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ETSI GANA in 5G Network Slicing PoC by ETSI NTECH AFI WG

5G Network Slices Creation, Autonomic & Cognitive Management & E2E Orchestration; with Closed-Loop (Autonomic) Service Assurance for the IoT (Smart Insurance) Use Case

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The PoC's Demo-2 of a Series of Planned Demos:

C-SON Evolution for 5G, and Hybrid-SON Mappings to the ETSI GANA Model

Federation of GANA Knowledge Planes for E2E Autonomic (Closed-Loop) Service Assurance for 5G Network Slices

AGENDA Outlook

AGENDA Outlook for Demo-2 of the PoC

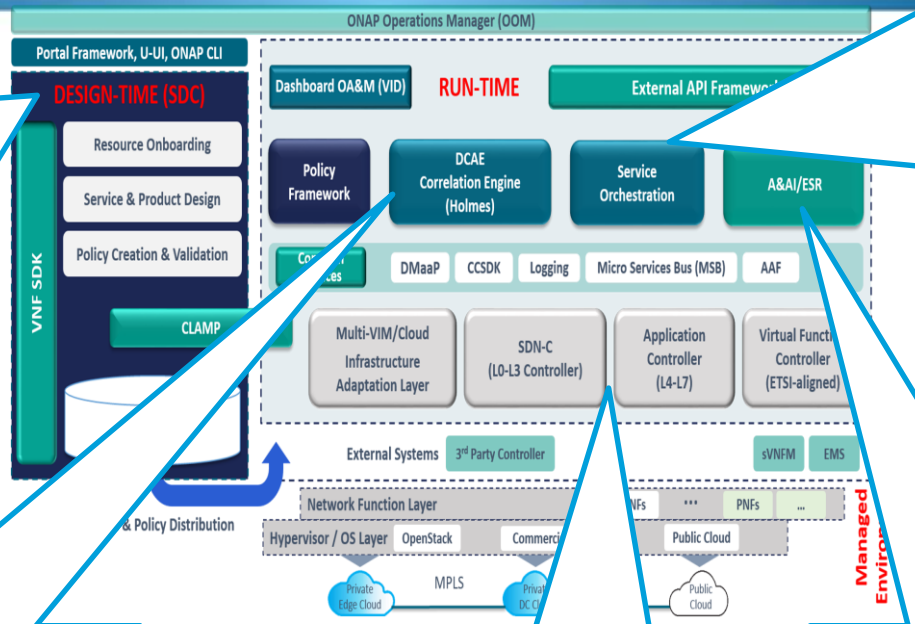
- Introduction to the ETSI AFI 5G GANA PoC
- Key Messages & Reflections
- ETSI GANA Model
- Hybrid-SON Mappings to the ETSI GANA Model
- Centralized SON as GANA Knowledge Plane (KP) for RAN – Cellwize Implementation

C-SON – ONAP Architecture, and *Early Thoughts/Proposal (Tentative) Emerging from the PoC Consortium on "ONAP Mappings to the GANA Model"*

ONAP Architecture for RAN Deployment

Design Studio

- **Service Design**: Rich catalog-driven environment to construct & maintain service & resource definitions, constraints & management processes & policies (recipes)
- **Policy Creation**: Associate anomalous & actionable conditions with automated remedy actions
- **Analytic App Design**: Design capabilities for creation of analytic apps



Master Service Orchestrator (MSO)

- **Orchestrates & manages** the delivery, modification or removal of networks & services
- **Provides cross domain orchestration** to optimize the utilization of resources or take broad corrective action
- **Interacts with various applications** to collect data to determine network facing parameters

Data Collection, Analytics & Events (DCAE)

- **Collects Data & Events** necessary to manage & evolve D2.0 networks & services
- **Makes collected data available** to real-time apps
- Provides framework for analytics apps to identify patterns/anomalies & publish events to drive closed-loop control
- Provides functions at all layers in architecture

