CSPs requirements in Network Autnonmy Analysis and Discussion

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01. Network Autonomy Vision

02. Generalized Common Architecture

03. Proposed WIDs on Policy Management

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The Phenomenon of Autonomous Driving Network since 2019

2018/12

China Mobile Research Institute

2019/10

ITU SG 13

2019/11

ETSI ENI ISG

2019/05

TMForum

2019/09

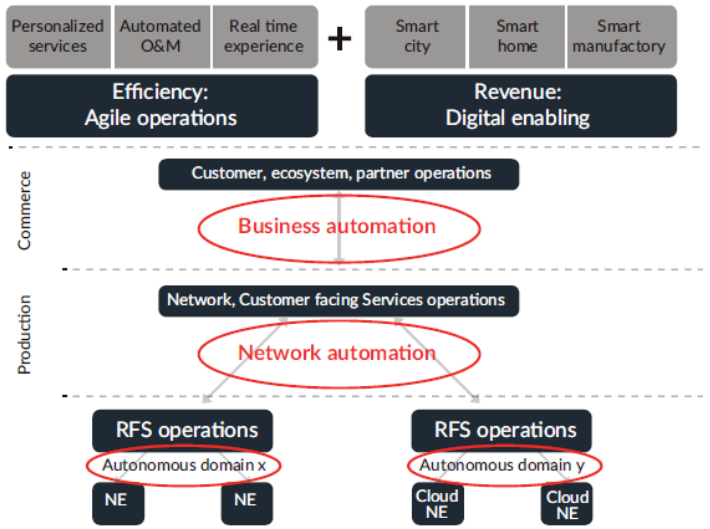
2019/11

Huawei

Highlights from TMForum White Paper

The main content of the 2019 version of the TMF Autonomous Network White Paper includes four parts:

- A **hierarchical architecture** is recommended to evolve resource mgmt. into autonomous domain, as the basis for network and service automation.
- A series of **autonomy levels** proposes a two-dimensioning goal for network autonomy: scenario-specific functional requirement and scenario coverage.
- A collection of **use-cases** is provided which includes more than 20 specific scenarios and their corresponding current autonomy levels.
- A **methodology** is proposed to prioritize the use-cases for deployment from business driver, technology maturity, and coverage scale.

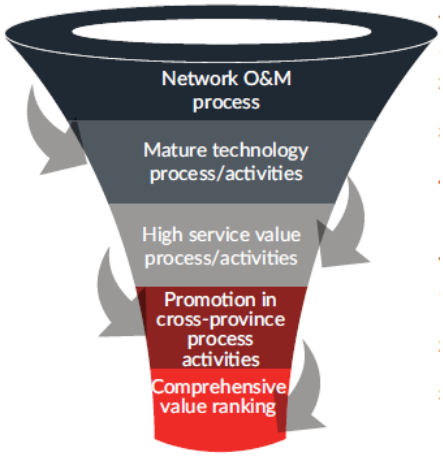


Hierarchical Architecture

Level Definition	L0: Manual Operation & Maintenance	L1: Assisted Operation & Maintenance	L2: Partial Autonomous Network	L3: Conditional Autonomous Network	L4: High Autonomous Network	L5: Full Autonomous Network
Execution	P	P/S	S	S	S	S
Awareness	P	P	P/S	S	S	S
Analysis	P	P	P	P/S	S	S
Decision	P	P	P	P/S	S	S
Intent/Experience	P	P	P	P	P/S	S
Applicability	N/A		Select scenarios			All scenarios

P: Personnel, **S:** Systems

Autonomous Network Levels



Methodology

Gap Analysis and Proposal Summary

Network Autonomous Levels

Open issue 1: From the coverage perspective, how to make the leap from selected scenarios to all scenarios?

Open issue 2: From the function perspective, is it possible to introduce common components in earlier stage and scale them later?

Hierarchical Architecture

Open issue 3: Autonomous domains assume more close **trust** relationship and further **delegation** from NOP/SP to device vendors.

Open issue 4: The linear dependence from network/business layers to autonomous domains raises risks of **uncertainty & complexity**.

Methodology

Open issue 5: Directly applied to each use-case, it is difficult to achieve **convergence** or identify **common interest** among NOPs/SPs.

