CALIAN

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Orchestrating Space and Ground

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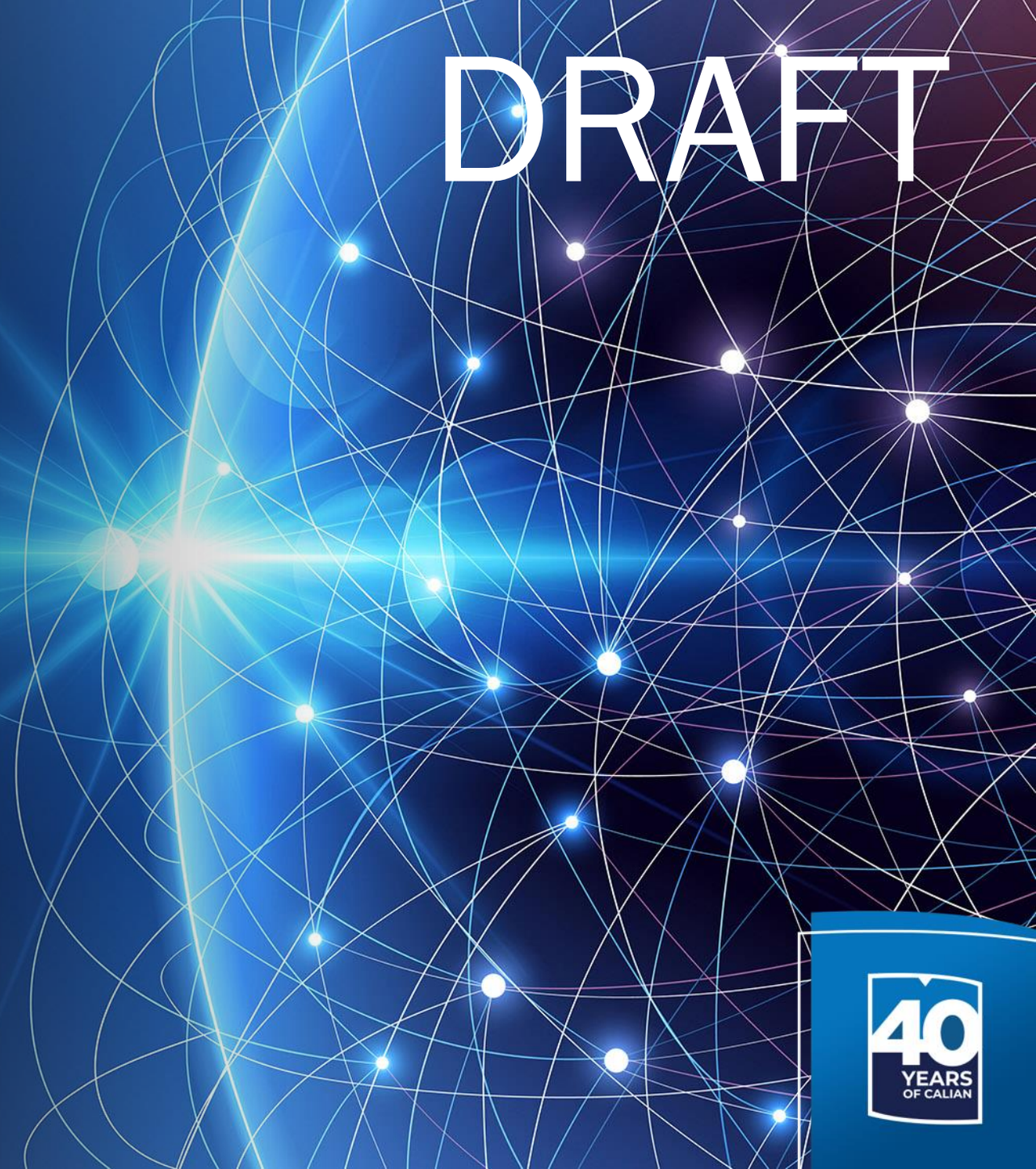
Advanced Technologies, Space



