Cloud-Satellite Integration:
A New Paradigm for Connectivity

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Satellite, Ground and New Space Connectivity

VHTS and Multi-Orbit Satellite Constellations

- Increase in orders of magnitude of capacity in space
- Reducing costs and opening opportunities for new apps

Software-Defined Satellites

Satellites have become smarter operating harmoniously to create an elastic network, constantly adjusting in sync with ever-changing conditions

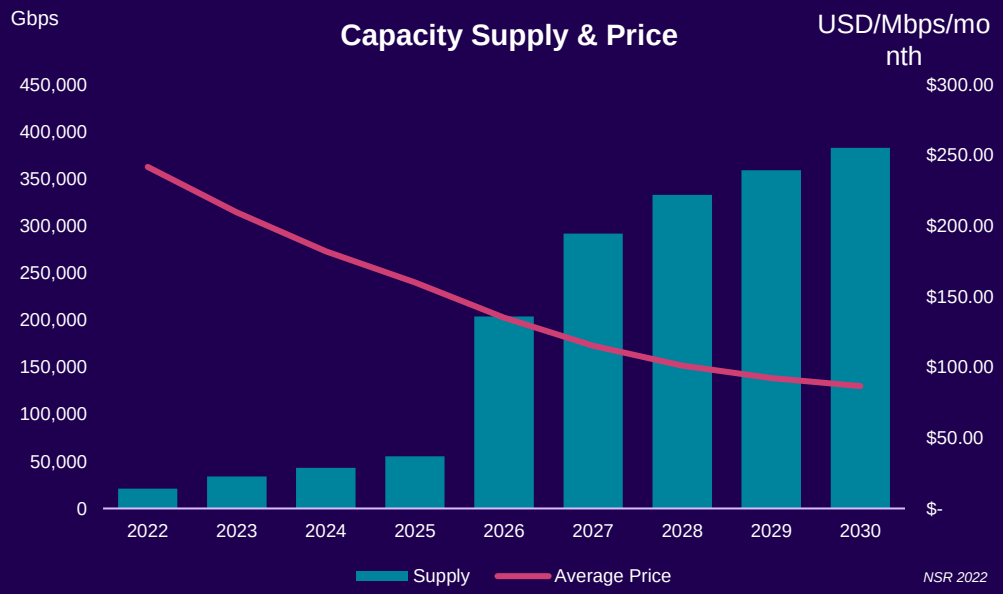
Cloud-Based Ecosystem

Software centric systems leveraging cloud operational advantages

Elastix-Access

Efficient use of satellite resources in a dynamic network

Abundance of Capacity – 44% CAGR Capacity Increase



Foundations for Expanding Satellite Services

Multi Orbit

Virtualization

On-Premises

IaaS
Infrastructure as a Service

PaaS
Platform as a Service

docker

openstack.

kubernetes

vmware

Microsoft Azure

aws

Standardization

5G

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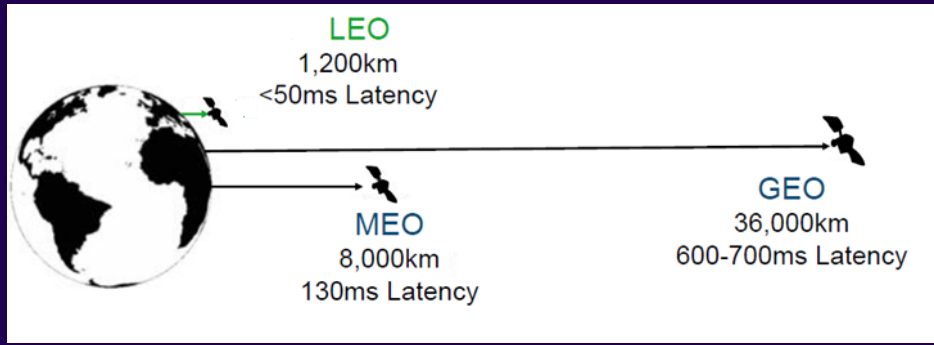
Multi Orbit - Augment Service Offering

- **A desire for a single platform supporting multiple satellites in multiple orbits**
- **A desire for a single terminal support multi-orbit communication**
- **Use Cases**
  - Broadcast over GEO + broadband over LEO/MEO
  - Backup - LEO as main and fallback to MEO
  - Switching between LEO and GEO based on various conditions (such as: Load, Applications, Cost, Link condition)
  - Simultaneous operation LEO/MEO/GEO with application-based routing (latency sensitive over LEO and others over GEO)

