

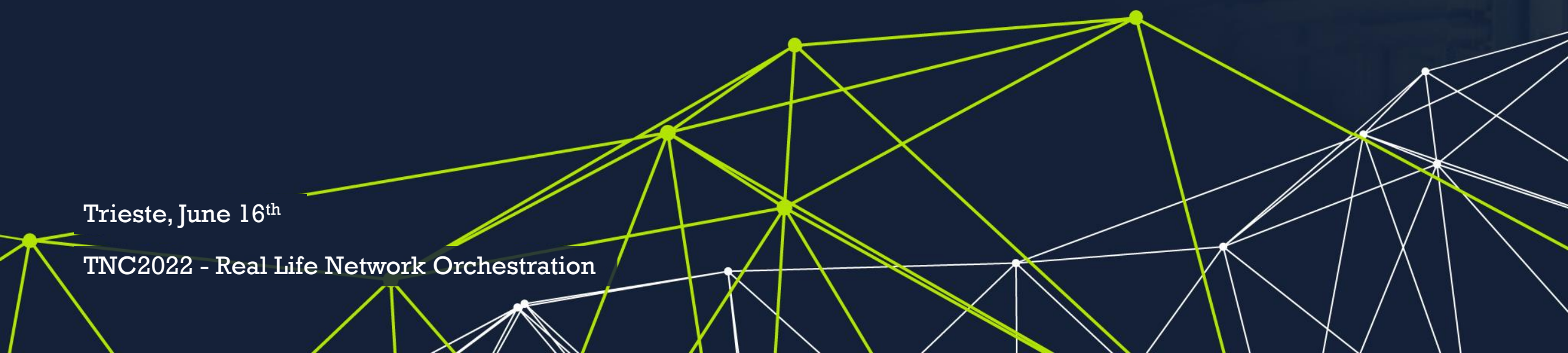
Automating GARR-T

exploring unknown seas of strategies, methodologies and tool

FABIO FARINA - GARR

Trieste, June 16th

TNC2022 - Real Life Network Orchestration



Outline

Why automation in GARR-T

The shortest path

The need for a paradigm shift

Conclusions, where we are heading



Architecture

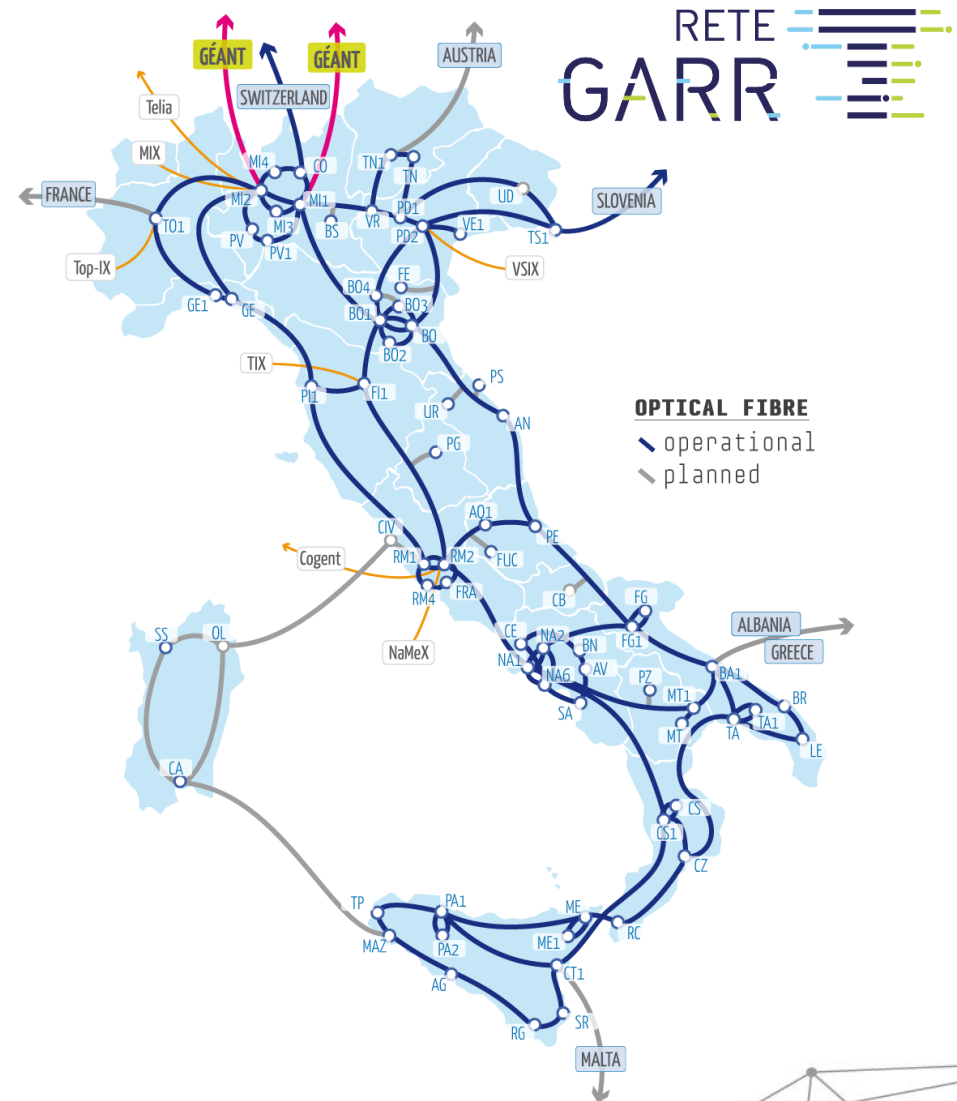
- Open
- Disaggregation and Decoupling
- Resiliency
- Automation and programmability

