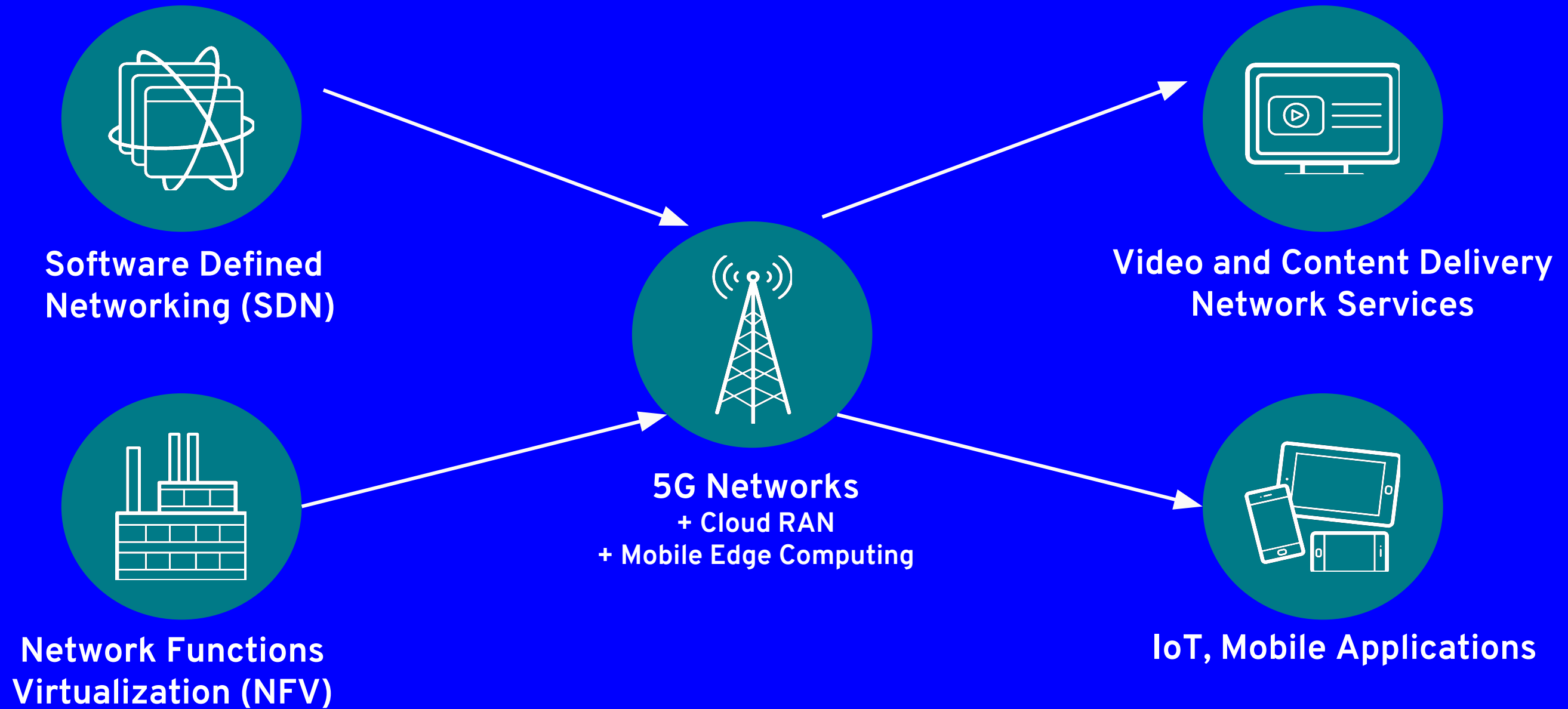




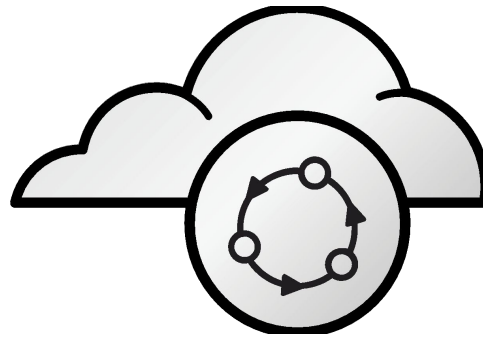
***MODERNIZE TELCO'S NETWORK INFRASTRUCTURE
to improve agility and to prepare for 5G***

