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NETWORKS AT PLANETARY SCALE

Aalyria brings together two technologies originally developed at Google Alphabet as part of its wireless connectivity efforts: a software platform for **orchestrating** networks across land, sea, air, space and beyond and an atmospheric laser communications technology for **delivering** the highest speed data transfer across the same domains.

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SPACETIME

NETWORK ORCHESTRATION
SOFTWARE PLATFORM

TIGHTBEAM

ATMOSPHERIC LASER
COMMUNICATIONS

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COGNITIVE NETWORKING WITH

TEMPOROSPATIAL SDN

Temporospatial SDN (TS-SDN) represents a new approach to networking. Unlike conventional SDN or SD-WAN technologies, which are only capable of route orchestration across the ground segment of a wired network, a TS-SDN augments the network information with a *digital twin* capable of modeling the position, orientation, and motion of physical platforms and forecasting their wireless signal propagation opportunities over time - building a holistic and predictive view of the entire accessible network topology. Leveraging predictability in motion, weather, and faster-than-realtime modeling allows TS-SDN to jointly optimize and solve the steerable beam tasking & scheduling, radio & optical transceiver resource management, and path-agnostic route orchestration across space and time in all domains.

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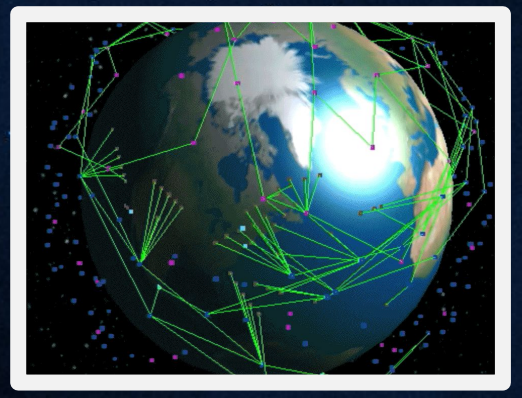

LEO
CONSTELLATION

HIGH ALTITUDE
PLATFORM CONSTELLATIONS

URBAN
MESH

AALYRIA

SPACETIME

A temporospatial SDN platform for all-domain mesh orchestration

- Antenna tasking, routing, and RRM
- Ground segment SDN and SD-WAN
- Planet scale digital twin
- ITU Article 22 and weather-aware ITU-R Propagation loss modeling (1 MHz to 100 GHz)
- Delay / disruption tolerance
- Atmospheric free space optics ready
- Hosted on K8s with pod autoscaling

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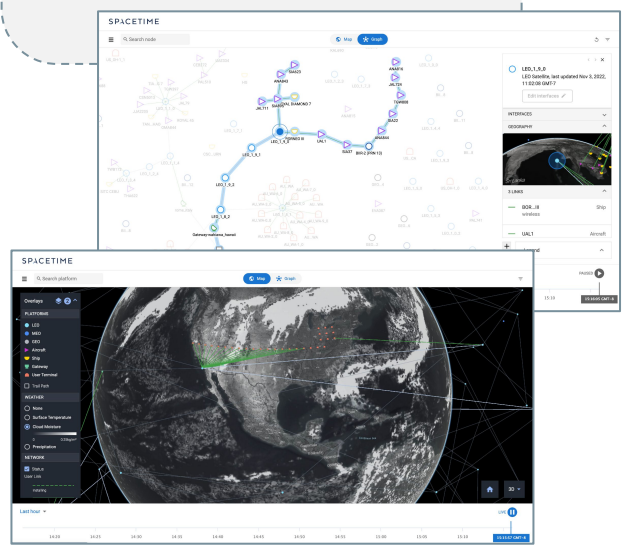
SPACETIME

HOW IT WORKS

Service Requests

Create Coverage: A → {region}, or
Create Connection: A → G
- MEF E-Line, E-LAN, E-Tree, etc.
- 3GPP “Slice”, etc.