Technology

- Scalability
- Efficiency and sustainability

Pilots and new applications

- Dev tools e advanced services
- New knowledge
- Reactivity



Automating GARR-T, why

Size and time

- #devices and #services
- Time to **adapt and evolve**

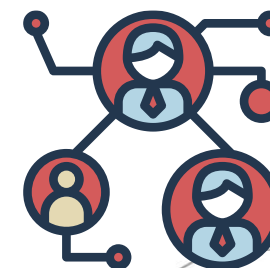


Automation is everywhere

- New technologies control
- Processes rationalization
- Orchestration as **harmonization**

High level functions

- Who's the user today
- Ops, Eng, Dev, **End-Users**



A Gordian Knot starting point

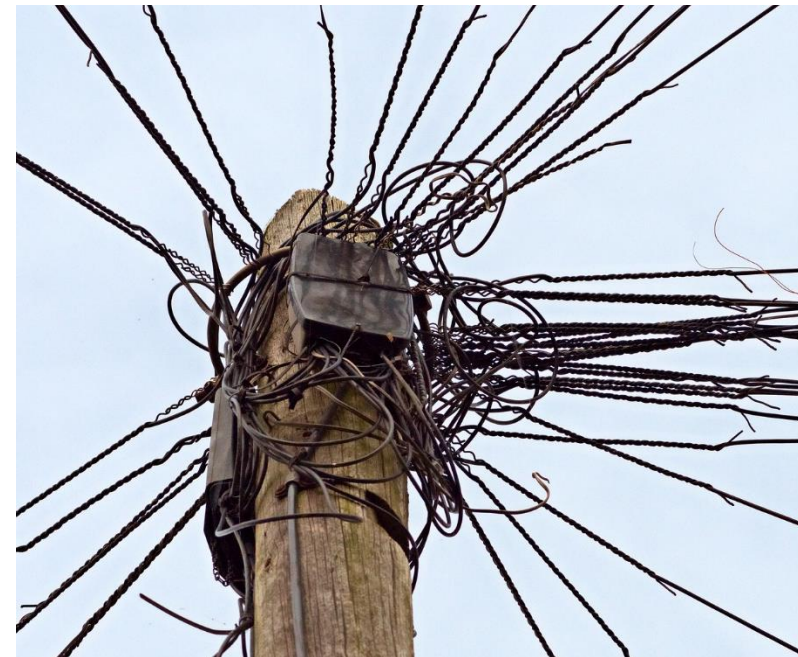
Complexity

- Involved parts interactions
- Steep **learning** curve
- Network and DevOps background gaps