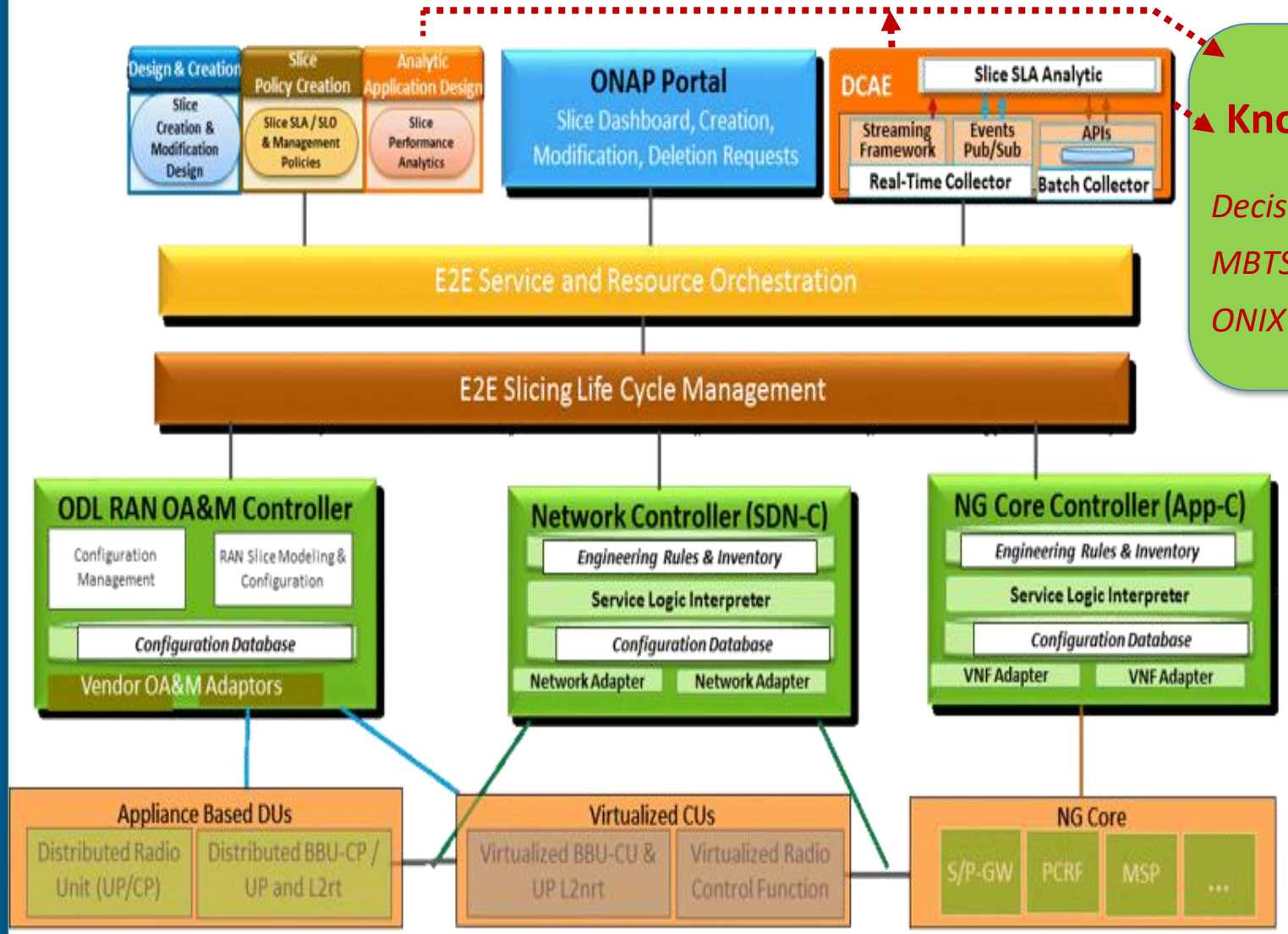
Controllers

- **Network**: Instantiates, configures & manages the lifecycle of Transport VNFs, infrastructure networking (e.g. leaf, spine & virtual switches) & WANs
- **Service/App**: Instantiates, configures & manages the lifecycle of Service VFs
- **Infrastructure**: Instantiates, configures & manages the lifecycle of infrastructure (compute, storage, etc.)

Active & Available Inventory (A&AI)

- **Real-time topology map** with context views of virtual networks, services & applications
- **Relationship context** between components & the network fabric & infrastructure Uses the network resources as the database of record due to their dynamic nature
- **Provides a registration method** used to discover & maintain services & resources

ONAP Architecture for Slice Management



ETSI GANA Knowledge Plane

Decision Elements (DEs)

