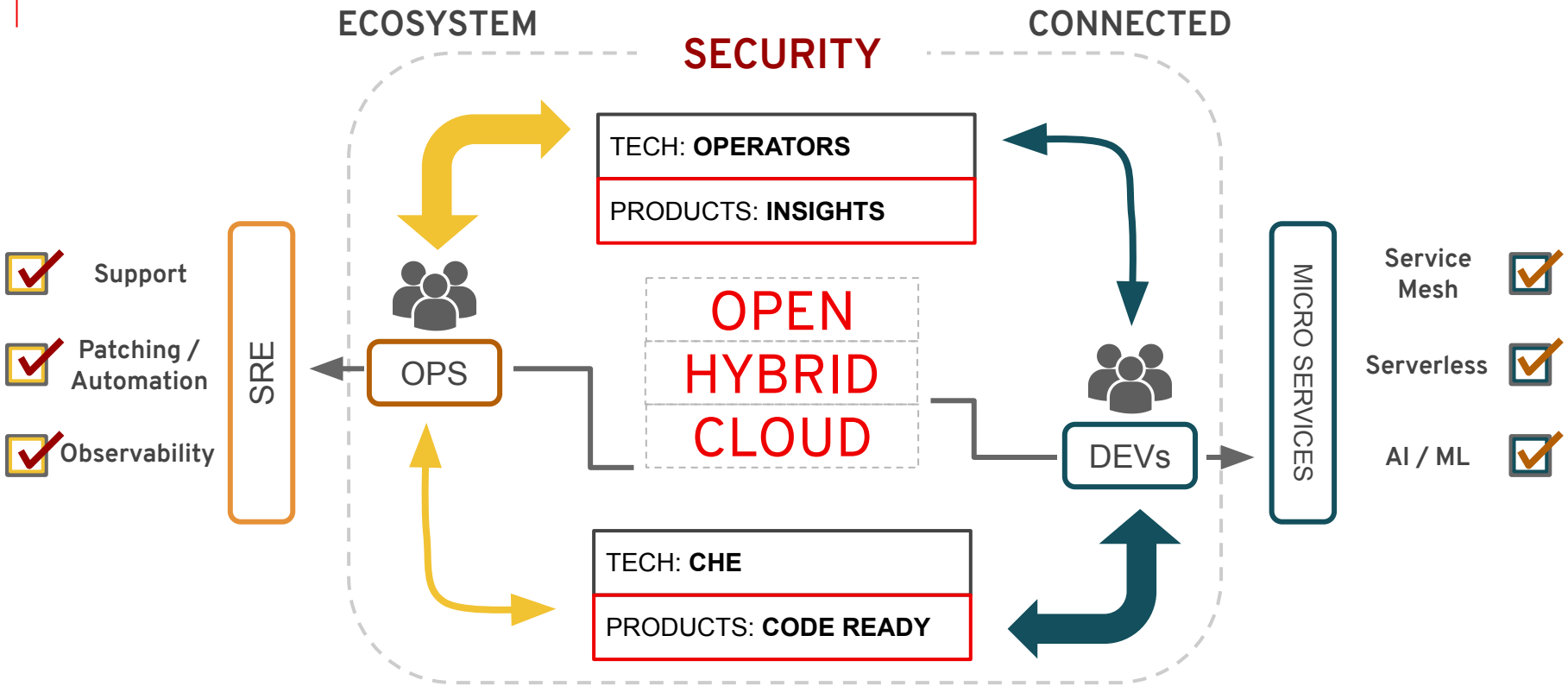
Red Hat

Open Source Software (OSS) Changes The Conversation

COMMODITIZATION

AGILITY

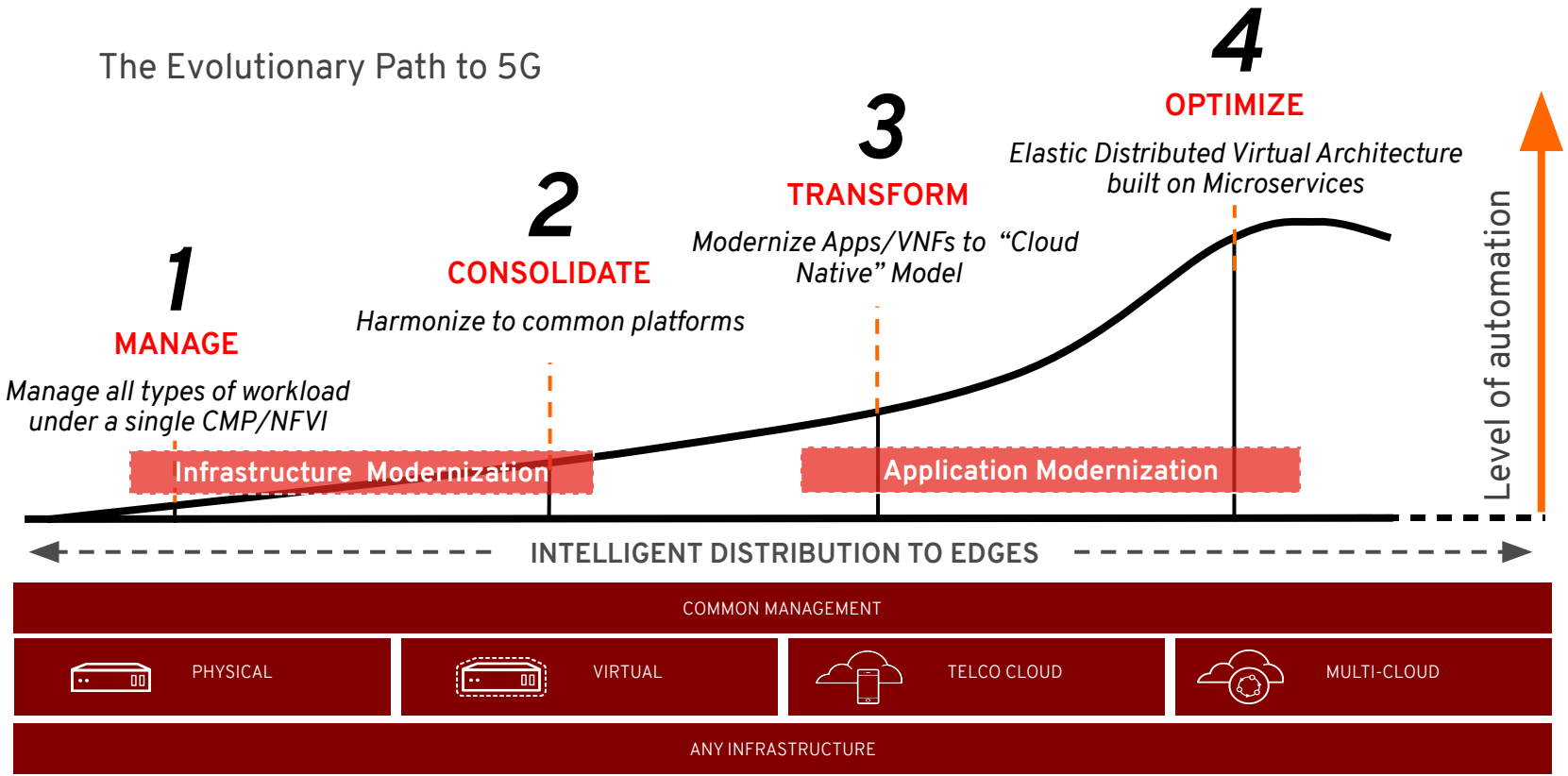