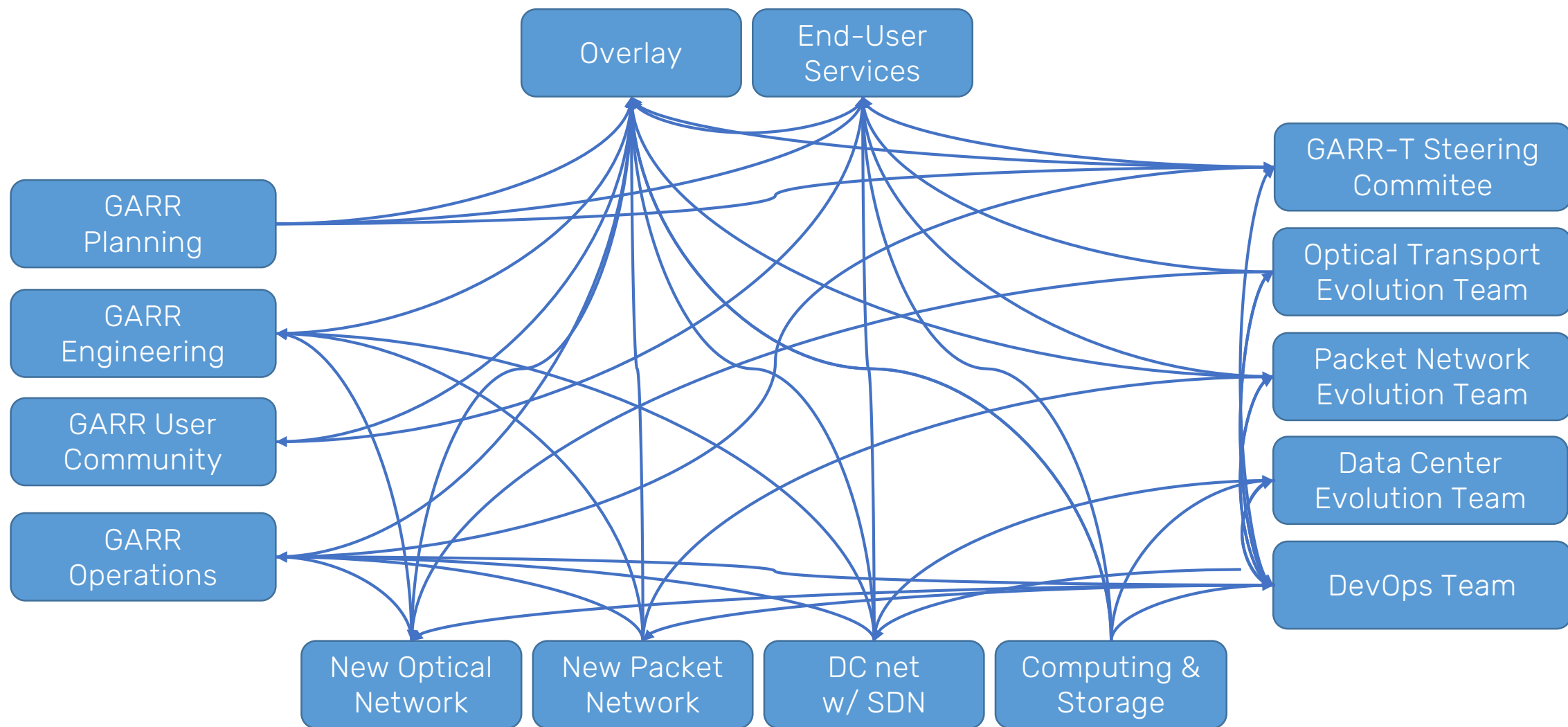
Uncertainty

- Lack of standards / references / experience
- Need for (continuous) processes **improvement**