40 YEARS OF CALIAN

Software-Defined Era

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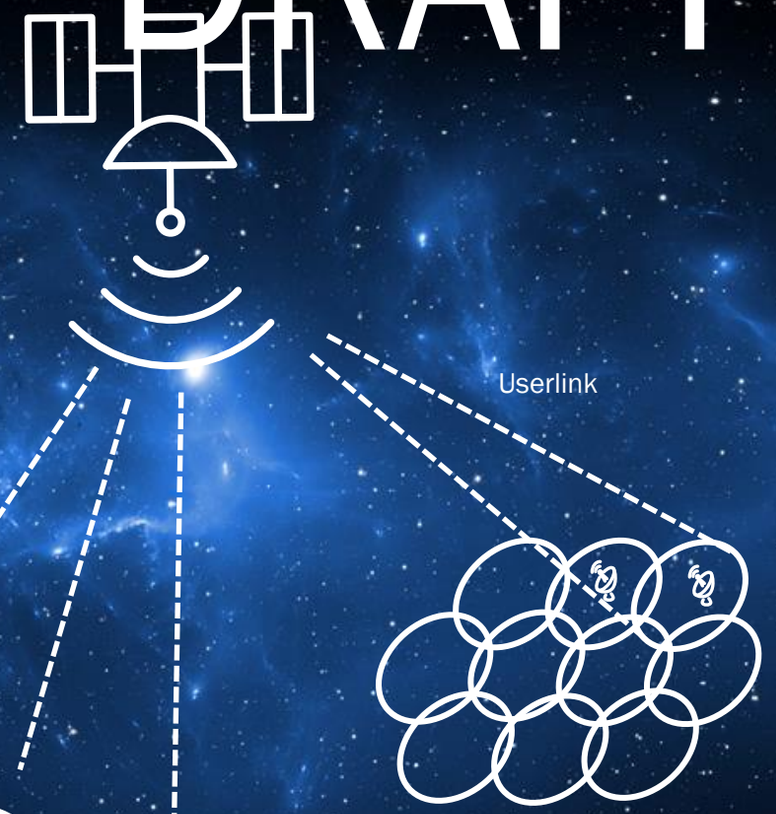
Software-defined Satellites

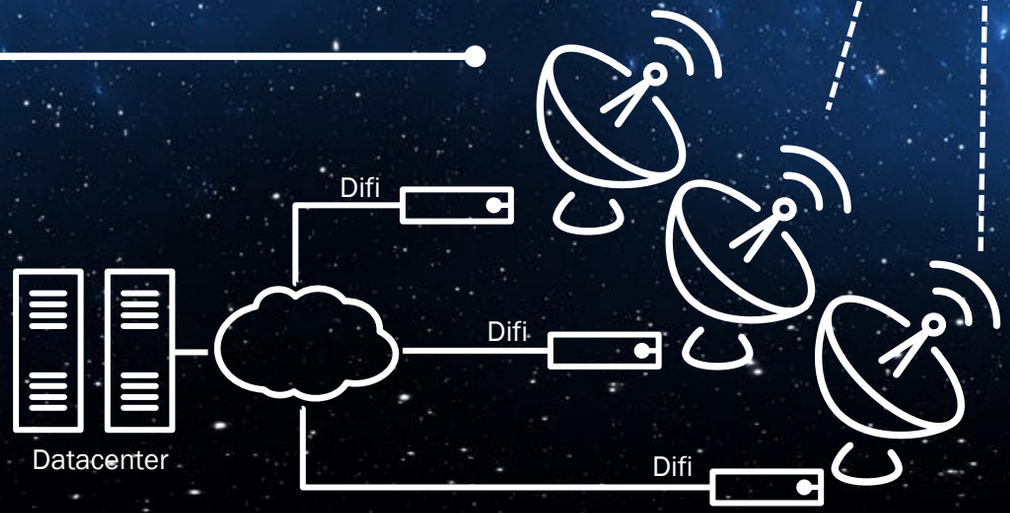
- Re-configurable In-orbit
- Digital Payloads
- Flexible Coverage
- Flexible Capacity
- Advanced Capabilities