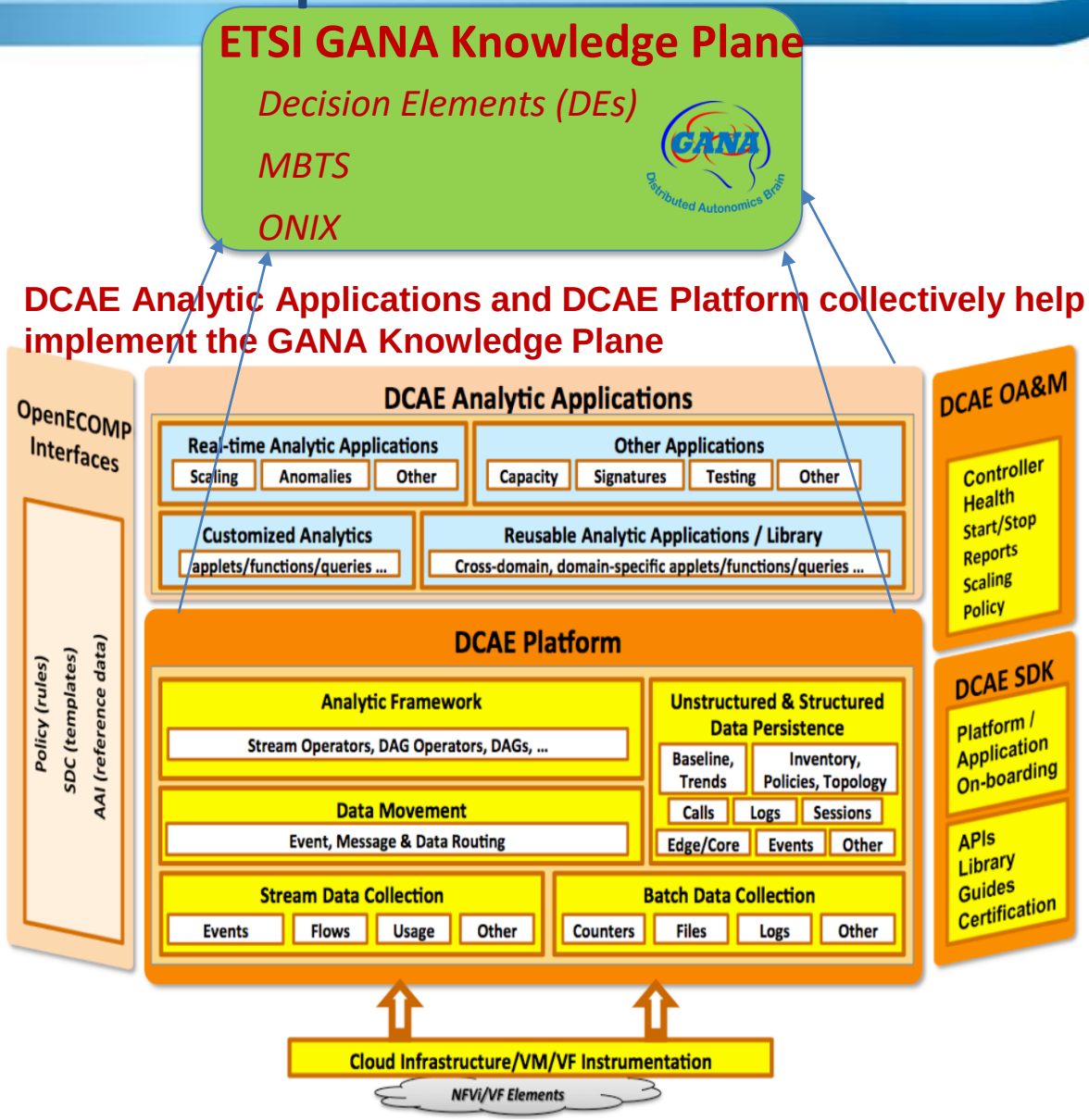
MBTS

ONIX

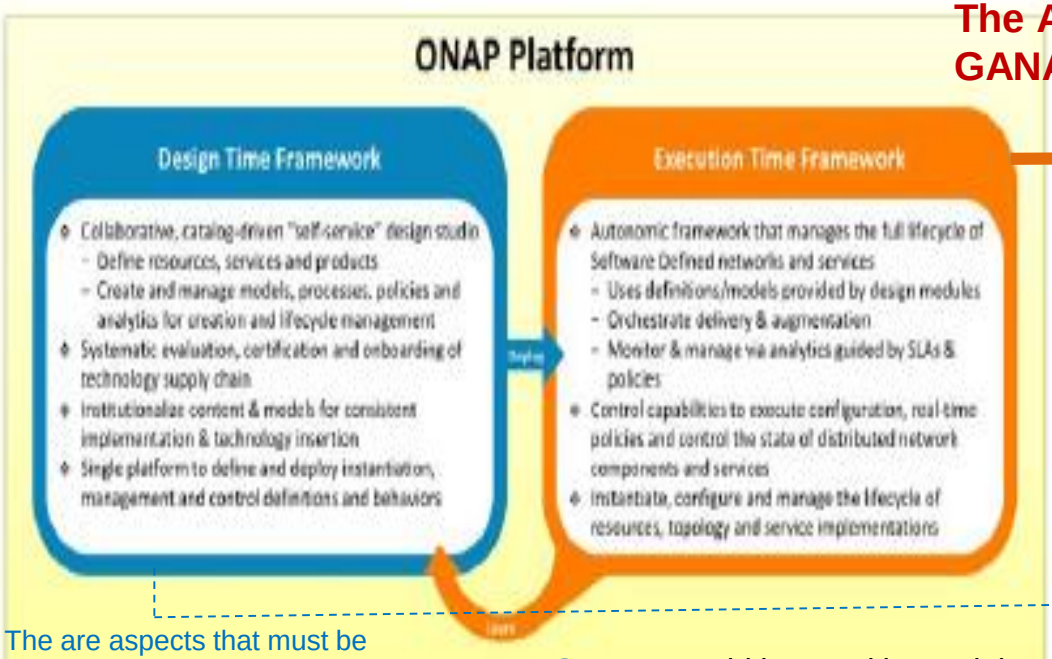
DCAE Platform High-level Architecture, and ONAP for Designing GANA Components

The ONAP **DCAE Platform** consists of several functional components that might **be used as data inputs for C-SON**:

- **DCAE Streaming**
  Radio Measurements, Cell KPIs, Core Network KPIs
- **DCAE Analytics**
  User Classification, Enrichment Data
- **Engineering Rules & Policies**
  SLA target, NSI priority level, policies, network slice template…



Overall ONAP to GANA Mappings



The Autonomic Framework maps to the GANA Knowledge Plane

ETSI GANA Knowledge Plane

- **Decision Elements (DEs)**
- **MBTS**
- **ONIX**

The are aspects that must be considered in Designing GANA KP DEs, ONIX and Governance Interface

e.g. CLAMP could be used in Desiging GANA Decison Elements (DEs) and their associated Control-Loops

The Closed Loop Automation Management Platform (CLAMP) provides a platform for designing and managing control loops. CLAMP is used to design a closed loop, configure it with specific parameters for a particular network service, then deploy and decommission it. Once deployed, a user can also update the loop with new parameters during runtime, as well as suspend and restart it.

ONAP Closed-Loop Automation Aspects that should be applied to Implement the ETSI GANA Knowledge Plane (KP) Components (e.g. DEs, ONIX and KP Governance Interface)

