

***tnc*19** Tallinn, Estonia
16-20 June 2019
Forging Digital Societies



Service orchestration in ESnet6

TNC19: Orchestration, Automation and Virtualisation (OAV) BoF

John MacAuley, ESnet

TNC19, D-hall, Tallinn Creative Hub (Kultuurikatel)

20 Jun 2019, 09:00 - 12:30

What is Orchestration?

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Orchestration is defined as the automated arrangement, coordination, and management of computer systems, middleware, and services within the network.

-- Wikipedia



Workflow management implements a repeatable pattern of steps for user-based interactions within our operations support system;

Automated service provisioning to programmatically change configuration across network, compute, and application resources.

ESnet5 Service Orchestration

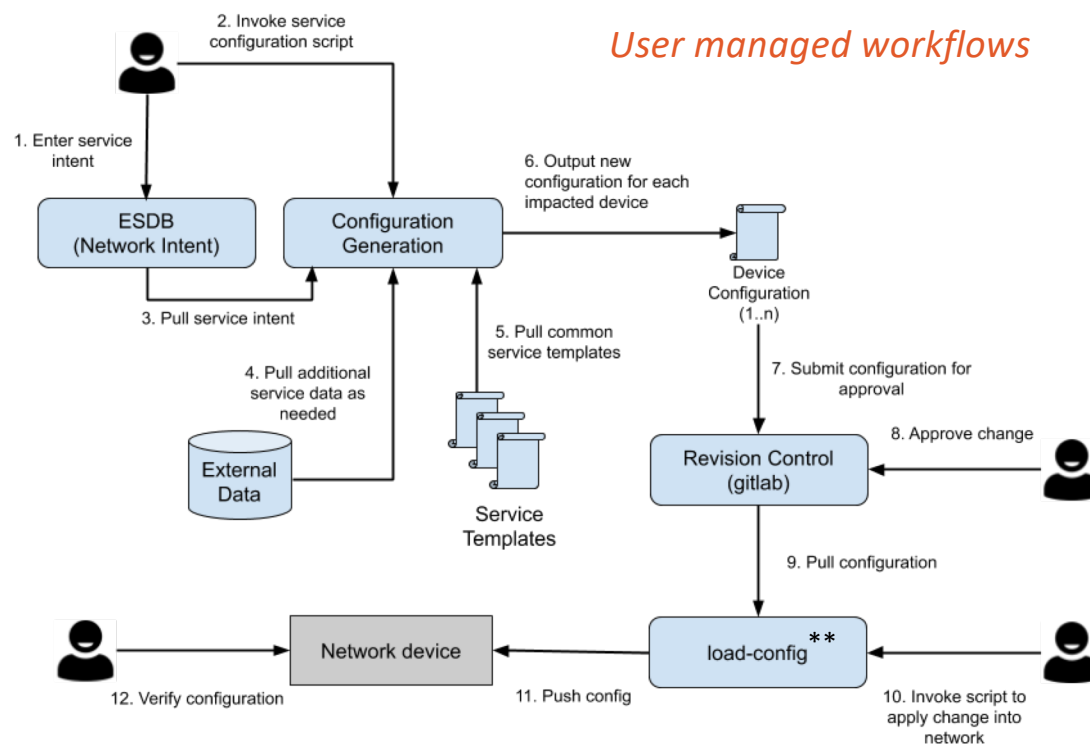
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Create and provision services on network devices

- Documented procedures for each service workflow;
- Service workflow steps executed by hand;
- ESDB used as source-of-truth for service intent.

Tools available to help simplify configuration generation and device provisioning

- Service specific scripts to assist in mapping service intent to device configuration;
- Service templates used for consistent configuration generation;
- Gitlab for revision control and approvals;
- Scripts used to push change to device via CLI.