INNOVATION



LEVERAGE RED HAT KNOWLEDGE OF OPEN SOURCE

Red Hat

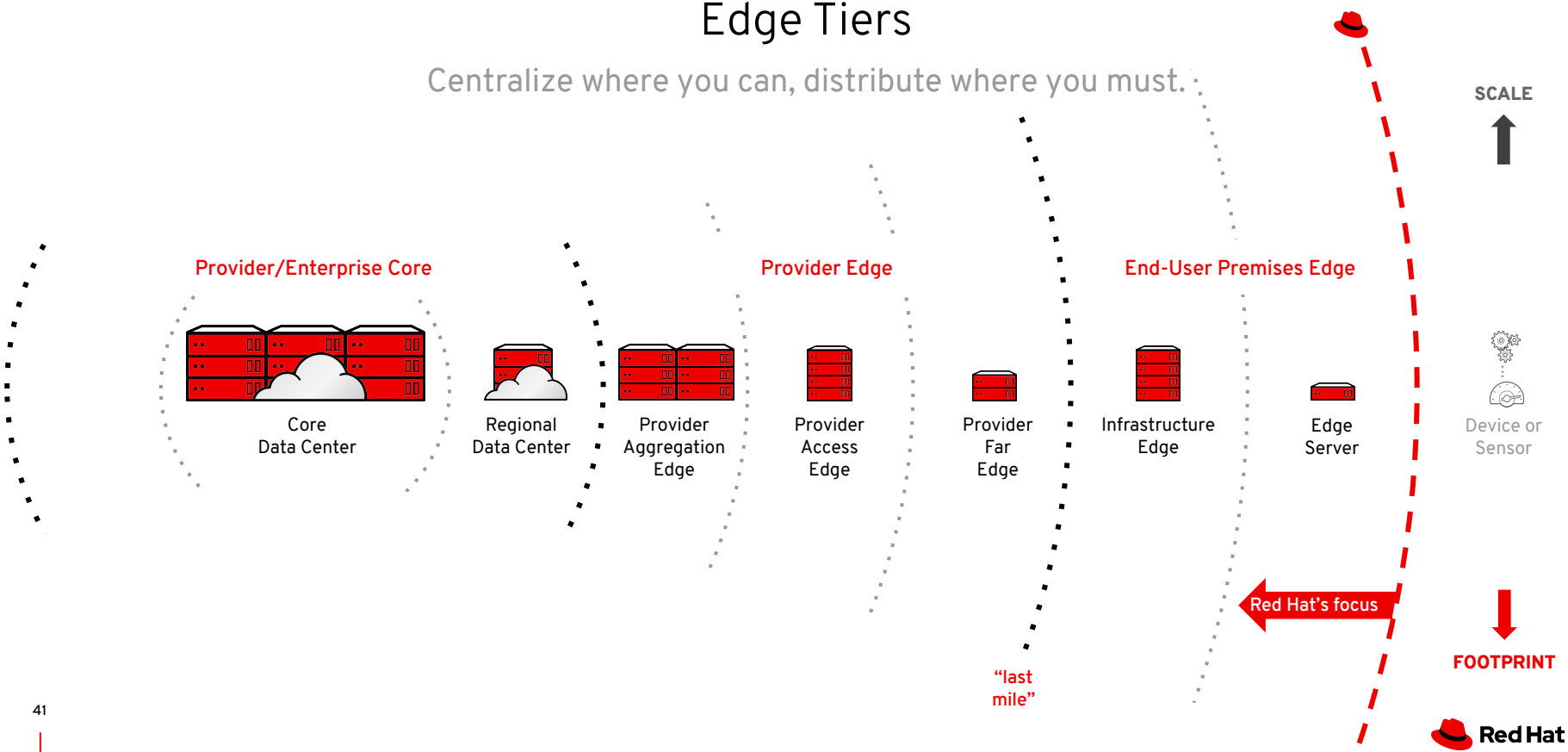
Common Infrastructure Requires Microservices