Design-Time Aspects of relevance for ETSI GANA Knowledge Plane (KP) DEs

Run-Time Behaviour of ETSI GANA Knowledge Plane (KP) DEs

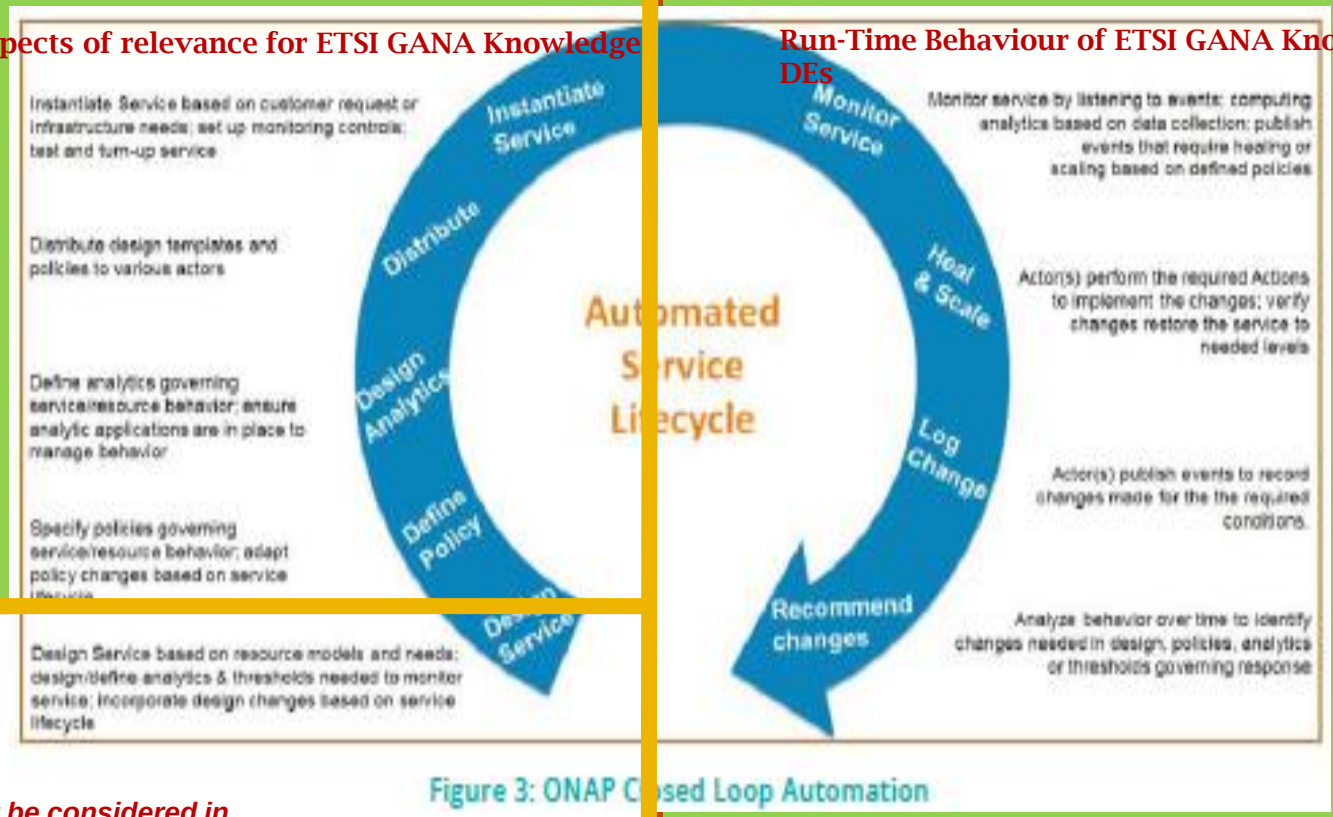


Figure 3: ONAP Closed Loop Automation

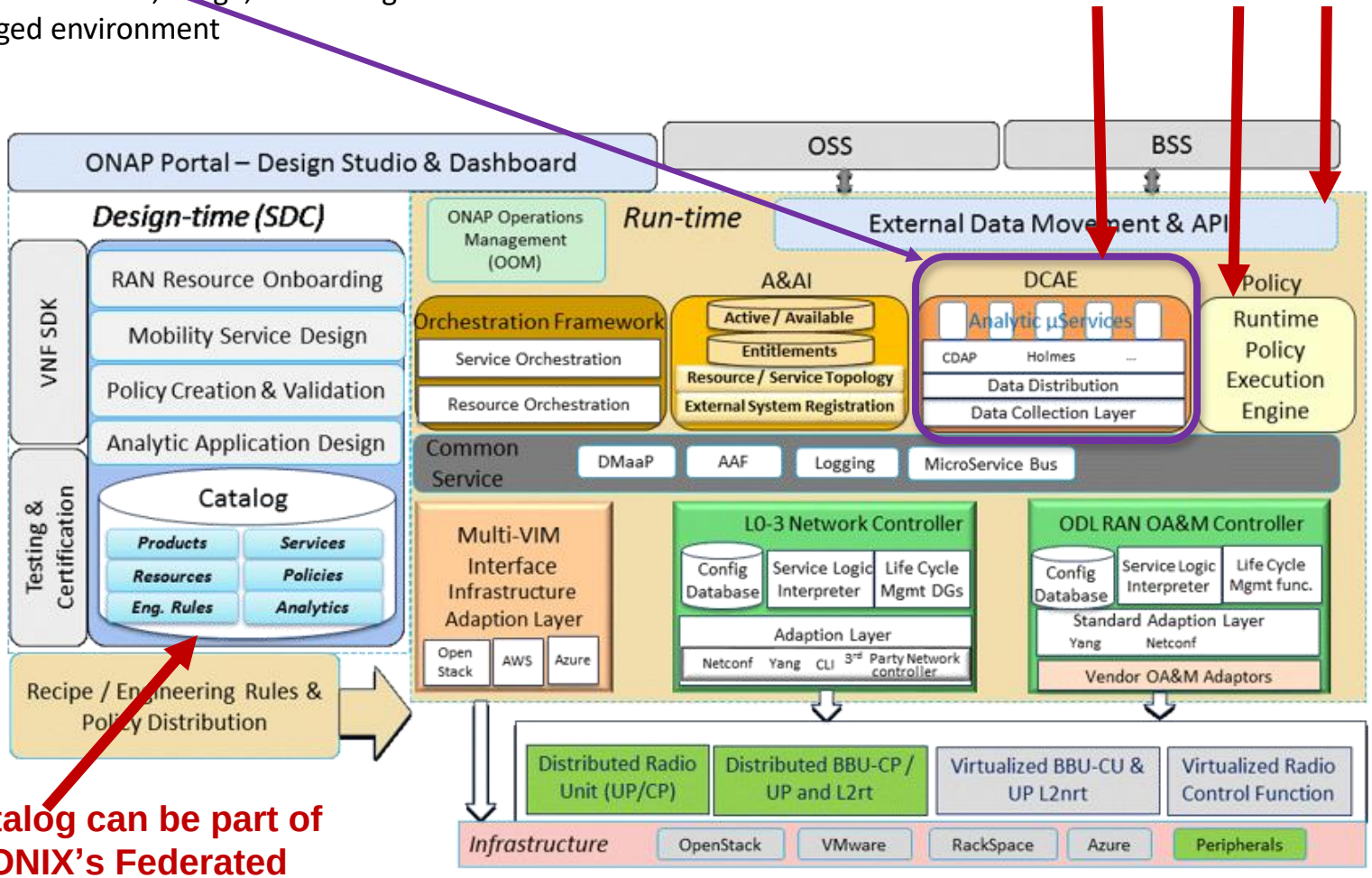
Aspects that must be considered in Designing GANA KP DEs, ONIX and Governance Interface