Nick Barcet - Sr Director of Product Management - OpenStack
November 2017

CAPTURING THE TECHNOLOGY REVOLUTION



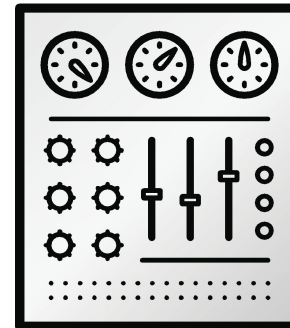
TELCO SERVICES WILL LOOK A BIT DIFFERENT



MODERNIZED NETWORK SERVICES

Virtualized and agile networking services

- vCPE
- vEPC
- SD-WAN

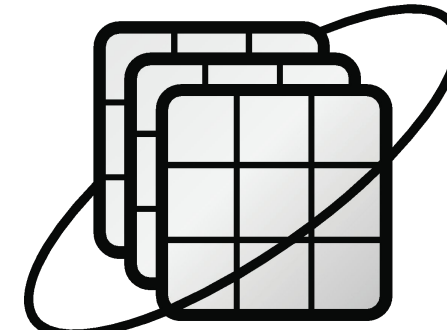


MOBILE EDGE SERVICES

Real-time monitoring

Caching / content optimization

Localized security



APPLICATION SERVICES

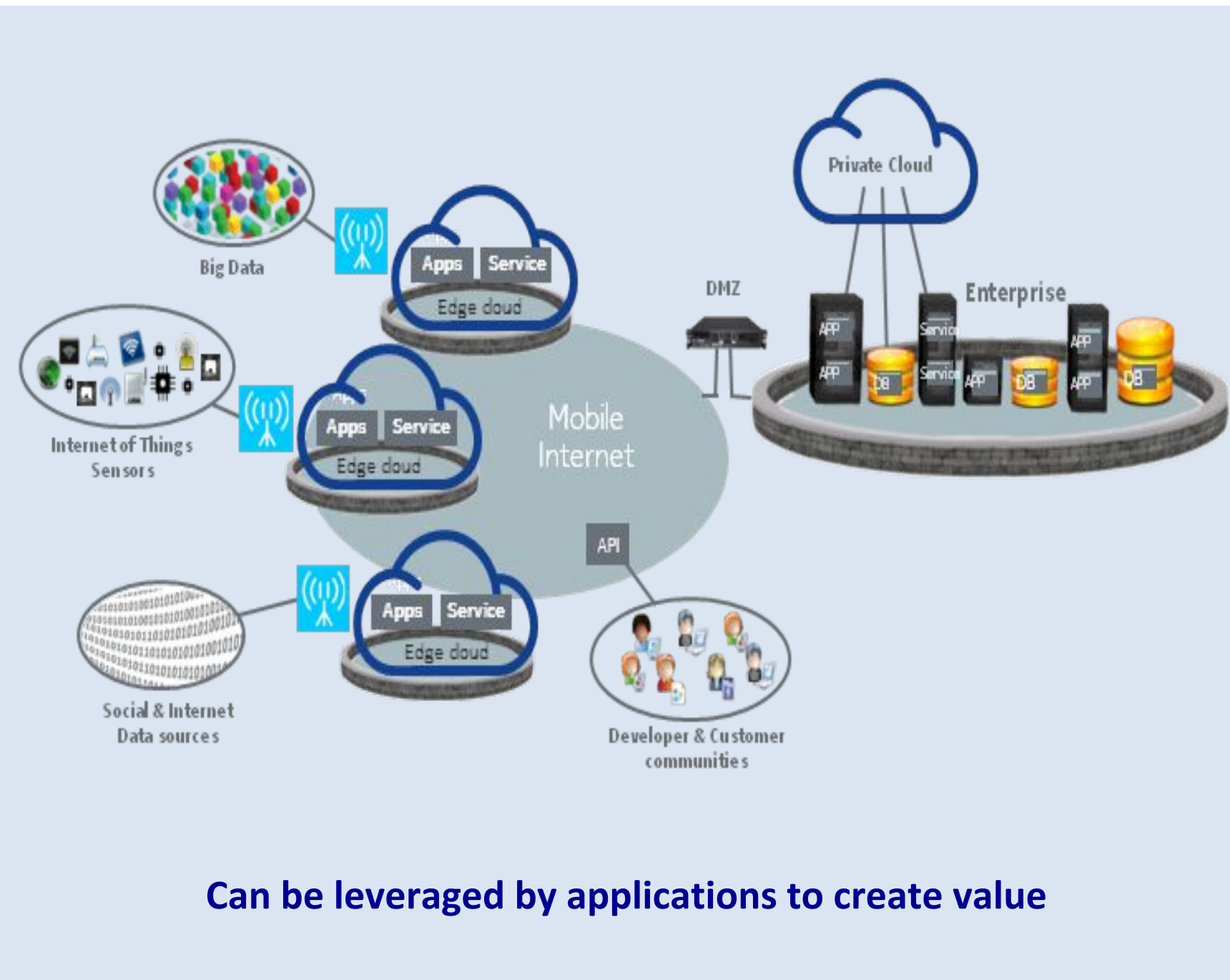
Media delivery

Home security

Industrial IOT applications
(smart metering, agriculture,
transportation)

Emerging Architectures – Driving New Strategies / Partnerships

An Environment for Innovation and Value Creation



Can be leveraged by applications to create value

Offers applications and content providers **cloud-computing capabilities** and an **IT service environment at the edge of the mobile network**

This environment is characterized by:

- **Proximity**
- **Ultra-low latency / Consistent Jitter**
- **High bandwidth**
- **Real-time access to radio network and user / service context information**
- **Location awareness**

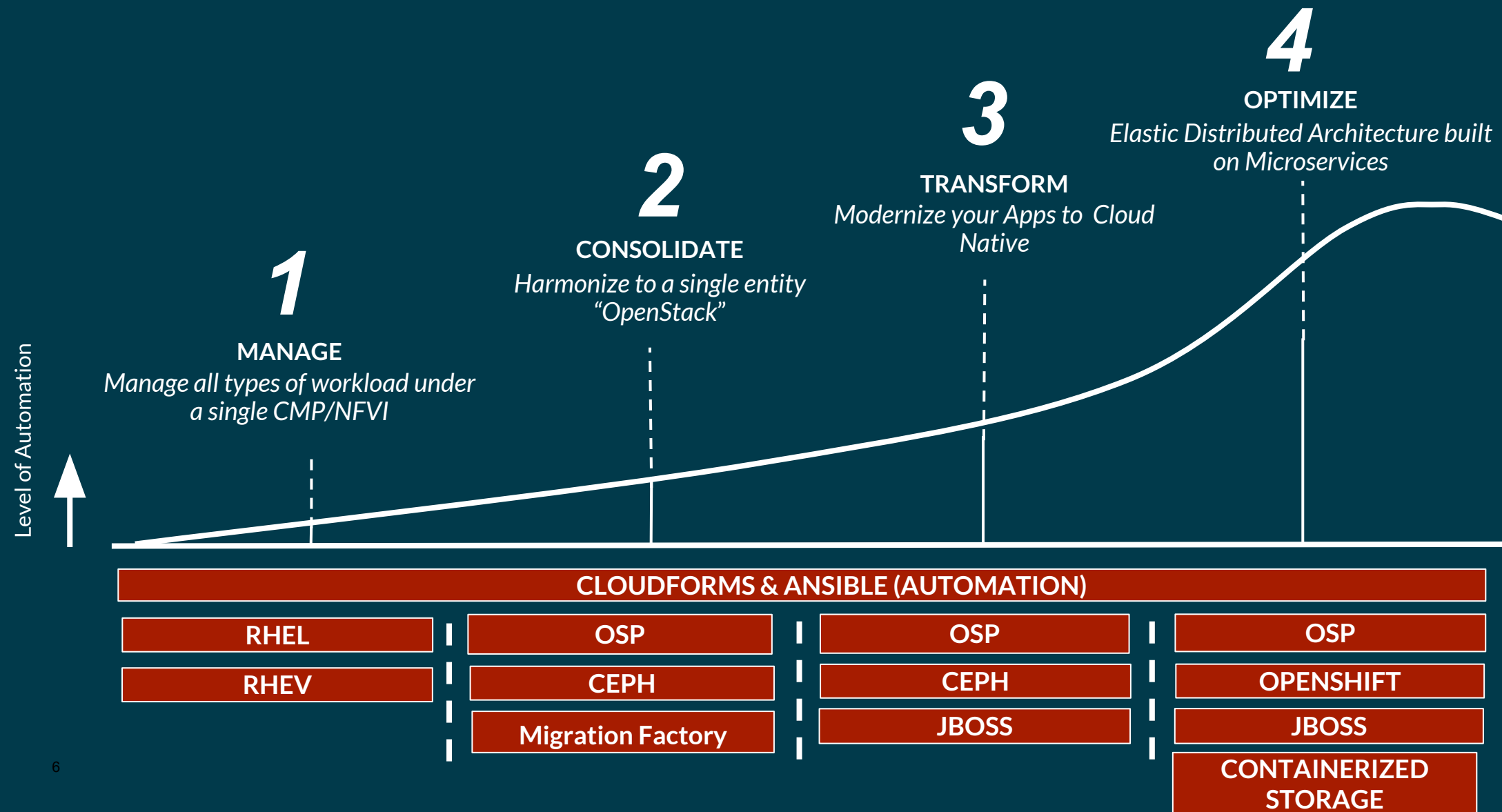
INNOVATIVE SERVICES – ENABLED BY 5G/MEC



<p>Broadband access everywhere</p> <p>50+ MBPS EVERYWHERE</p>	<p>Broadband access in dense areas</p> <p>PERVASIVE VIDEO</p>	<p>Higher user mobility</p> <p>HIGH SPEED TRAIN</p>	<p>Massive Internet of Things</p> <p>SENSOR NETWORKS</p>
<p>Extreme real-time communications</p> <p>TACTILE INTERNET</p>	<p>Lifeline communications</p> <p>NATURAL DISASTER</p>	<p>Ultra-reliable communications</p> <p>E-HEALTH SERVICES</p>	<p>Broadcast-like services</p> <p>BROADCAST SERVICES</p>

Build a virtual zero latency gigabit and ultra reliable experience for people and objects when and where it matters