Red Hat

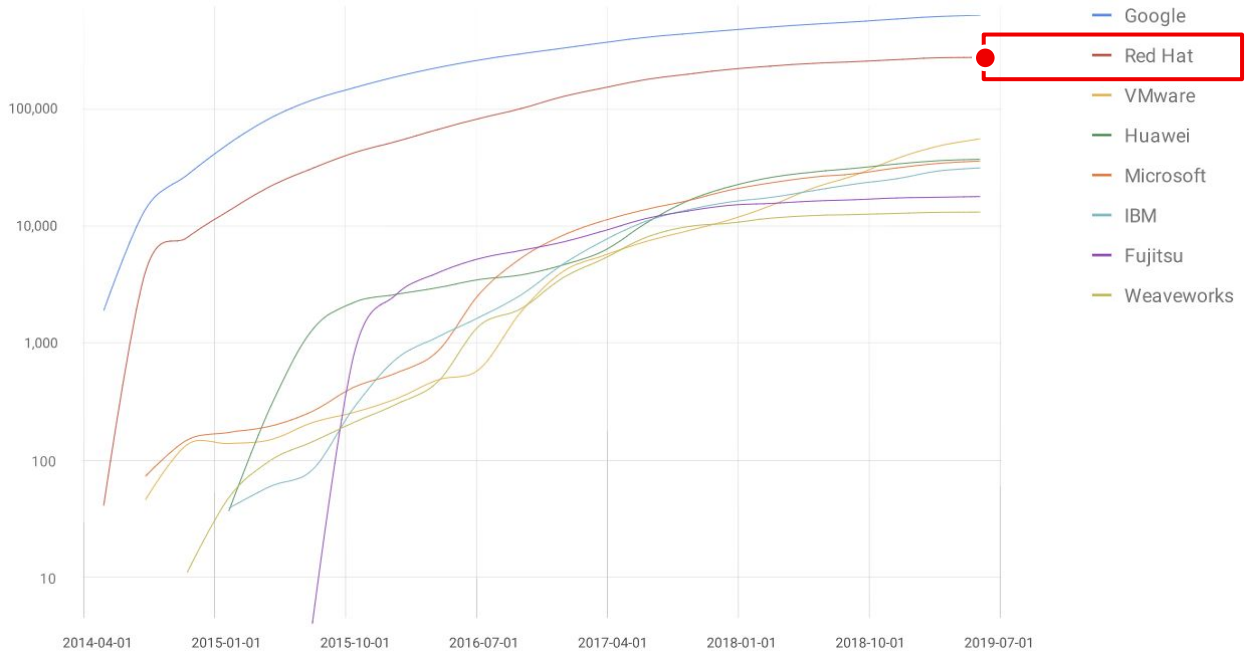
Edge Tiers

Centralize where you can, distribute where you must.



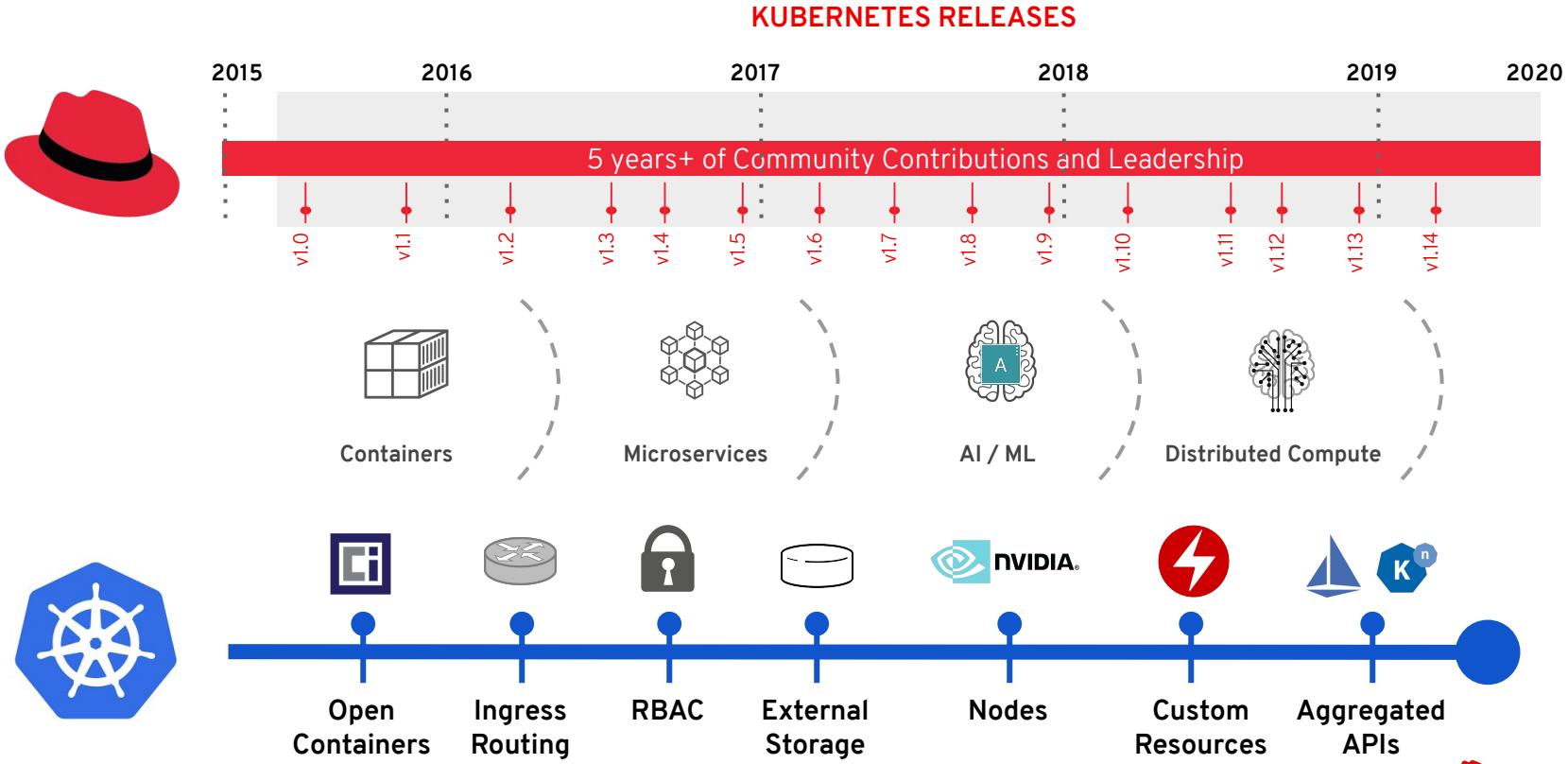
* Edge computing == Fog computing
(there is no real difference other than marketing)