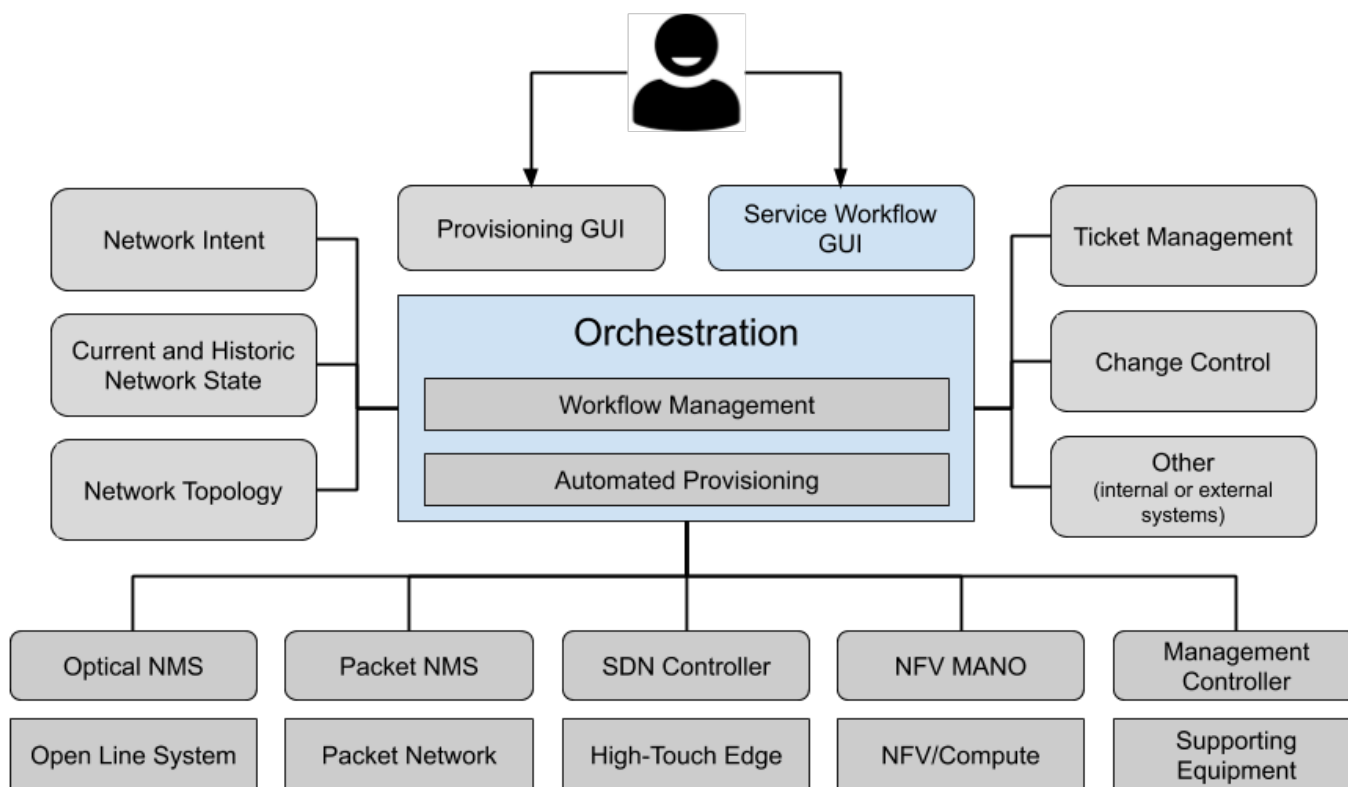


*** Automated provisioning pilot underway to replace manual configuration distribution with Ansible.*

- Abstraction to decouple components
- Modular, flexible, and extensible
- Minimally intrusive where possible
- Clearly defined source of truth
- Model driven network using standardized protocols and models
- Normalized service definitions
- Work closely with stakeholders to achieve the “best possible” solution

Build versus Buy versus Collaborate

Orchestration Architecture



Workflow management

- Sequence of steps needed to achieve an outcome.

Automated provisioning

- Instantiate the outcome within the network.

Network intent

- Intended state of the network.

Network discovery

- Actual and historic state of the network.

Network topology

- Topological view of the network based on actual and intended state.

Workflow Engine Architecture

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A workflow is a repeatable pattern of steps needed to orchestrate an outcome