Run-Time Behaviour of ETSI GANA Knowledge Plane (KP) DEs, but with possibility to Execute Recommendations in Closed-Loop Mode

Some ONAP Components that can be used or extended to Implement GANA Components

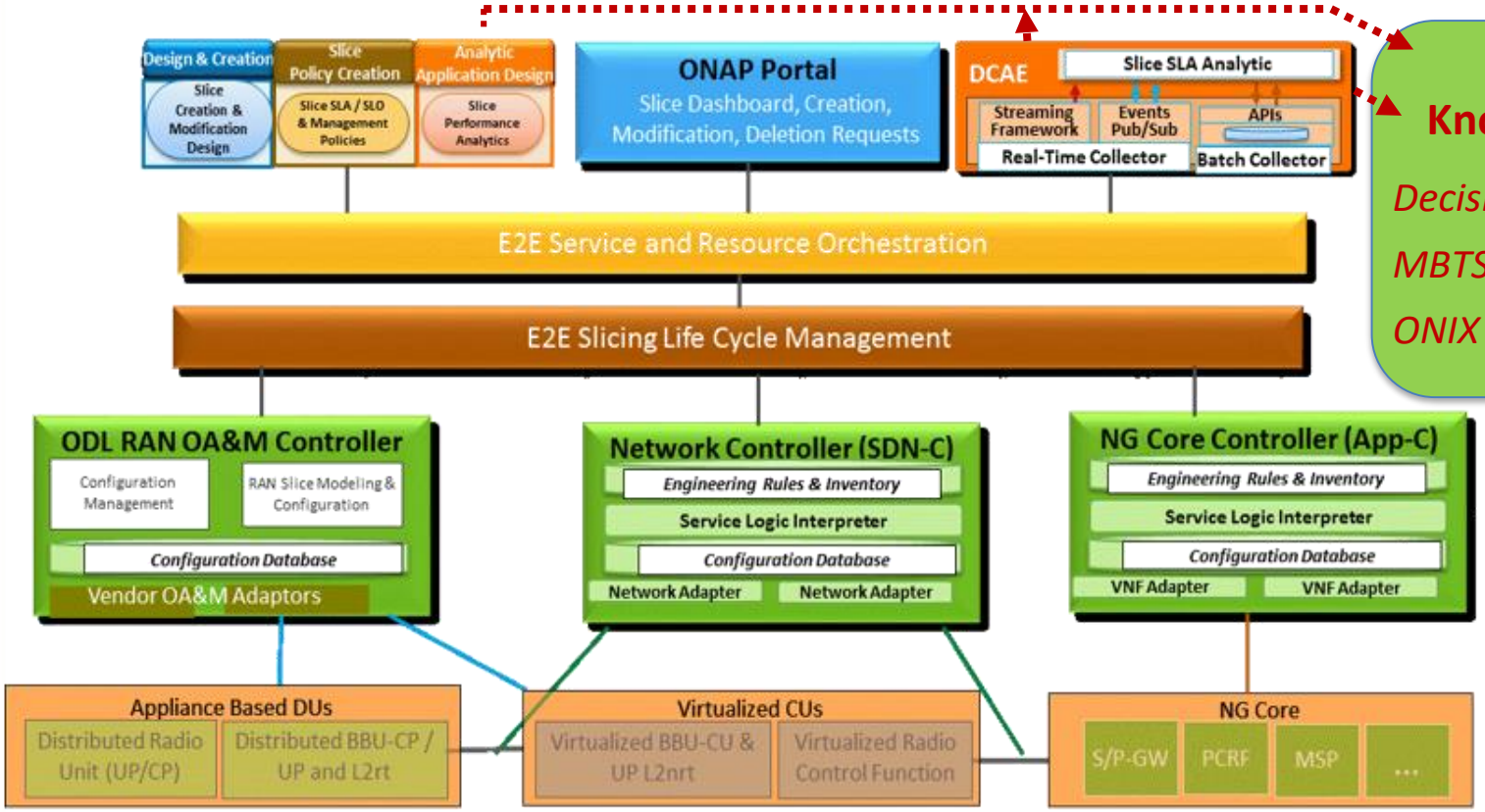
DCAE - Data Collection, Analytics and Events
gathers performance, usage, and configuration data from the managed environment

