The ETSI ZSM Reference Architecture Framework

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"Collaboration among SDOs is critical to accelerate Telco automation – ETSI ZSM is the glue that holds all of them together from an end to end automation perspective."

(Anil Rao, Analysis Mason)

ETSI ZSM: A framework rather than a system

Management automation requires a flexible management framework, not a fixed management system.

- ✓ Management services that can be composed; support for service exposure and service integration
- ✓ Open, model-driven, intent based interfaces
- ✓ Separation of management concerns: Domains and End-to-End; allows encapsulation of complexity
- ✓ Shared data (stored, streamed) as the lifeblood of automation
- ✓ Foundation for closed loops at various levels as the driver of automation

→ **Deployment flexibility, open for evolution!**

The ETSI ZSM framework reference architecture

ZSM service aka management service: A set of offered management capabilities.

Management function: Logical entity playing the roles of service consumer and/or service producer.

Management domain: A scope of management delineated by a technological, business, administrative or other boundary.
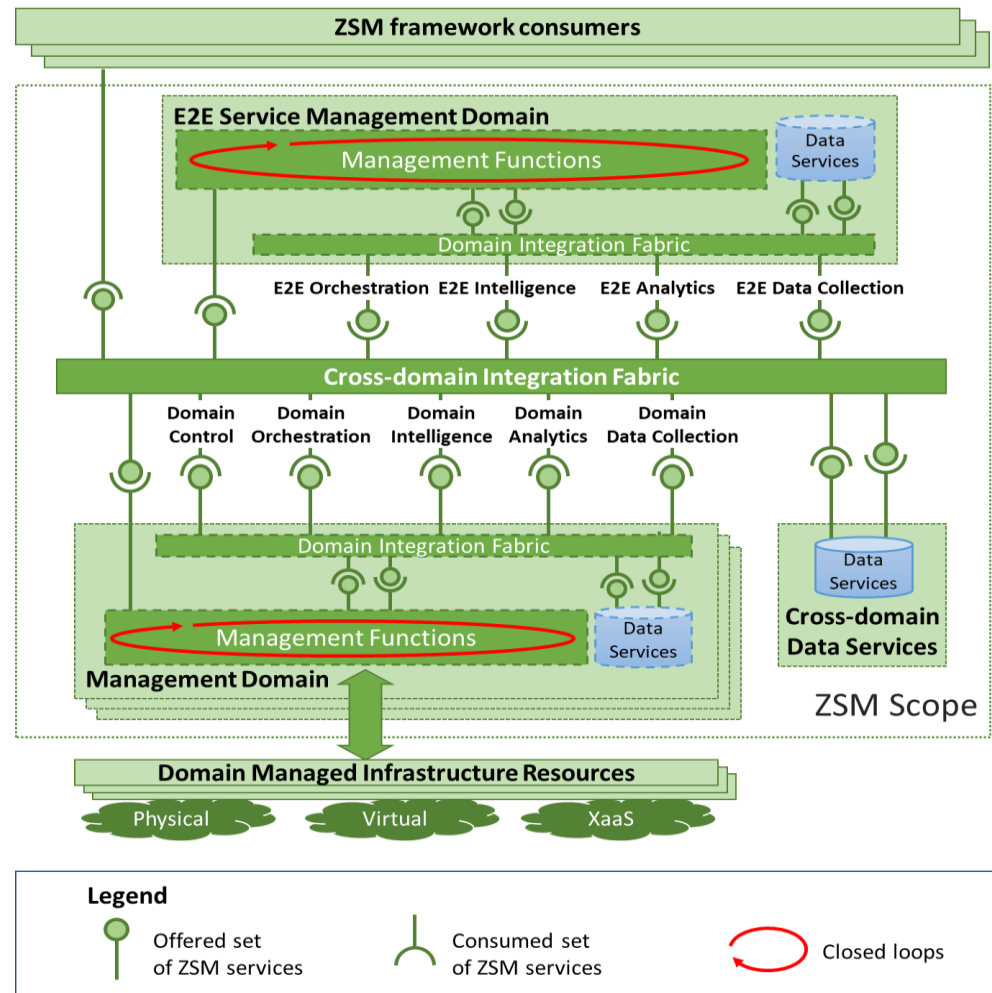
E2E service management domain: A management domain specialized in managing E2E services.

Integration fabric: A management function, playing the roles of both service consumer and service producer, that enables interoperation and communication between management functions within and across management domains.