- ✓ **True global coverage**
- ✓ **Multiple connectivity options**
- ✓ **Better utilization of satellite fleet**
- ✓ **Best match - connectivity to application**



Multi-Orbit Support - Reality

- **LEO solutions are currently a close garden with no interoperability**
- **On the Terminal the Antenna side is challenging due to various band support (Ku/Ka)**
  - Ku Antenna can operate on LEO-GEO (there is no MEO Ku)
  - Ka Antenna can operate on MEO-GEO (future constellations will include LEO in Ka)
- **The Modem part is technically agnostic to band**
  - Due to the close garden environment today in LEO, dual modem is needed for LEO-GEO operation
  - MEO-GEO operation can be achieved by a single Modem (Gilat SkyEdge IV modems portfolio)

Virtualization

- Running platform as cloud native
- Use General purpose HW
- Private or Public Cloud
- Sharing Infra. resources with other systems (Compute, Storage, networking)
- Dynamic scaling

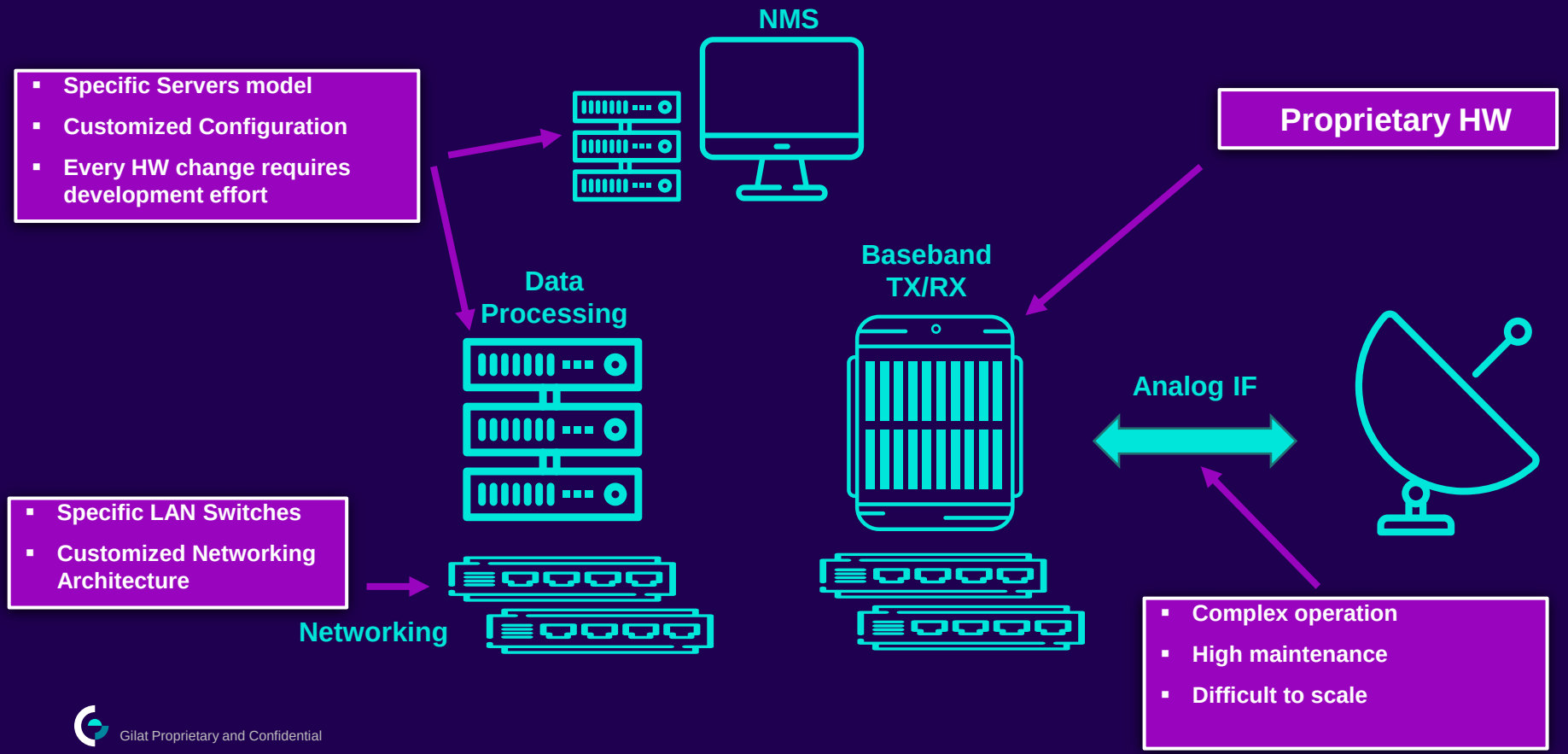
Public

Private

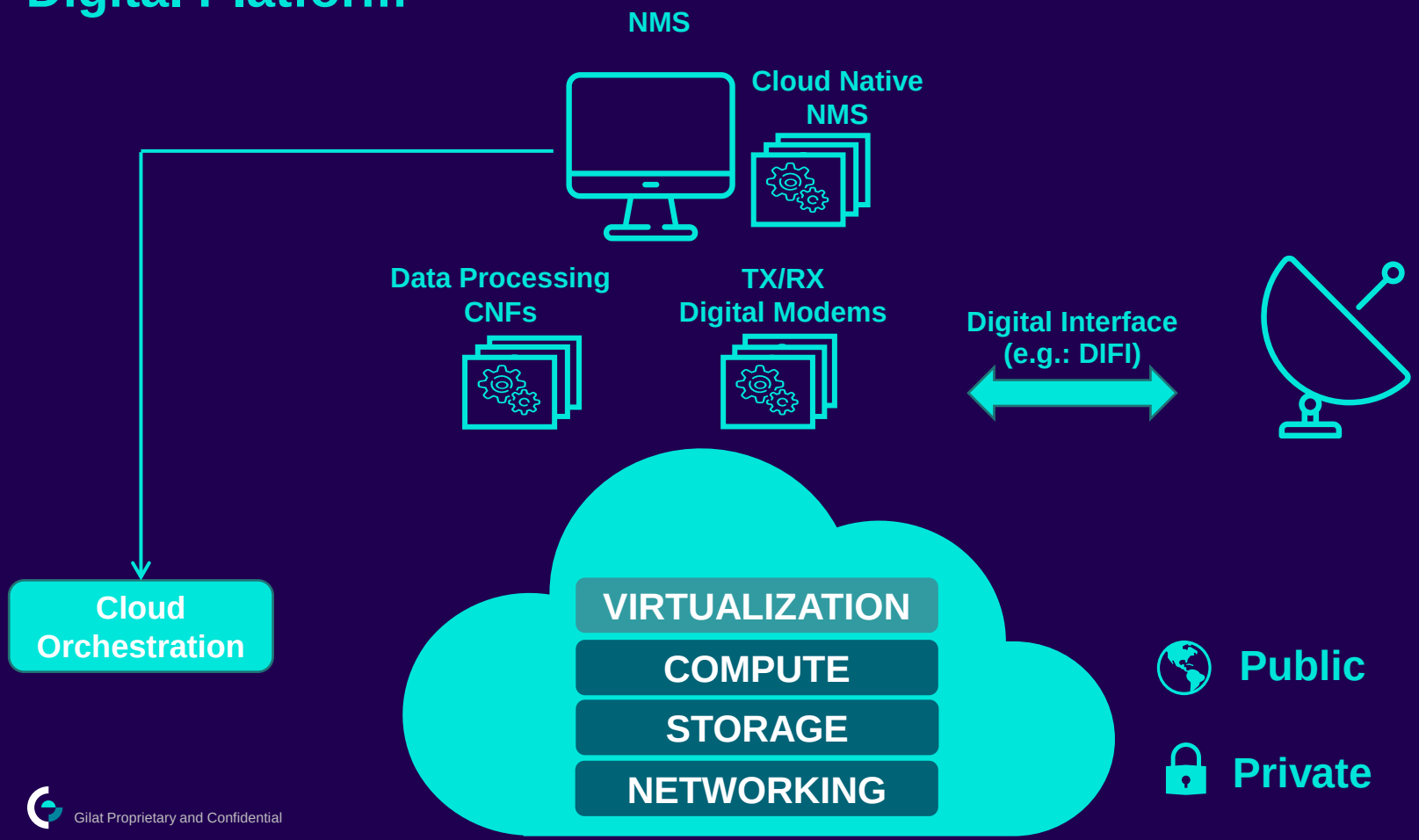
There is no cloud
It's just someone else's computer

- ✓ Unlock vendor dependency
- ✓ Unified processes to manage all IT infrastructure
- ✓ Reuse of resources between systems
- ✓ Increased security
- ✓ Dynamic optimization of resources to needs