Use-cases

Open issue 6: Without a generalized approach, it is not clear how to enable new cases in a **sustainable** and **future-proof** manner.

Proposal to Leverage Open Collaboration Platform for

①**AN Level**, Evaluate IT maturity of common functional blocks from open-source communities and product readiness.

②**Layering**, Leverage open industrial platform, to explore and converge to interworking interfaces across layers.

③**Methodology**, Evaluate CT maturity of known cases from both data/operation standards and product readiness.

④**Use-cases**, Equip software-defined network with DevOps tooling chain, for operational and customer applications.

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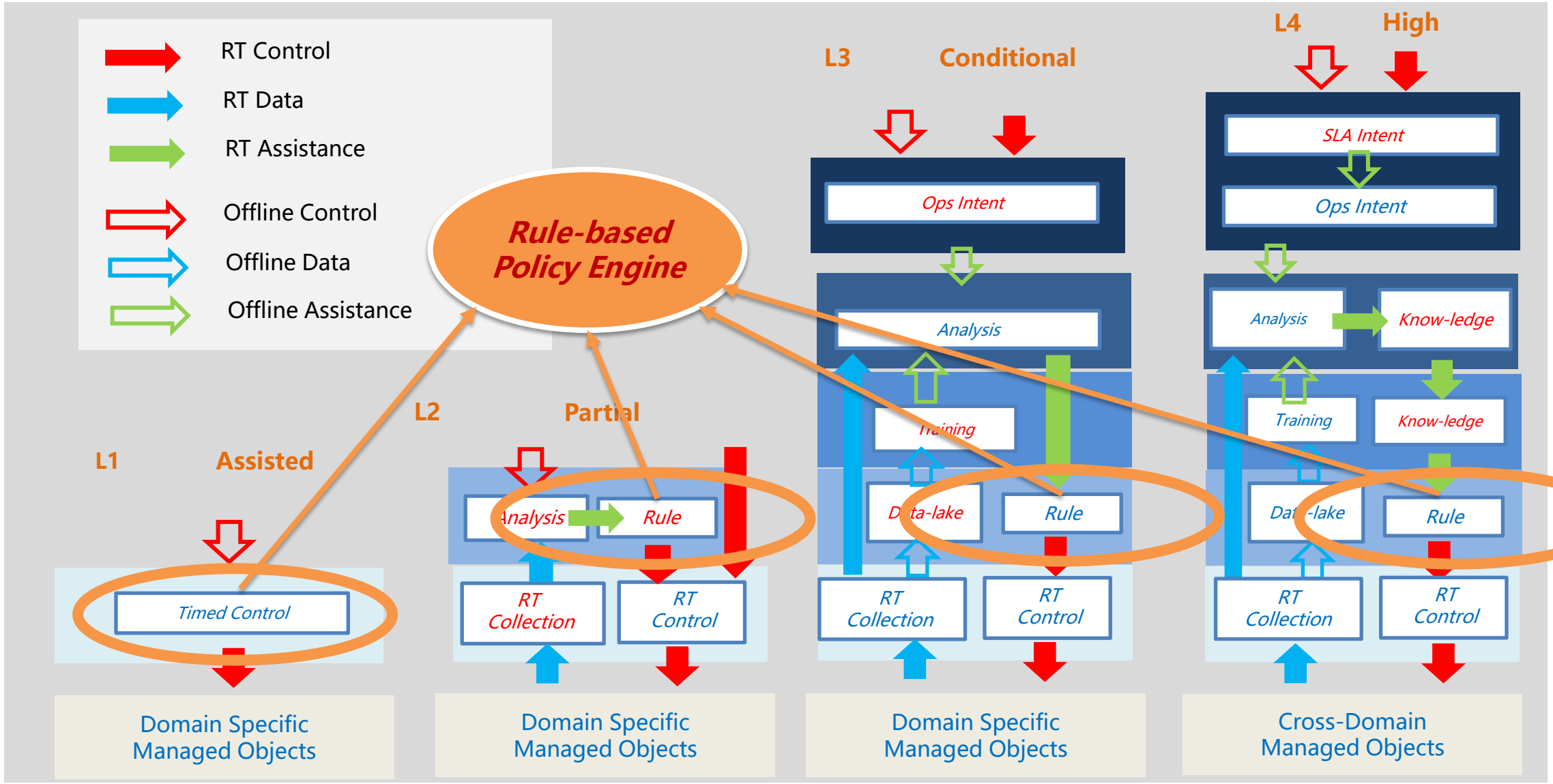
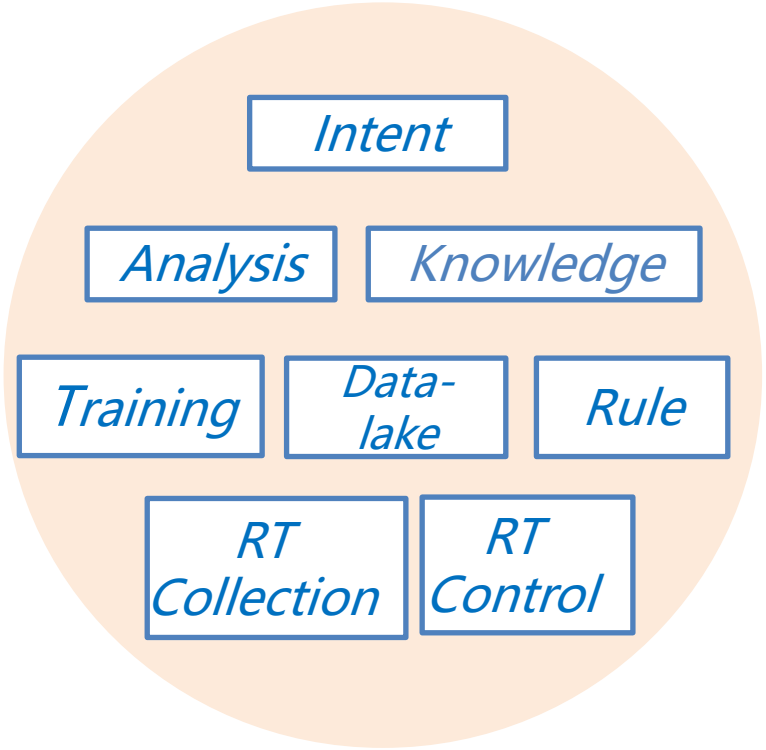
1 The EASY Way: Common Functional Architecture for Autonomous Levels

