OPEN NETWORKING SUMMIT 2012
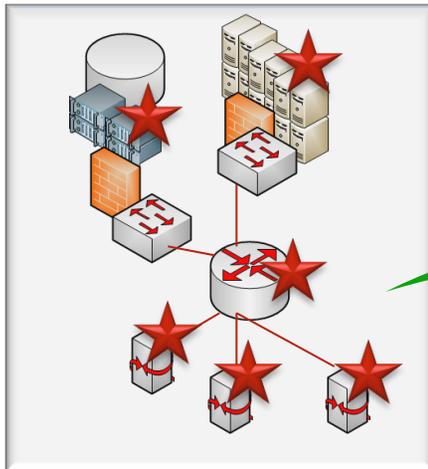
Adoption of SDN:
Progress Update

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**Service intelligence distributed
across dedicated network elements**

Opportunity:

- Service Elasticity

- Global Presence

- Speed to Market

Enabler:

- High Performance
COTS Hardware

- Hardware / Software
Separation

- Virtualization

**Service intelligence
'centralized' in data centers**

- By subscriber based on subscriber policy

- By application type through content inspection

- By cache asset based on URL

- By destination based on RAN congestion signaling

- By server based on performance and availability
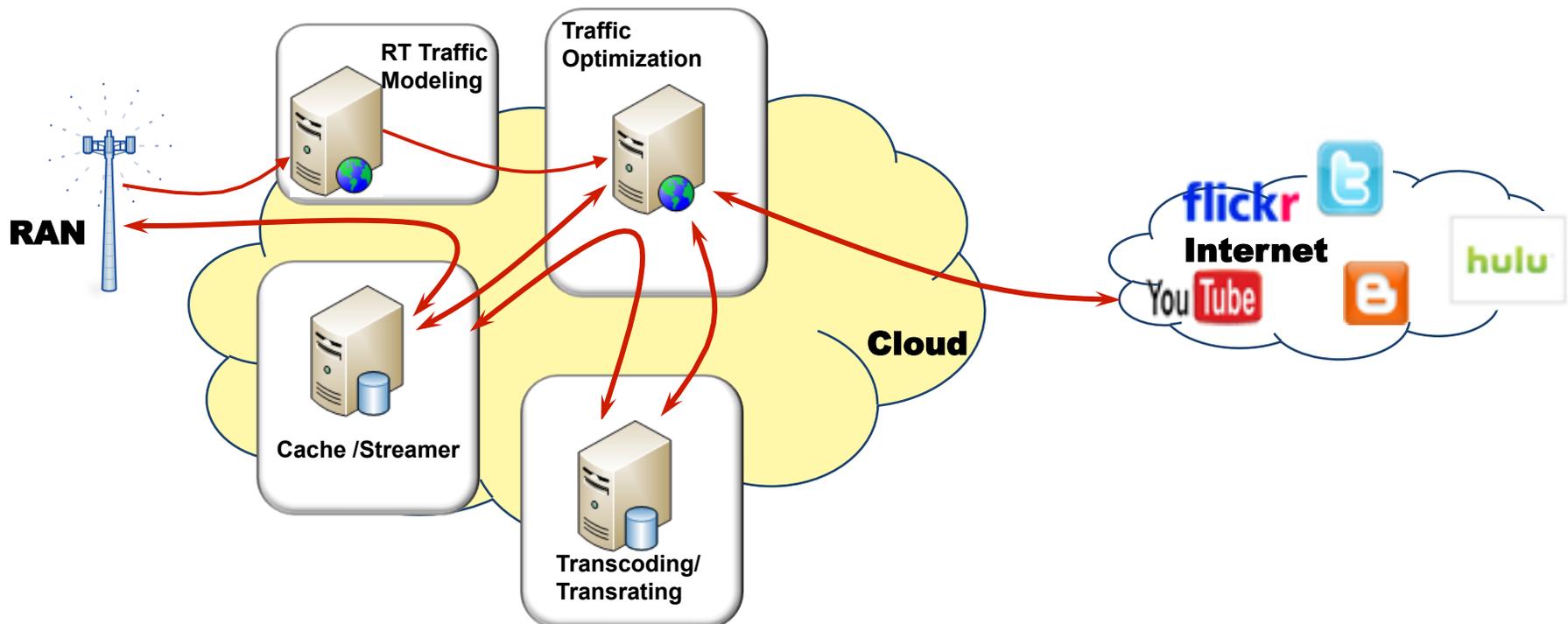
Software Defined Networking + OpenFlow: Optimized Cut-through Routing