JOURNEY TO A MICROSERVICES ARCHITECTURE EVOLUTIONARY PATH TO 5G



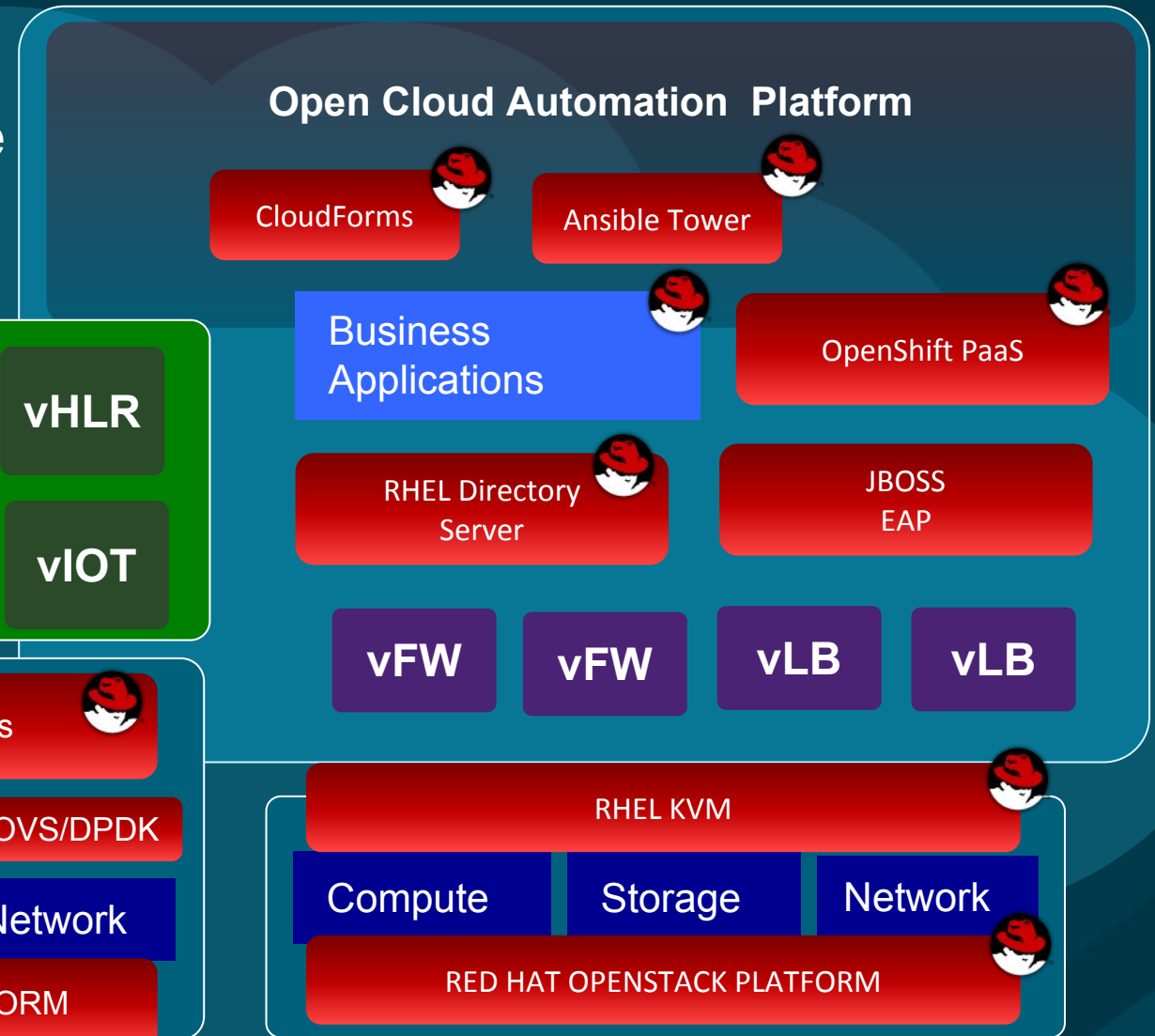
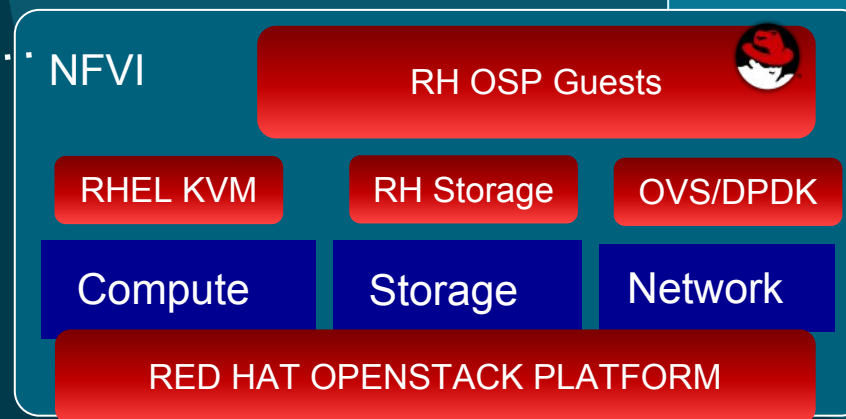
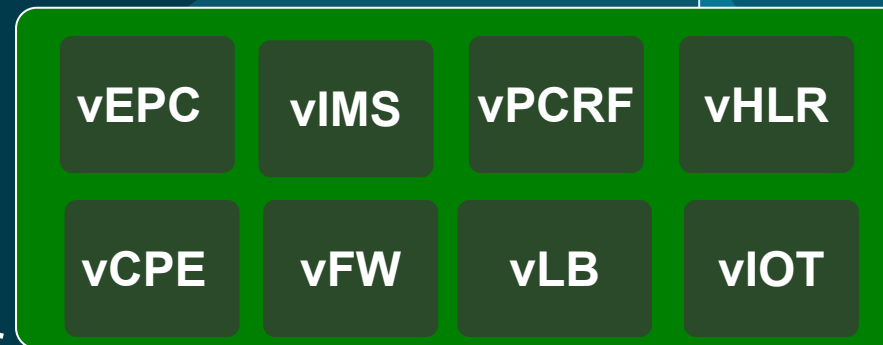
6

MODERNIZE TELECOM- IT APPLICATIONS AND NETWORK SERVICES

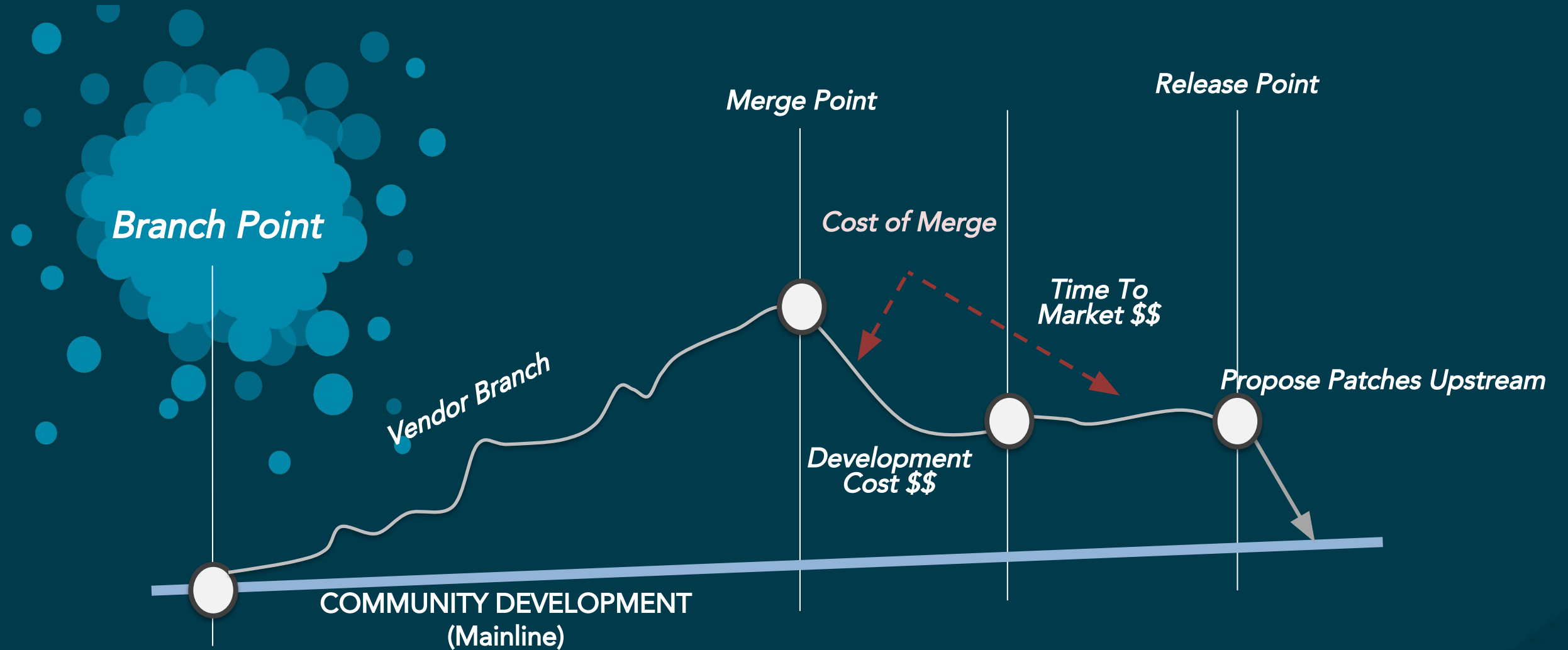
Business Locations
Event Venues
Mobile Customers