- High Throughput
- 100s of Beams
- 1000s of Channels

Virtualized Gateways

- Digital IF/RF
- SDN/NFV
- SDR – FPGA/GPU, x86
- Data Processing
- Scalable



Resource Management & Orchestration

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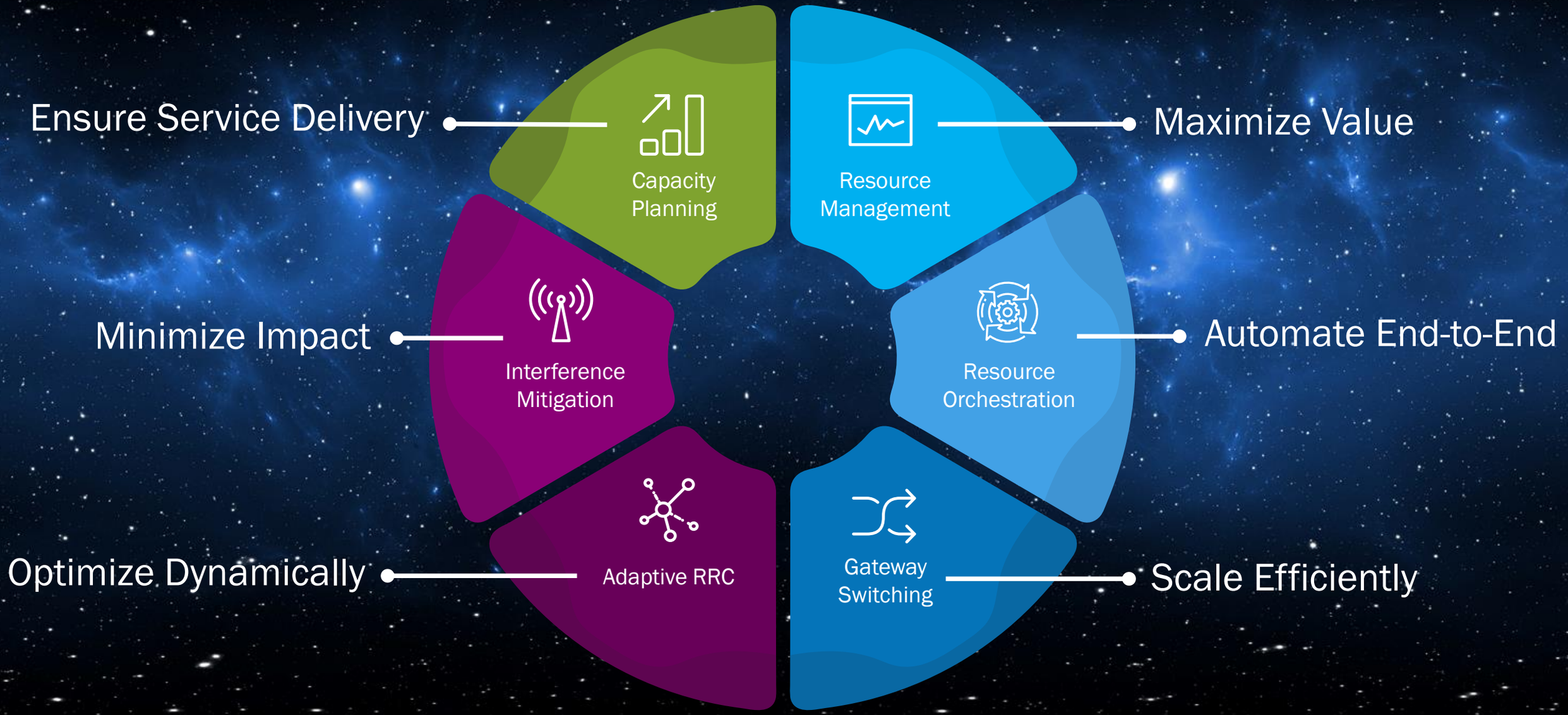

