Driving ONAP S3P through Multi-Cloud Information Model Standardization

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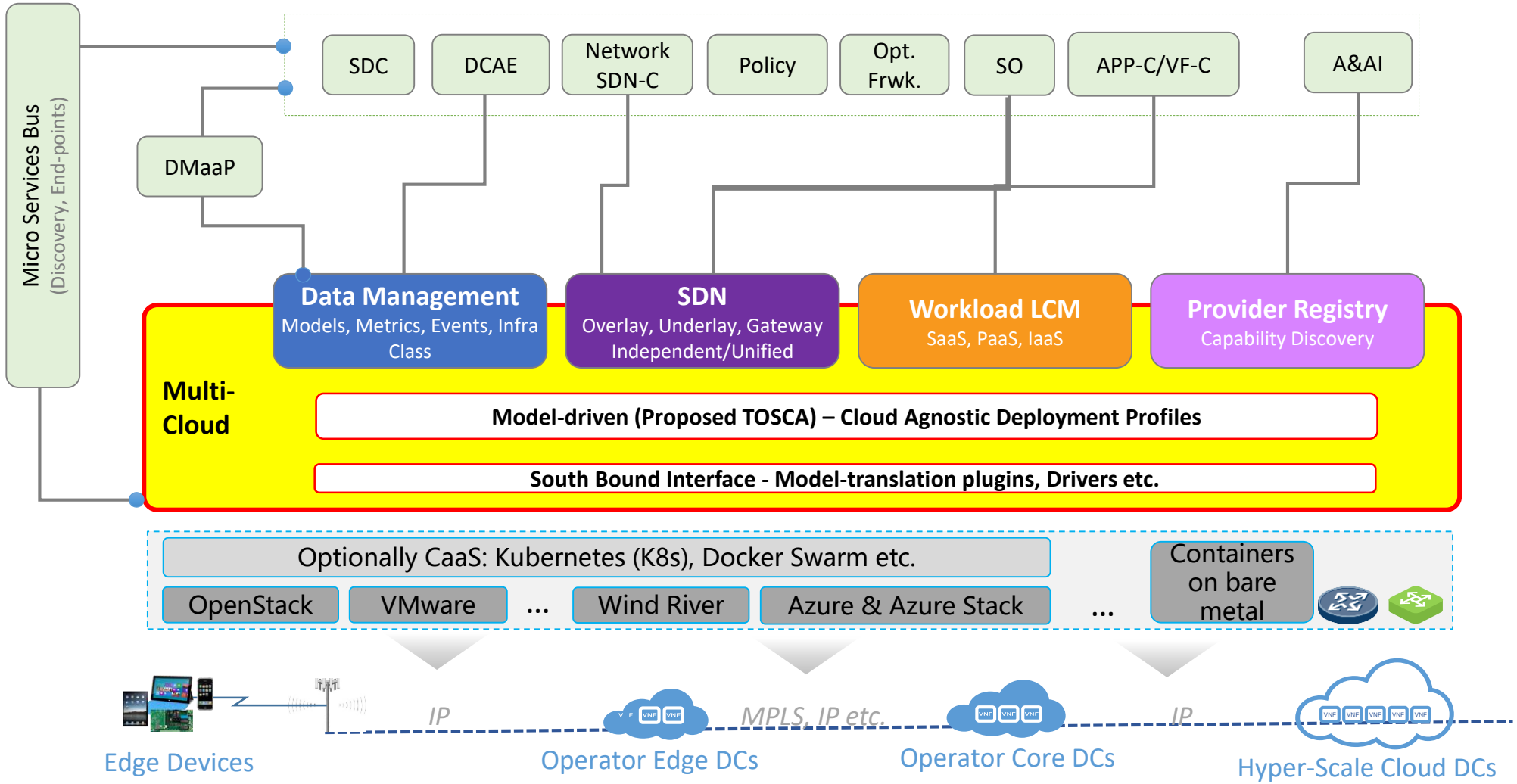
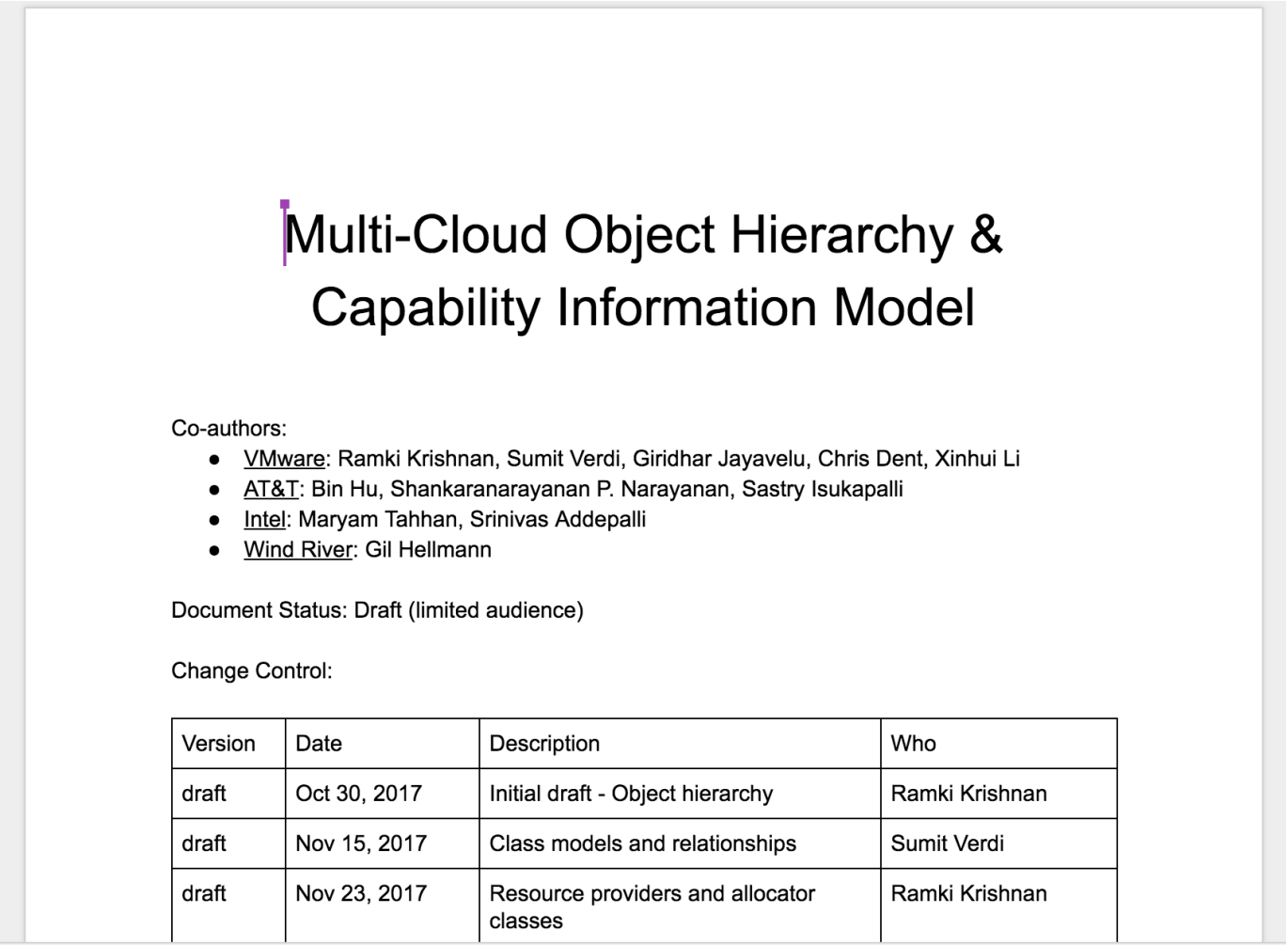
Multi-Cloud Reference Architecture – R2 & Beyond