Service Provider Private Cloud (IT)

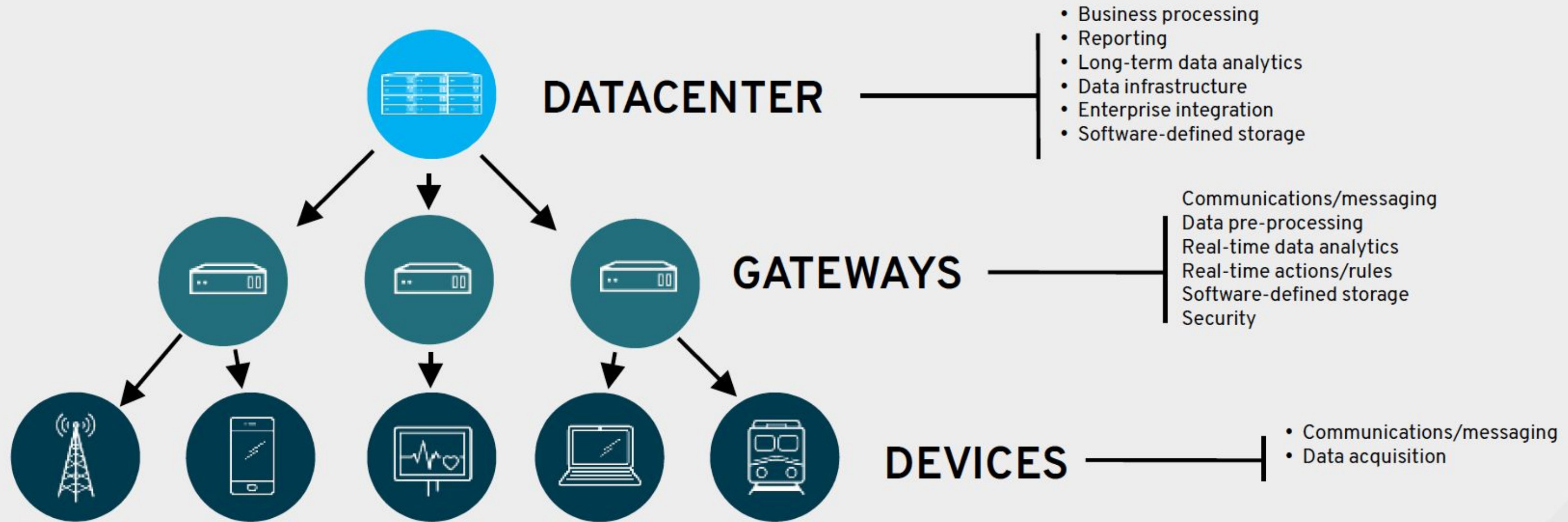
Service Provider Private Cloud (NaaS)



THE HIDDEN COST OF BRANCHING OFF

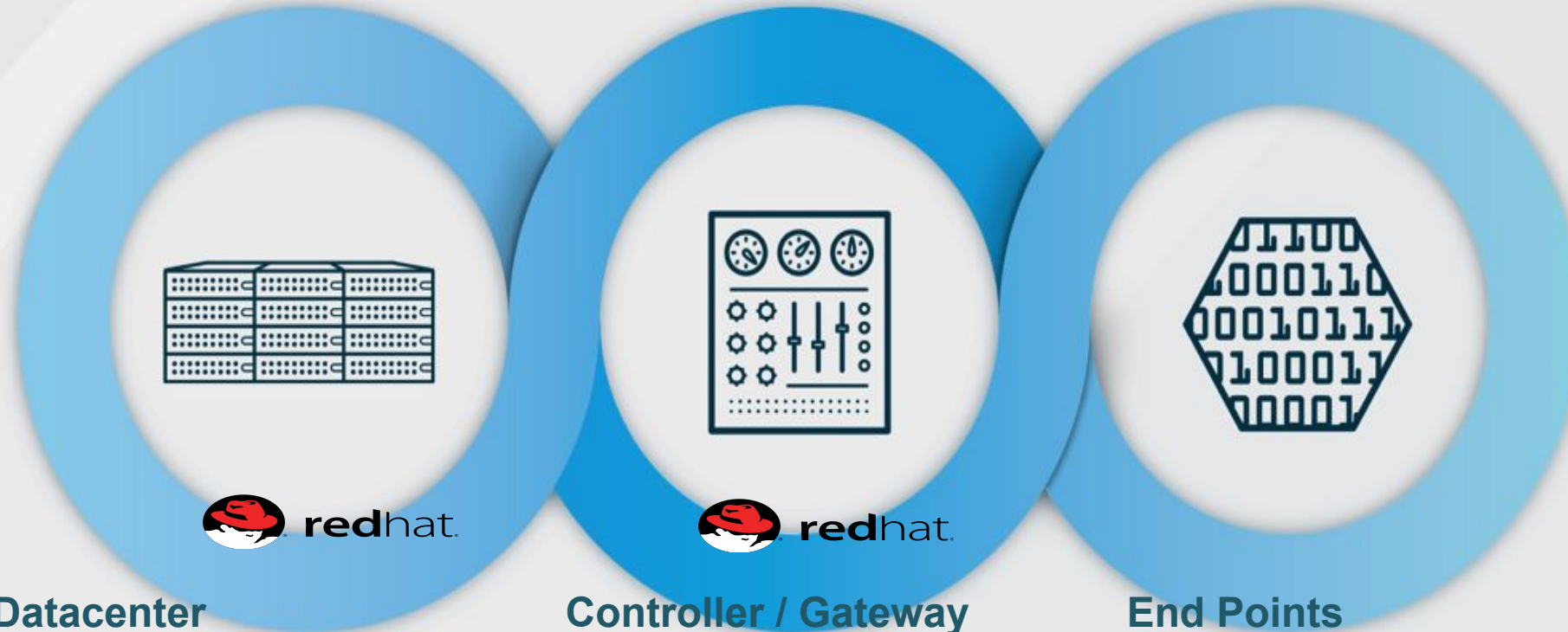


Mobile Edge Compute / IOT Architecture (3 Tiers)