DTN Flow?	No
Set Priority:	High
Data Rate:	10 → 100Mbps diurnal



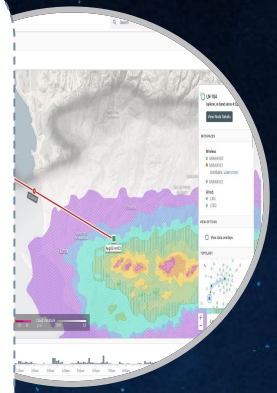
Realtime Schedule Optimization

“Digital Twin” models:

- Weather
- Physical Geometry
- Spectrum Physics
- Tx Power to Target
- Throughput

“Cognitive Engine” considers:

- Real Telemetry
- Priority
- Other Requests
- Keep Out Zones



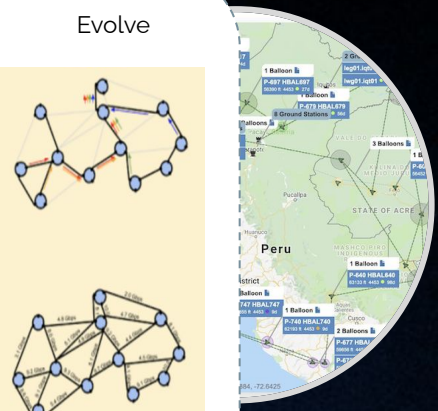
Cognitive Engine output

Task

Evolve

IPv4, IPv6

SR-MPLS, SRv6



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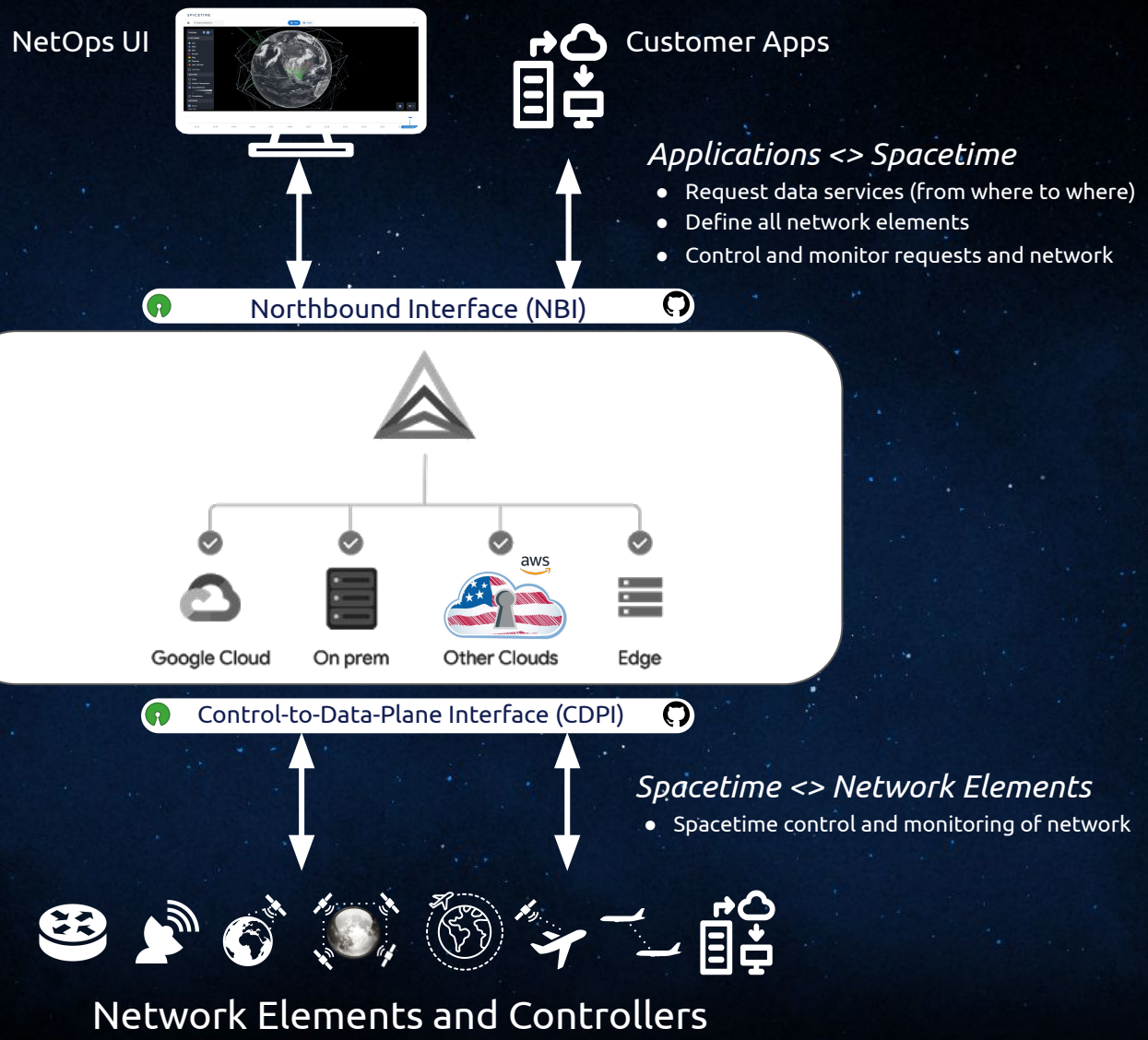
SPACETIME