Reference – "Multi Cloud (MC) Architecture for R2+ & Alignment to S3P" - https://wiki.onap.org/download/attachments/8225716/ONAP-mc-r2-s3p-v1.pdf?api=v2

Specification Under Review & Evolution



Multi-Cloud Object Hierarchy & Capability Information Model

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- Intel: Maryam Tahhan, Srinivas Addepalli
- Wind River: Gil Hellmann

Document Status: Draft (limited audience)

Change Control:

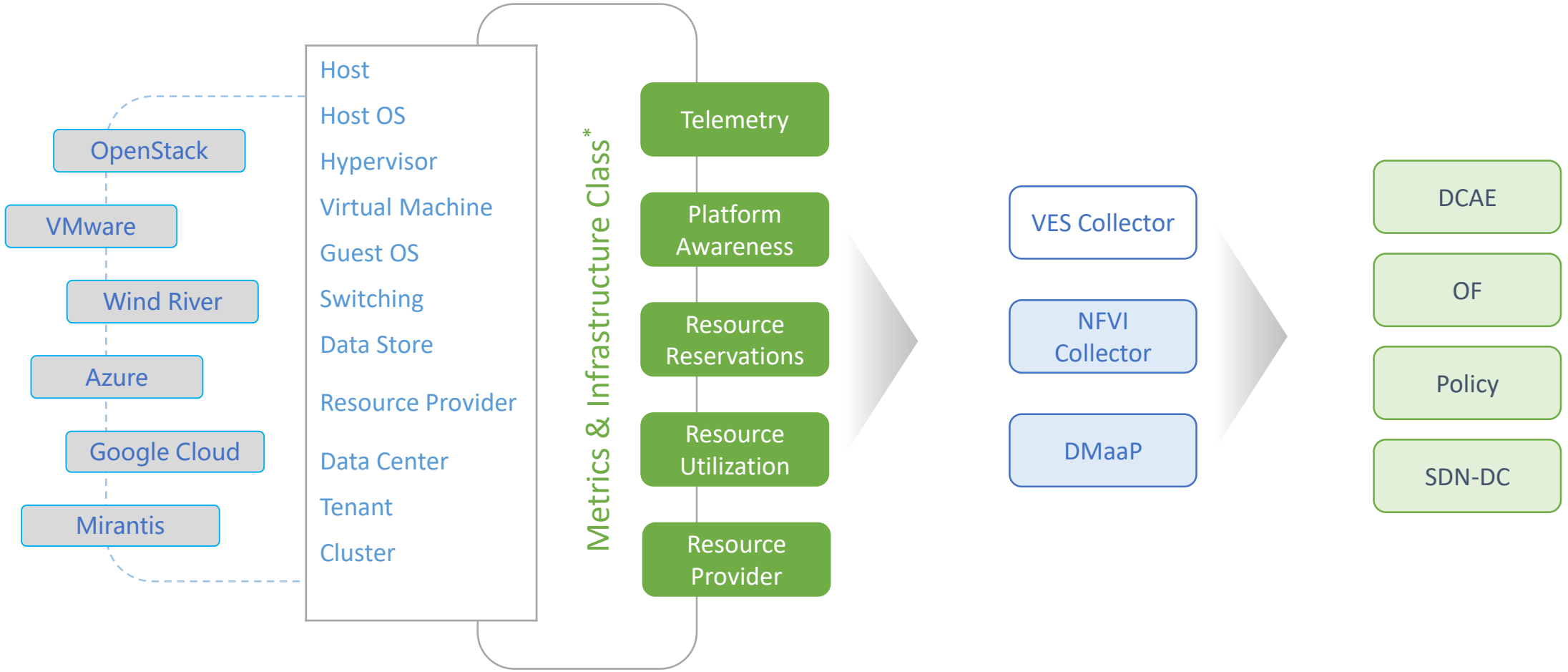
Version	Date	Description	Who
draft	Oct 30, 2017	Initial draft - Object hierarchy	Ramki Krishnan
draft	Nov 15, 2017	Class models and relationships	Sumit Verdi
draft	Nov 23, 2017	Resource providers and allocator classes	Ramki Krishnan