BREAKING DOWN IoT: THREE TIERS

MOVING DATA CENTER TECHNOLOGIES TO THE EDGE



Datacenter

Long-term data analytics

- Long-term control
- Rule creation
- Reporting

Controller / Gateway

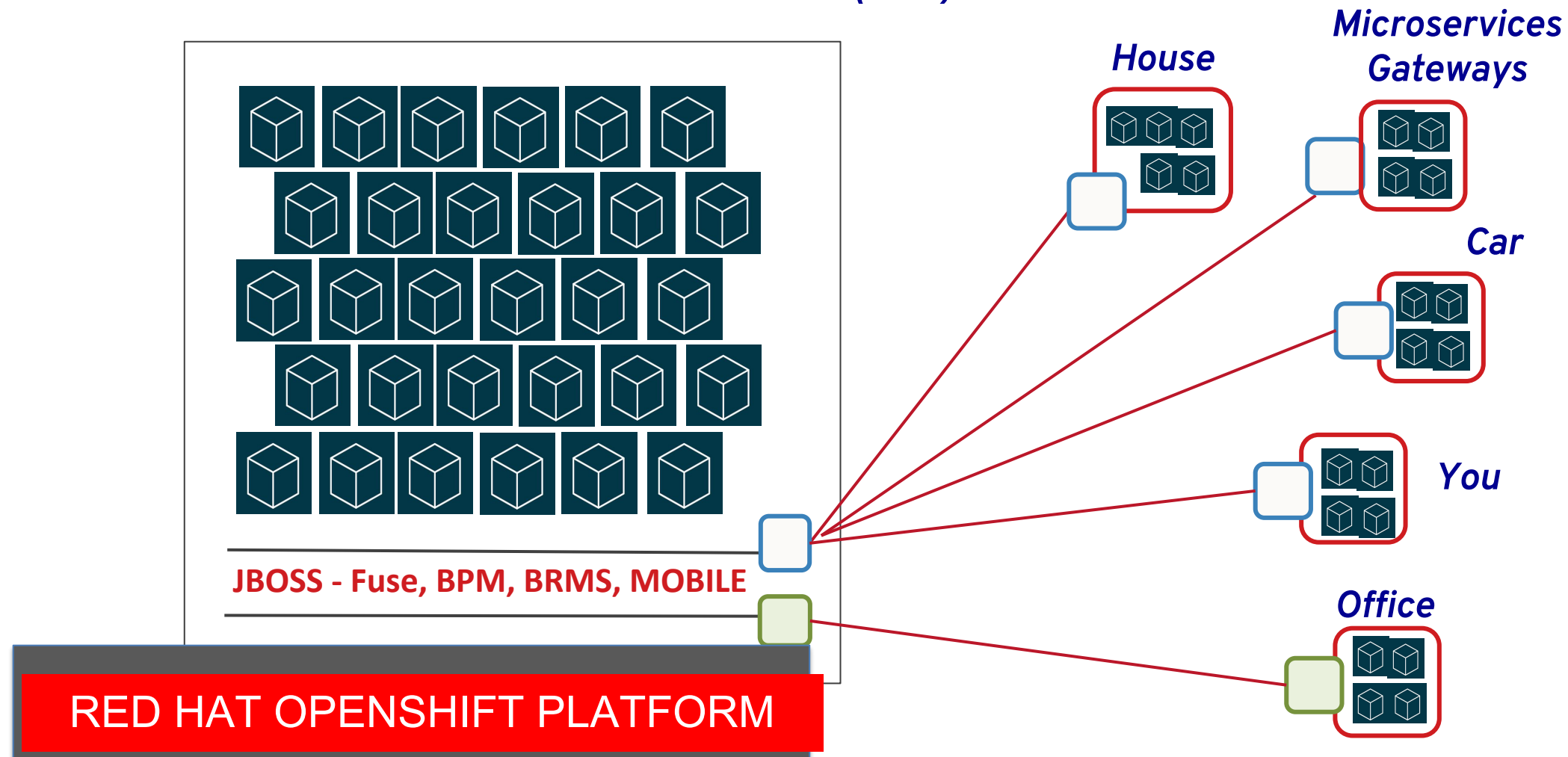
- Communications
- Data summary
- Real-time data analytics
- Real-time actions/rules

End Points

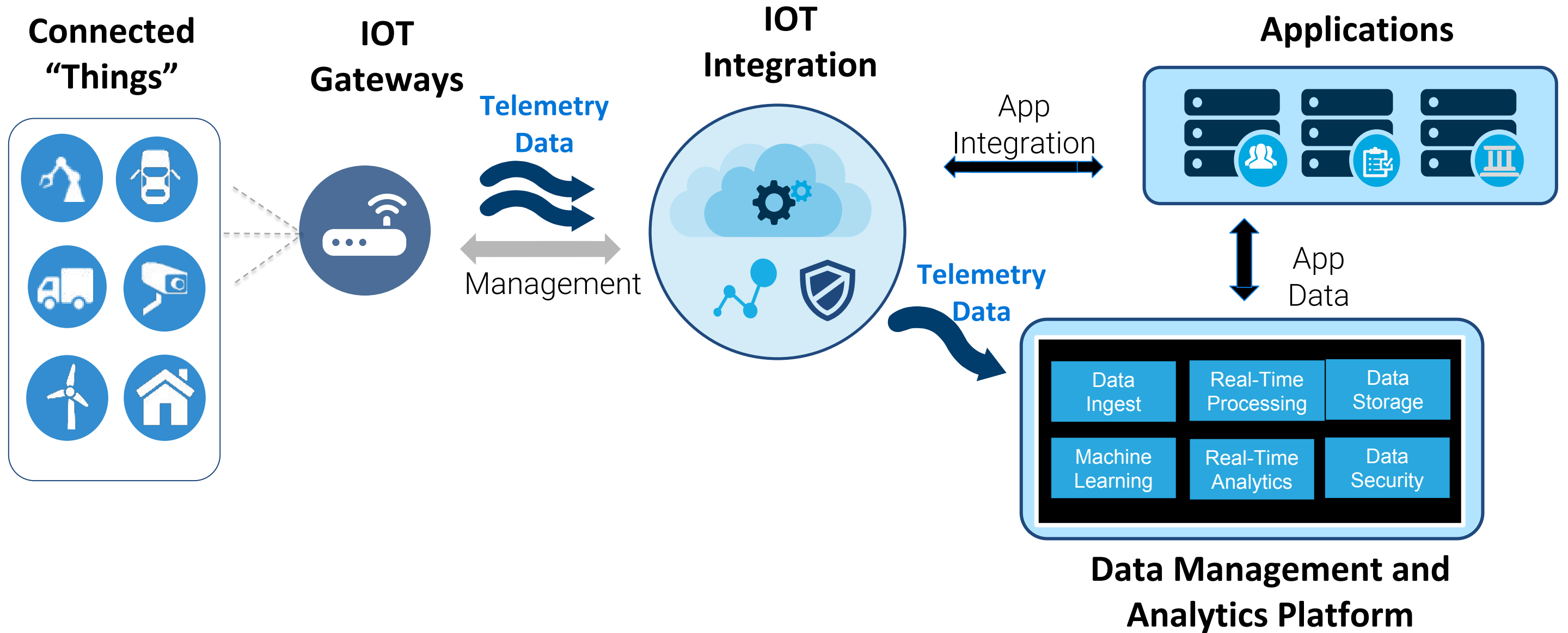
- Data Acquisition
- Device Communications

Creating a Distributed Smart Architecture

Next-Gen Virtual Central Office (VCO)