ARCHITECTURE



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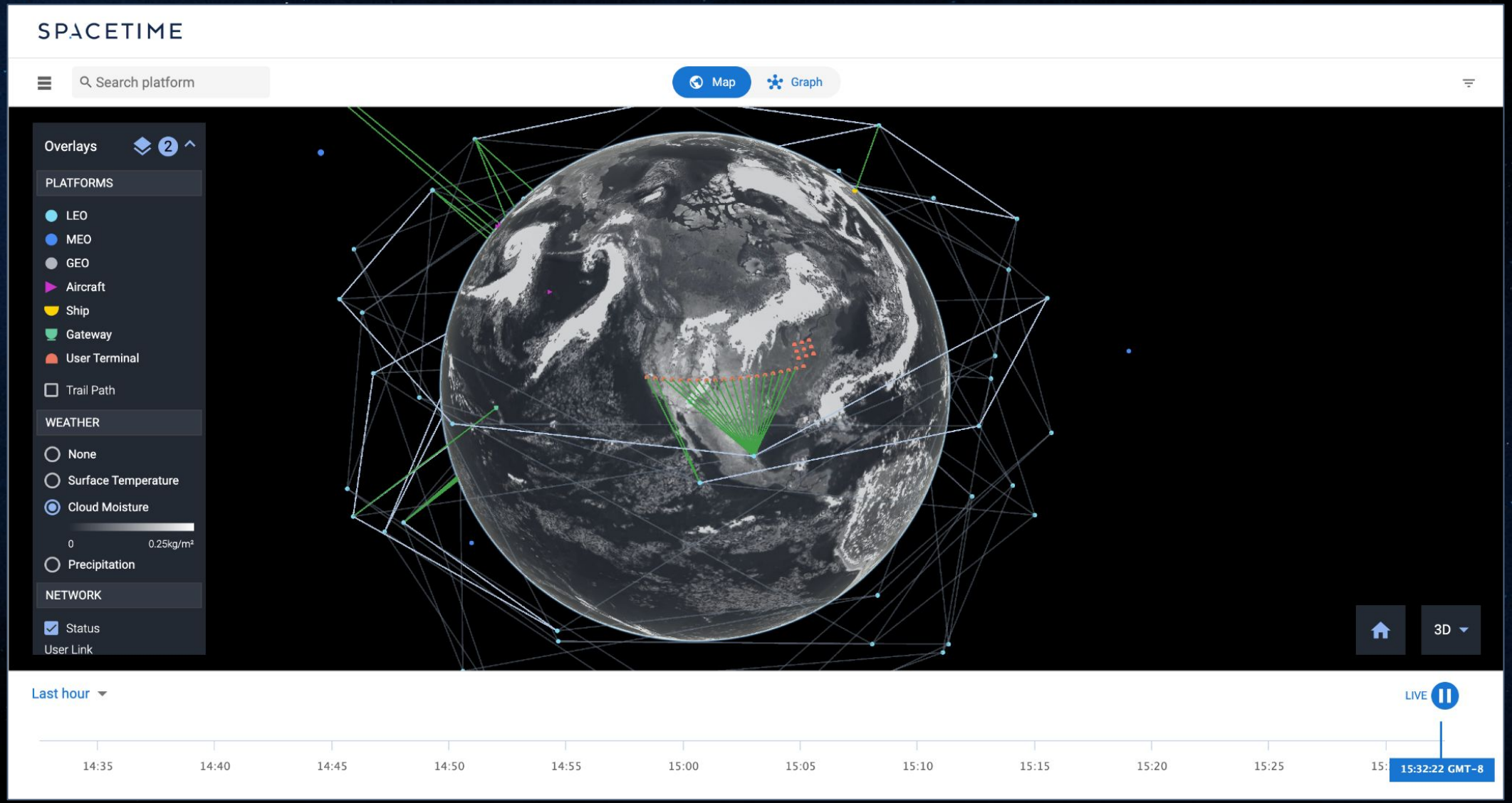
PAST, PRESENT, AND FUTURE SITUATIONAL AWARENESS