*Joint collaboration between VMware, Intel, AT&T, China Mobile, WindRiver

Link: https://docs.google.com/document/d/1iOb8SymGoK7U6N5ZcYtrIPh_LaJMW_UHYdFWe7UOBNk/edit?ts=5a04e5f4#heading=h.3bc6ryzdgbkh

Data Management - Common DM, Distribution & Integration

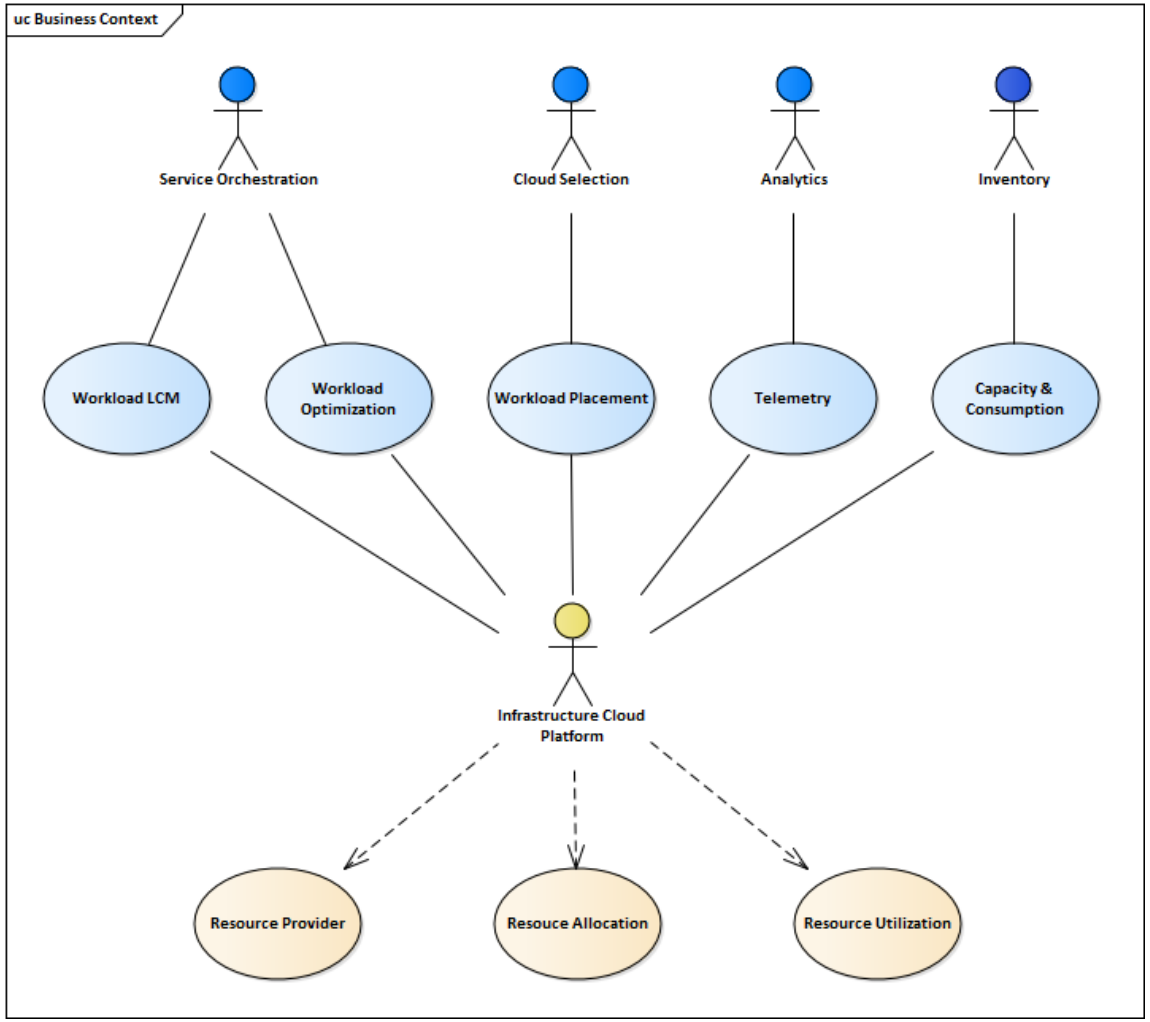
*Joint collaboration between VMware, Intel, AT&T, China Mobile, WindRiver



Reference - ONAP Paris MC Workshop FCAPS Telemetry - "Standardized Infrastructure Class statistics Model" - https://wiki.onap.org/download/attachments/11928197/ONAP-mc-fcaps.pdf?version=2&modificationDate=1506519214000&api=v2