Resource Management & Orchestration

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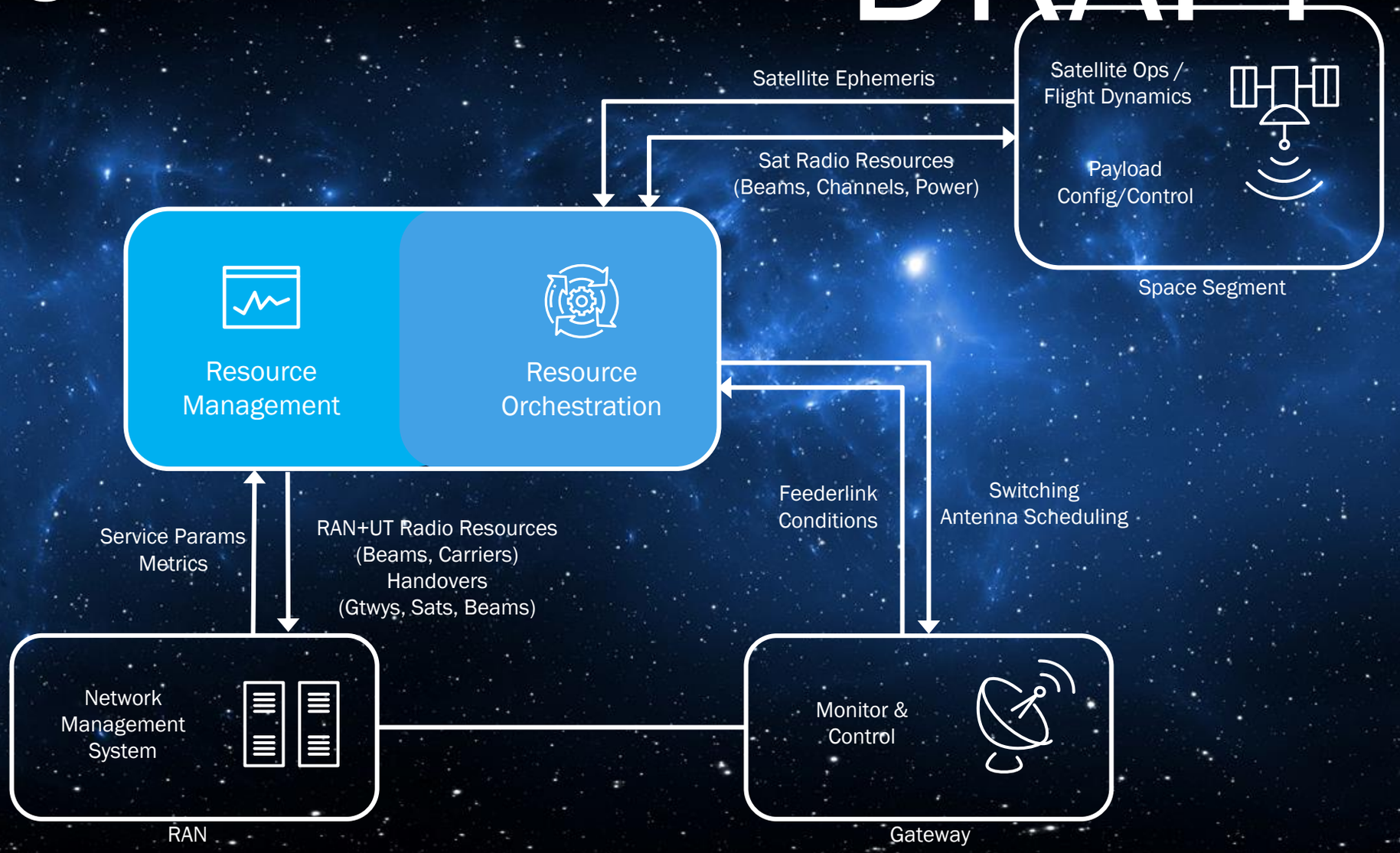
Managing Radio Resources
- Payload Config
- Feederlink and Userlink
- Monitoring Performance

Managing Handovers
- User Mobility
- Load Balancing
- Gateways

Interoperability
- Vendor Agnostic
- Open APIs



Gateway Switching

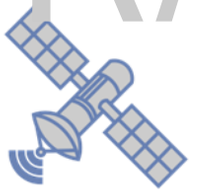
Orchestration
Coordinates handovers across RANs, gateways, and satellites to ensure seamless transitions

Multi-Orbit / Multi-Satellite
Supports GEO/MEO/LEO and interoperability between constellations

Feederlink Conditions
Monitors feederlink fade from different sources including gateways, CSMs, and RANs

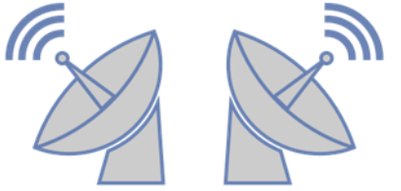
Manual Commanding
Provides manual commanding interfaces and configuration options for manual control / maintenance

Adaptive Redundancy
Status of gateways and satellites is used to adjust redundancy schemes for availability



Gateway Redundancy

- Multiple N+1 redundancy clusters with prioritization between gateways
- Detects feederlink fade
- Automatically switches to backup or recovers to primary
- Warm or hot standby modes
- Coordinates satellite reconfiguration if needed
- Options for early fade predictions and integration with weather forecast



Satellite Handover

- Coordinates handover of feederlink from descending to ascending satellite
- Single or multiple gateways
- Optionally coordinates UT handovers for seamless transition

Smart Gateway Switching

- Scale gateway capacity with N+0 redundancy
- Condition-aware load balancing between gateways
- Automatically reduce radio resource config if needed
- Enforces regulatory constraints
- Asymmetric uplink/downlink capacity

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Adaptive Radio Resource Control