Kubernetes Community Leadership Is Critical…



Source: Cloud Native Computing Foundation. "CNCF Kubernetes Project Journey Report." 2019.

...To Develop Expertise To Continually Meet Customer Demands



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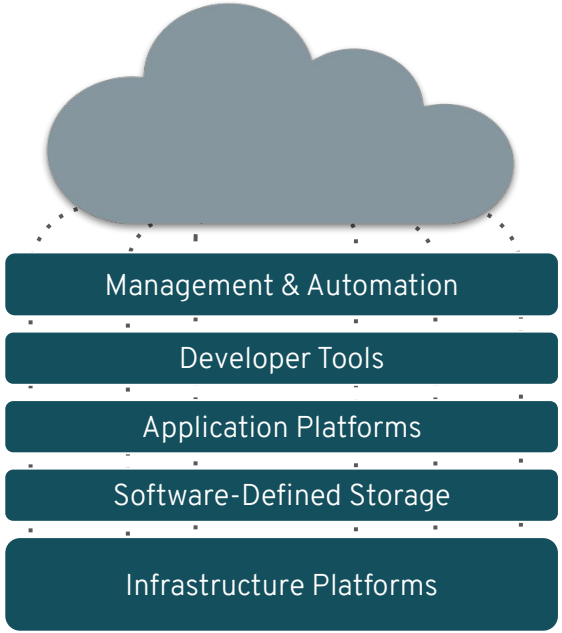
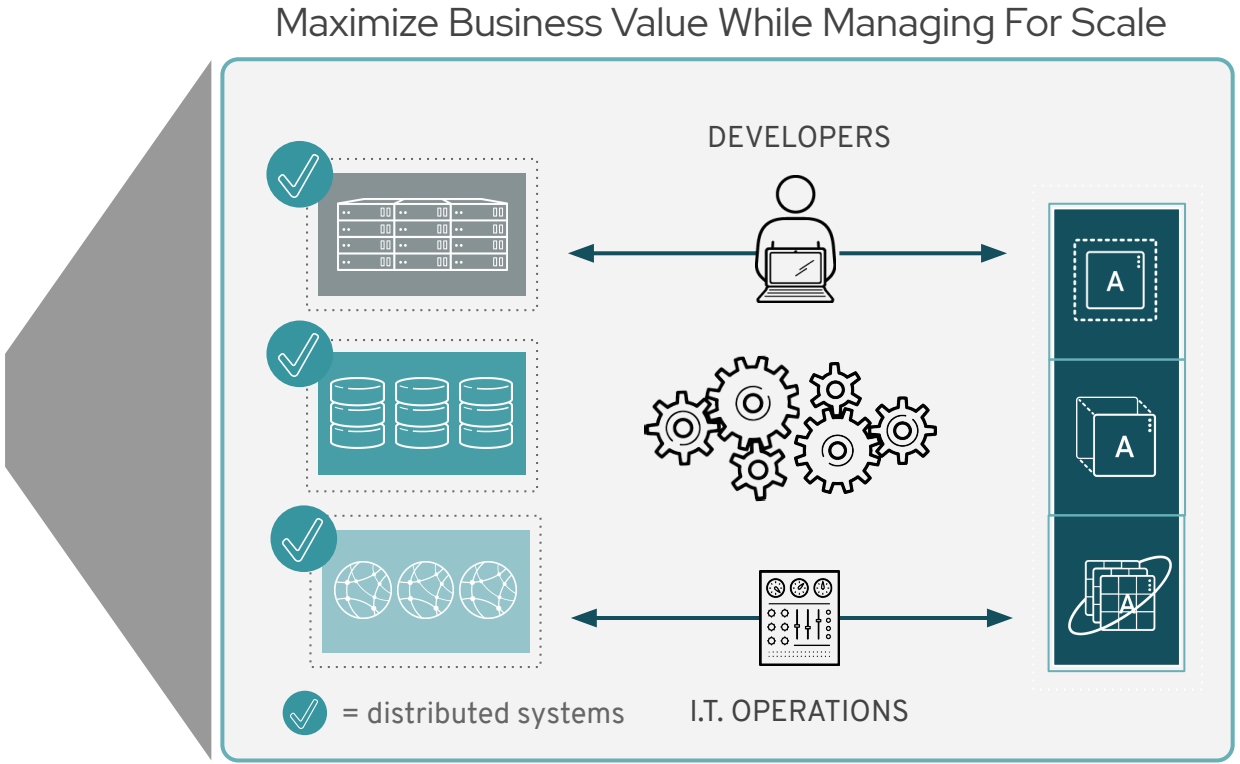
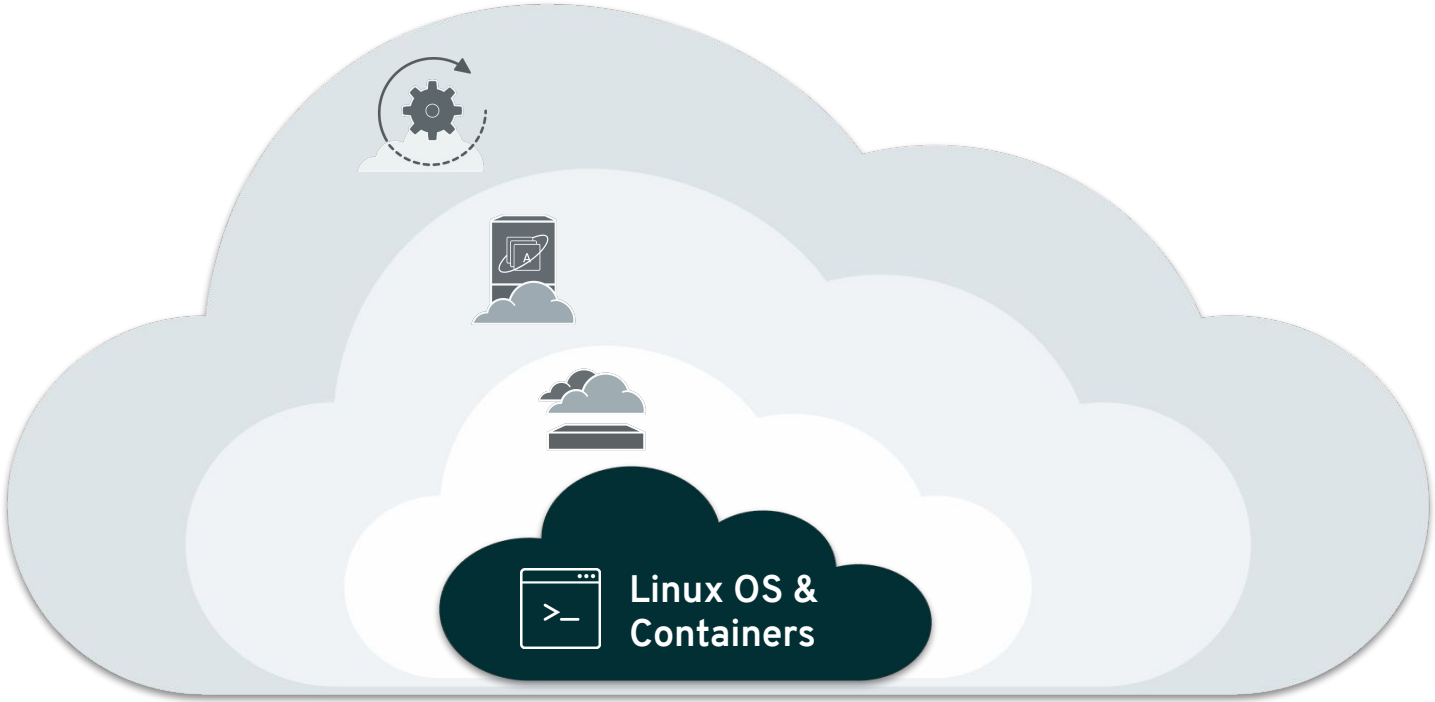
Distributed Systems Are Complex, Requiring Automation to Scale