Objectives for a Standardized Information Model

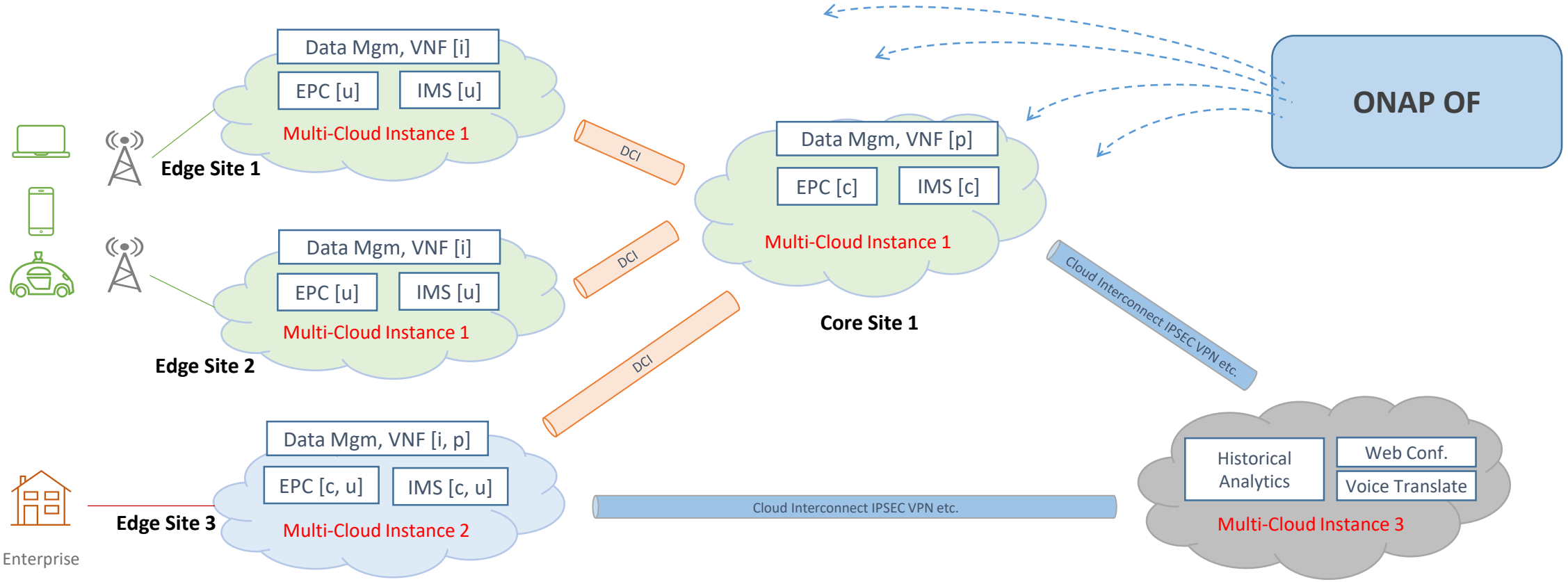
- **Cloud agnostic** representation of information across disparate cloud platform providers
- **Object hierarchies** to generalize entities and relationships spanning infrastructure subsystems and capabilities
- **Generalized Resource representations** in their aggregate and atomic granularities to serve different actors in the ONAP subsystem
- **Discrete classes** for infrastructure and cloud capabilities profiles (includes Platform Awareness)
- **Stability** of ONAP Platform through reusable code, policies etc.



Note: The standardization effort is only for infrastructure related objects/capabilities and excludes application related information

VoLTE: Distributed DC VNF Placement (Homing) Use Case

Workflow: Continuous Deployment - Day 1 & Beyond



Current ONAP Challenge: Static MC instance selection for workload placement leading to higher cost due to under-utilization or poor application QoE due to over-subscription of infrastructure

Value Proposition: OF to deliver the best VNF placement solution in terms of Cost, Security and Application QoE by dynamically determining the appropriate multi-cloud instances leveraging aggregate infra data from MC