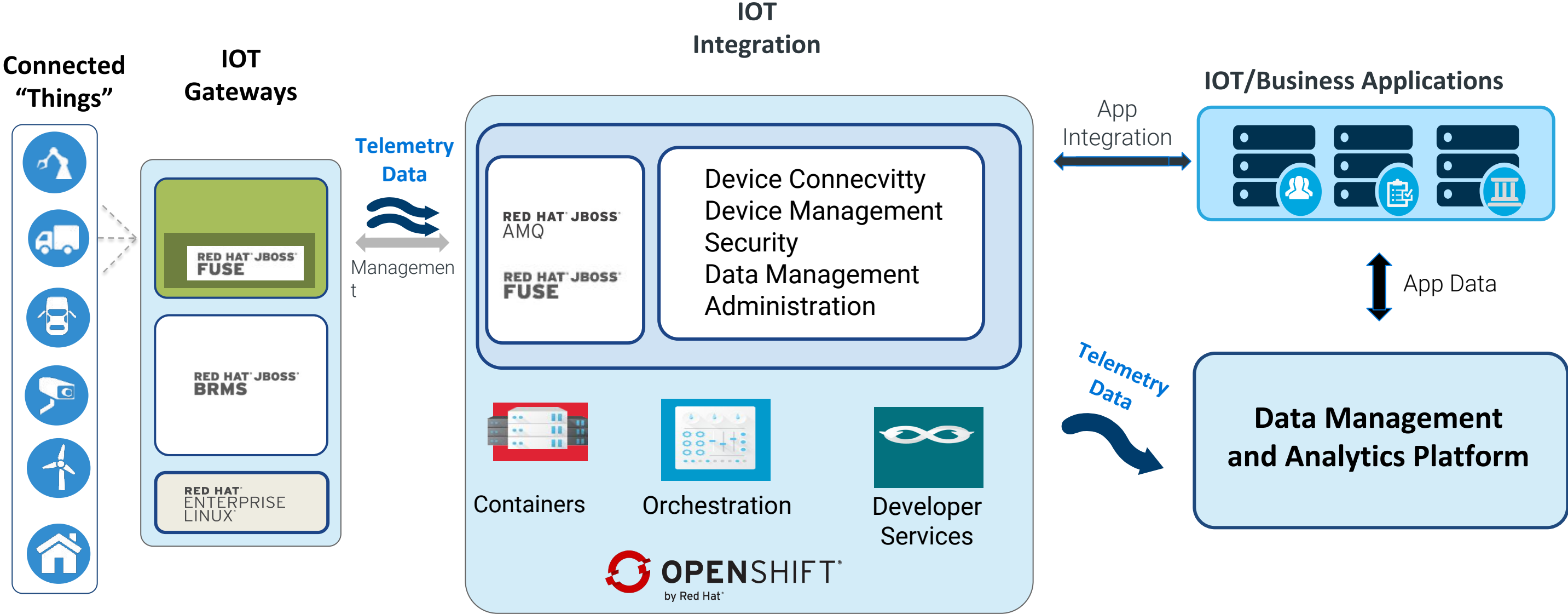


Open IOT Architecture



Open IoT Architecture

Integrating IOT Operating Technology, Data Management, Analytics, and Applications



Enabling MEC / IOT Applications and Services

Manufacturing/Oil/Gas



Healthcare



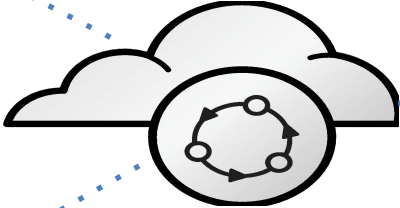
Smart Cities



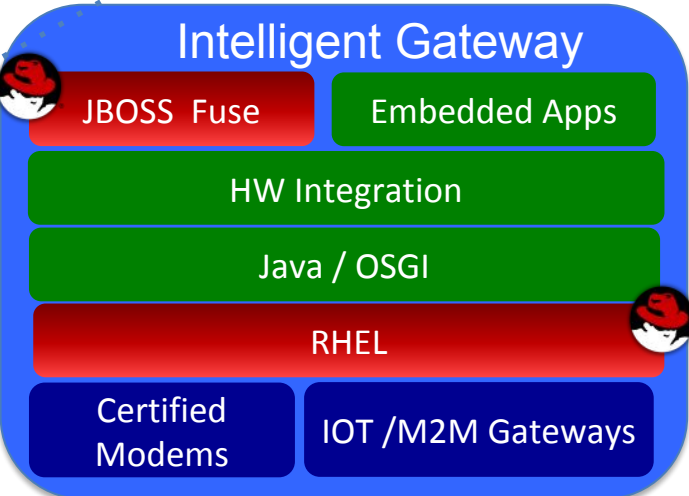
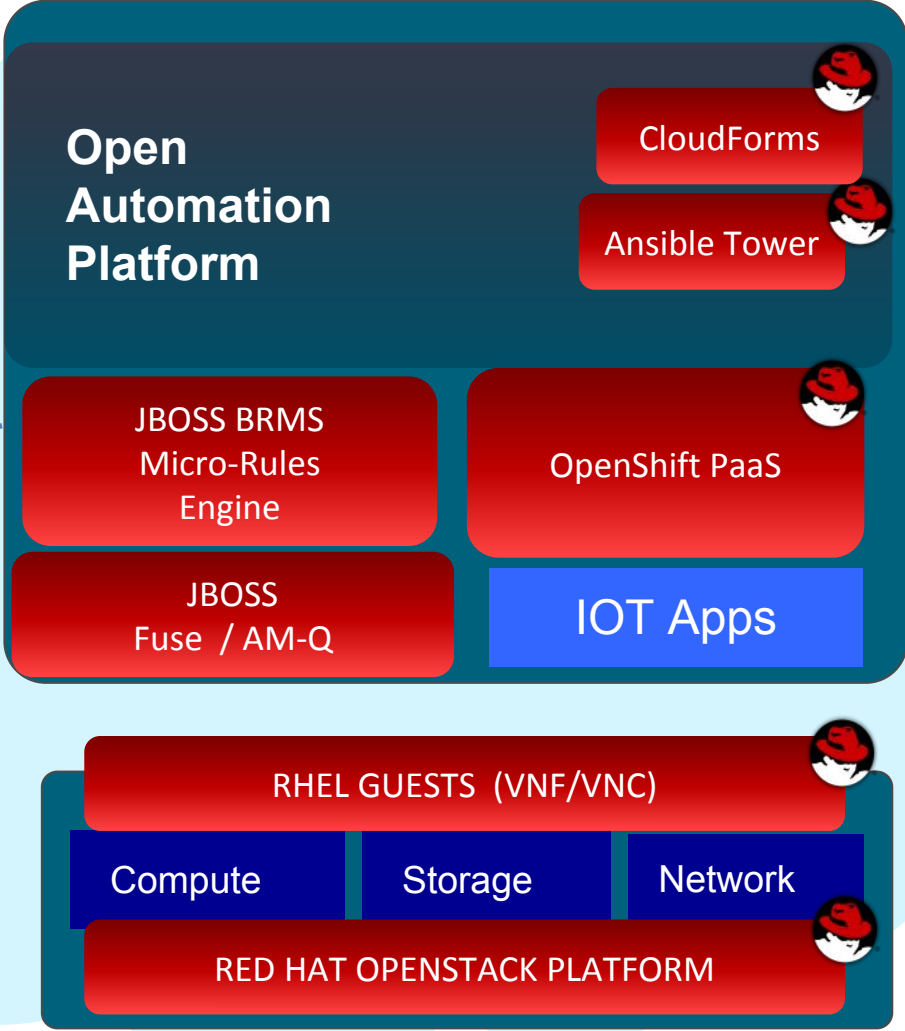
Intelligent IOT Gateways