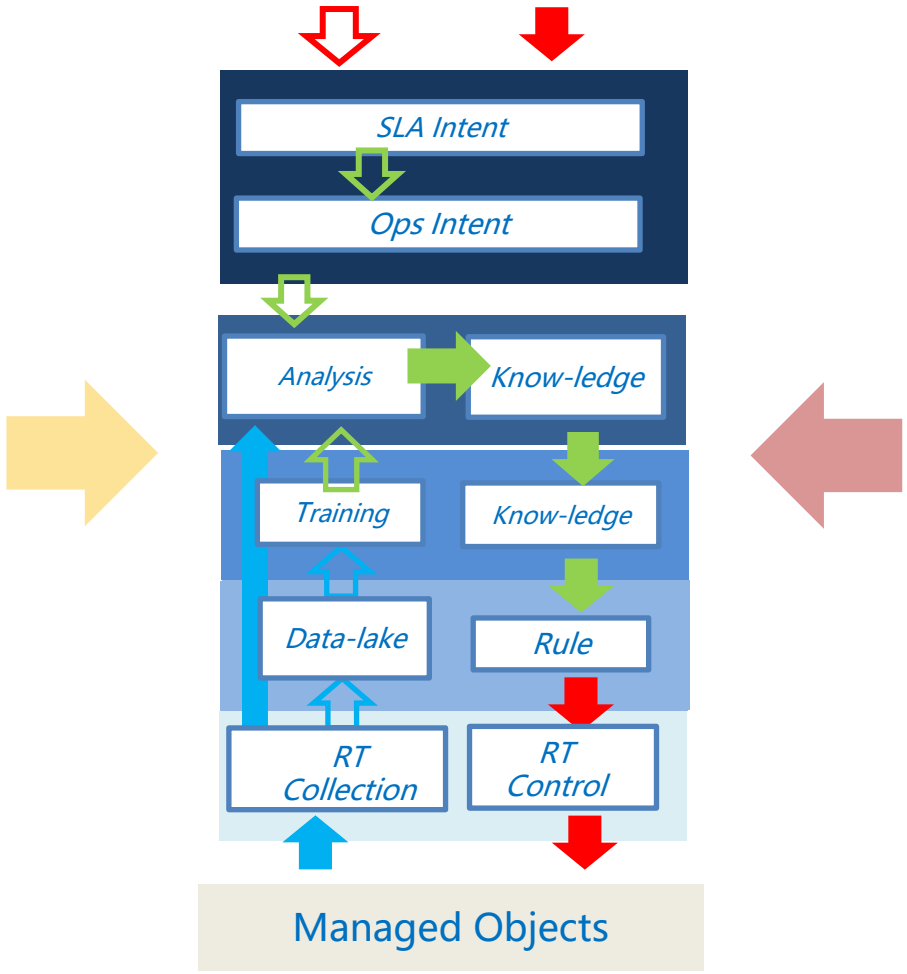


1 The EASY Way: Open Collaboration Platform

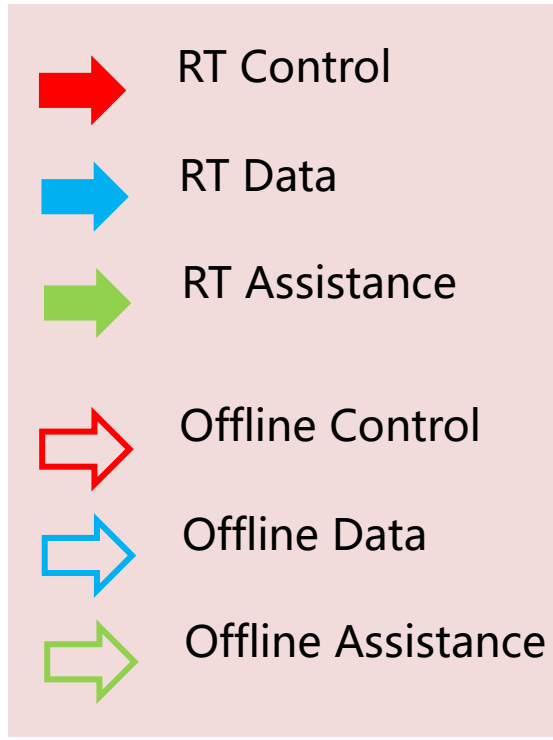
Open Implementation



Case-Agnostic
Functional Components



Open Standards

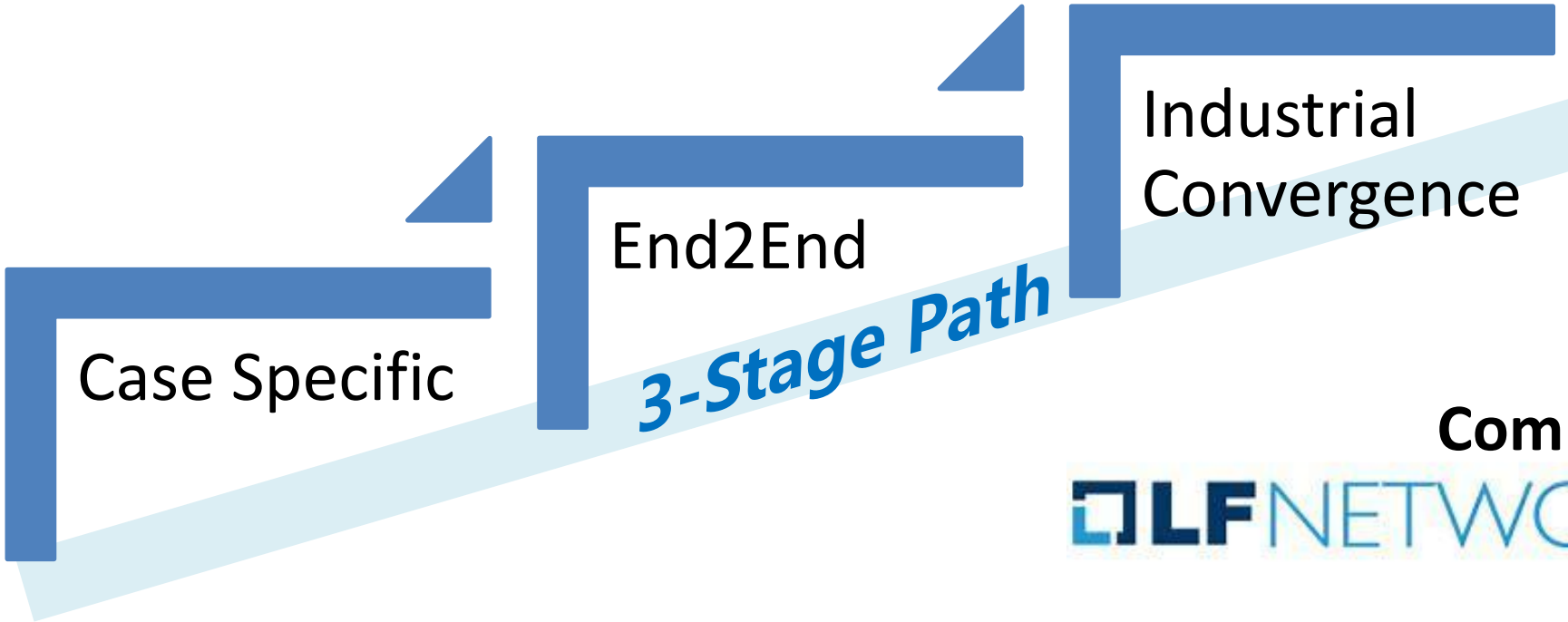


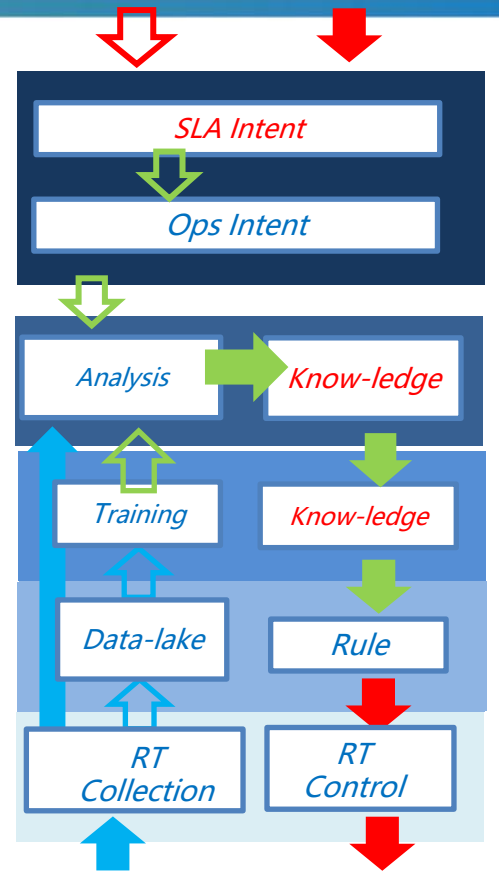
Case-Specific
Data/Control/Assistance

4 Proposal Summary

Metric Definition
Benchmarking Standards

DevOps Tooling
Cross-Organizational Practice





Common Architecture

LF NETWORKING ONAP OPEN NETWORK AUTOMATION PLATFORM

Related Practice in LF Networking

EUAG

- Operator Survey
- Vision Convergence

TAC/TSC

- Architecture Analysis
- Community Convergence

OVP

- Devops tooling
- Metric & Benchmarking

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X-Organizational Policy Management Workshop

Overview of the Workshop

- On September 25, 2020, ETSI ENI ISG together with NFV ISG and representatives of other standards and open source organizations held an online workshop on policy management.
- This conference was initiated by China Mobile and hosted by ENI ISG and NFV ISG.
- 28 representatives from 14 companies including China Mobile, China Telecom, Telefonica, Verizon, NTT and other operators and manufacturers such as Huawei, Samsung and AsiaInfo participated in the online Workshop.
- Workshop links: https://docbox.etsi.org/ISG/ENI/Open/20200925_Workshop_ENI_policy

Aims of the Workshop

- Address policy management assistance in ETSI ENI and explore its relation to other SDOs and open-source communities.
- Understanding the synergies, working together, removal of any overlaps, between ETSI ISGs/OSG and other SDOs.
- Investigate the possibilities for technical co-operation between ETSI ISGs/OSG and other SDOs.
- Develop a roadmap of future actions and ways of working together.