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- Autonomous management of radio resources across space and ground
- Recognizes and adapts to trends in demand and performance
- Dynamically redistributes radio resources to meet traffic demands
- Mitigates congestion, balancing across satellites and beams
- Monitors and ensures service level performance
- Predicts trends across geography and time

Interference Mitigation

Monitor Dynamic Spectrum

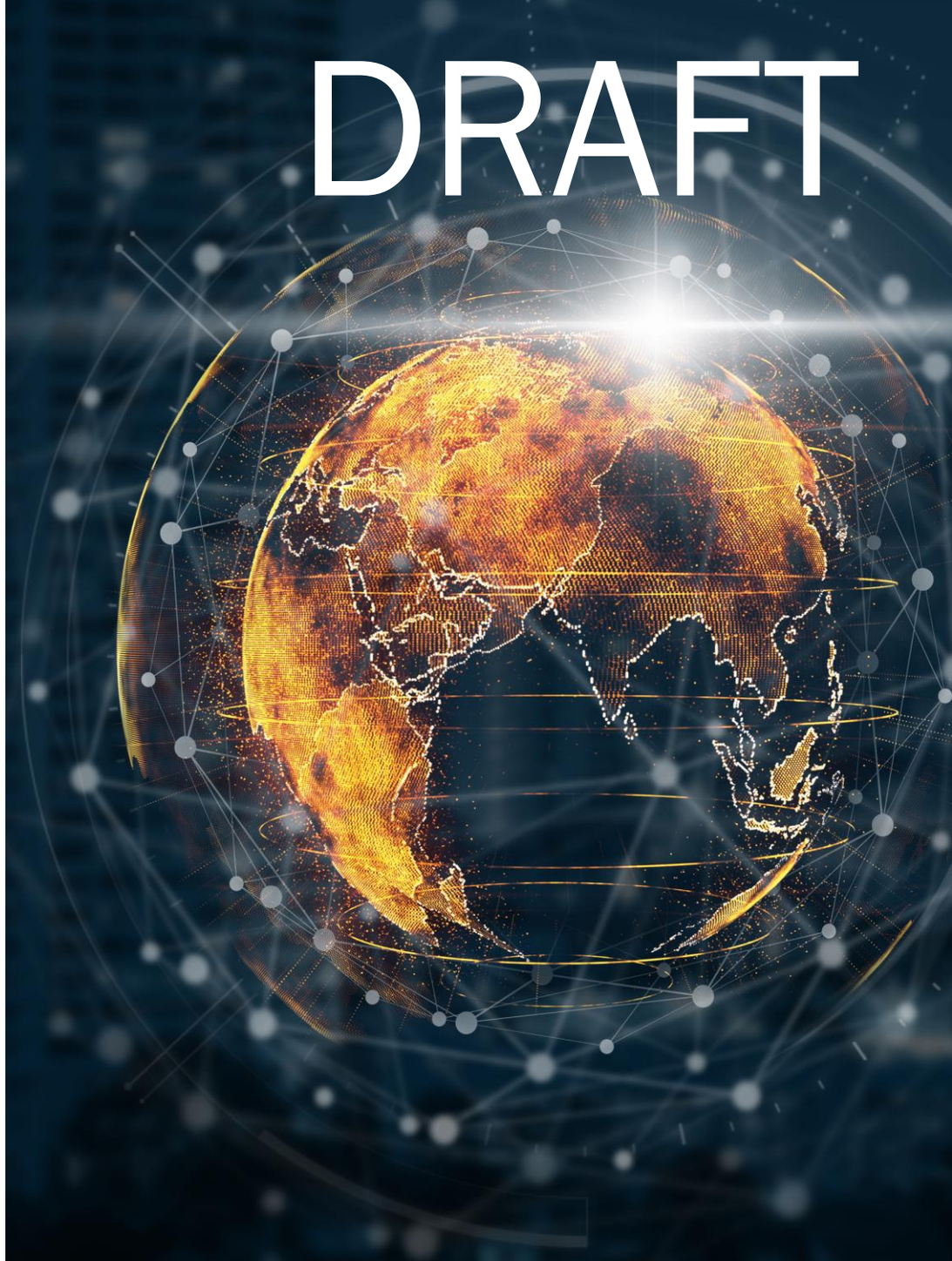
- Monitor dynamic radio resource assignments
- Integrate with carrier/spectrum monitoring
- Integrate with geolocation functions

Minimize Impacts of Interference

- Avoid spectrum/regions incurring interference
- Model and avoid terrestrial interference sources