Cross-domain data services: Services that allow to persist data and share them with authorized consumers across domains.
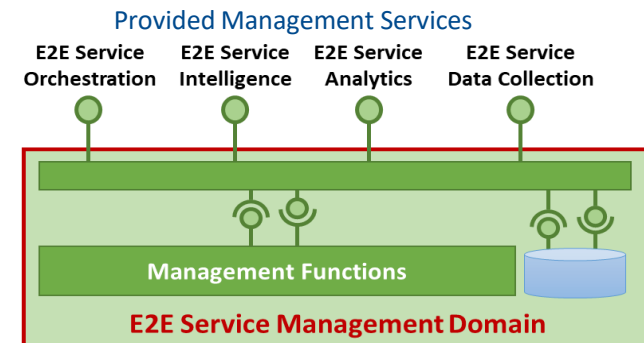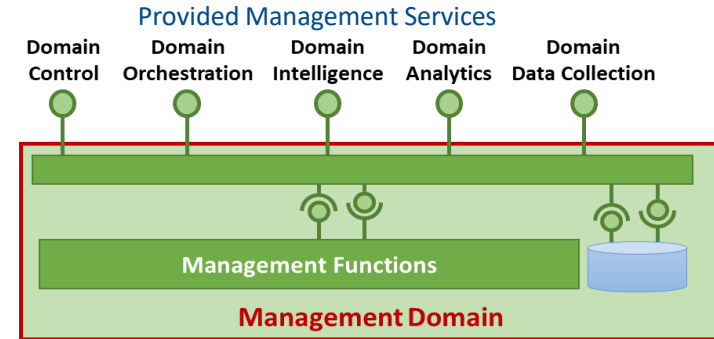
(Source: ETSI GS ZSM 002)

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ZSM architecture feature:
Separation of concerns in management

Management Domain (aka Network Management Domain)

- Scope of management delineated by an, e.g., technological, business, administrative, geographical or other boundary

- Manages resources and services based on these

- Produces management services and consumes management services from other domains

- Decouples the inner domain details from the outside world

E2E Service Management Domain

- Special type of management domain that

  - Manages E2E services that span multiple management domains, but typically does not manage resources

  - Coordinates between management domains

Provided Management Services

Domain Control · Domain Orchestration · Domain Intelligence · Domain Analytics · Domain Data Collection

Management Functions

Management Domain

Provided Management Services

E2E Service Orchestration · E2E Service Intelligence · E2E Service Analytics · E2E Service Data Collection

Management Functions

E2E Service Management Domain

(Source: ETSI GS ZSM002)

ZSM architecture feature: Service-based

The ZSM architecture defines management services which can be produced and consumed by management functions.

(The realization of the actual management functions is out of scope.)

Domain data collection
- Event notification services
- Performance measurements streaming service
- Performance measurements collection service
- Log collection service

Domain analytics
- Analytics services
- Domain condition detection service
- Data optimization services

Domain intelligence
- AI model management service
- Deployed AI model assessment service
- AI training data management service
- Knowledge base service
- Health issue reporting service

Domain orchestration
- Domain orchestration service
- Feasibility check service
- Managed services catalogue management service
- Testing service
- Domain inventory information service
- Domain inventory management service
- Domain topology information service

Domain control
- Resource configuration management service
- Resource lifecycle management services
- Configuration data generation service

E2E service data collection
- E2E performance data reporting service

E2E service analytics
- Analytics services
- E2E service quality management service
- E2E service condition detection service

E2E service intelligence
- AI model management service
- Deployed AI model assessment service
- AI training data management service
- E2E service health issue reporting service

E2E service orchestration
- E2E service orchestration service
- Feasibility check service
- Managed services catalogue management service
- E2E testing service
- E2E services inventory information service
- E2E services inventory management service
- E2E services topology information service

Integration fabric services
- Management services registration service
- Management services discovery service
- Management communication service
- Management service invocation routing service
- Management capability exposure configuration service

Data services
- Data store management service
- Data persistence services
- Data processing service

(Source: ETSI GS ZSM002)

ZSM architecture feature: Integration fabric

The integration fabric allows management service (MnS) interoperation and communication.