[u] – User Plane
[c] – Control Plane
[i] – Data Ingestion
[p] – Data processing

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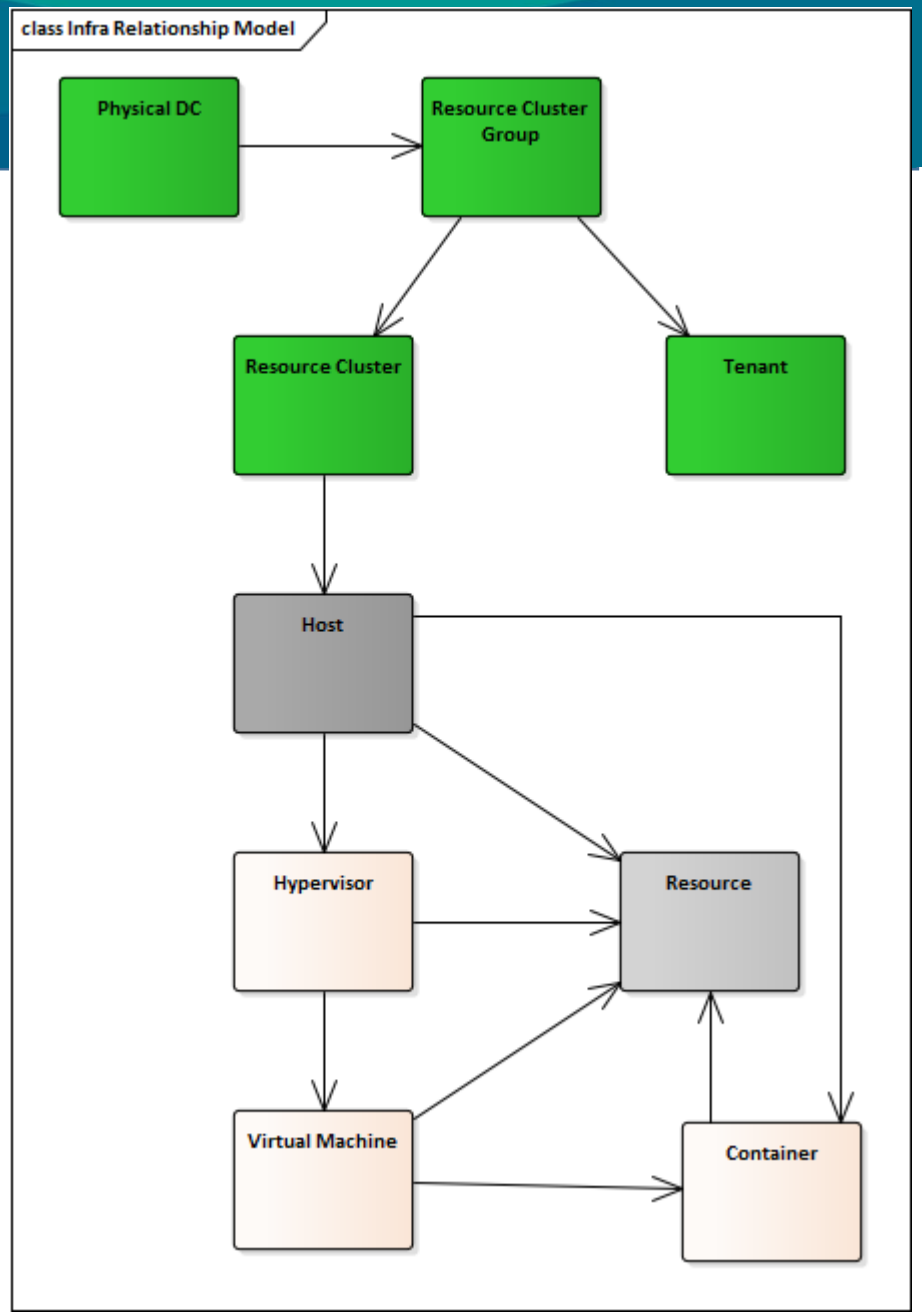
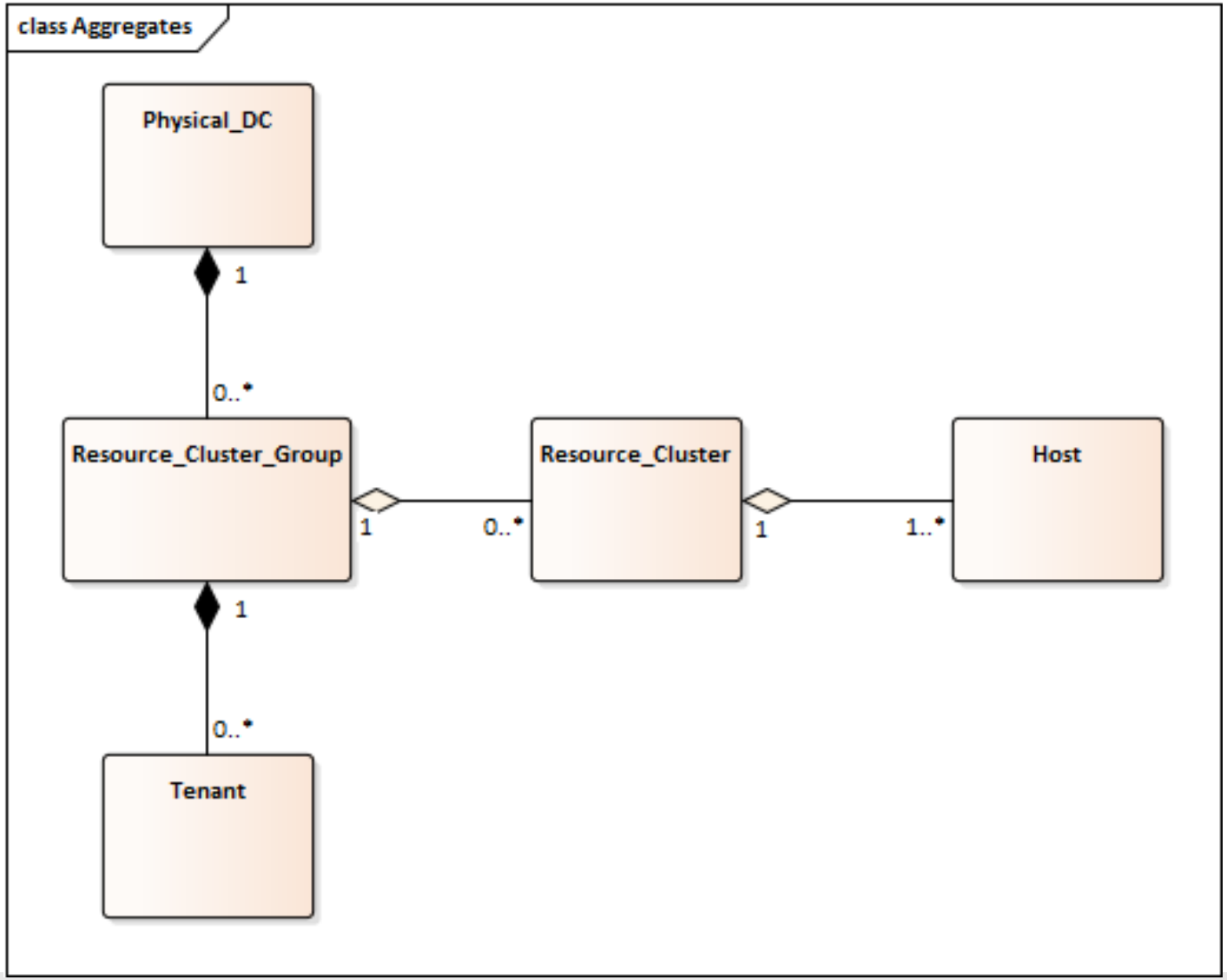
Object Hierarchies

- Aggregate representations
  - **Consumers**: Optimization framework, service orchestration, planning, inventory, etc.
  - **Objects**: Physical DC, Resource Cluster Group, Resource Cluster, Tenant
- Atomic representations
  - **Consumers**: DCAE, monitoring, remediation, automation, SLA monitoring, Security, inventory, etc.
  - **Objects**: Host, Hypervisor, Virtual Machine, Container, Infrastructure resource



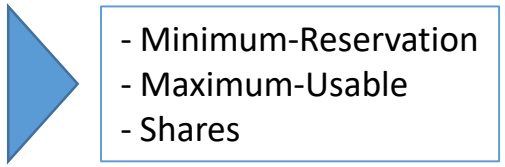
Aggregate Representations



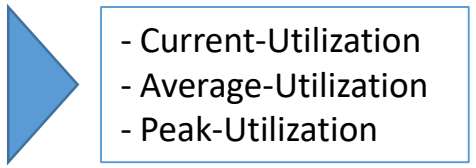
Generalized Resource Representation Classes for Aggregates

- **Resource Provider Class** - This class describes a common way of representing a resource which can be modelled for consumption by other infrastructure resources. Besides the availability and usage, another important parameter is the allocation step size.