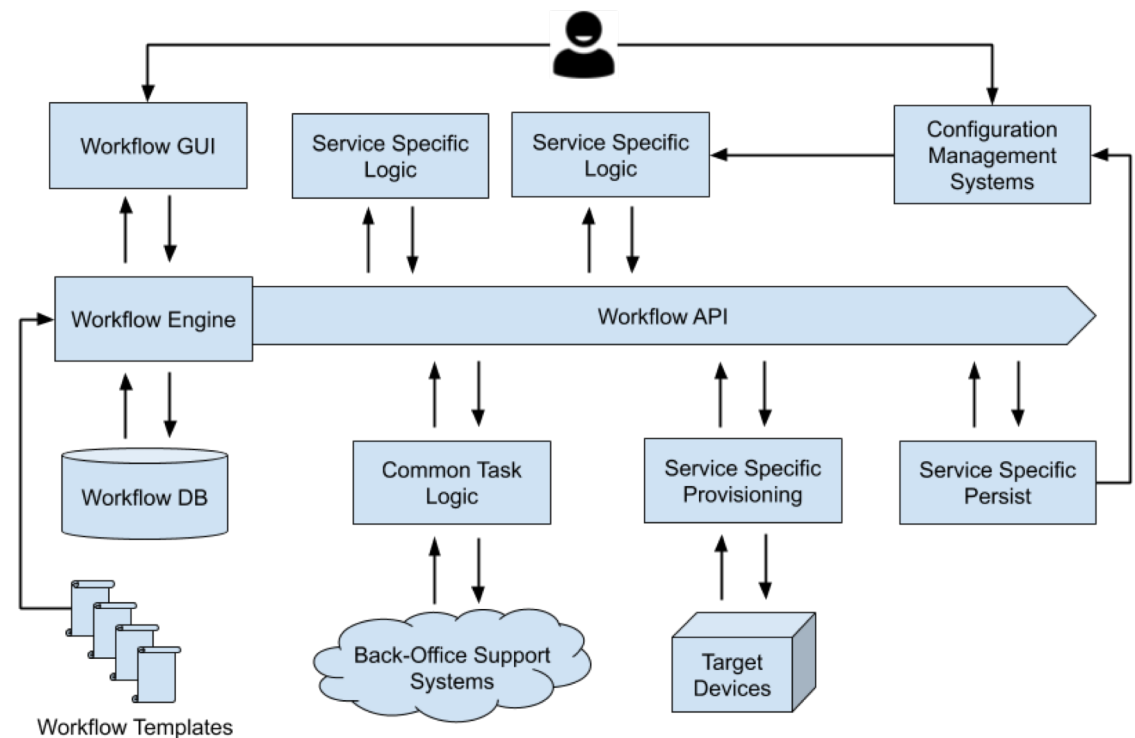
- A workflow is defined through template descriptions;
- The workflow engine invokes workflow modules associated with steps described in template;
- Workflow modules are defined for reusability to allow for use in multiple workflows.

Composite workflows can be defined using discrete base workflows

- For example, turning up a new BGP peering workflow may be dependent on a physical connectivity workflow.

Agnostic to provisioning technology

- Must support services that span technological domains using different provisioning solutions;
- Workflows can also be defined for non-provisioning related tasks.



Automated Provisioning

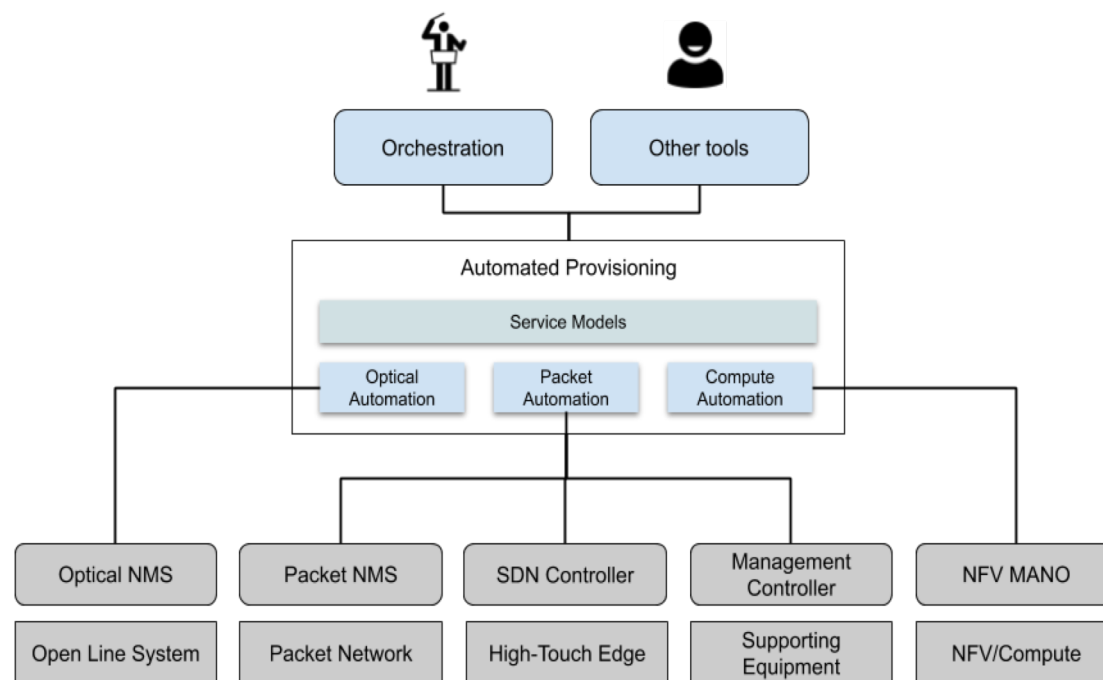
The automation of pre-defined procedures to programmatically change configuration within the network