- MnS communication → asynchronous or synchronous, e.g. event notifications, streaming data, request/response
- MnS registration and discovery
- MnS invocation, including support for service meshes (direct invocation also possible)
- MnS exposure management and access control
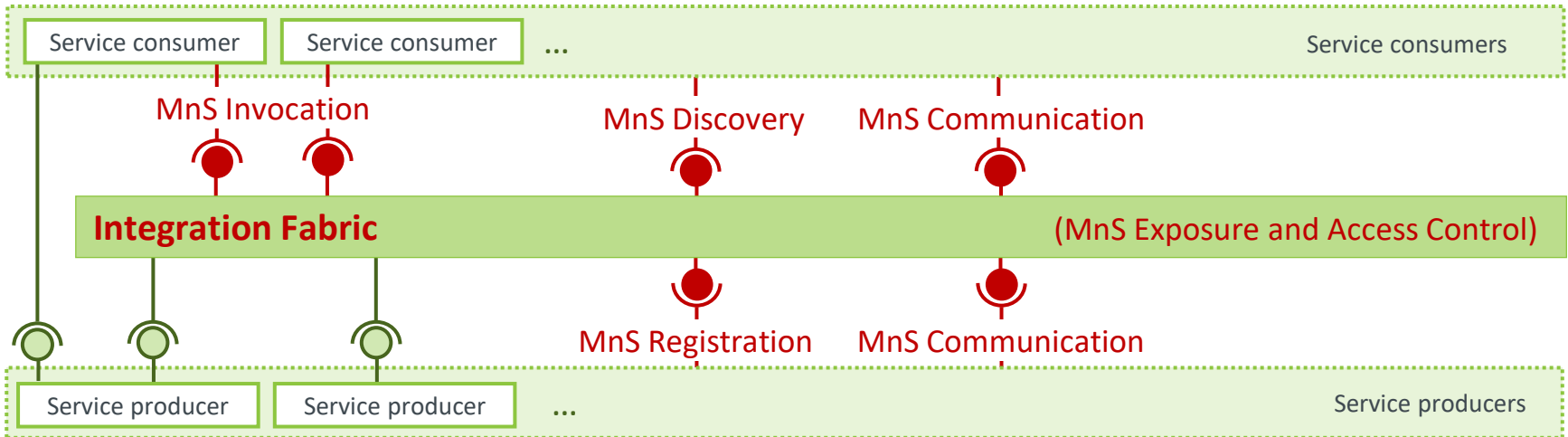
# ZSM architecture feature: Cross-domain data services

Data are the lifeblood of automation.

Cross-domain Data Services allow

- Storing of management data

- Sharing of management data with authorized consumers across domains

- Supporting big data analysis

Examples of shared data related to managed entities:

- performance monitoring data (e.g. performance counters)

- assurance data (e.g. performance/fault alarm events)

- trace data (e.g. packet capture data)

- configuration data

- miscellaneous log data

- network/service topology data

- network/service inventory data

Cross-domain Data Services

(Source: ETSI GS ZSM002)
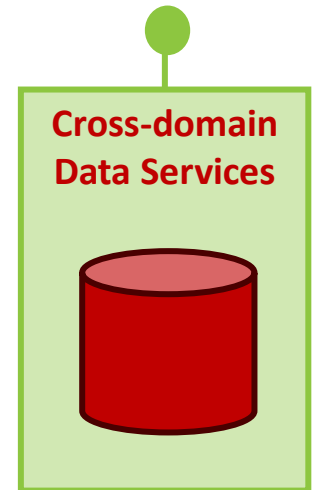
ZSM architecture feature:
Enabling automation based on closed loops

Observe

- *Data collection services* monitor the managed entities (resources and services) and provide live performance and fault data to support closed-loop automation.

Orient

- *Analytics services* provide specific insights based on data collected by data collection services and on other data / knowledge.