Network
AMQ-P
MQTT



Centralized Data Management



Telefonica Smart City IOT Framework



Big Data
Map & Reduce based on Apache Hadoop

ST Historic
Allows users to search short term historic data

Open Data
Expose public data (based on CKAN de-facto standard)

Identity Management
Provides the platform Authentication & Authorization system: services, users, roles and permissions (Oauth 2.0)

CEP
Analyses events, enabling instant predefined actions

Portal
Platform configuration portal simplifying service set up

Connector Framework (Cygnus)
Adapts NGSI data from Context Broker to internal or external systems

Context Broker
Retrieves, maintains and deliver Context Information into the IoT Platform components and external systems
Supports standard OMA NGSI9/10 Publish-Subscribe APIs

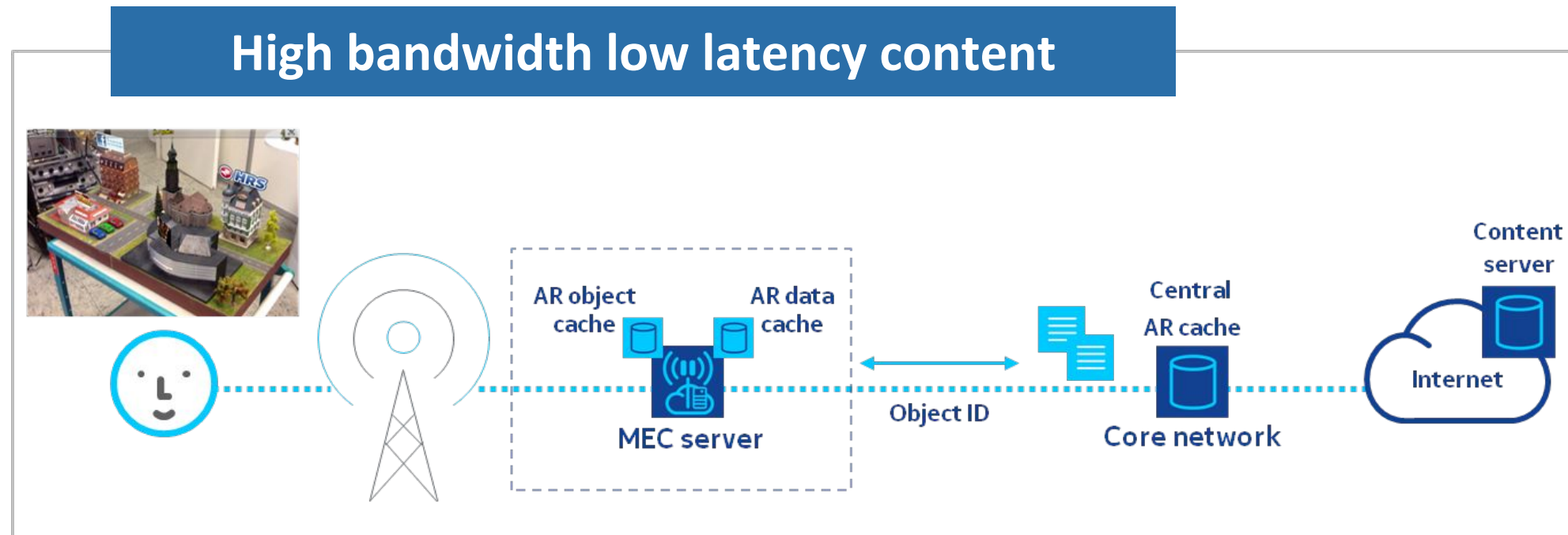
ETL

redhat **ESB**

IoT Agents
Collects data from devices using heterogeneous protocols and translates them into standard NGSI entities.
Supports UL/2.0, MQTT, Push/Pull Commands

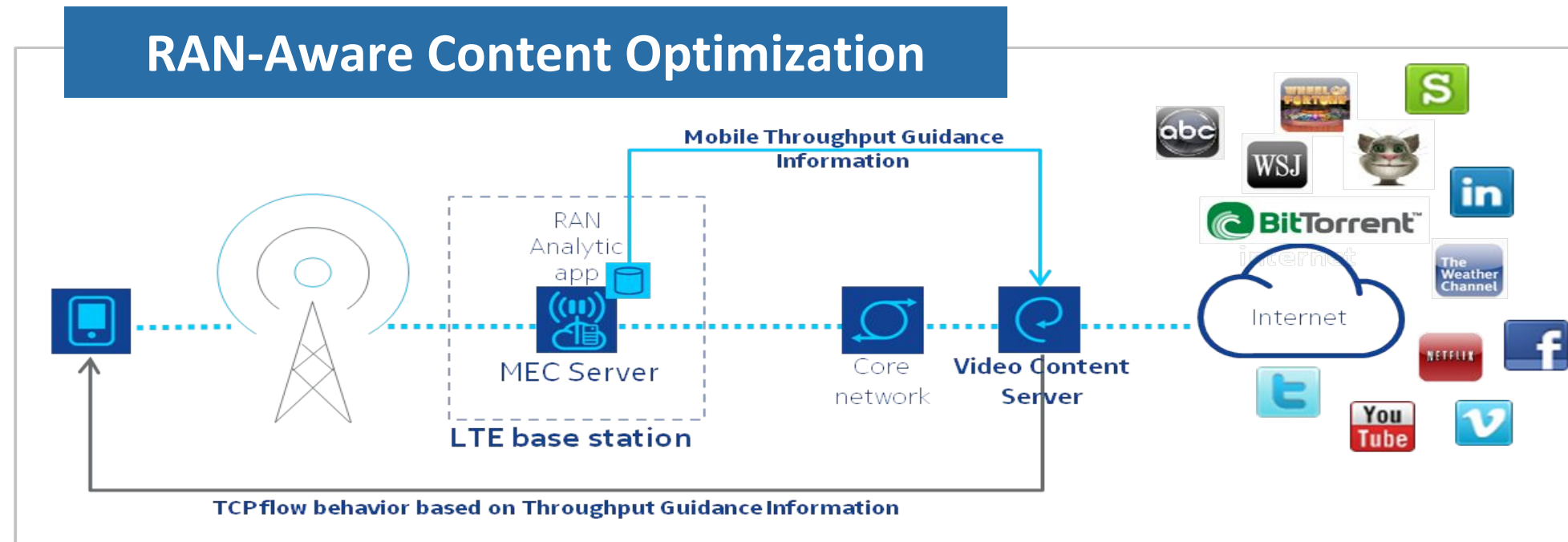
redhat **RED HAT ENTERPRISE LINUX OPENSTACK PLATFORM**

CONSUMER SERVICE SCENARIO – AUGMENTED REALITY



- Application software analyses the output from a device's camera and the precise location
- Objects viewed on the the device camera are overlaid with local augmented reality content
- Enables unique experience of a visitor to a museum or other (indoors or outdoors) points of interest
- Ensures low latency and high rate of data processing