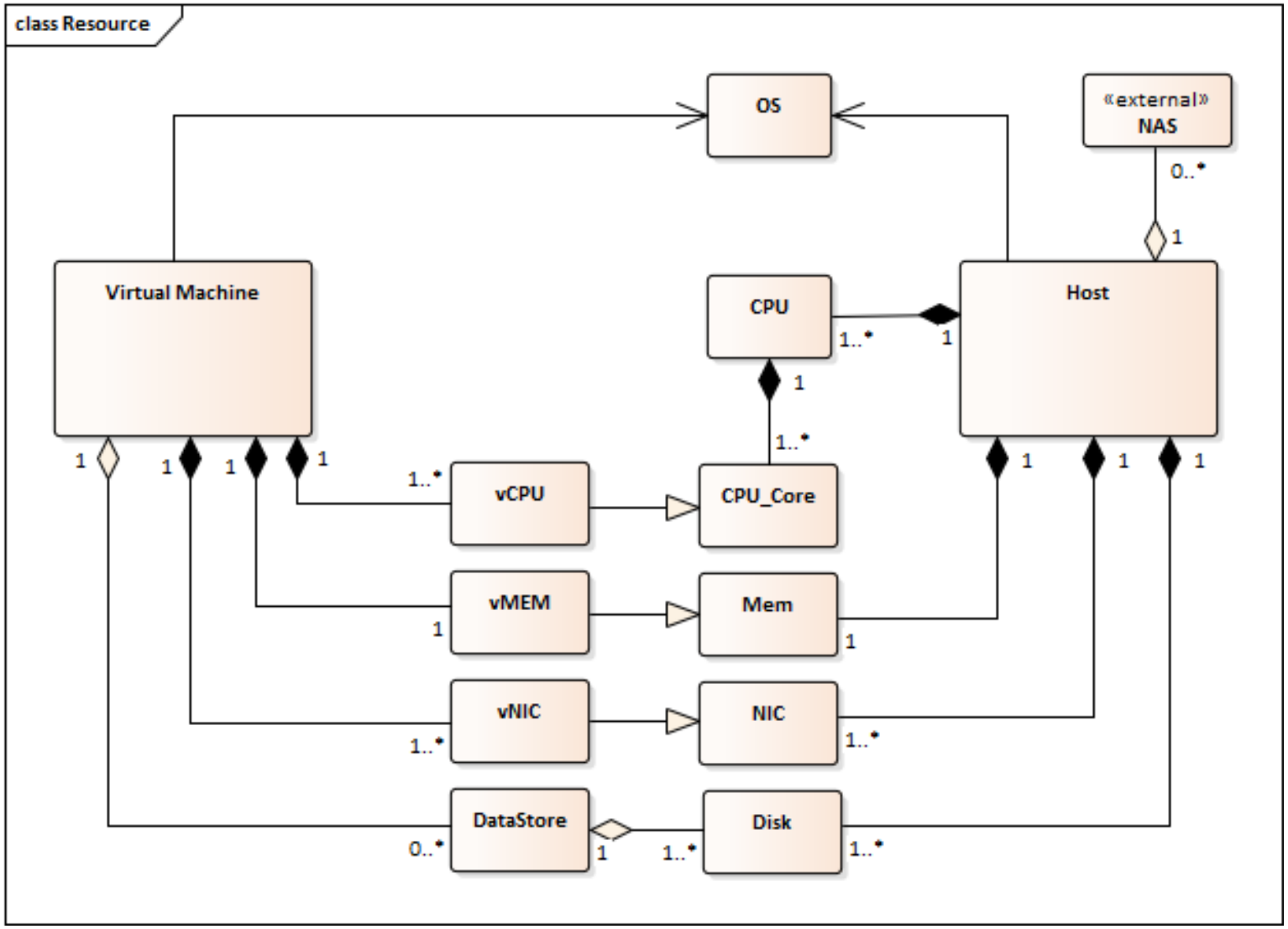
- **Resource Allocation Class** - This class describes a common way of representing a resource which can be modelled for reservation of relevant infrastructure resources.

