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Leveraging MI and Operations Analytics to Assure Virtualized Networks and Services

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Agenda

- Virtualization complexities
- NFV/SDN adoption/deployment
- Role of Operations Analytics and Machine Intelligence
- Evolution of analytics
- Dynamic resource allocation
- Operations Analytics and making networks more customer-centric
- Use cases
    - Right-Sized & QoE-Aware Resource Allocation (Cloud Guide & Network DVR)
    - DOCSIS channel licenses
    - DOCSIS 3.1 profiles
- SDN's cousin – Software-Defined Operations

NFV introduces new complexities

Need for orchestration layer with more advanced service assurance capabilities to:

- Assure new services launched by enabling automatic discovery of new VNFs and their underlying topology/infrastructure
- Autonomous and contextualized anomaly detection across VNF performance indicators, virtual topology and user equipment inventory
- Applied commonalities for root issue discovery on service, virtual infrastructure and topology
- Assure the performance of VNFs by correlating anomalies and alarms from different components involved in delivering those services
- Communicate with external systems to close the loop and dynamically adjust the HW resources to the needs of each service

Clouds and Virtualization

Neither NFV nor SDN in Wide Deployment Today

Virtualization being adopted in waves:
First: nDVR, cloud-based guides
Second: vCCAP
Next: NFV

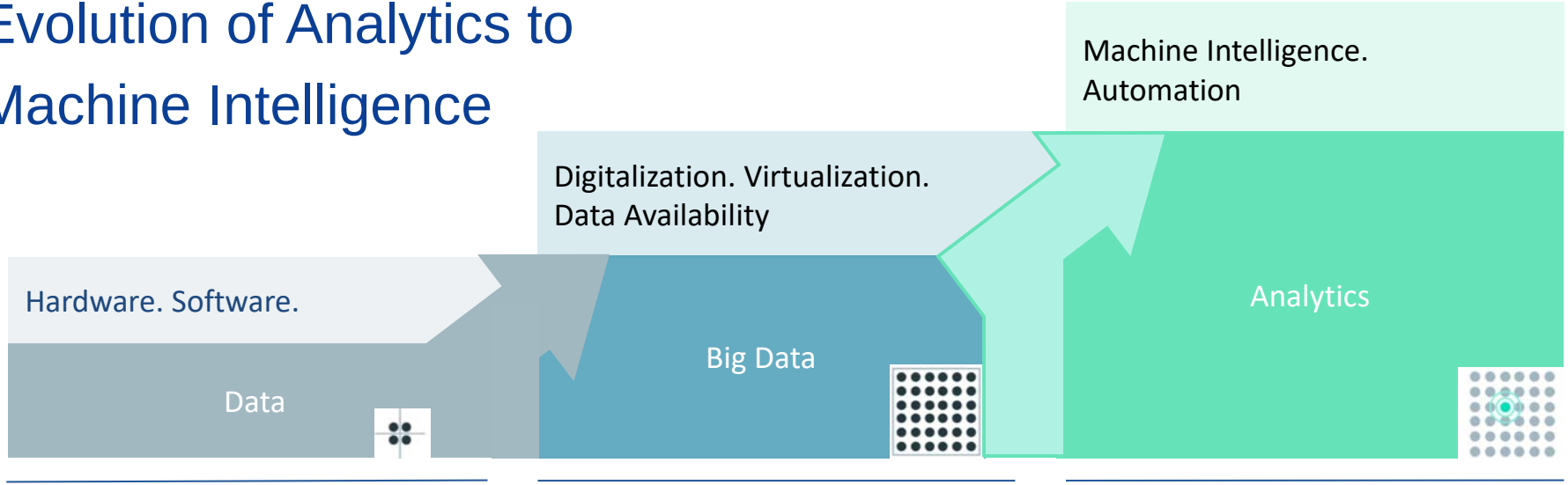
Limited SDN-style control plane deployments
Industry leaders aligning with broader NFV initiatives such as:
ONOS, CORD and HERD

SDN + NFV

Applying MI and Operations Analytics to Virtualization

- Provides the necessary automation needed to help SDN NFV reach its potential:
- Able to provide more intelligent, closed loop decision-making from the huge volumes of data generated by programmable networks
- Draws new connections and insights through real time data processing, becoming integral to orchestration and next-gen OSS
- Offers dynamic and more customer focused outcomes with greater accuracy