Can be used to Implement GANA Knowledge Plane DEs' and MBTS Features



The Catalog can be part of GANA ONIX's Federated Servers

ONAP DCAE Analytic Applications and DCAE Platform collectively help implement the GANA Knowledge Plane



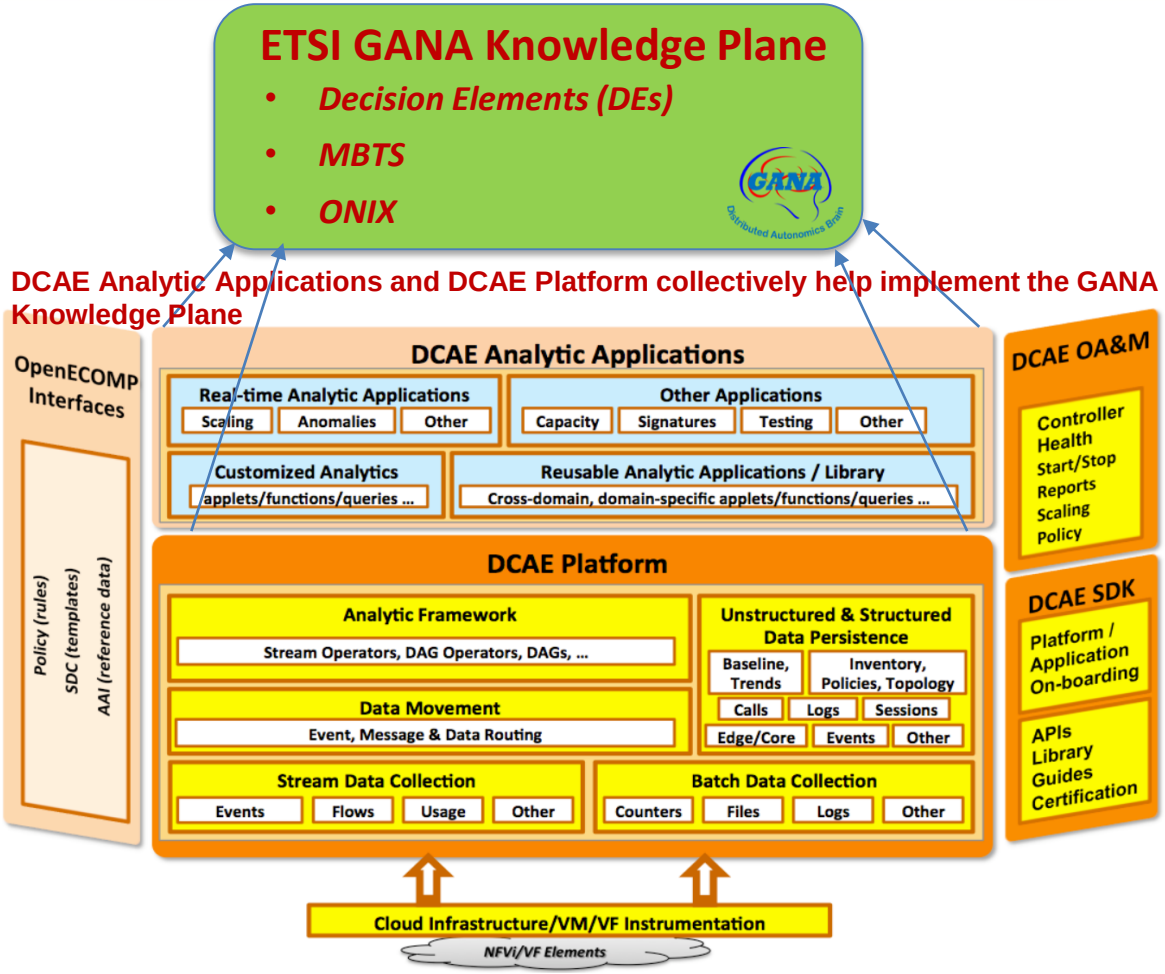
ETSI GANA Knowledge Plane

Decision Elements (DEs)

MBTS

ONIX

ONAP DCAE Analytic Applications and DCAE Platform collectively help implement the GANA Knowledge Plane (KP)