ESnet6 requires automated service provisioning across network, compute, and application resources

Automation solutions are typically focused on domain specific provisioning tasks

Must support model driven design and provisioning

- Each network service is defined using a service model that is decomposed into domain specific provisioning operations.



Network Discovery (Netbeam)

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Scalable data collection infrastructure implemented on the Google Cloud Platform

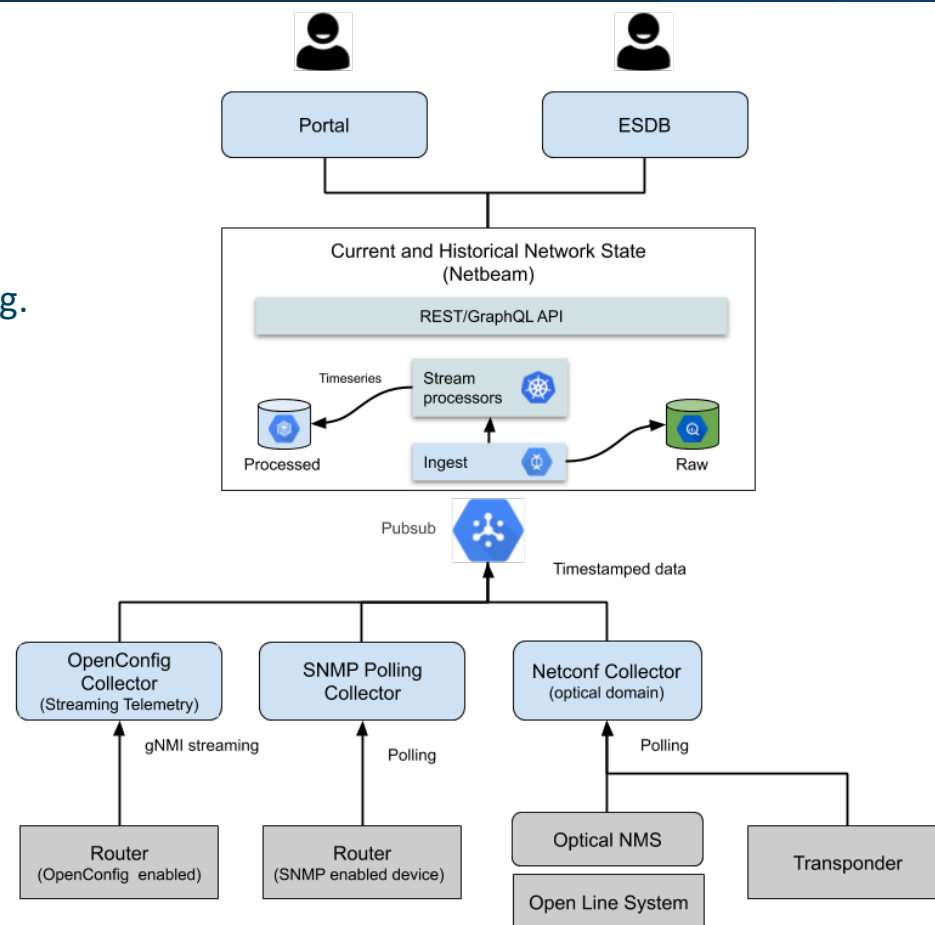
- Low latency access to real time and historical data with scalable storage;
- Elastic computational power for analysis and bulk processing.

Platform for network discovery

- Collection, time-series creation, and archiving of network measurement data, managed router attributes, etc.;
- Well-defined API for application access to stored data sets.

Data visualization (ESnet Portal)

- Provide tailored views and analysis of network statistics;
- Network heat maps;
- Per site and per port views;
- Generation of historical reports.