Complexity and Uncertainty **combine**



Automating GARR-T, the main characters



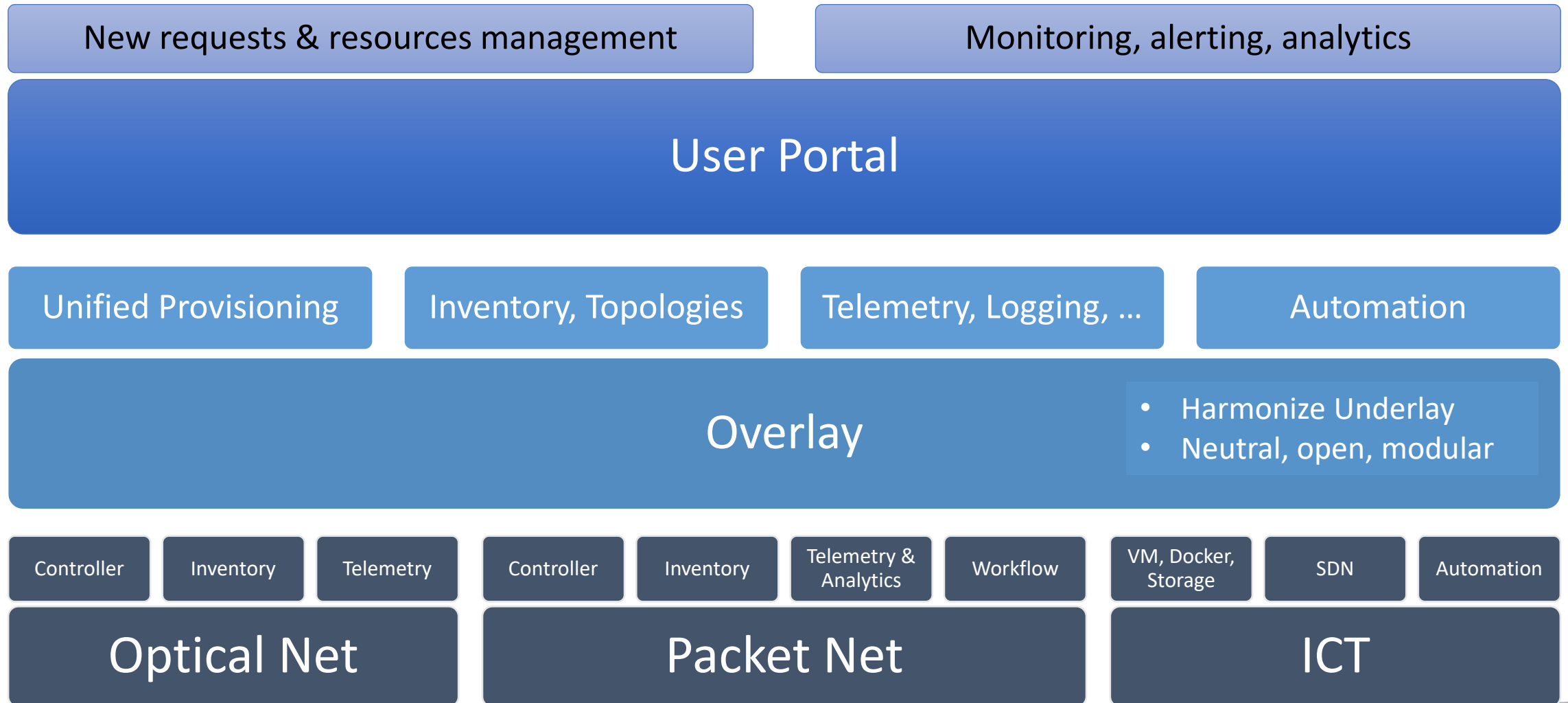
Starting from fixed points

Underlay – specialized independent platforms

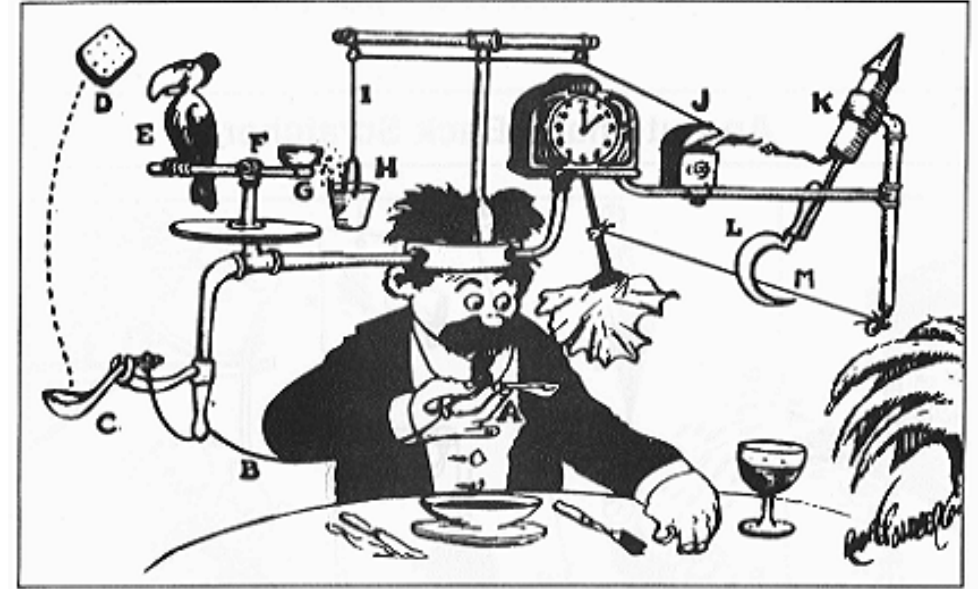
- Similar common North Bound features
- Autonomy degree: self-healing, self-optimization, ...



Desired destination point



Long exploration, field trials and blueprints



Ready-to-go solutions

- Limitation vs **expectation**
- Maturity, openness, flexibility
- No real support to **brown-field**

Automate ICT as usual

- “The Network OS”
- “The big Ansible playbook”