Maximize Spectrum Use

- Increase frequency reuse based on link performance
- Enforce regulatory and coordination constraints



Capacity Planning

Maximize Network Revenue

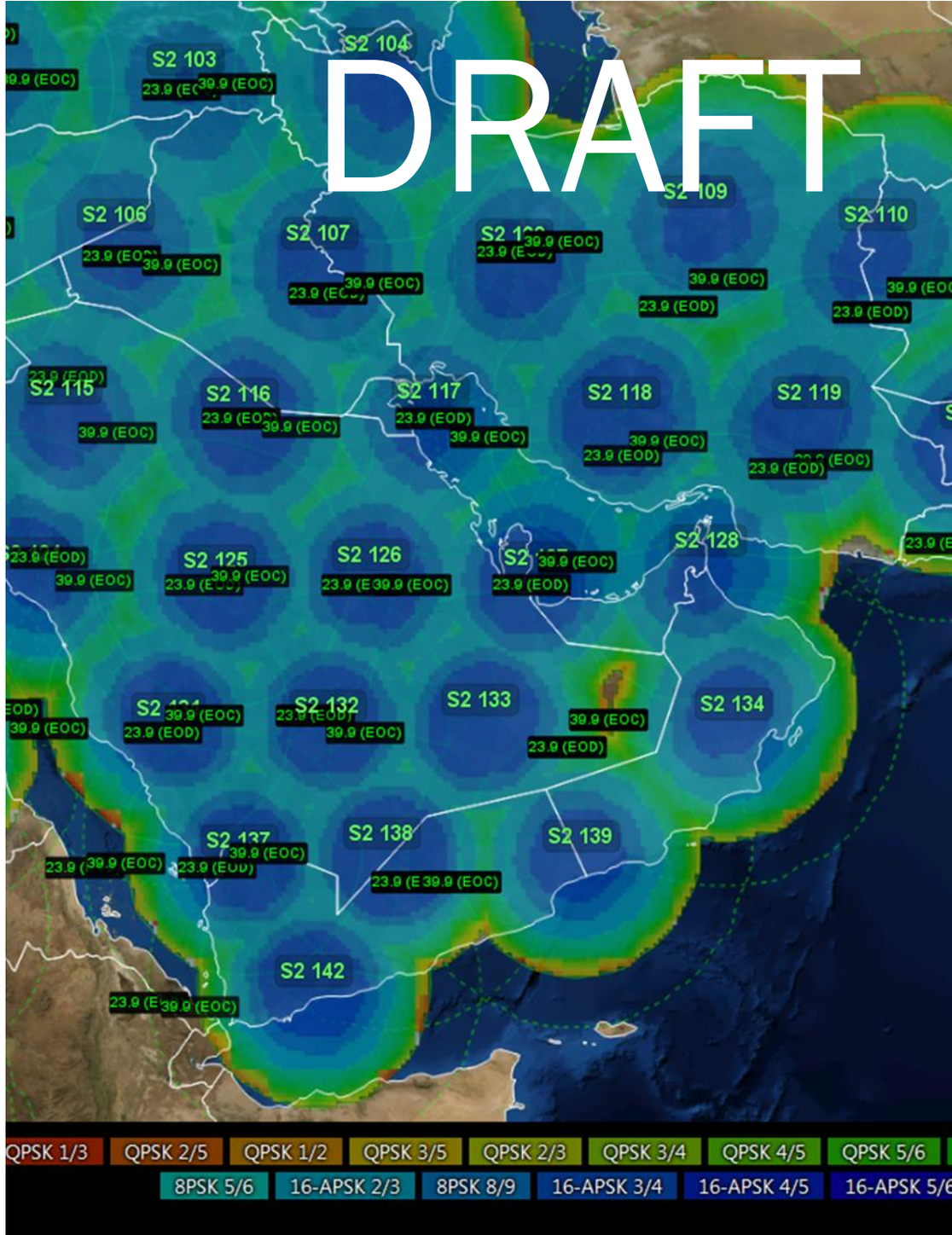
- Plan for network growth with confidence
- Model user density/movement and traffic demand
- Model service performance and link requirements
- Determine capacity requirements
- Analyze capacity vs. service delivery over time

Visualize

- Beam coverage
- User demand, capacity, and performance

Manage Dynamic Beamforming

- Adjust beam laydown and coverage
- Plan for follow-me beams



Resource Management & Orchestration

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- ✓ Interoperable
- ✓ Extensible
- ✓ Scalable

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Thank you!

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