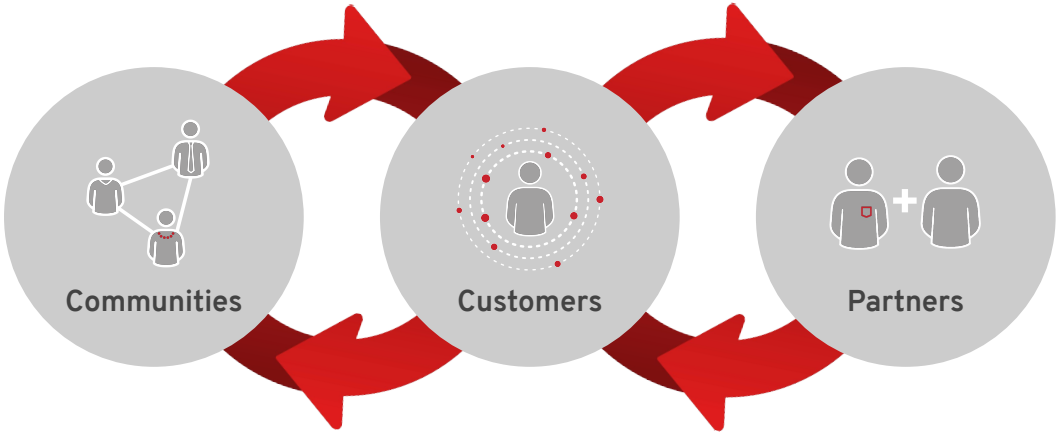




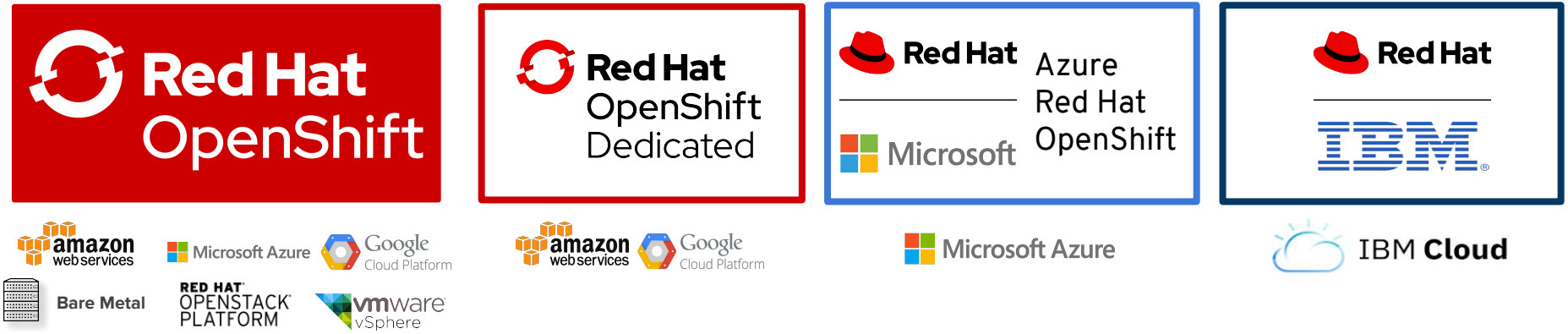
Linux is at the Core of The Hybrid Cloud