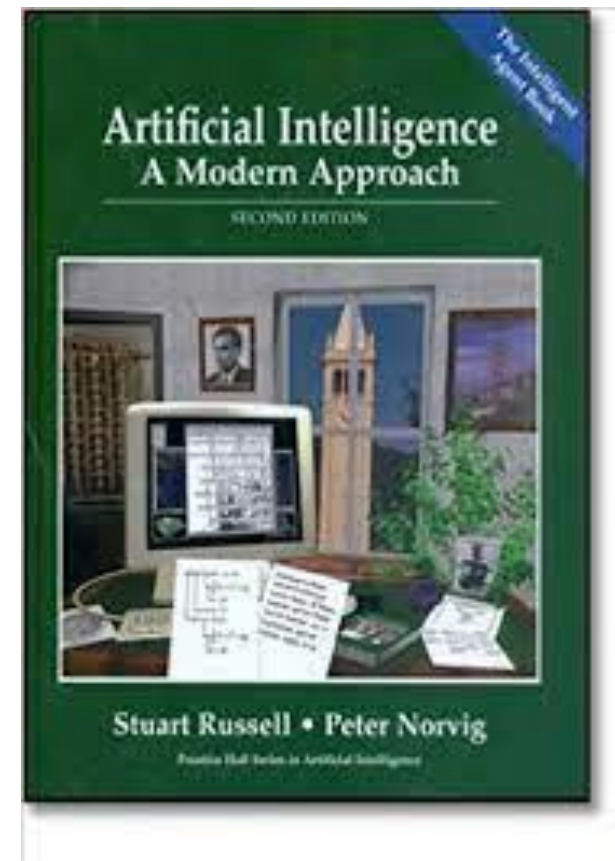
Getting out of the deadlock

Self-driving cars, networks, ...

- Self-healing, Self-configuring, Self-*
- Adaptive to unknown situations
- Hiding complexity

In other words... ROBOTS

- Many specialized automata
- Ecosystem



Internal structure of an Agent

1. Sensors

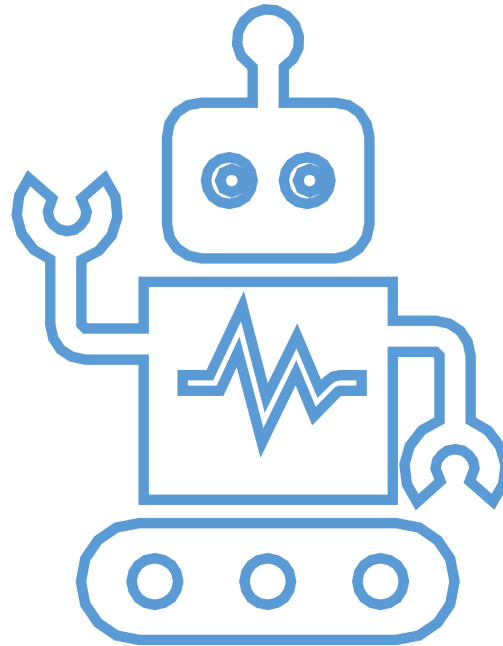
Interactions perception,
self-sensing

2. Memory

Learn, abstract, analyze

Long-term (slow)

Short-term (fast)



4. Actuators

Change other agents,
environment, self

3. Objective

Planning policies
Action shaping

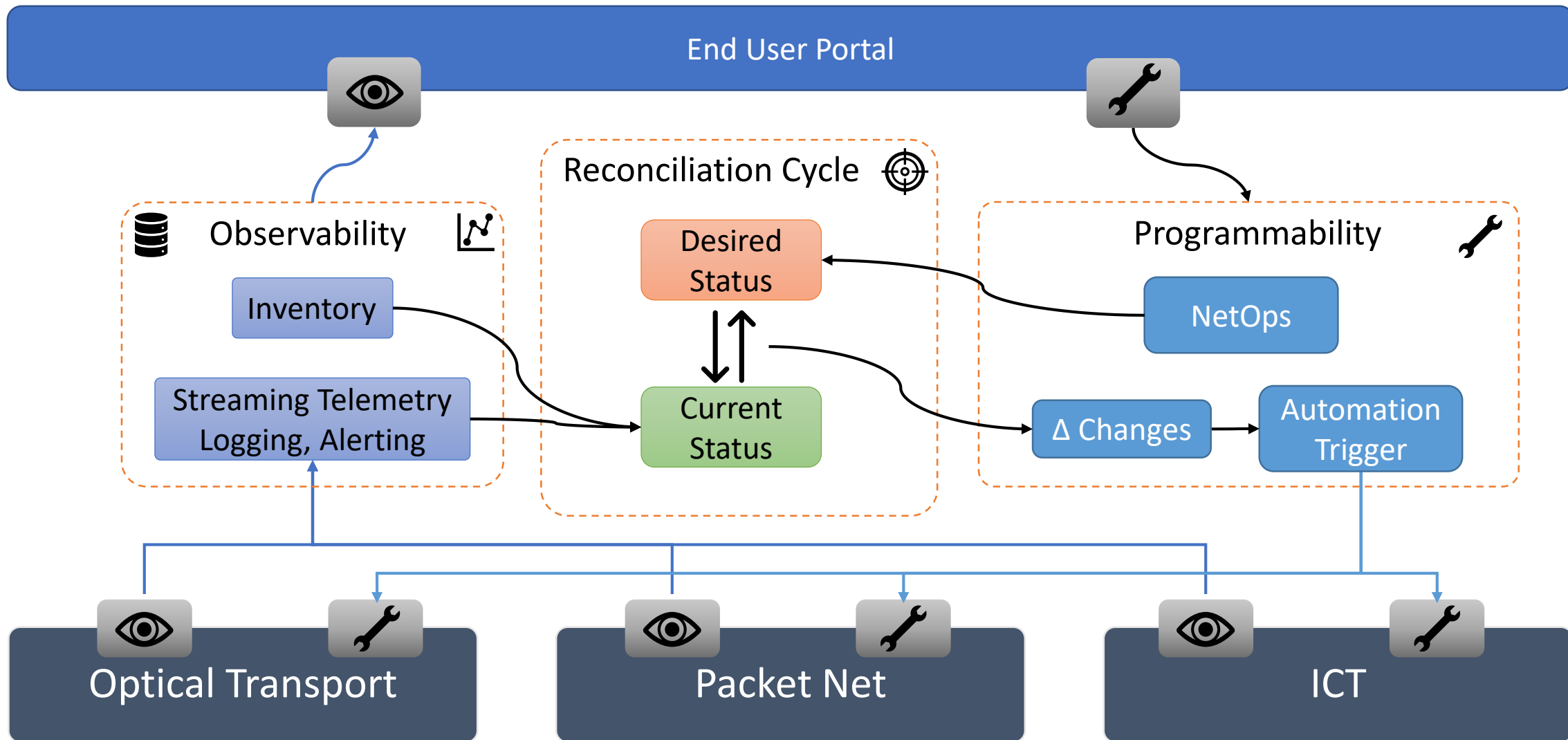
Platform interactions as Agents interactions