Network Intent (ESDB)

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Source of truth for intended network configuration

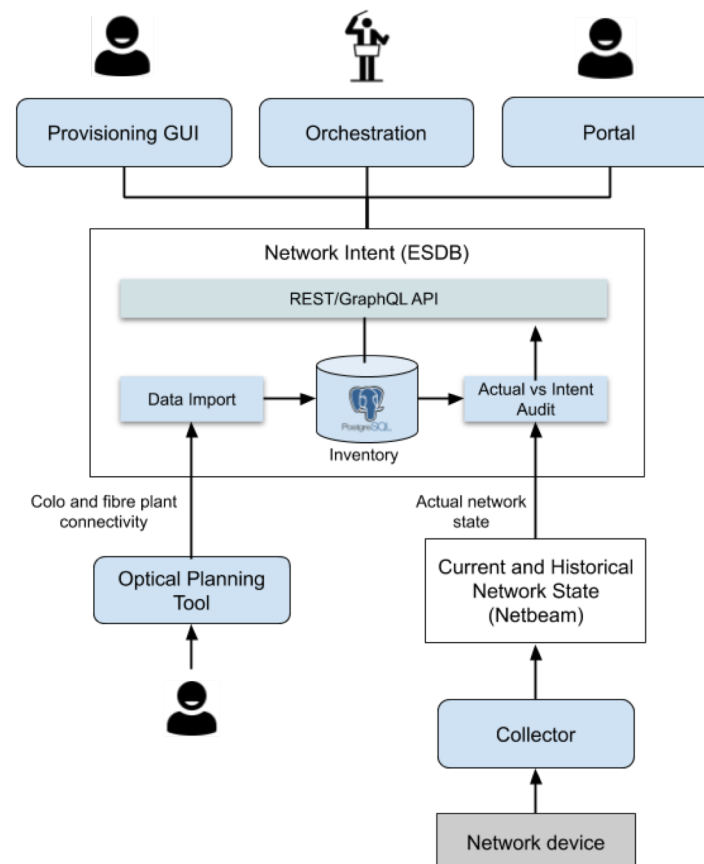
- Maintains engineering, operations and business data such as customers, colocation sites, fibre plant, power, network services, and related information;
- Provides inventory data to other internal systems.

Largely hand curated data

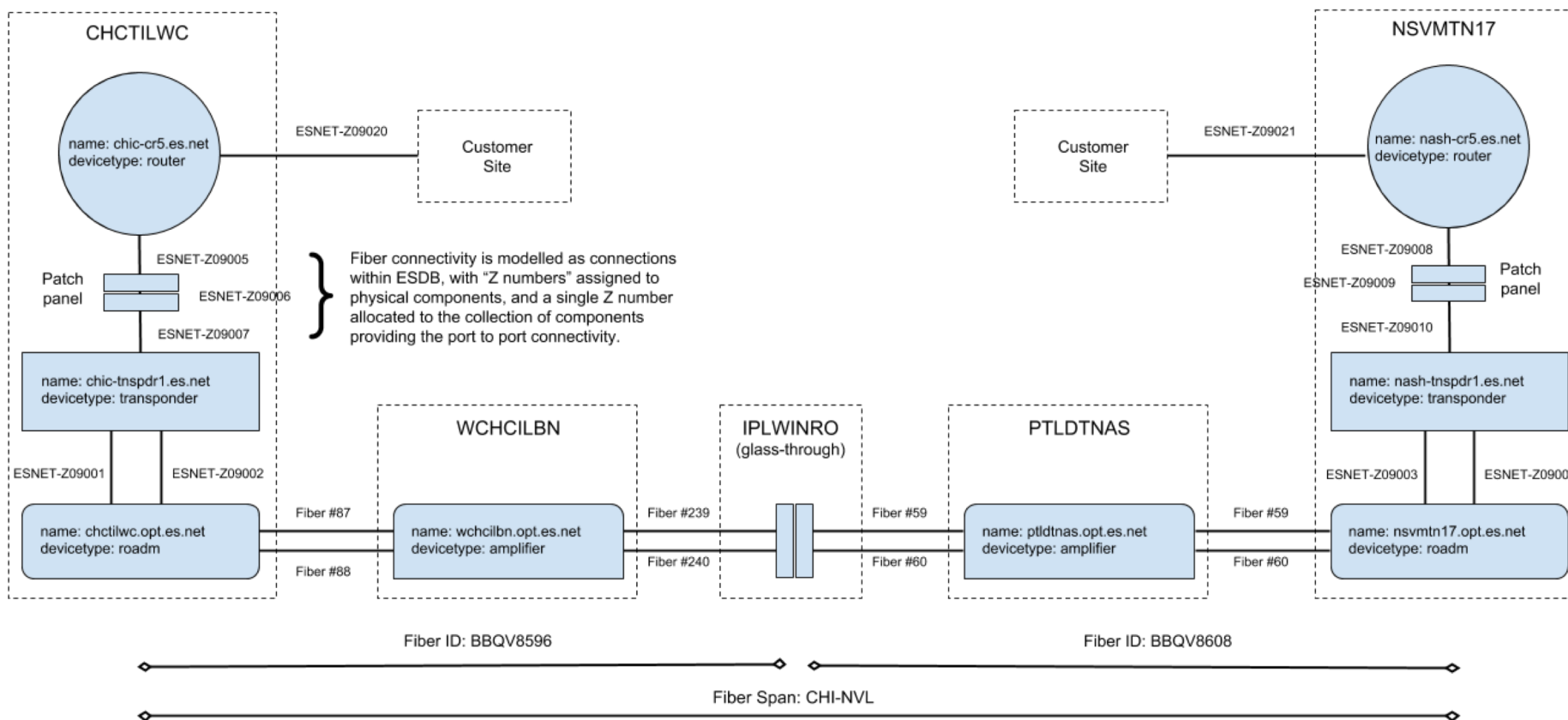
- Datasets can be imported from external sources;
- Manual provisioning of network information that cannot be dynamically discovered.