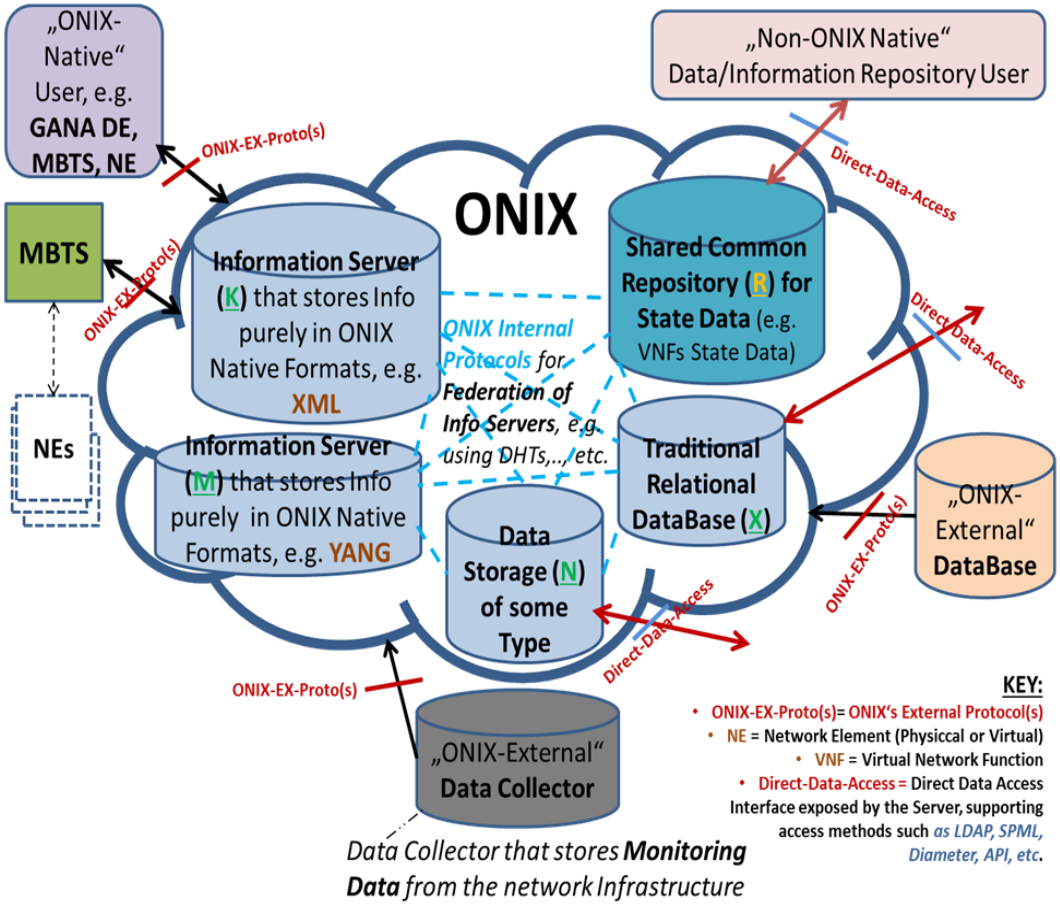
How some ONAP Components can be used to Implement a GANA ONIX Server and possibly ONIX's Federated Information Servers as well

ONIX as Real-Time Inventory

- Useful for Inventory awareness of changes over time, including Cache of Historical Decisions made by GANA Knowledge Plane DEs
- Near real time updates and extended auto-discovery, thanks to Publish/Subscribe Paradigm employed by ONIX
- Cognitive Algorithms running on some Information Servers in the management of certain information and knowledge makes ONIX a Cognitive inventory
- ONIX can be used for dynamic maintenance of network slice configurations

ONAP Capabilities of relevance to ONIX:

- Need to check and discuss how the AINI in ONAP is implementing some GANA ONIX Server Features
- ONAPs' Active & Available Inventory (A&AI) can be considered as ONIX Server:
  - **Real-time topology map** with context views of virtual networks, services & applications
  - **Relationship context** between components & the network fabric & infrastructure Uses the network resources as the database of record due to their dynamic nature
  - **Provides a registration method** used to discover & maintain services & resources