NETOPS UI



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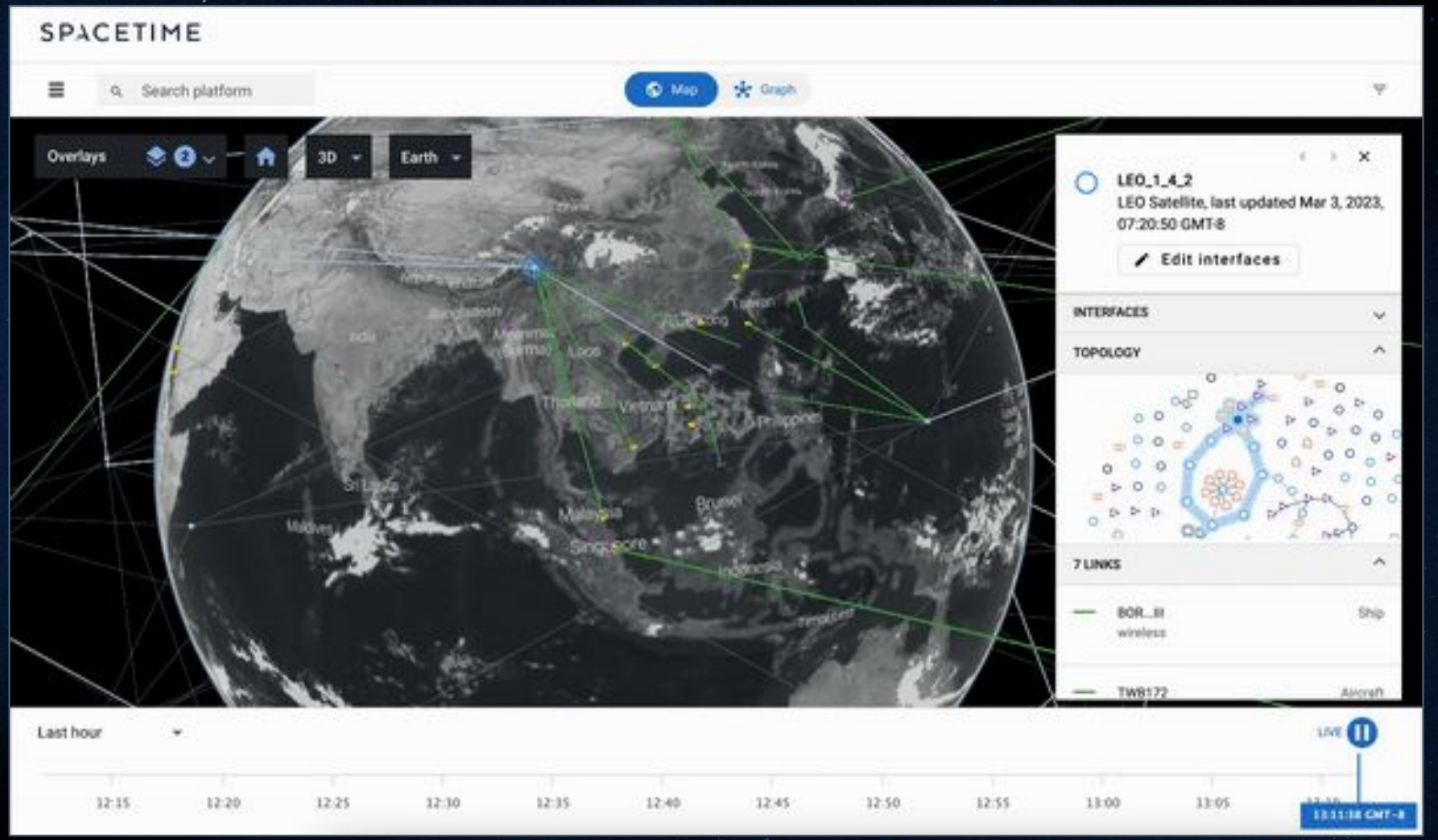
DYNAMIC, AUTOMATIC, AND REAL-TIME

RE-CONSTITUTION AND SELF-HEALING



Self-Discovery, Self-Healing Real-Time Network Resiliency in Action. Spacetime reacts to the removal of any node to evolve the entire network and deliver on-demand resupply of connectivity. *Spacetime achieved this in <100 milliseconds.*