- On detection of long-lived flow, SDN signals OpenFlow Controller
- OpenFlow Controller pushes explicit route to Hybrid OpenFlow Router
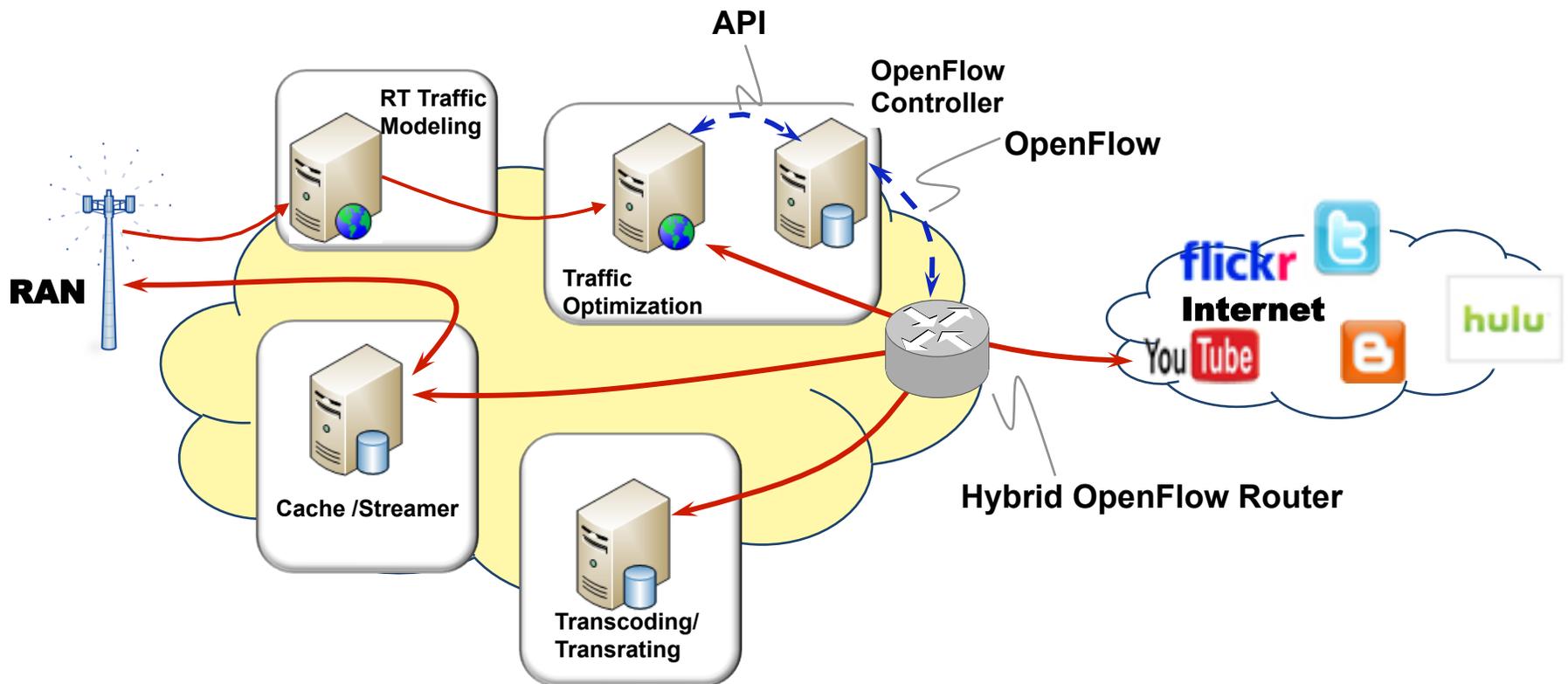
- **Problem Statement**
  - LTE/IMS network is not optimized for multi-tenancy and subscriber-less services