Traditional Ground Segment Platform



Digital Platform



Virtualization – It is more than technology change

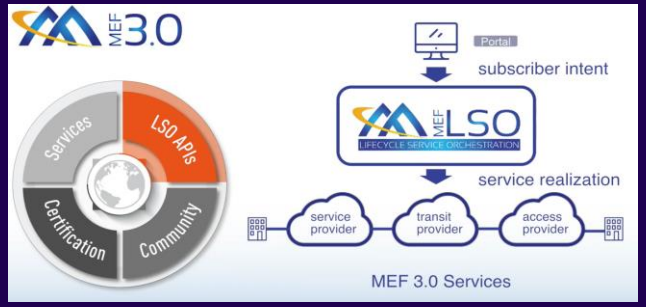
Time To Adapt

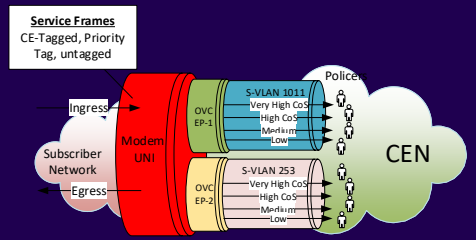
Standardization

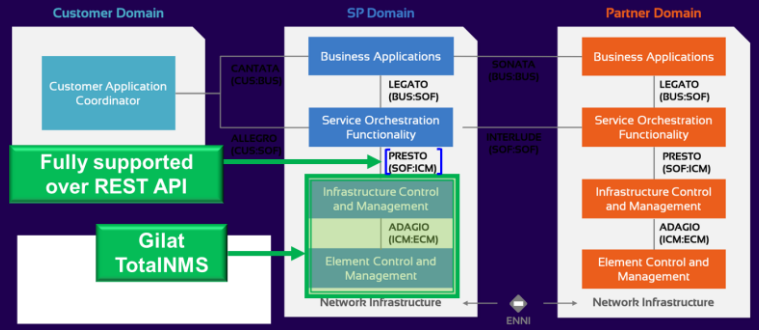
- Waveform
- Protocols
- Services
- Interfaces

Network MEF Carrier Ethernet

- **End-to-end carrier ethernet MEF based**
- **Service Types**
  - Access E-LINE
  - Transit E-LINE
- **Interfaces**
  - User Terminal side - UNI/ENNI (802.1q, 802.1ad)
  - Data Center side – ENNI (802.1ad)
- **MEF based QoS - 4 classes policing per OVC/CoS color aware**
- **Standard Service Orchestration**
  - Based on MEF LSO FRAMEWORK
  - REST API
  - MEF 60







What 5G Brings to The Table

5G New Radio

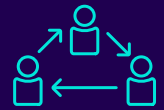
Non Terrestrial Networks

5G NR NTN
O-RAN

5G Core

Mobility Management

Session Management



User Management

Policy Control

Converged Charging

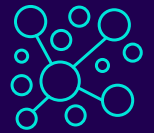
Security

Network Slicing

Network Data Analytics

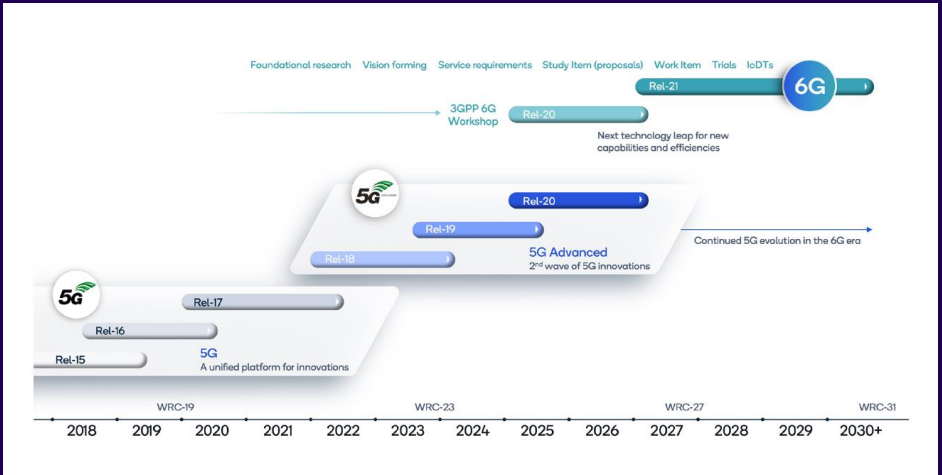
Value Added Services

Cloud & Edge Compute



Open Ecosystem

5G expanding to Satellite with 5G-NTN



Rel-17

- NR-NTN (5G), IoT-NTN (4G)
- Transparent Satellite architecture
- New NTN bands in FR1 (L, S)
- Time & Frequency Synchronization
- Enhancement for HARQ & RACH
- Mobility Support
- Satellite Ephemeris information