Optical Transport Net	
	Metrics endpoint, logging, ...
	Transport NMS REST API
	Observe, Notify, Provision
	Optical circuits status
	Automatic Inventory

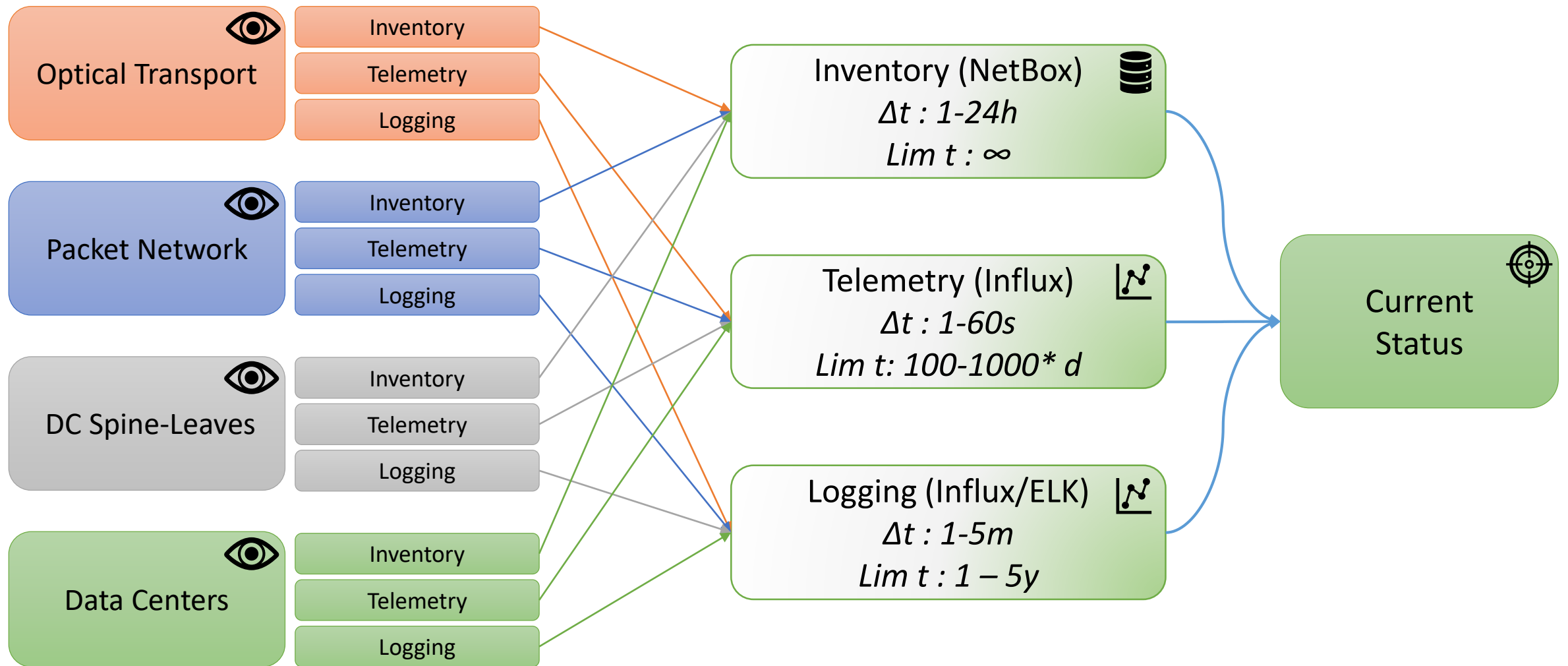
Packet Network	
	Metrics endpoint, logging, ...
	Orchestrator REST API
	Closed-Loop Automation
	LSP Status, Policy compliancy, ML
	Automatic Inventory, trends