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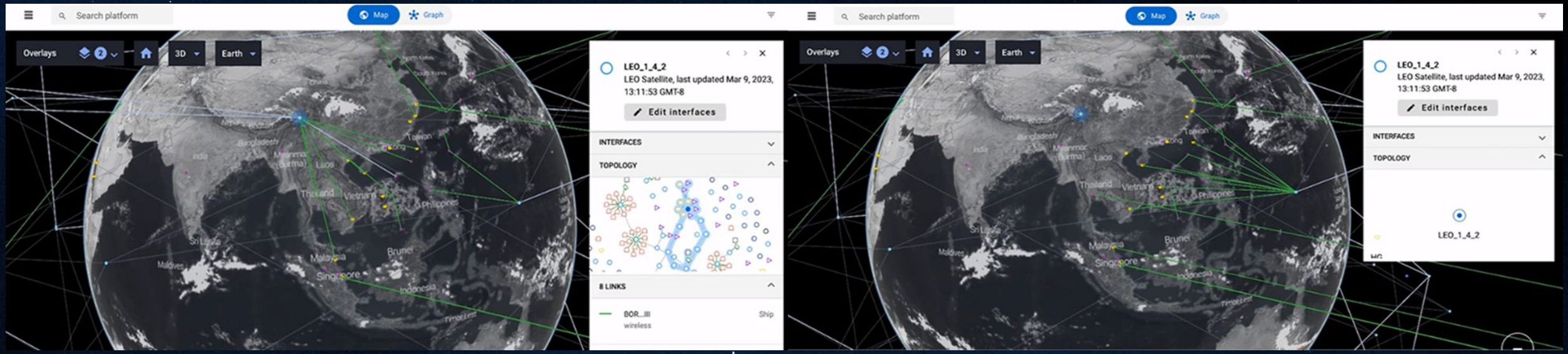
DYNAMIC, AUTOMATIC, AND REAL-TIME

RE-CONSTITUTION AND SELF-HEALING



Self-Discovery, Self-Healing Network Resiliency in Action. *These UI images show Spacetime's dynamic reconstitution of the network and re-routing of traffic in response to the loss (or isolation) of a satellite - shown in blue. Spacetime achieved this in <100 milliseconds*

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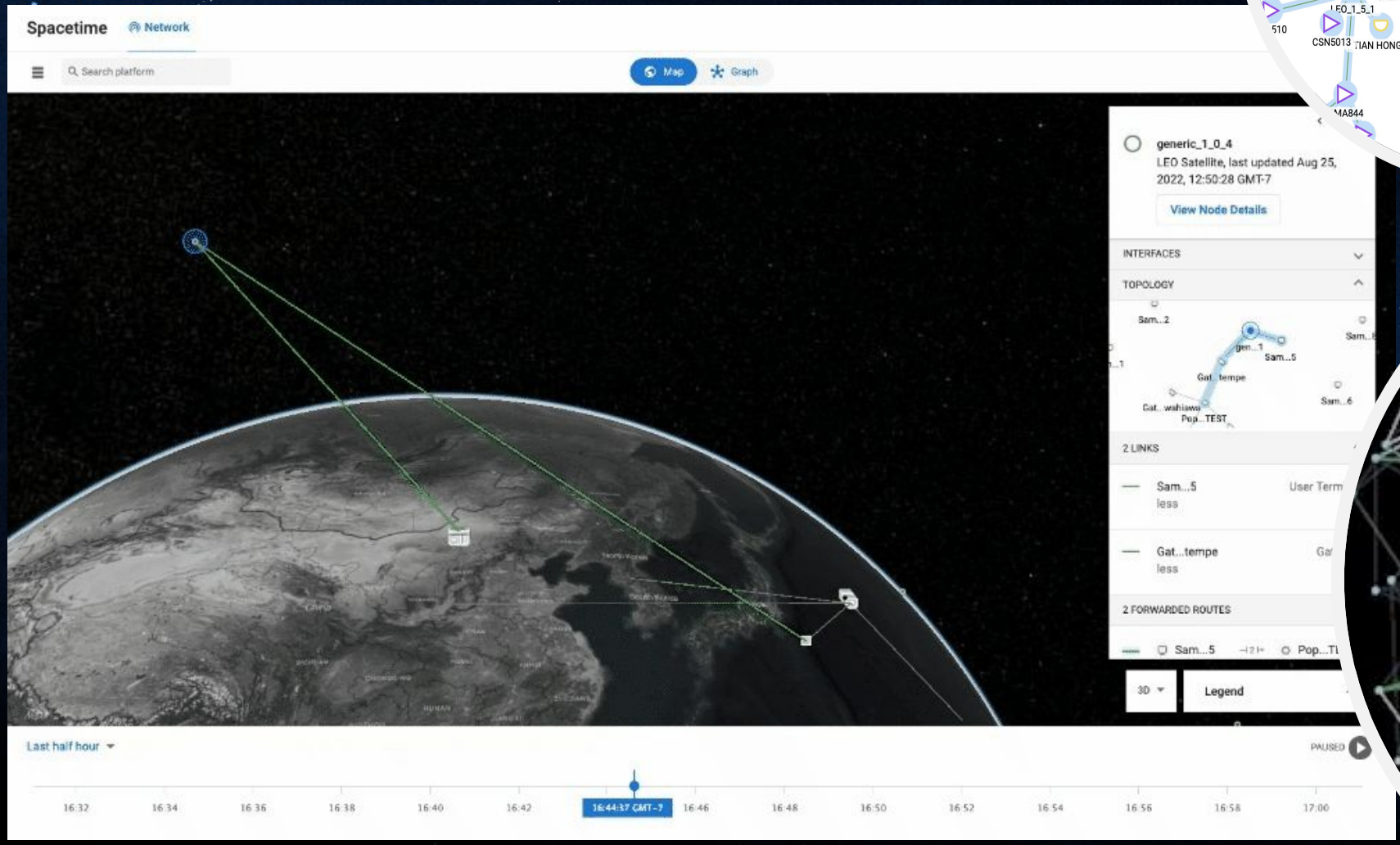
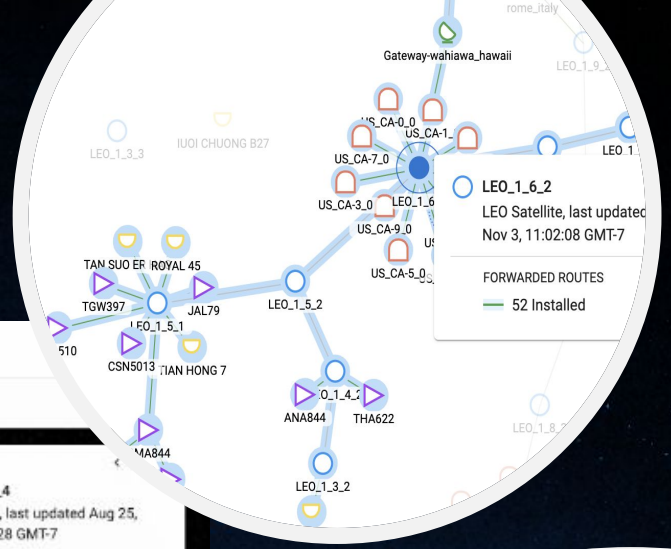
MAPPING LOGICAL NETWORK ← → PHYSICAL WORLD