- **Solution Summary**
  - Leverage cloud computing technology
  - Leverage SDN
  - Build once, replicate multiple instances

- **Example Services**
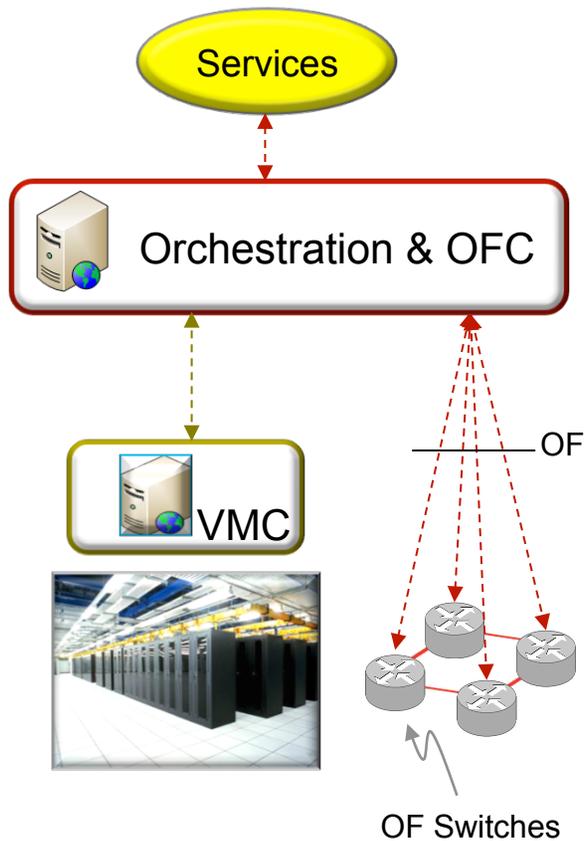 - M2M
  - "Private" IMS for Enterprise