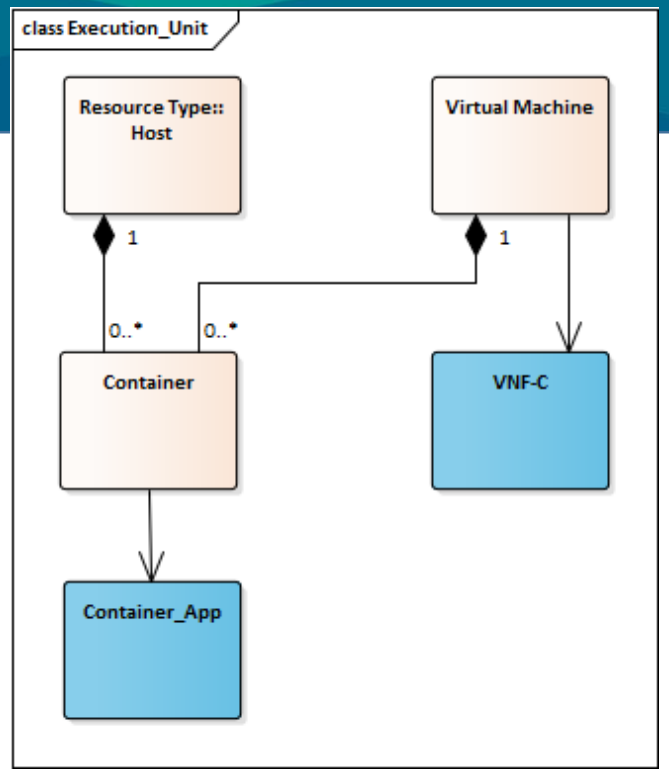


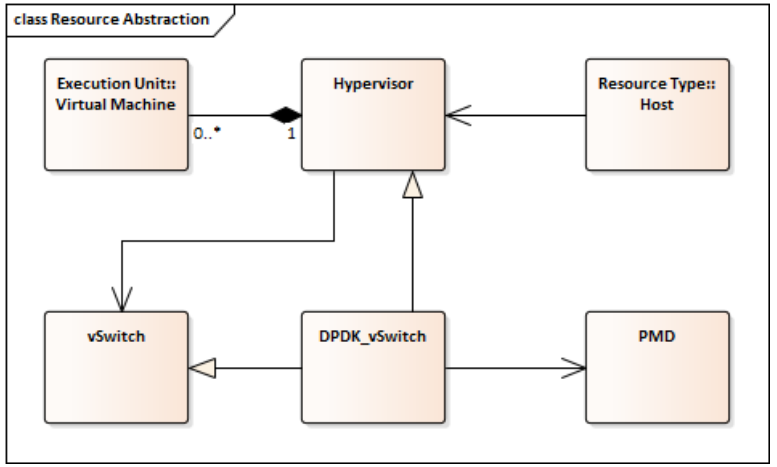
- **Resource Utilization Class** - This class describes a common way of representing a resource which can be modelled for utilization for all infrastructure resources.



Atomic Representations







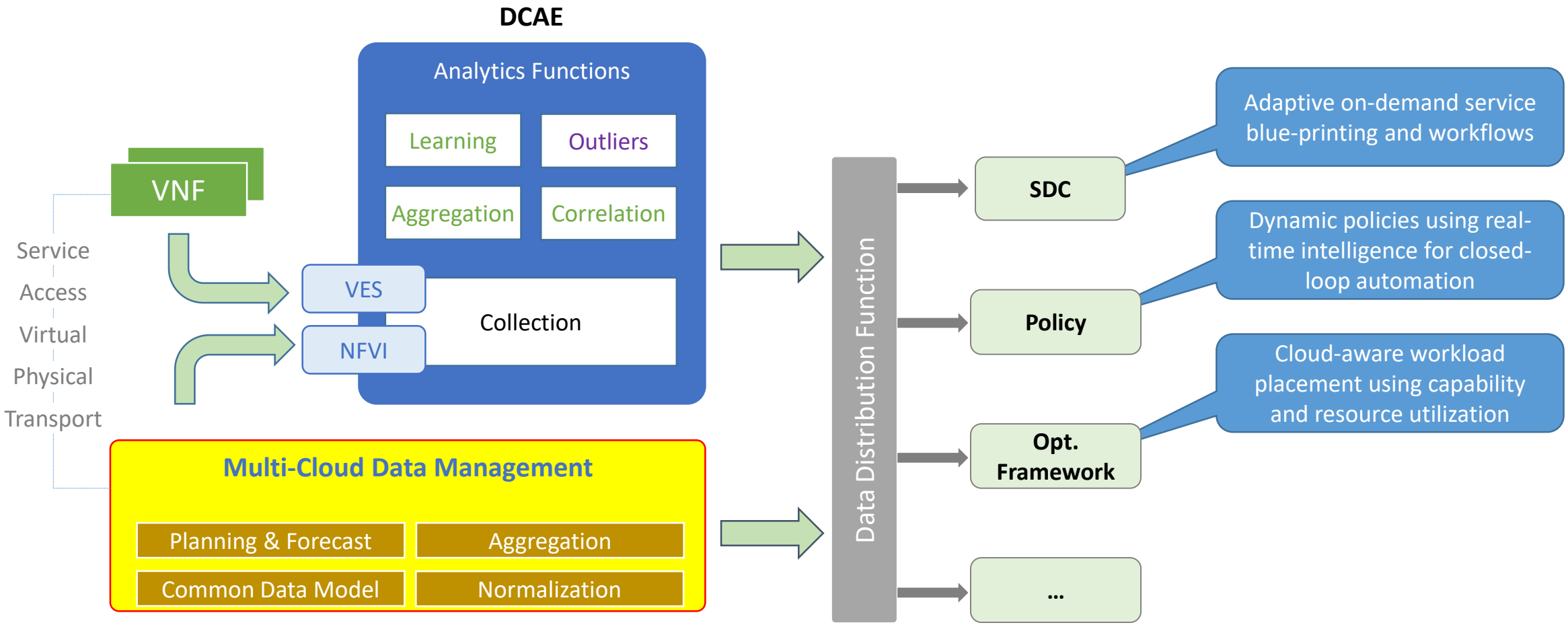
Cloud Capability for Platform Awareness and Beyond

- Scheduling Features
  - Minimum-guarantee (CPU, Memory, Network bandwidth etc.)
- Guest-pa
  - trusted-execution - trusted pools of compute resources
  - mempage-size
  - cpu-pinning-policy
  - cpu-thread-pinning-policy
  - numa-policy
  - PCIe-device
- Host-pa
  - cpu-model
  - cpu-arch
  - cpu-vendor
  - cpu-socket-count
  - cpu-core-thread-count
  - numa-memory-topology (available host numa node resources)
  - numa-pci-dvice-topologies
  - other cpu features
- Hypervisor-pa
  - type
  - Version
- Hardware
  - Provider (intel, arm)
  - Acceleration (transcoding, encryption)