SINGLE PANE OF GLASS





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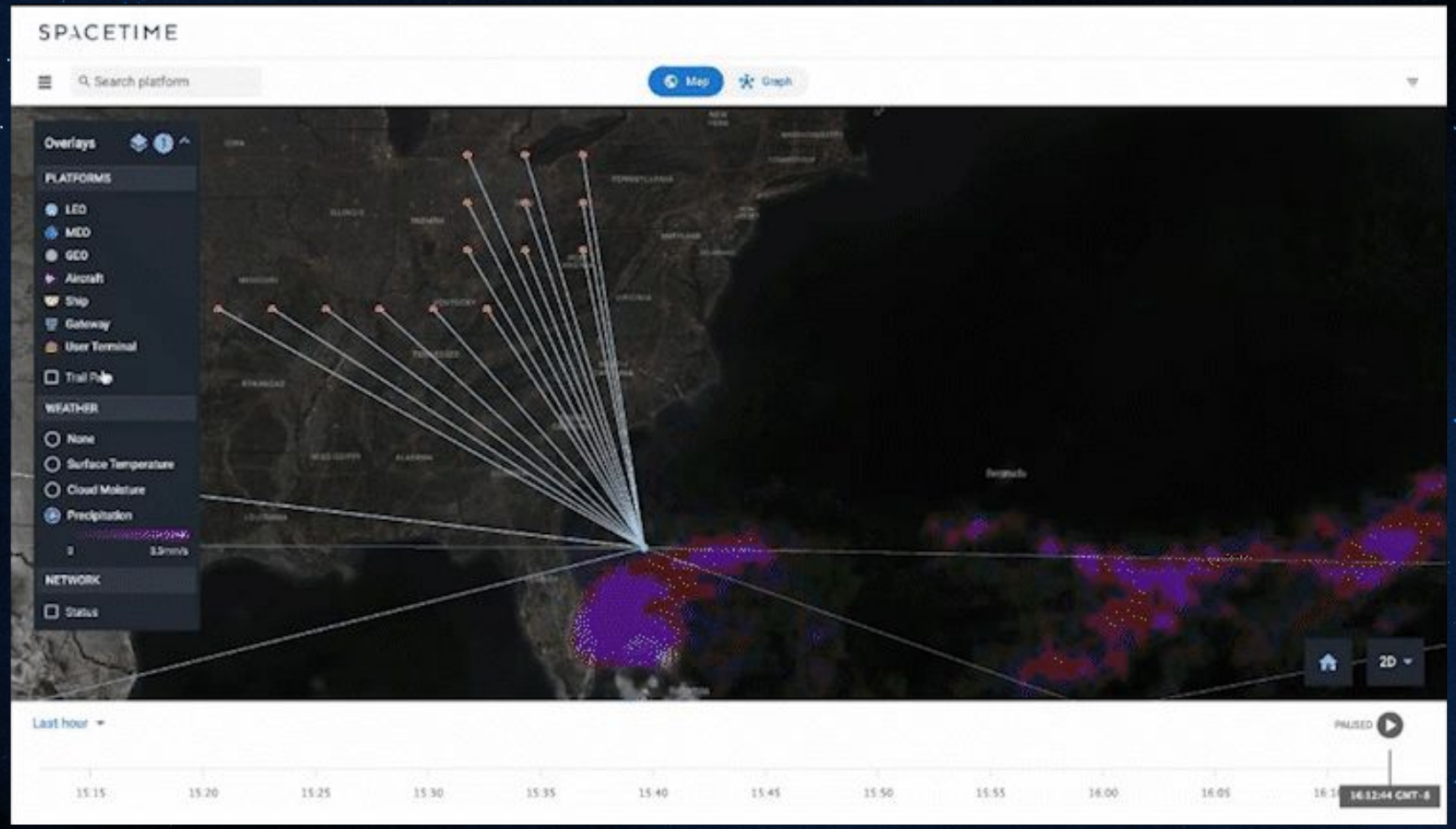
NETOPS APPLICATION