Intended versus actual audit

- Use discovered network state to audit for consistency.



Network Topology



Network Topology Service

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Builds a layered topological representation of the network

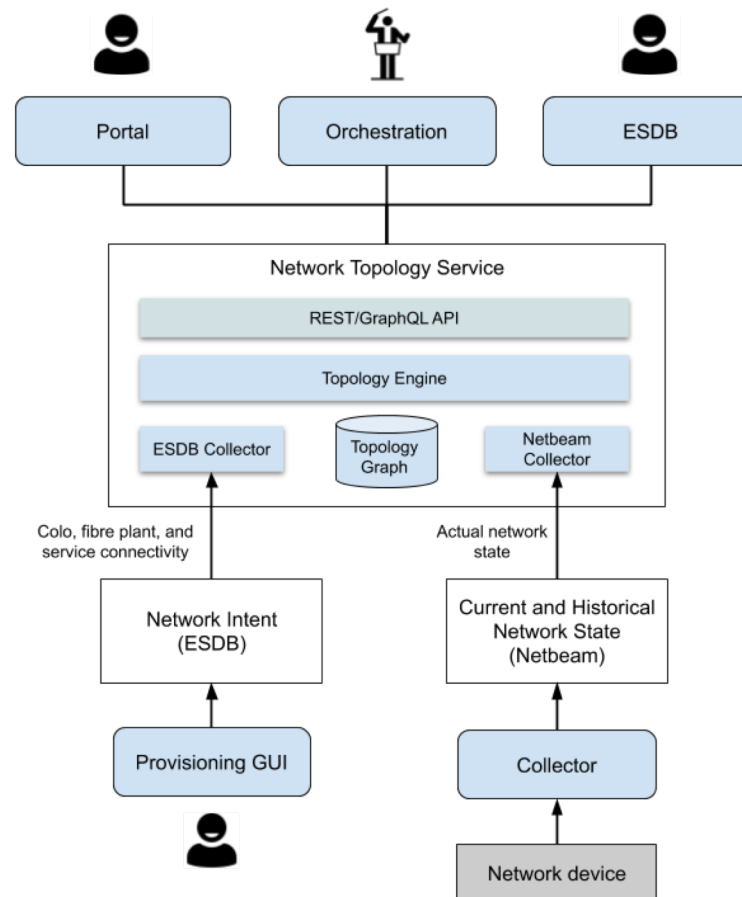
- Models fibre plant through to IP services;
- Consumes actual topology (Netbeam) and intended topology (ESDB).

Detailed topology information is required for daily operations

- PMC for inter-layer relationships and service impact analysis (planned and unplanned outages);
- ESDB for layered topology visualization and dependency navigation;
- Portal for network visualization;
- OSCARS for path finding.

Data is never 100% accurate so solution must be robust to partial data

- Multiple correlation points to support missing layered data.



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Thank you
Any Questions?

macauley@es.net



As part of the GÉANT 2020 Framework Partnership Agreement (FPA), the project receives funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 856726 (GN4-3).