Decide

- *Intelligence services* provide specific decisions and recommendations, to drive closed-loop automation.
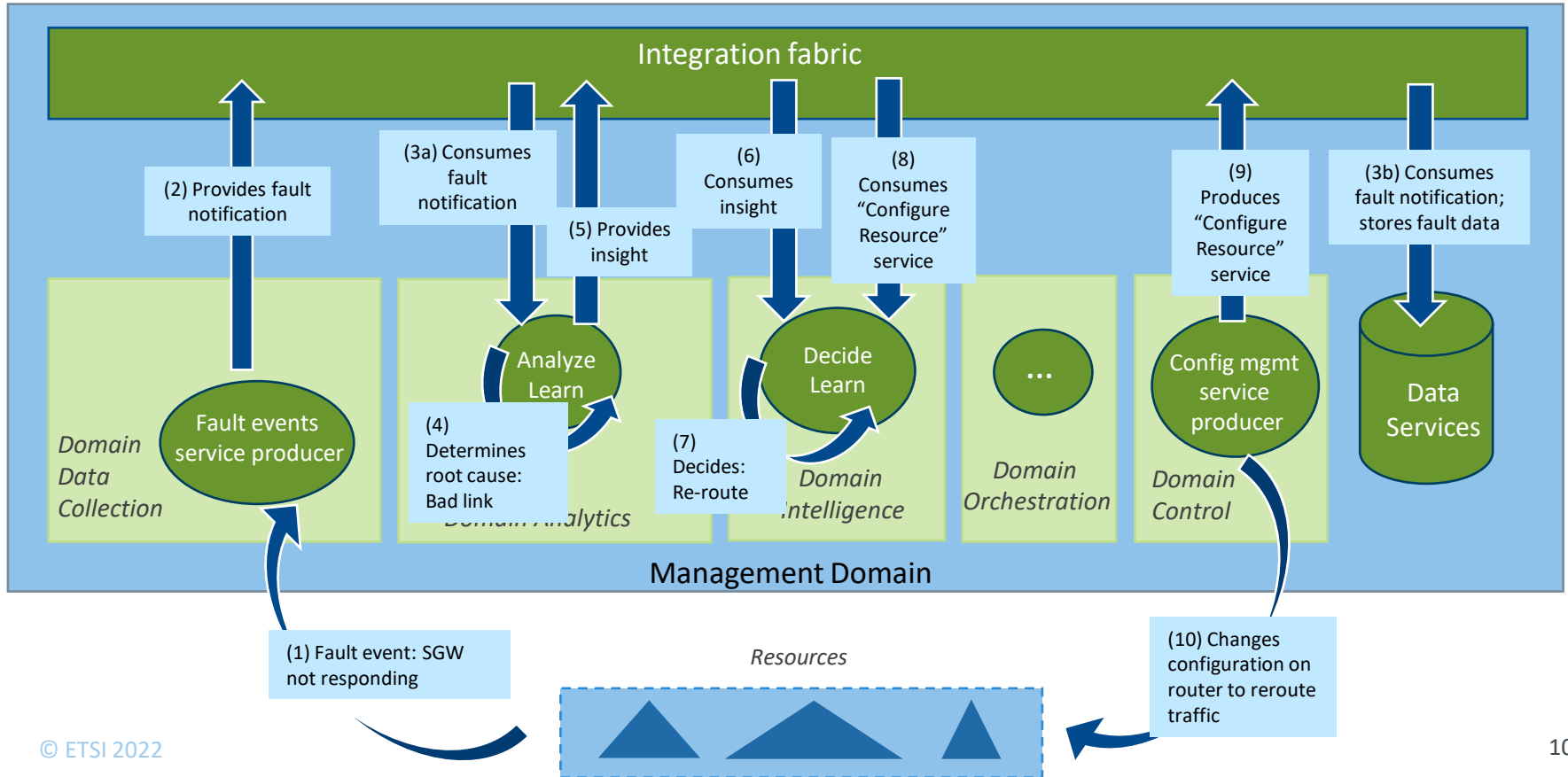
Act

- *Orchestration services* automate workflows and processes to handle instantiation and lifecycle management of the managed services.