Data Management Policy Example

Operational Intelligence for Dynamic Orchestration

Application and Infrastructure correlated context is key…



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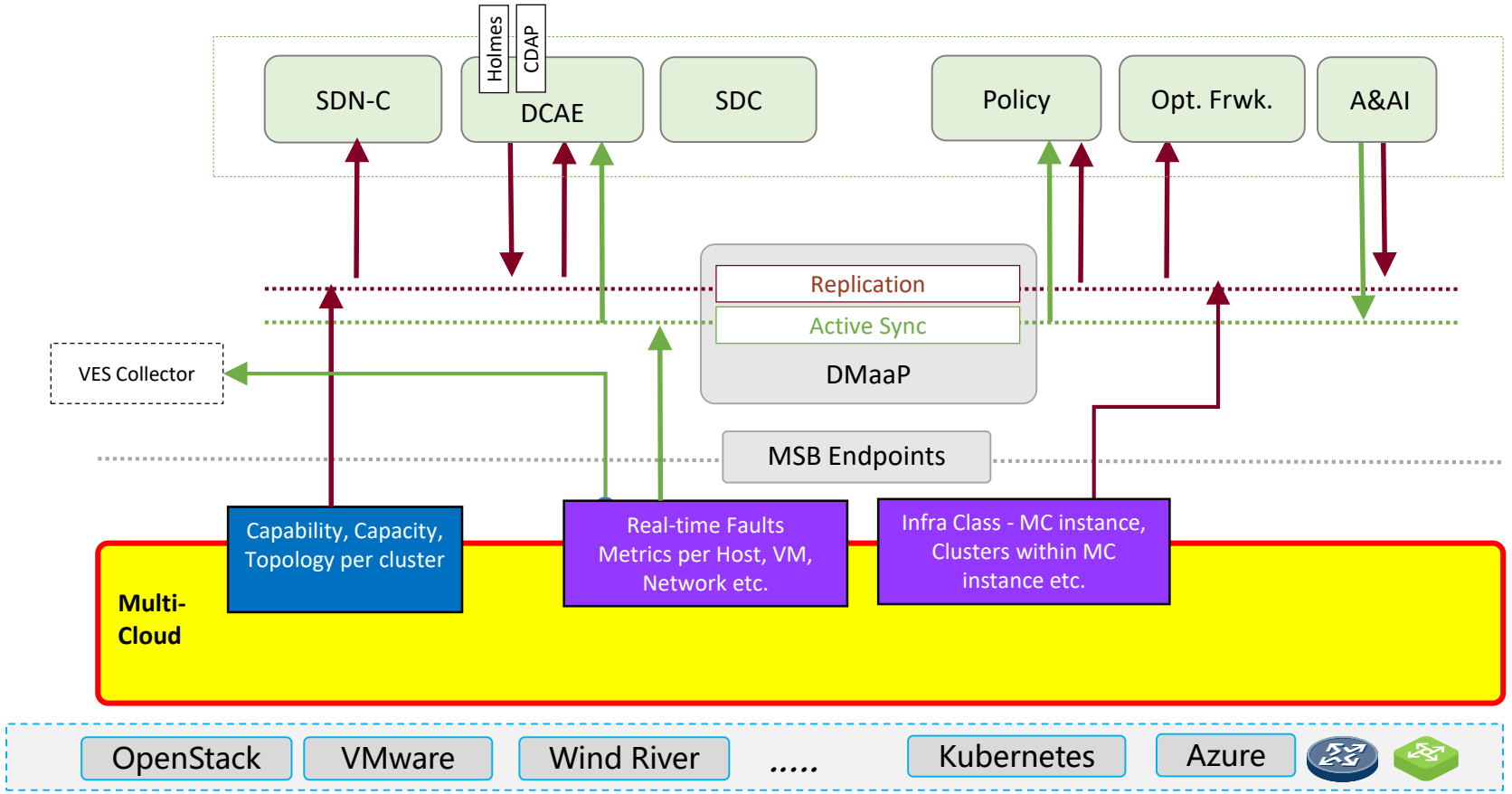
Multi-Cloud Data Management Architecture

- **Aggregate Data (Tenant, Cluster etc.)** is key to hierarchical multi-site VNF placement solutions driven by OF, DCAE etc.
  - Data at atomic level (VM, Host etc.) does not scale

- **Asynchronous Push Model for Latest Data** enabled by DMaaP pub-sub active-sync or lazy replication across WAN is key to scale
  - Synchronous Poll model for volumetric data does not scale and often lands up using stale data



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vCPE Optimization Policy Example using Aggregate Objects

- **R1 vCPE use case – Illustrative Sequence Diagrams**
  https://wiki.onap.org/display/DW/Residential+Broadband+vCPE+Drafts+for+discussion?preview=%2F10783327%2F16005563%2FvCPE+Use+Case+-+Customer+Service+Instantiation+-+171103.pptx
- **Constraints used by Optimization Framework (OF)**
  - VBNG location is fixed based on subscriber
  - VG MUX to VBNG Data Center connectivity latency cannot exceed certain value
- **Optimization Policy used by OF**
  - Choose optimized multi cloud instance for the placement of VG MUX for a given subscriber based on the above
- **Information/Data model Standardization Example**
  - VNF Type - EPC CP, PGW DP, SGW DP, BNG DP etc. – where CP is Control Plane and DP is Data Plane
  - VNF Type maps to Resource Cluster Group Class (a Resource Cluster Group could have one or more Resource Clusters)
    - Multi Cloud Mapping of Resource Cluster Group
      - <Host Aggregate> in OpenStack; <Host Aggregate, Cluster> in VMware integrated OpenStack
  - In this example, each VNF maps to a Tenant in the infrastructure
    - Multi Cloud Mapping of Tenant
      - <Project> in OpenStack and VMware Integrated OpenStack; <Tenant> in Azure
- **Multi Cloud inputs used by OF**
  - Near-real-time stats per <Tenant, Resource Cluster Group> at scale using asynchronous push model using DMaaP

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