Next Generation Network Services

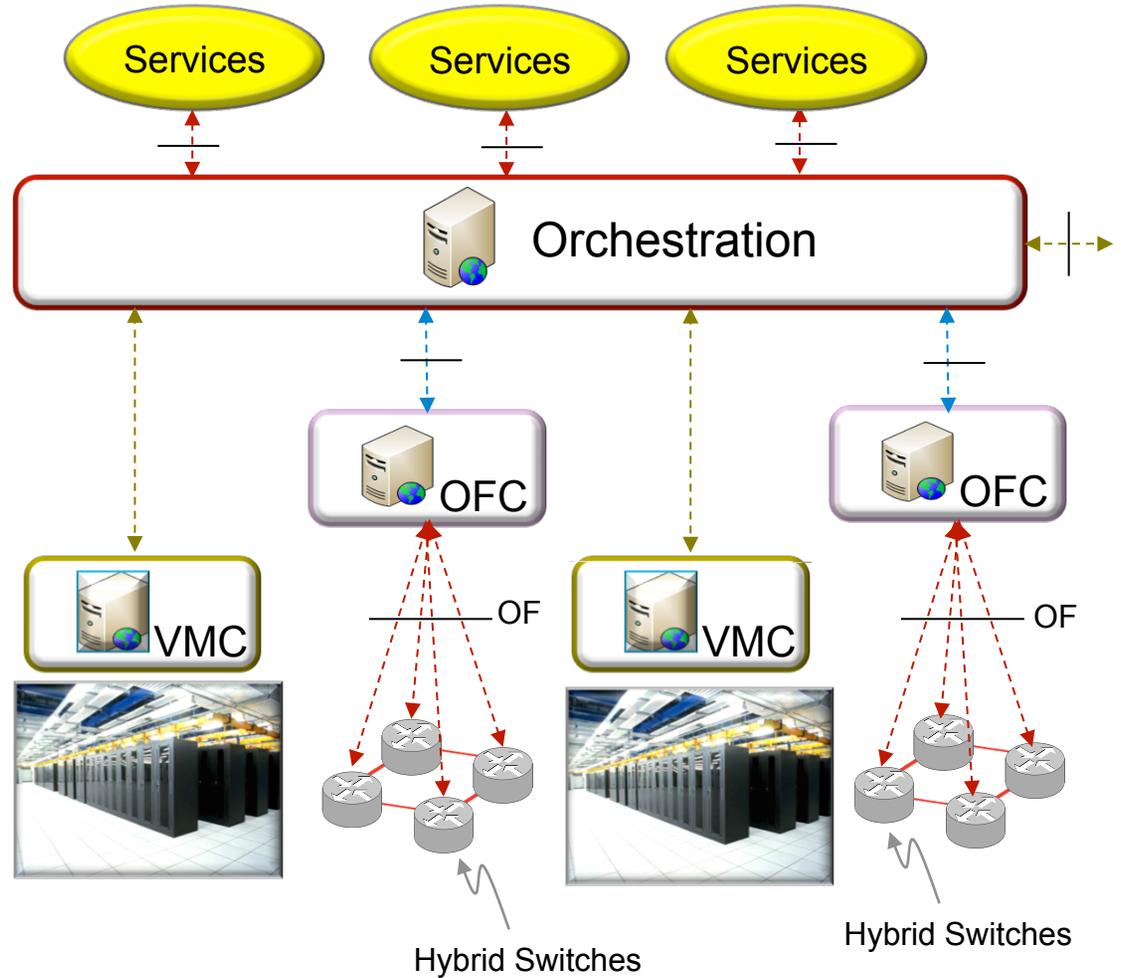| Today	Tomorrow
Deployment Cycle: 12-24 months	Days
Failure Analysis: Post Mortem	Predictive
Failure Domains: Large; mainly geographic	Small topologies
Asset Utilization: Typically 20%	>80%
Geographic Scope: Tied to Service Network	Global
Unit cost	10X decrease

Software Defined Networking / OpenFlow Evolution

Today

Desired State

Services

Orchestration & OFC

VMC

OF

OF Switches

Services

Services

Services

Orchestration

VMC

OFC

OF

VMC

OFC

OF

Hybrid Switches

Hybrid Switches

SDN Requirement	Gap with Current Industry
Coordinated resource virtualization, aggregation, orchestration and optimization	Major gap is coordinated network and cloud computing orchestration
Abstractions and programming languages enabling higher-level service composition	Common form of abstract representation for applications, computing resources and networks will be needed.
Use of dynamic multilayer network capabilities and abstraction to achieve pooling, scaling, optimization, and simplification	Global optimization may only be possible with a logically centralized system.
Protocol specifications for major aspects of SDN ecosystem while still leaving room for differentiation and experimentation	OpenFlow only solves part of the lower-layer networking problem.
Operations functions to provision, monitor, diagnose and maintain services that are dynamically composed of network and compute resources.	No systems to enable stable, responsive and robust operation in a production environment.

- A collaboration to develop prototypes demonstrating the next generation network architecture based on cloud computing techniques and software defined networking.
- Core partners are providing resources, lab facilities, technical expertise.
- Other ecosystem partners are engaged based on functionality and alignment with the mission.

Ecosystem Partners

- **Verizon has deployed SDN as an overlay network for video distribution services**

- **Inefficiencies in this architecture can be alleviated through the integration of OpenFlow technologies**

- **For scale and flexibility, the SDN framework must support multiple VM domains, multiple network domains, and multiple services/applications with open, standard interfaces**

- **Significant gaps still exist to tightly couple and optimize the dynamic management of virtualized data center and network resources**

- **HP, Intel and Verizon are collaboratively standing up an innovation center to examine carrier-centric SDN use cases and help identify and close technology gaps**