NetOps UI users can overlay streaming nowcast / forecast weather data used by Spacetime to better understand its automation decisions

NEAR SPACE ENVIRONMENT

OPERATIONS AT SCALE

3M+
FLIGHT HOURS

20+
MESH HOPS

4000+
KILOMETER MESHES

LOON HISTORICAL FLIGHT PATHS 2018–2019

AALYRIA

SPACETIME

U.S. GOVERNMENT

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https://github.com/aalyria

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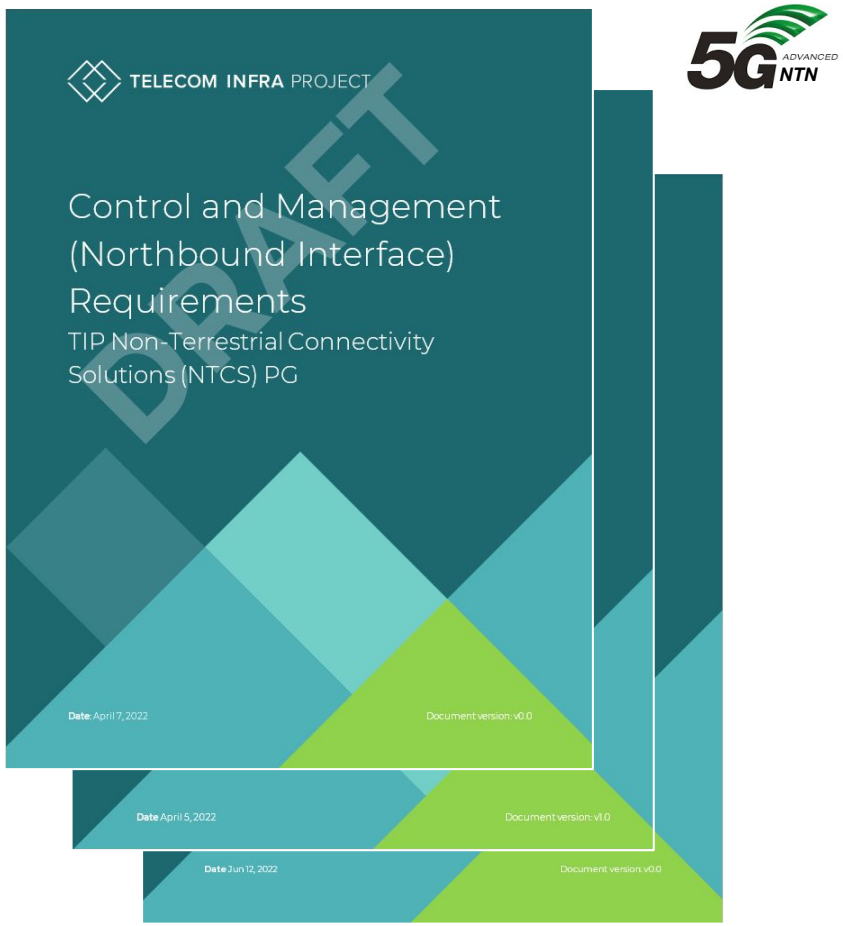
TELECOM INFRA PROJECT