INTELLIGENT VIDEO ACCELERATION – IMPROVED QoE

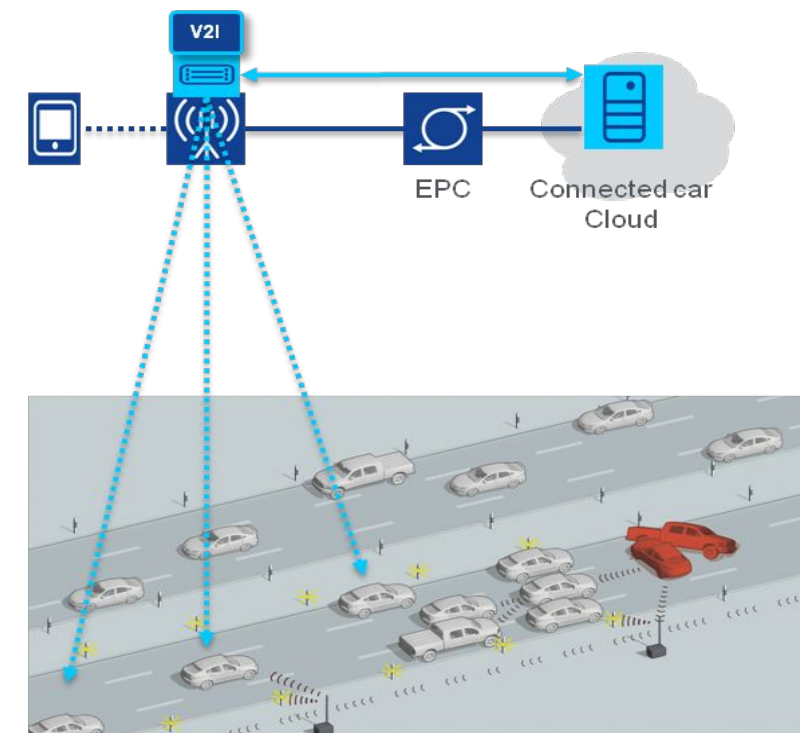


- Radio Access Network Analytics application provides the video server with an indication on the throughput estimated to be available at the radio downlink interface
- The information can be used to assist TCP congestion control decisions and also to ensure that the application-level coding matches the estimated capacity at the radio downlink
- Enables improved video quality and throughput

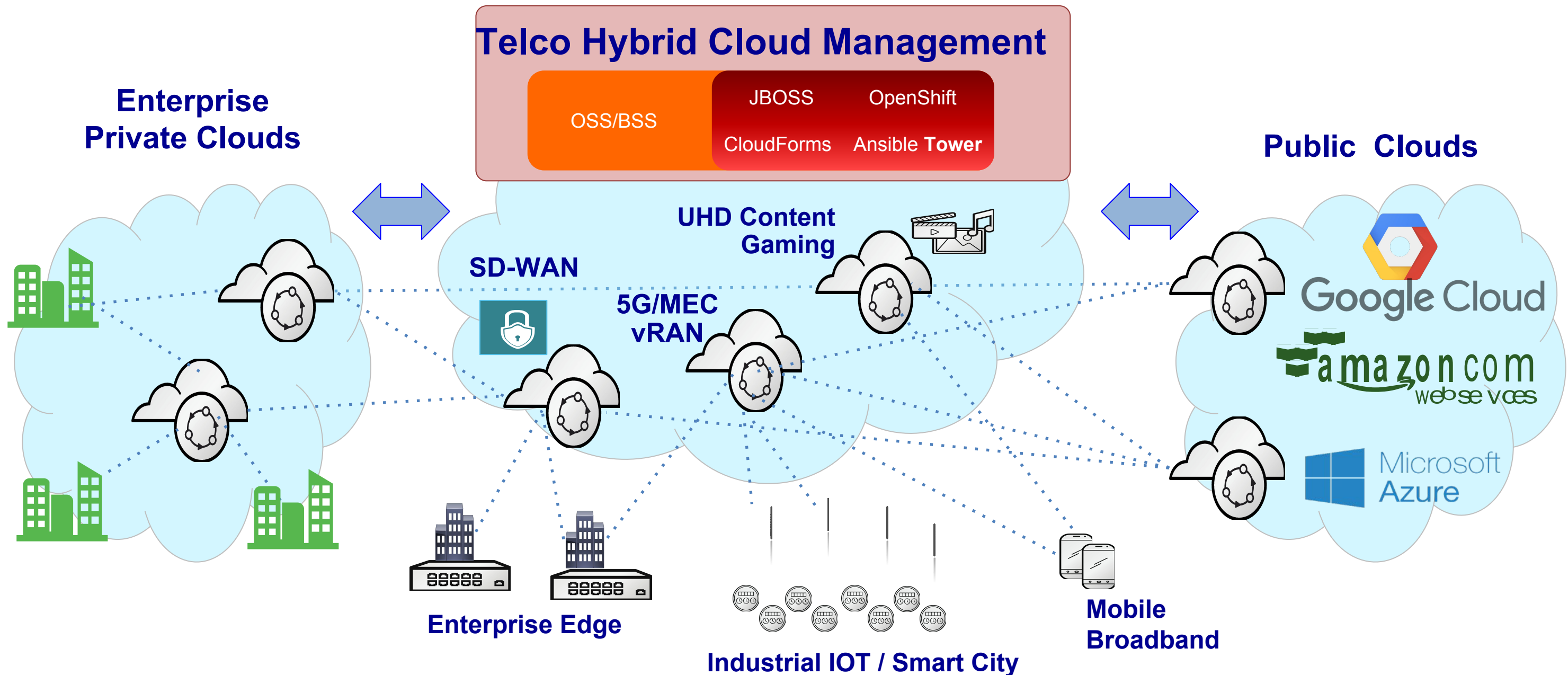
INTELLIGENT VEHICLES – CONNECTED CARS / FLEETS

- Existing cloud services are extended into the highly distributed mobile base station environment, leveraging the existing LTE connectivity.
- The vehicle application operates as a roadside unit for vehicle-to-infrastructure
- Road hazards can be recognized and warnings can be sent to nearby cars with extremely low latency
- Enables a nearby car to receive data in a matter of milliseconds, and the driver to react instantly.

Vehicle-to-infrastructure



Hybrid Clouds - Any Application to Any Infrastructure



Why 5G / Mobile Edge Computing / VRAN / IOT / Enterprise Edge?

- Unparalleled Quality of Experience
- Improve Security of Business Value – Closer to Customers
- Contextualized applications and services, tailored to individual needs and preferences
- Efficient utilization of the Radio, Network, Compute, and Storage Resources
- Innovative applications and services towards mobile subscribers, enterprises and vertical segments on any infrastructure

Real-Time

Interactive

Analytical

**Security and
Privacy**

Distributed

PRODUCTION CUSTOMERS & COUNTING

Telefonica

verizon^v



Experiencing success across Telco,
Media & Entertainment

EXPANSIVE PARTNER ECOSYSTEM

SEAMLESS AND SUPPORTED INTEGRATION WITH CERTIFIED PARTNERS



CERTIFIED PARTNERSHIPS

OEMs GSIs NEPs ISVs

- Success in Information and telecommunications service providers
 - Network Functions Virtualization
 - Software Defined Networking

- Success with world's top Network Equipment Providers (NEP)

OPEN SOURCE IS EVERYWHERE

RED HAT SOLUTIONS POWER LEADING ORGANIZATIONS

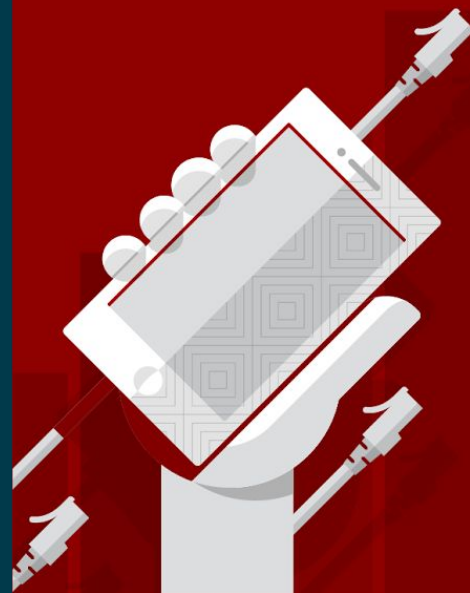
100%

of airlines in the
Fortune Global 500
rely on Red Hat



100%

of telcos in the
Fortune Global 500
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THANK YOU



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