Three thematic links

- MANO policy requirements.
- ENI policy management and requirements mapping.
- Policy management open source realization.

Analysis and Suggestions

Standards

- ENI is positioned as a general policy management architecture serving all kinds of application scenarios. At present, each SDO is carrying out different granularity standardization work at different levels of policy management, and there are obvious differences in the specific implementation schemes of some common requirements.
- ENI needs extensive research and in-depth analysis and summary to refine the common requirements in different application scenarios and provide common solutions compatible with various implementation schemes, otherwise it is difficult to meet specific requirements or standards in various practical application scenarios.

Open source

- The closed-loop control architecture of OSM is still in the stage of primary design and gradual implementation, while the policy framework of ONAP has included three policy execution engines through repeated iterations and continuous optimization, supporting a variety of application scenarios.
- In particular, the apex policy engine of ONAP can flexibly support various types of closed-loop/policy models based on free mode, which is a powerful candidate to support the reference implementation of general policy management module for different SDO specific application scenarios under ENI architecture.

Proposed Work Items for ONAP Policy Further Consideration

1. The implementation of interoperability between NFV policy model and ENI will be analyzed, combined with ETSI alignment use case planning.

2. The implementation of SON collaboration policy on ONAP will be analyzed, combined with SON use case planning.

3. The implementation of intent policy general model on ONAP will be analyzed, combined with slicing/SON use case planning.

Proposed Case Study – NFV IFA023

- IFA023 is an Group report of ETSI NFV IFA WG. It provides a study on managing policies in the NFV MANO architecture.
- IFA023 defines 2 policy management roles which can be mapped to MANO FBs:

Role	Description
Policy Administration Point (PAP)	The PAP is responsible for defining MANO policies. It is not in the scope of this document to define a jurisdiction (one administrative domain or multiple administrative domains) for a PAP.
Policy Function (PF)	The PF is responsible for making policy decisions, i.e. to evaluate whether the policy conditions are met and to define what is to be done when they are met.

- IFA023 provides 3 types of policy use cases:

Use case type	Example	Description	PAP	PF
Global management policy	Distribution of energy efficiency policy---cost of energy reduction	Service provider creates an energy cost reduction policy and transfer it into effect in the NFVO. The NFVO uses the policy rules as input to the selection of NFVI PoPs when answering a Grant VNF lifecycle operation request.	Service provider	NFVO
Management policy specific to VNF instance	Optimization of NFVI-PoPs resource utilization --- Load Balancing	In this use case, Operator desires to maintain a uniform resource utilization level across its own NFVI. One approach is to migrate one or more VNFs from the currently most-loaded NFVI-PoP(or going to be the most-loaded) to the currently least-loaded NFVI-PoP(within time T).	NFVO	NFVO
Management policy specific to NS instance	Transferring NS healing policy to the NFVO	The OSS/BSS have the information of available VNF instances, for the sake of setting NS healing policy information. One possible example of NS healing policy may contain the following information: If the faulty information of a specific VNF or VL is reported to NFVO, according to the severity of the fault, the NFVO determines whether to migrate the VNF to other VM(s) or any other healing actions.	OSS/BSS	NFVO

Proposed Case Study: Intent policy in IDMS

IDMS： Intent driven management service (IDMS) reduces the complexity of management without getting into the intricate detail of the underlying network infrastructure.

Intent Description:

<***IntentDrivenAction***>,<***IntentDrivenObject***>

IntentDrivenAction（*IDA*）:

<IntentDrivenActionName>{<IntentDrivenActionProperities>}

IntentDrivenObject（*IDO*）:

<IntentDrivenObjectName>{<IntentDrivenObjectProperities>}

O-RAN A1-P: In O-RAN architecture, SMO(Service management and Orchestration) uses intent policies through A1-P interface to intelligently and dynamically control O-RAN internal radio resources.