Rel-18

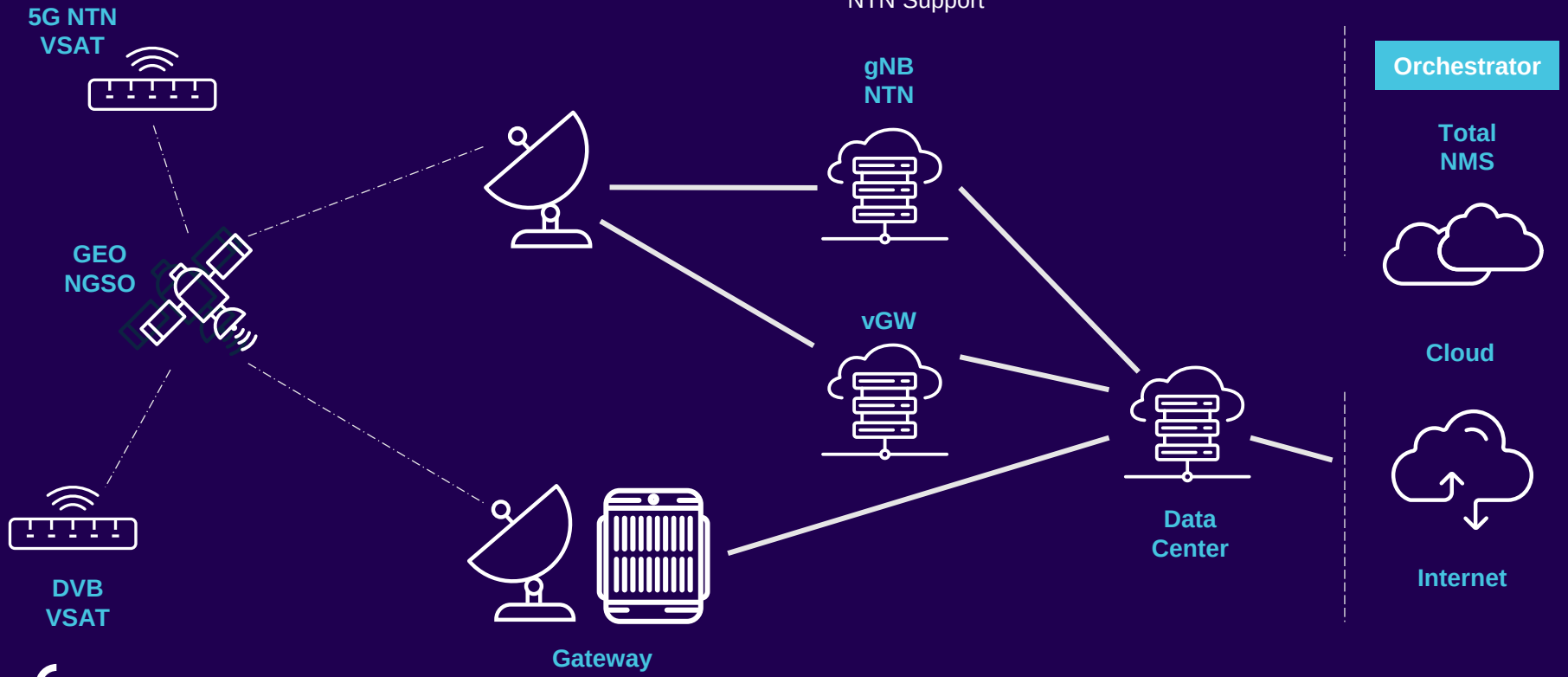
- Transparent Satellite architecture
- New NTN bands in FR2 (Ka)
- NR-NTN further enhancements (mobility, performance, location)
- TN-NTN Mobility & Service Continuity

Rel-19

- Regenerative Satellite architecture
- Coverage Enhancements
- Enhanced GNSS operation
- Multi-orbit connectivity
- Ku band
- NTN-TN Spectrum Coexistence

Multi-Waveforms Architecture

The Path to Multi-waveform Architecture with 5G NTN Support



SUMMARY

- **Our Industry is under constant changes: a lot more capacity in multiple orbits is in the base line of this change**
- **This leads to an evolution of the satellite networks into cloud**
- **3 major technology trends are leading the way**
  - Multi Orbit
  - Virtualization
  - 5G NTN
- **Gilat with SkyEdge IV as a proven platform for multi orbit SDS satellite, is leading the evolution into virtualization and multi-waveform support to enable new services for satellite operators and service providers**

Multi Orbit

Virtualization

On-Premises IaaS PaaS

docker openstack kubernetes vmware

Microsoft Azure aws

Standardization

5G

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Thank You

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