AALYRIA SPACETIME



5G ADVANCED NTN

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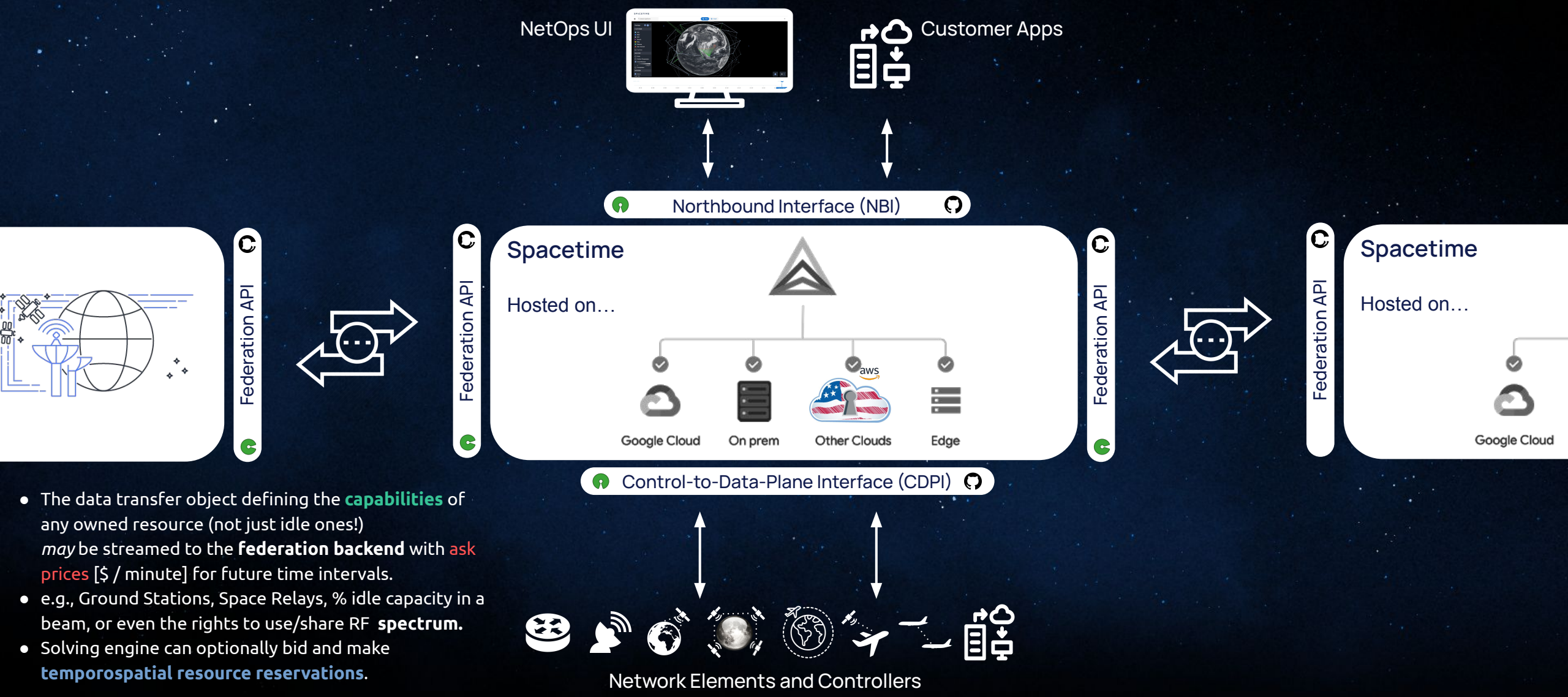
SPACETIME FEDERATION



- The data transfer object defining the **capabilities** of any owned resource (not just idle ones!) *may* be streamed to the **federation backend** with ask prices [$ / minute] for future time intervals.
- e.g., Ground Stations, Space Relays, % idle capacity in a beam, or even the rights to use/share RF **spectrum.**
- Solving engine can optionally bid and make **temporospatial resource reservations**.

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