Intent Description:

<***Scope identifier***><***Policy statement(s)***>

<Policy statement>:

<Policy objective><Policy resource>

Proposed CaseStudy: SON Policy and Coordination

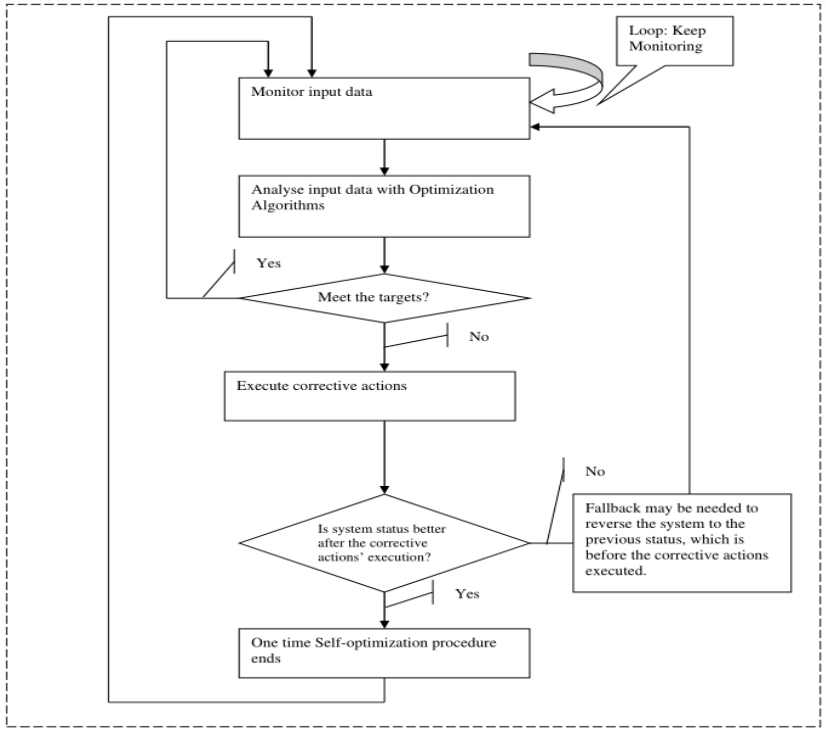
SON Optimization Policy

- The SON functionality keeps monitoring input data according to the operator’ s objectives and targets.
- Whenever the objectives and targets are not met, optimization algorithms will be triggered.
- Corrective actions are provided and executed.
- Evaluating the result of the executed corrective actions.

  a. If the system status is not satisfactory, fallback may be needed to recover the system configuration as the original state.

  b. If the system status is satisfactory, the one time optimization ends.

  c. Return the input data to monitoring.



SON Coordination

- Some SON functions will affect the common network parameters/States directly or indirectly, there may be conflicts or dependencies between the son functions.
- The SCF (son coordination function) is introduced to do SON coordination.
- SON Coordination Methods:

  a. Based on priority of SON functions

  b. Based on the cell state

  c. Coordinating based on cell state and the priority of SON functions jointly

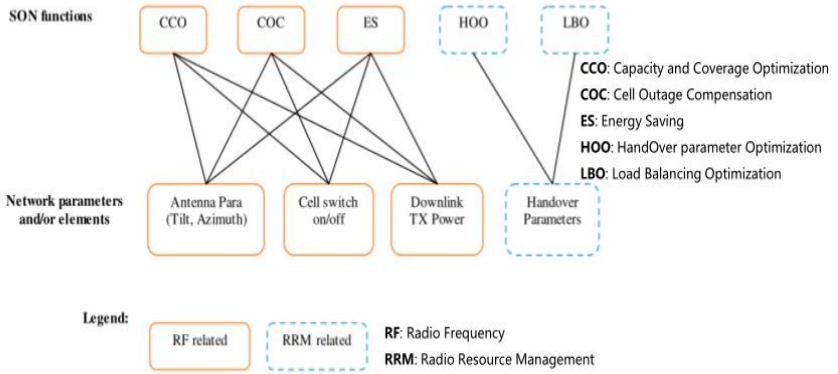


Fig 2. Mesh relationship between SON functions and network parameters[2]

THANK You

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