ICT – Data Centers & Spine-Leaf IP Fabrics	
	Metrics endpoint, logging, ...
	Orchestrator REST API
	Observe, Provision
	Status of VMs, Storage, Net, Containers, Services
	Inventory, middleware, trends

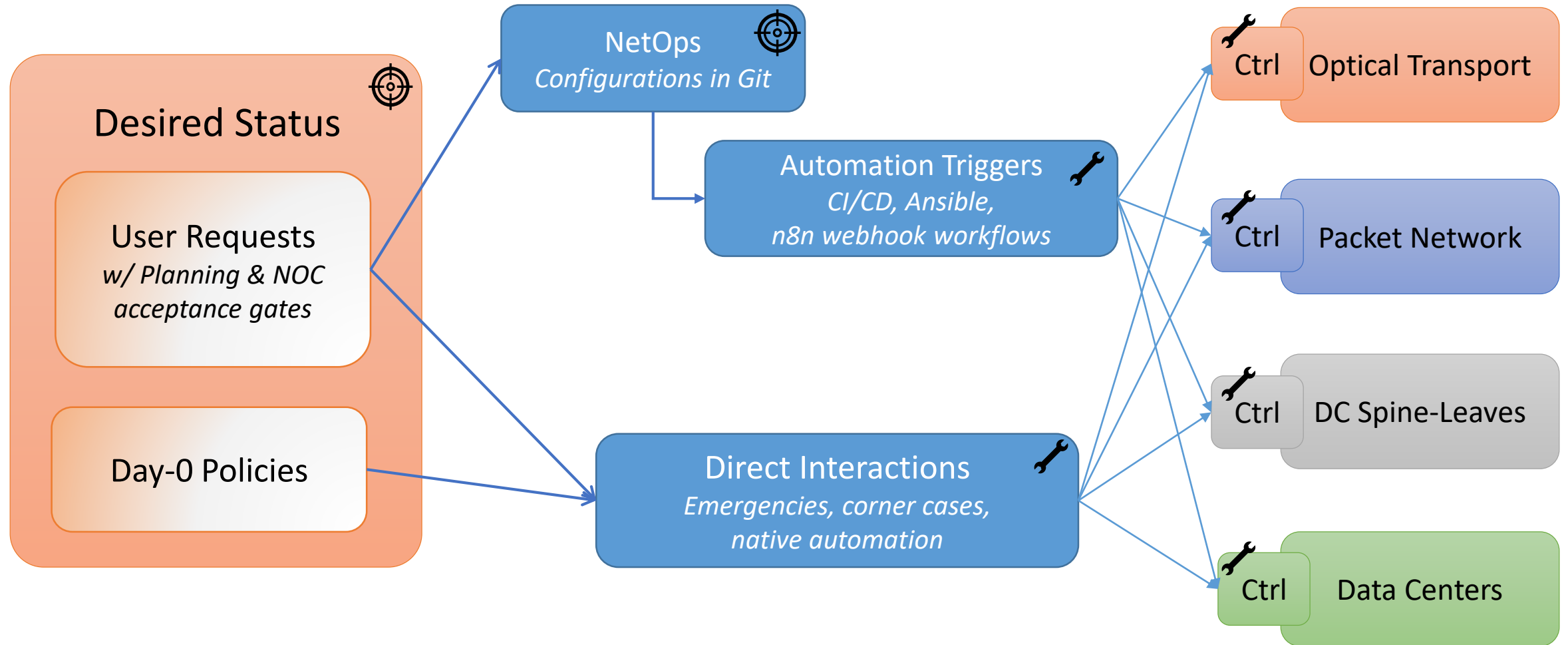
Designing the Overlay as an agent



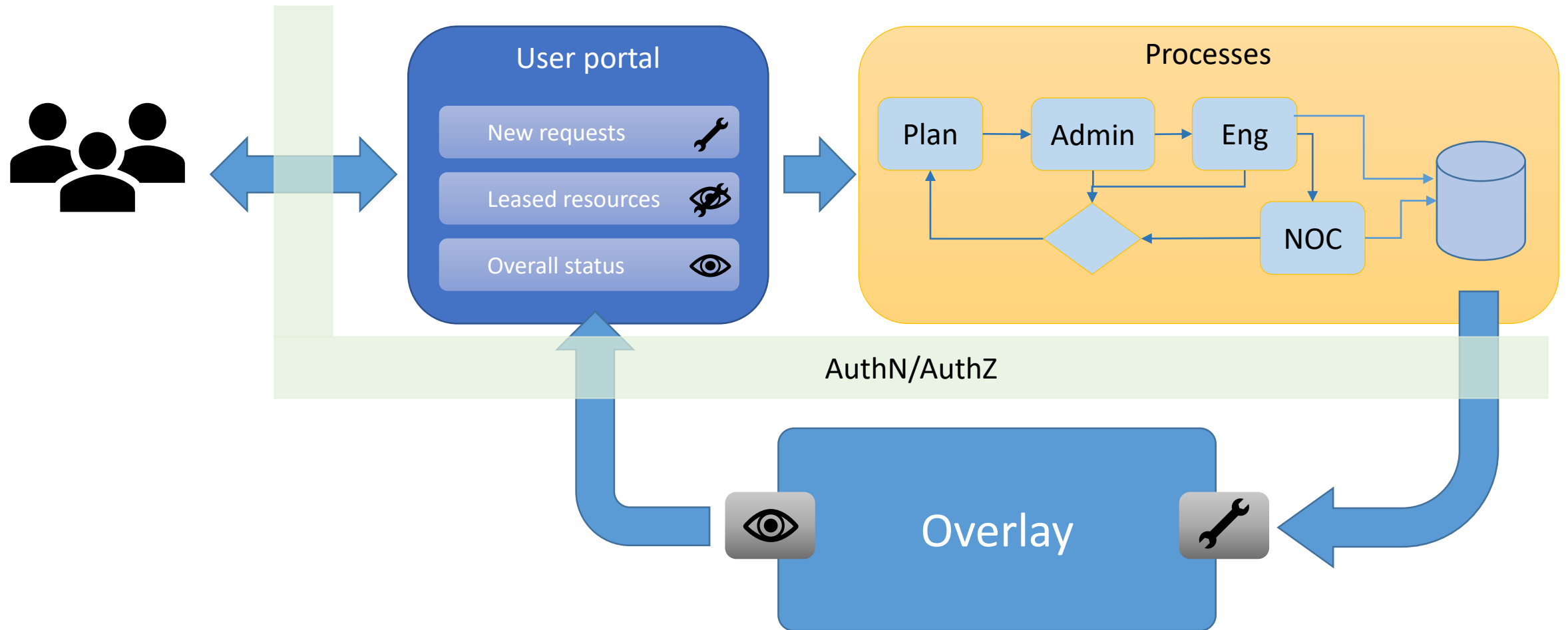
GARR-T sensing – data flows



GARR-T action shaping & objectives actuation



Hints for GARR-T northbound



Conclusions: On-going activities

Agent-based approach

- Overlay key functionalities identification
- Underlay factorization: Sensors/Actuators

Observability

- Unified Automatic inventory & topologies
 - IPAM entries self-registration