- *Control services* individually steer the state of each managed entity (resource, service).
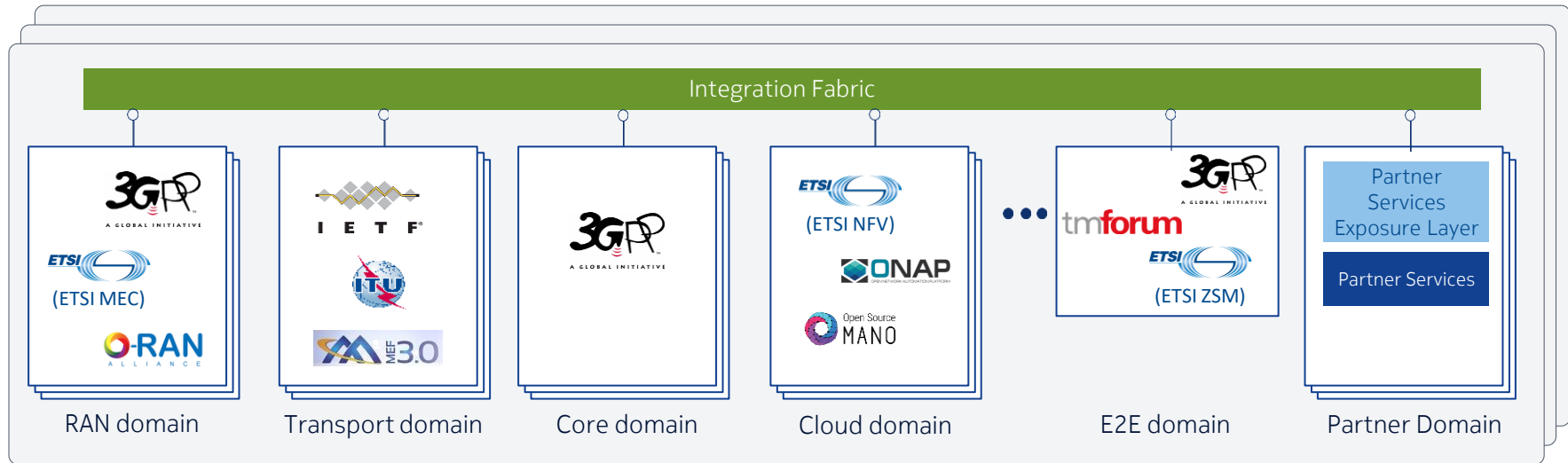
→ **Follow-up specifications: ZSM009-1, ZSM009-2, ZSM009-3**

(Source: ETSI GS ZSM002)   9
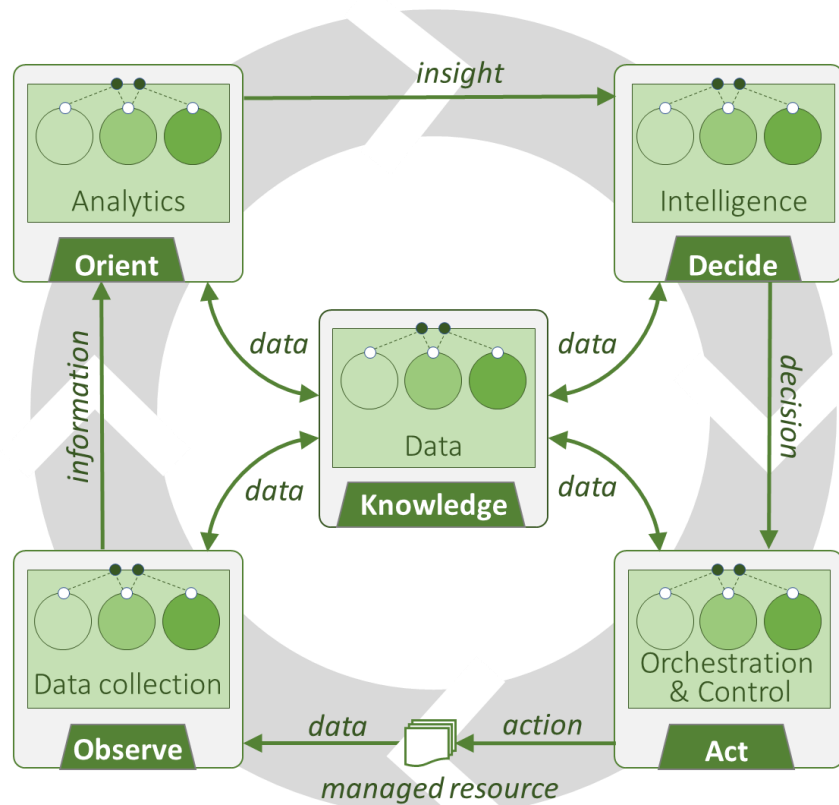
Closed loop example:
# Automatic fault mitigation

Role of the ZSM architecture framework in the industry

- Work done in organizations such as 3GPP SA5, ETSI NFV, ETSI MEC, IETF, BBF, ONF, TMF, ONAP, OSM, NEPHIO etc. fits well into the ZSM architecture. It can help enabling the orchestration and automation of end-to-end services.

- The ETSI ZSM specifications provide guidance on the design of management services to achieve automated end-to-end management solutions and architecture instantiations.