We Act As A Catalyst For Communities, Customers, And Partners



The Importance of Expertise in Hybrid Multi-Cloud



SELF-MANAGED

HOSTED SERVICES

Red Hat

Open Hybrid Cloud: Platform Requirements

LIFECYCLE

From 10 changes per hour
to
10-year lifecycle

OPEN
HYBRID
CLOUD

SECURE BY DEFAULT

Trusted
Content

Trusted
Updates

OPEN SOURCE

UPSTREAM

OPEN
HYBRID
CLOUD

OPEN ECOSYSTEM

CO-CREATION

CentOS Streams

BARE METAL

VIRTUALIZED DATA CENTER

OPEN HYBRID CLOUD

PRIVATE CLOUD

EDGE

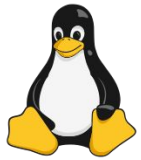
PUBLIC CLOUD

(Multi)

BARE METAL

VIRTUALIZED DATA CENTER

OPEN HYBRID CLOUD



PRIVATE CLOUD

EDGE

PUBLIC CLOUD

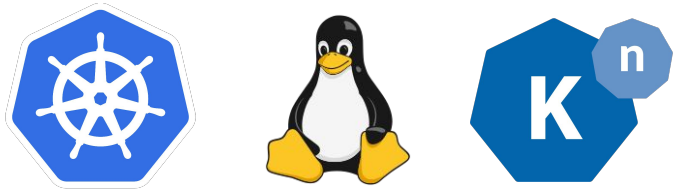
(Multi)