Evolution of Analytics to Machine Intelligence

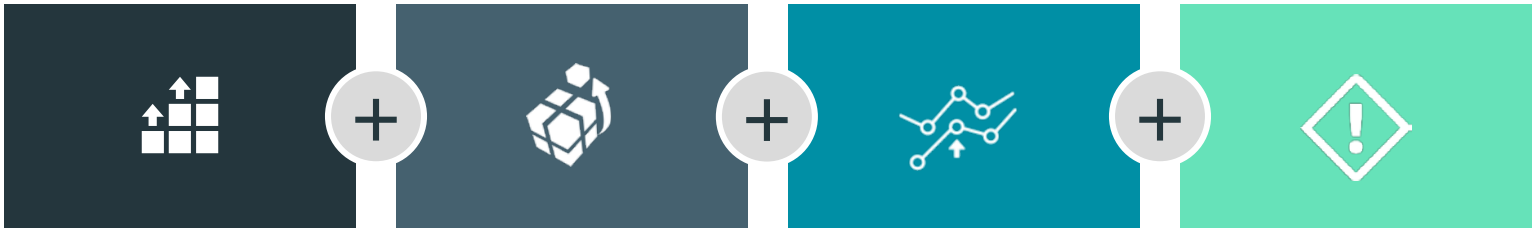


- *Expensive*
- *Slow*
- *Siloed*
- *Not Shared*

- *Inexpensive*
- *Frequently non-real time*
- *Federated*
- *Shared*

- *Value-Based*
- *Real-Time with Purpose*
- *Federated & Contextualized*
- *Shared & Orchestrated*

Operations Analytics Functions & SDN/NFV



Collect at scale	Enrich & fuse in real time	Automate with Machine Intelligence	Drive action or decision
Collect event data in real time and at massive scale from a variety of sources, batch or streaming, leveraging a big data engine	Enrich and fuse cross-silo data in real time with other events and reference data, combining data in motion with data at rest	Monitor millions of event time-series, apply machine learning for baselining, anomalies detection and actionable intelligence	Prescribe actions and Integrate with downstream systems for automated alerts and real-time actions and operations

Use Case: Cloud Guide

MI/OA optimize both resource allocation and subscriber QoE

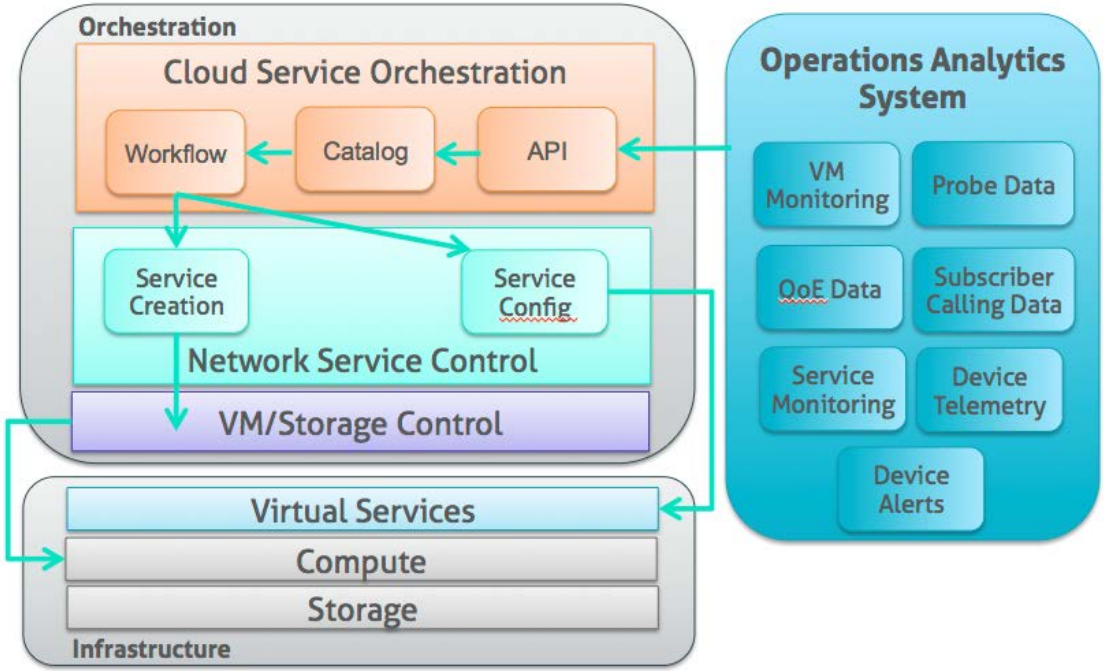
AFS-based model of predictors of capacity-driven service degradation

Legacy: Static CPU Utilization Threshold

MI/OA: Predict service degradation from multiple machine data sources

Optimized, just-in-time capacity

- Maintaining QoE
- Adapting to both localized and time-varying user perception.