 - GARR-T self-documentation
- Unified logging
- Telemetry
 - Datacenters
 - Optical Transport

Actuation

- NetOps
 - DC Spine-Leaves VXLAN provisioning
 - Firewall terms and rulesets
 - Low-code orchestration workflows
- Northbound, user portal, AAA

Conclusions: what we're learning

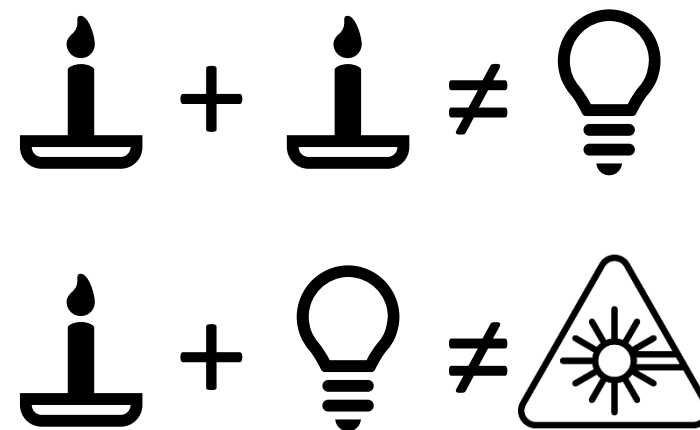
Automation in GARR-T is inevitable

Usual strategies are not enough

- multi-agent approach as a design strategy
- implementation guidelines

Dare to explore “exotic” knowledge

- Networking and AI/ML
- Be pragmatic – goals, implementation and tools



Grazie!

Domande? Questions?

Images

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