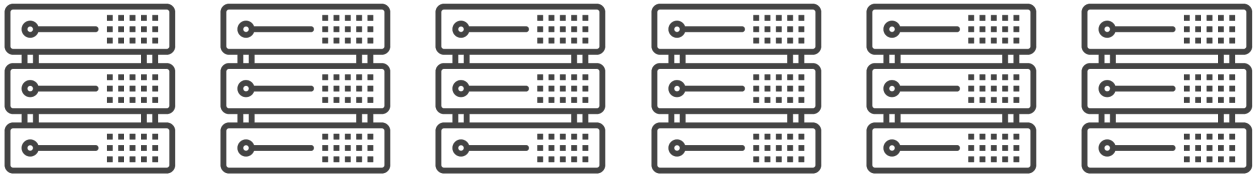
Red Hat

CLOUD NATIVE

SCALE OUT

RUN ANYWHERE





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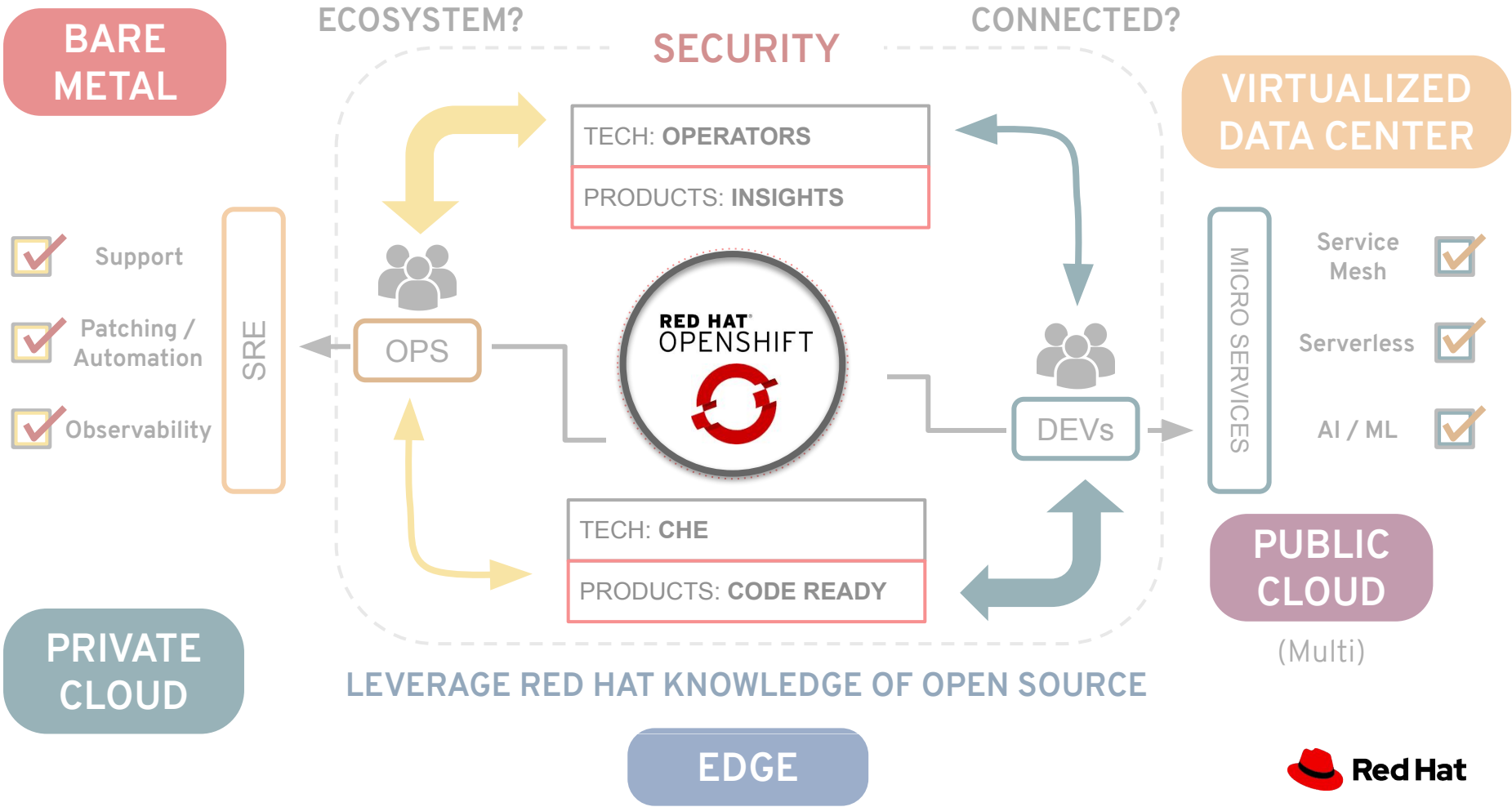
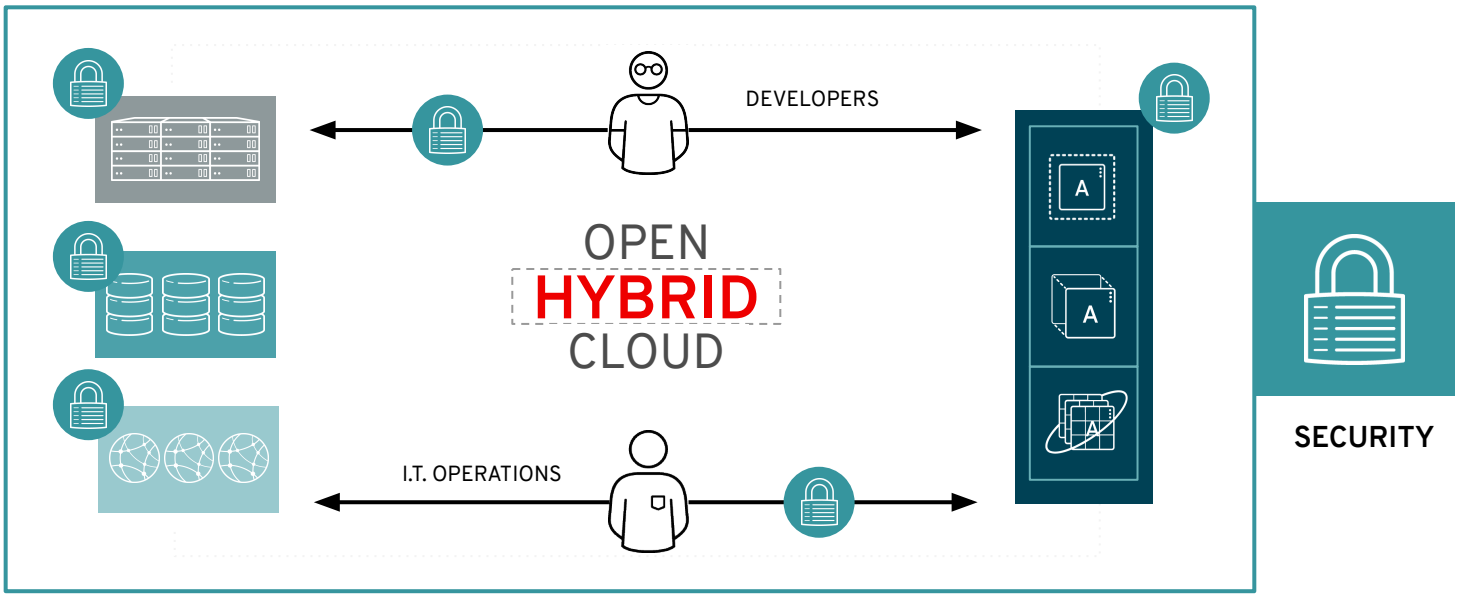
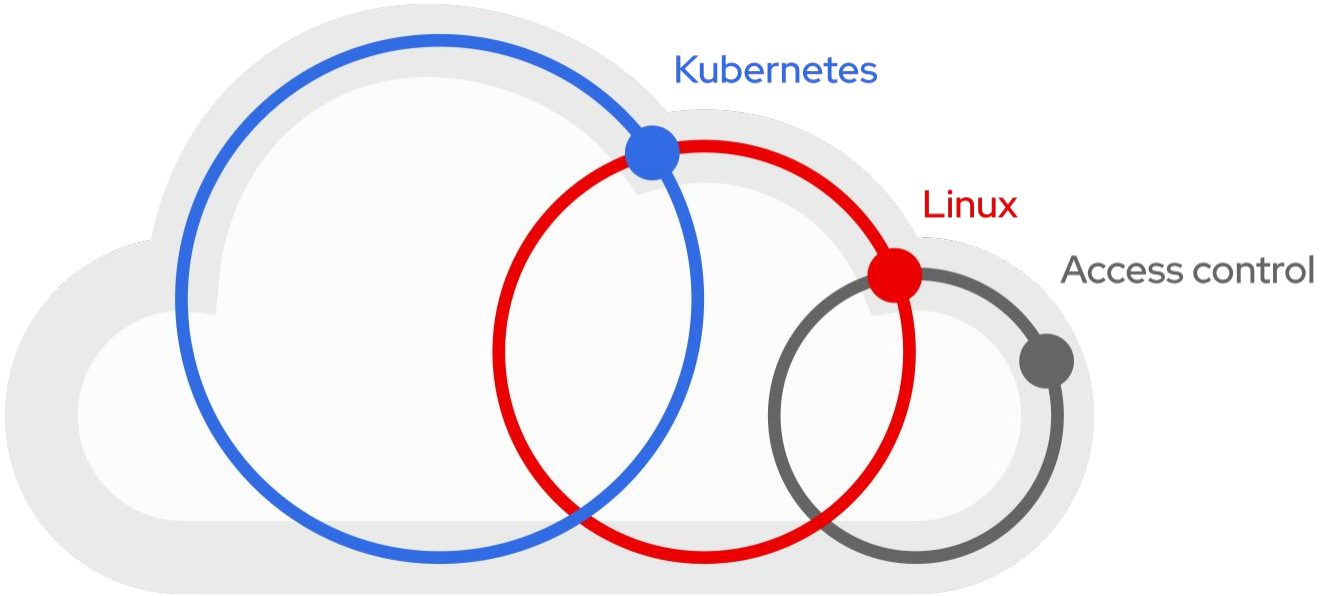