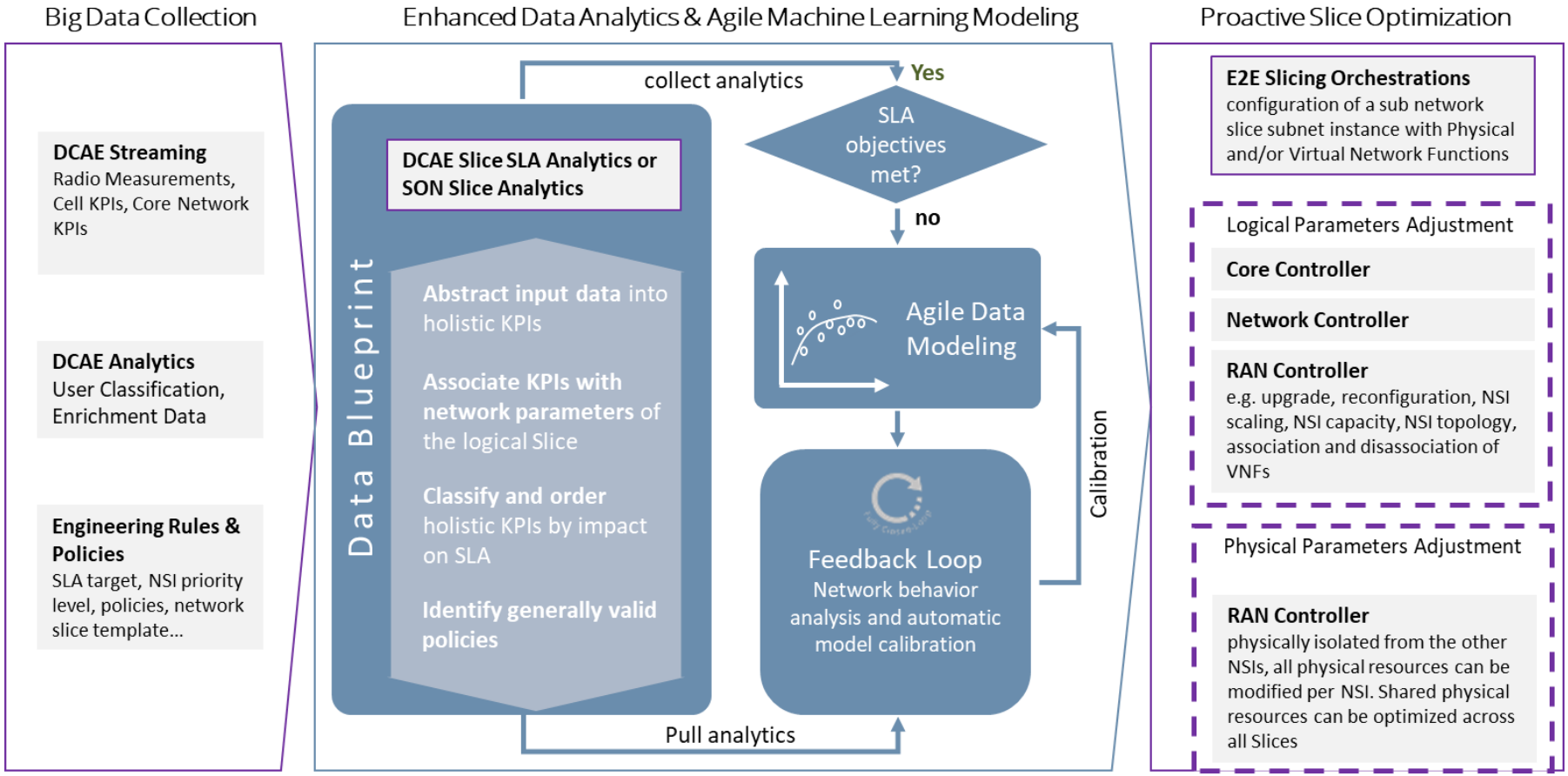


Other early thoughts on GANA and ONAP Mappings and how to extend ONAP to fulfil GANA Requirements

For Further Study: Further examine the DCAE in ONAP to see the extent to which the DCAE is implementing some functionalities of the **GANA Knowledge Plane such as DEs, MBTS and ONIX features. Some of the Questions for investigation are:**

- Is the **AINI in ONAP** implementing some of the functionalities specified for the GANA ONIX?
- If so, how can the ONAP component be evolved to be used to implement an ONIX Server and an ONIX system?
- How does the DCAE Analytic Applications and DCAE Platform collectively help to implement the GANA Knowledge Plane overall?

ONAP Mapping MBTS for 5G Slice Service Assurance



Assumptions Regarding ONAP

- ONAP supports the complete lifecycle management of network slicing including
  - Lifecycle management of PNFs
  - Enhanced SDC to support modeling of network slicing
  - AAI extensions for slicing data models
  - Enhanced orchestrator to manage lifecycle of network slices (may be a new orchestrator)
- ONAP supports edge cloud deployment
- Optimal placement of 5G VNFs
- Policy-driven performance optimization capabilities
- Near real-time data collection and processing
- C-SON reconfigures slices during run-time to assure SLA and optimize resources
  - Sub-slice instantiation
  - Logical parameter adjustment
  - Physical parameter adjustment

Use Cases for SON & ONAP Coordination

- E2E 5G Slice Service Assurance (RAN and Core)
- 5G White space/unlicensed spectrum management
- SON management of disaggregated RAN components
- Online PnP
- New techniques for HetNet load balancing across RATs
- Datafill & consistency assurance

Key Takeaways

Key Takeaways

- **Cellwize C-SON and its framework for policy control of D-SON implements the GANA Knowledge Plane for the RAN**
- **Cellwize provides an implementation of the GANA Knowledge Plane for the Backhaul to some degree**
- The Cellwize C-SON Implementation Opens a Door and **Opportunity Towards a Specification/Standardization of an MBTS for RAN (an MBTS that also covers 5G)**
- **The GANA model empowers Autonomic (Closed-Loops) Service Assurance for 5G Network Slices**
- This ETSI 5G PoC is clarifying the Required Carriers'(Operators') ***Framework for E2E Autonomic (Closed-Loop) Service Assurance for 5G Network Slices***

  → E2E Autonomic Slice Assurance shall be achievable through the Federation of GANA Knowledge Planes for RAN (C-SON), Front-/Backhaul and 3GPP Core Network, Complemented by lower level autonomics, for Multi-domain state correlation and programming by the GANA KPs (RAN, DC, MEC, Backhaul, Core Network)

Key Takeaways

- There is a need for Integration/Convergence of Autonomic Service Assurance with Orchestrated Assurance in the Carrier/Operator's Environment
- Further Study on how to evolve ONAP Components to address GANA Requirements should now be triggered and contributions to ONAP and other Open Source Projects like TIP and BBF CloudCO and Open BroadBand should now be launched
- We are calling upon the IPv6 Community to Showcase in this PoC and Discuss more on IPv6 Features that play a role in Autonomic Management and Service Assurance in 5G, and IPv6 expectations in 5G Traffic Flows and QoS Tuning
- Hybrid-SON Model (Combining C-SON and D-SON) is an illustration of GANA for the RAN

Implementation of Action Point suggested by Participants at the Demo-2, regarding Need for Interaction/Liaison between ETSI NTECH AFI WG and ONAP

One of the Comments Received during the Demo-2 Presentation was on the "***Need for Interaction/Liaison between ETSI NTECH AFI WG and ONAP***" in order to encourage the launch of an activity on "*ONAP for GANA requirements (i.e. GANA components that can be implemented using ONAP components)* "

Implementation of the Action Point: ETSI NTECH AFI WG is preparing a Liaison Statement (LS) to ONAP, with the aim to send the LS to ONAP within March 2018.

Consortium and Contact Details for Demo-2

Contact Details of PoC Leader (contact to join the consortium)

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- Orange
- Verizon
- NTT
- Altran
- Asocs Networks
- Cellwize
- Huawei
- Incelligent
- QualyCloud
- IPv6 Forum

Thank you!

At Every Moment of Truth