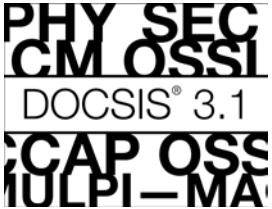


Use Case: DOCSIS Channel Licenses

Pinpointing where DOCSIS channels should be best deployed

- CCAP vendors allow MSOs to pool licenses across their networks
  - Decoupling them from a physical device
  - Allowing flexibility in deployment of CCAP channels
  - Optimize license allocations such that licenses from under-utilized portions of the network can be reallocated to “hot spots” in the network
- Leveraging OA/MI
  - Adds the benefit of right-sizing capacity based on the sensitivities of the local subscriber population
  - Identifies real-time variations from narrower sub-populations and prescribes precise and on-going resource reallocation with greater efficiency

Use Case: DOCSIS 3.1 Profiles



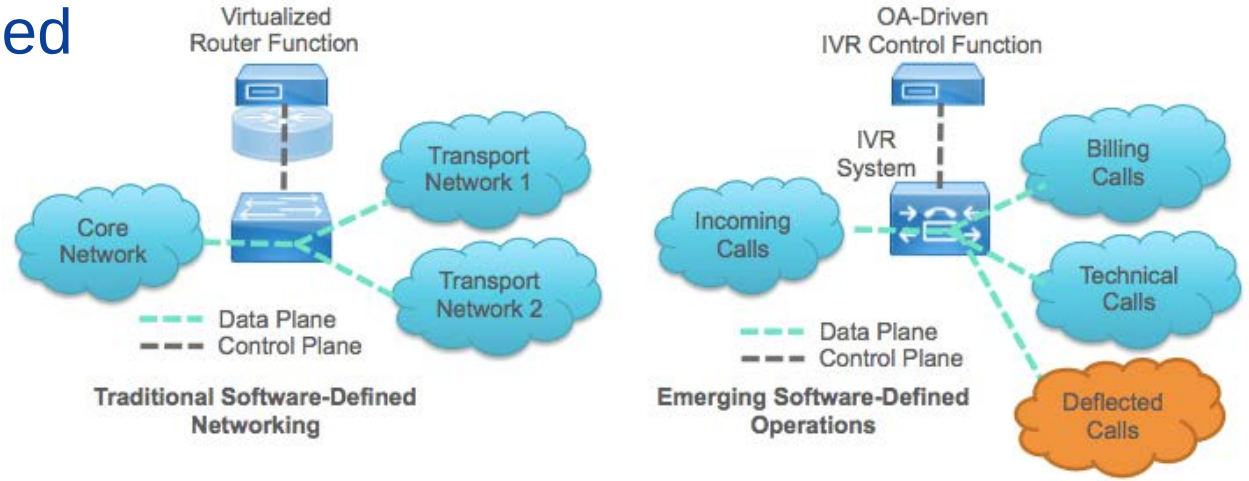
OA/MI to optimize the set of profiles for a large number of CMs per channel.

- Only 16 OFDM profiles per downstream channel, but each CM has unique RF characteristics

- CCAP itself has limited capability for optimizing profiles
  - Small amount of available storage or CPU for such optimization
  - Specialized hardware; less expensive general-purpose compute off device

- External OA/MI system can leverage longer RF history and other data sources
  - e.g. usage patterns of given CMs, diurnal/seasonal RF variation
  - Better optimize OFDM profiles for predicted usage & conditions

Software-Defined Operations



- SDN
  - Data Plane (routing data packets) and Control Plane (VRF)
- SDO
  - Data Plane (routing calls through IVR) and Control Plane (OA-Driven IVR Control)
- Faster call deflections can significantly reduce OPEX
  - One MSO $6.7M in savings from deflections & elimination unnecessary truck rolls

Conclusion

- MSOs can realize tangible benefits from MI and OA now
- Reduced OPEX and increased NPS
- Now is a good time to explore such applications of MI and OA
- The application of MI/OA is a good fit for both back-office environments (guide, nDVR) and access networks (DOCSIS)
- There are many more applications of MI/OA to be discovered

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THANK YOU!

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