BARE METAL
ECOSYSTEM?
SECURITY
CONNECTED?
VIRTUALIZED DATA CENTER
TECH: OPERATORS
PRODUCTS: INSIGHTS
Support
Patching / Automation
Observability
SRE
OPS
RED HAT OPENSHIFT
DEVs
MICRO SERVICES
Service Mesh
Serverless
AI / ML
TECH: CHE
PRODUCTS: CODE READY
PUBLIC CLOUD
(Multi)
PRIVATE CLOUD
LEVERAGE RED HAT KNOWLEDGE OF OPEN SOURCE
EDGE
Red Hat

Security Requires A System View



Red Hat

What Is The System We Are Securing?



Red Hat

UPSTREAM DYNAMICS

LINUX KERNEL (NOT INCLUDING USERSPACE)

PROJECT INFLUENCE

21.6M

Lines of code

4,000

Committers

CONSUMPTION CONSIDERATIONS

230

Changes a day

6,340

Number of bugs

Over 2 years, 33% of the code has changed.

Red Hat

UPSTREAM DYNAMICS
OPENSTACK

PROJECT INFLUENCE

13.4M
Lines of code

2,600
Committers

CONSUMPTION CONSIDERATIONS

467
Changes per day

3,400+
Number current issues / bugs

Over 3 years and 6 major releases, 97% of the code has changed.

Red Hat

MAKING OPEN SOURCE PRODUCTION GRADE

257

BUGS FIXED between Kube 1.9 and OpenShift 3.9

194

BUGS FIXED between OpenShift 3.9 and 3.9.33

Source: Matthew Barnes, *OSD 3.9 upgrade summary*. internal blog post, Mojo. August 2018.

Red Hat

- The Hybrid Cloud is a Reality
- Linux is at the core of cloud
- World is changing (megatrends)
- Open source communit(ies) driving innovation in a perpetual pursuit of excellence
    - Sine Wave w/ numbers
    - Perpetual
        - Implicit is refinement on a bunch of ideas coming from upstream
- [Technical Discussion] Open Source Innovation as applied to Open Hybrid Cloud:
    - Kube, dev experience on Kube improving (Isto and KNative), ops improving by using common platform (Kube), insights into code (Operators), generating data and doing analysis to feed back recommendations, and then automating recommendations (closed-loop remediation system)
- Product v Project
    - Technology Rate of Change: not just justification for RHT, but shows how quickly things are evolving and that some discipline is needed in consumption
        - Note: "hear more about from Deb"
- OCTO (in between upstream and polished, supported product)

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1. **The Hybrid Cloud is Reality.**
    a. Factors driving behind why
2. **Open Source drives the Cloud**
3. **Innovation Question:**
4. **Open source is driving innovation, specifically hybrid cloud innovation -- consume software**
5. **Improve developer / operational experience (which is largely what we do)**
6. **Specific projects + details on those projects**

We make big bets at RHT and dont bet on too many things; bet based on applicability of technology

Single, vertically integrated cloud, or an open hybrid cloud
Why? Industry moving along these trends (mega trends)
Then what open source is doing in response of that (perpetual pursuit of excellence)
Take that, and apply it to open hybrid cloud (open / hybrid / cloud)

World is changing (how) - megatrends
Open source communit(ies) driving innovation in perpetual pursuit of excellence (implicit is refinement on a bunch of ideas)
-- break into two slides; put the sine wave first (OSS innovation engine); what doing? Perpetual pursuit slide
When you take that concept and apply that to the OHC now we're talking about Kube, dev experience on Kube improving Isto and KNative, ops improving by common platform (Kube), insights into code (Operators), generating data and doing analysis to feed back recomendations, and then automating recommendations (closed-loop remediation system)
Product v project((hear more about from Deb -- not just justification for RHT, but shows how quickly things are evolving and that some discipline is needed in consumption)
- **Rate of Change: needs refreshing (if we are to use it)**

This is not just OCTO
OCTO

Red Hat

OUTLINE

- **The Vision**
  - Red Hat Intro
    - Sine Wave: Red Hat creates stable enterprise platforms from numerous upstream communities
    - Challenge: enabling developers to create more business value with less wasted time / effort
  - Red Hat's Vision is the expansion of a "Self-driving" (fully automatable) distributed Open Hybrid Cloud to the edge
    - Linux as core to cloud
    - Open / Hybrid / Cloud
    - Open Hybrid Cloud = RHEL & OpenShift
  - This requires:
    - A similar ease of use to that found in the operating experience of a public cloud
    - Superior enablement (automation through data)
    - Unrivaled choice (strong ecosystem of partners)
  - What's driving this?
    - [megatrends slides]
    - Conclusion: The Hybrid Cloud is becoming increasingly distributed; an open solution is critical
  - The Office of the CTO works with Red Hat customers **and partners** to refine and deliver Open Source emerging technology insights
    - Pipeline of innovation
    - [Introduce OCTO as a refiner of insights, utilizing customer perspectives to clarify business needs)
  - OCTO covers many technologies; based on customer feedback, we'll be presenting on these today:
    - [Introduce sectors / speakers]