O-RAN SMO in the context of the ZSM architecture

Open question: Define the NBI towards the E2E Service Management Domain
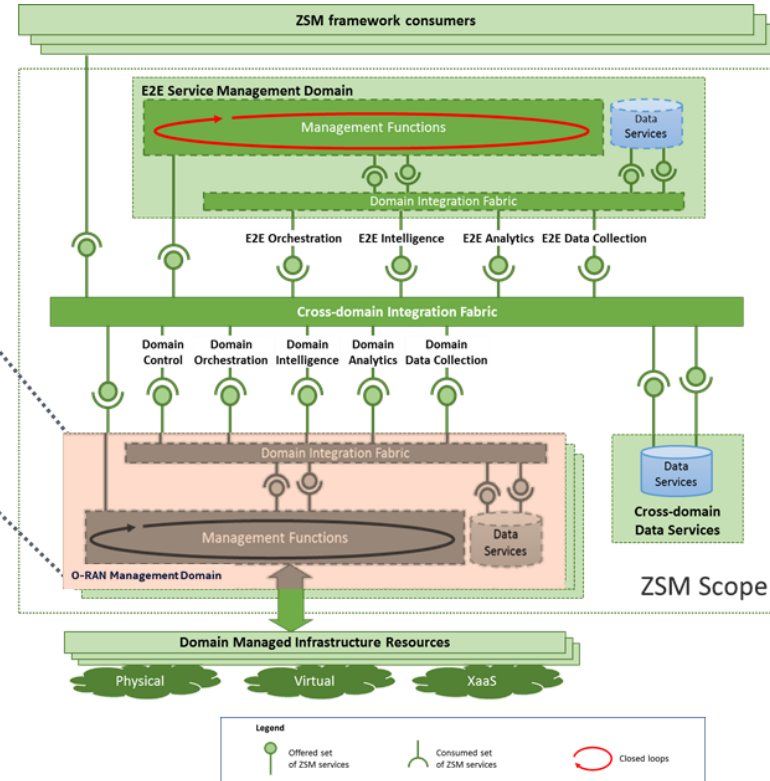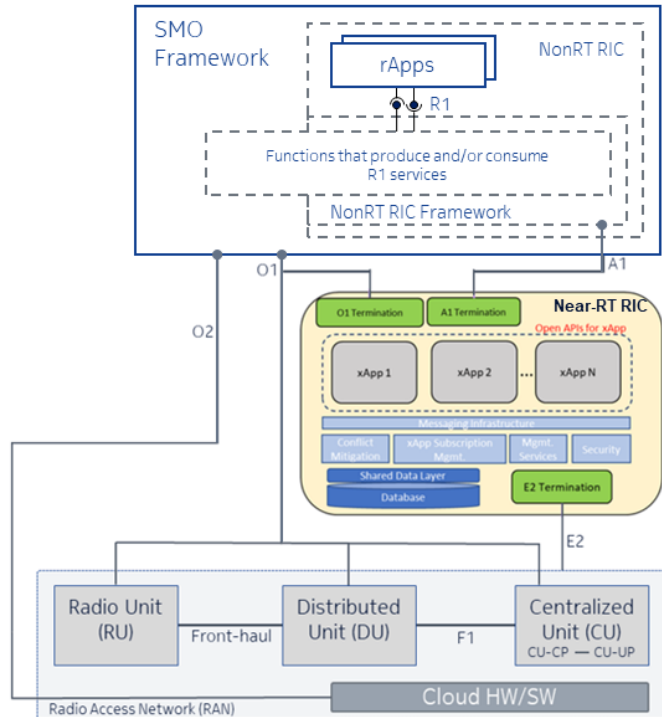
Conclusion

✓ The ZSM framework architecture is <u>flexible and service based.</u>

✓ The ZSM framework architecture separates the concerns of <u>Network Domain Management</u> and <u>E2E Service Management</u>.

✓ <u>Integration Fabric</u> and <u>Cross-domain Data Services</u> in the ZSM framework architecture provide flexibility to

- integrate and compose management services and

- build <u>closed automation loops</u>
across domains.

✓ The ZSM framework architecture provides the "glue" to integrate work done in organizations such as O-RAN, 3GPP SA5, ETSI NFV, ONAP etc.

   ✓ Its <u>concepts and principles</u> are also used in service-based architectures developed in other SDOs such as O-RAN and 3GPP SA5.

Thank you.

Author's contact

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More information on ETSI ZSM

ZSM Reference Architecture specification: **ETSI GS ZSM 002**

ZSM Technology Page: **http://www.etsi.org/zsm**

ZSM Wiki: **https://zsmwiki.etsi.org/**

Published ZSM specs: **https://www.etsi.org/committee/1431-zsm**

ZSM Open Area (Draft specs): **http://docbox.etsi.org/ISG/ZSM/Open**

ZSM Portal (members' working area): **http://portal.etsi.org/zsm**