INTUITION

iDirect

GROWTH
TAKES
INTUITION

INVITATION TO EXPERIENCE INTUITION

The satellite industry is in the throes of a major shift. Today, the burning question is not how much the market will grow. It's how operators will capture that growth in a market that's being radically reshaped by new technologies, new players, and new expectations.

Intuition is ST Engineering iDirect's next-generation satellite ground system designed to meet the real operational and commercial challenges of the modern connectivity market.

This e-book offers a comprehensive look at the capabilities behind Intuition, the market forces driving its development, demo experiences that show Intuition in action, and what's possible when ground infrastructure is no longer a constraint—but a catalyst.
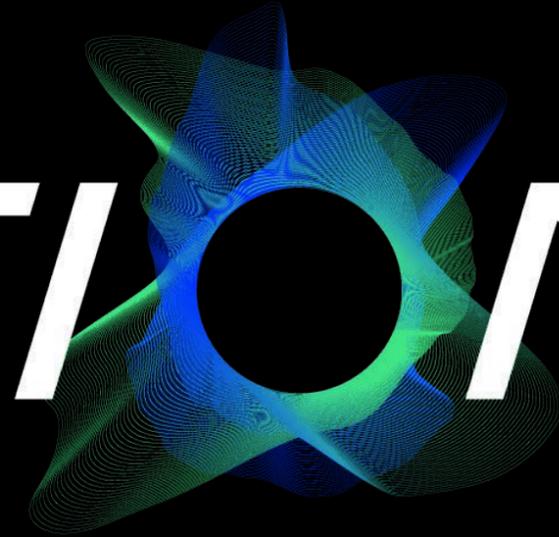
Please enjoy!

Sridhar Kuppanna
CTO AND SVP ENGINEERING, ST ENGINEERING IDIRECT

iDirect

INTUITION
AT EVERY STEP

An advanced, secure satellite networking ground system based on a cloud-native, multi-orbit architecture that capitalizes on automation and the latest standards-based technologies, and unifies iDirect's industry-best capabilities.

INTUITION

Intuition core capabilities

Intuition core capabilities

Unifying iDirect's industry-best technologies with the latest innovations

CLOUD-NATIVE ARCHITECTURE

Scale services quickly and securely for the fastest return on investment

INTELLIGENT MULTI-ORBIT SUPPORT

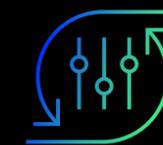Deliver tailored services for every application

STANDARDS-BASED NETWORK CONVERGENCE

Efficiently integrate your satellite network into the global communications domain

AUTOMATION AND END-TO-END ORCHESTRATION

Leverage dynamic orchestration and automation for network operations

FLEXIBLE GO-TO-MARKET MODELS

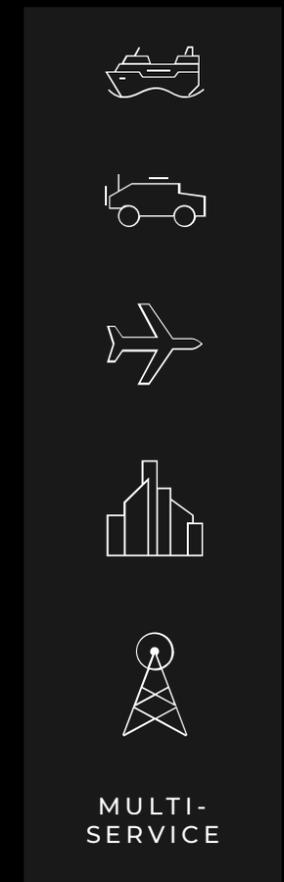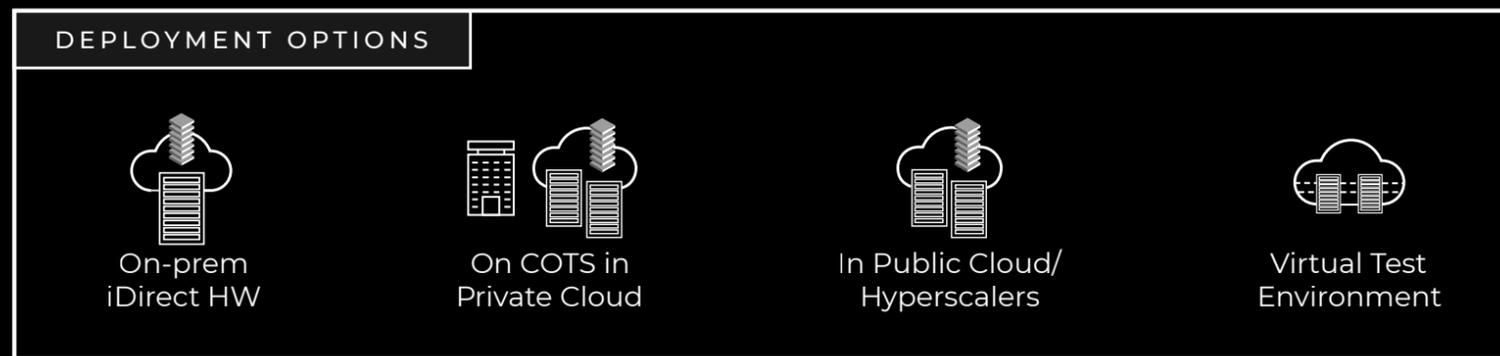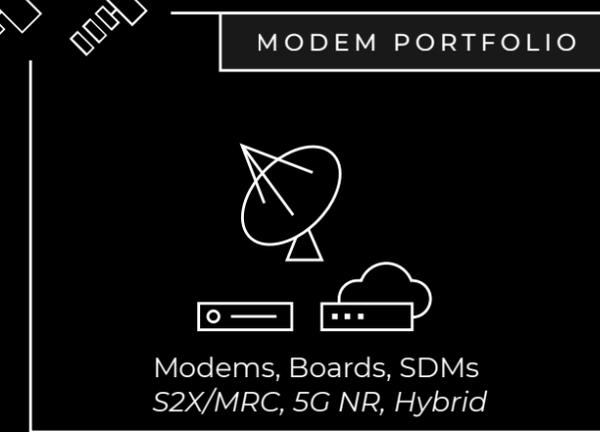Expand your customer base with the broadest range of business models

SECURITY AT THE CORE

Protect your network from evolving threats

INTUITION

Intuition ground system

![iDirect logo]

Intuition ground system

TECHNOLOGY APPLICATIONS

Automation/AI/ML

Multi-Orbit Solutions

Global Bandwidth Management

Advanced Waveforms Incl. MRC/5GNR

Resource Orchestration APIs

Advanced Mobility

Enterprise Networking

Security System/Defense

GROUND SEGMENT ARCHITECTURE

MODEM PORTFOLIO

Internet — 5G CORE — NFs

NMS

NFs

Network Processing
Clusters or 5G NTN CU

Baseband Processing
Clusters or 5G RAT/gNB NTN

Modems, Boards, SDMs
S2X/MRC, 5G NR, Hybrid

DEPLOYMENT OPTIONS

On-prem iDirect HW

On COTS in Private Cloud

In Public Cloud/ Hyperscalers

Virtual Test Environment

MULTI-SERVICE

INTUITION

Technology applications

Automation/AI

Revolutionize network control with end-to-end automation and AI/ML-powered applications

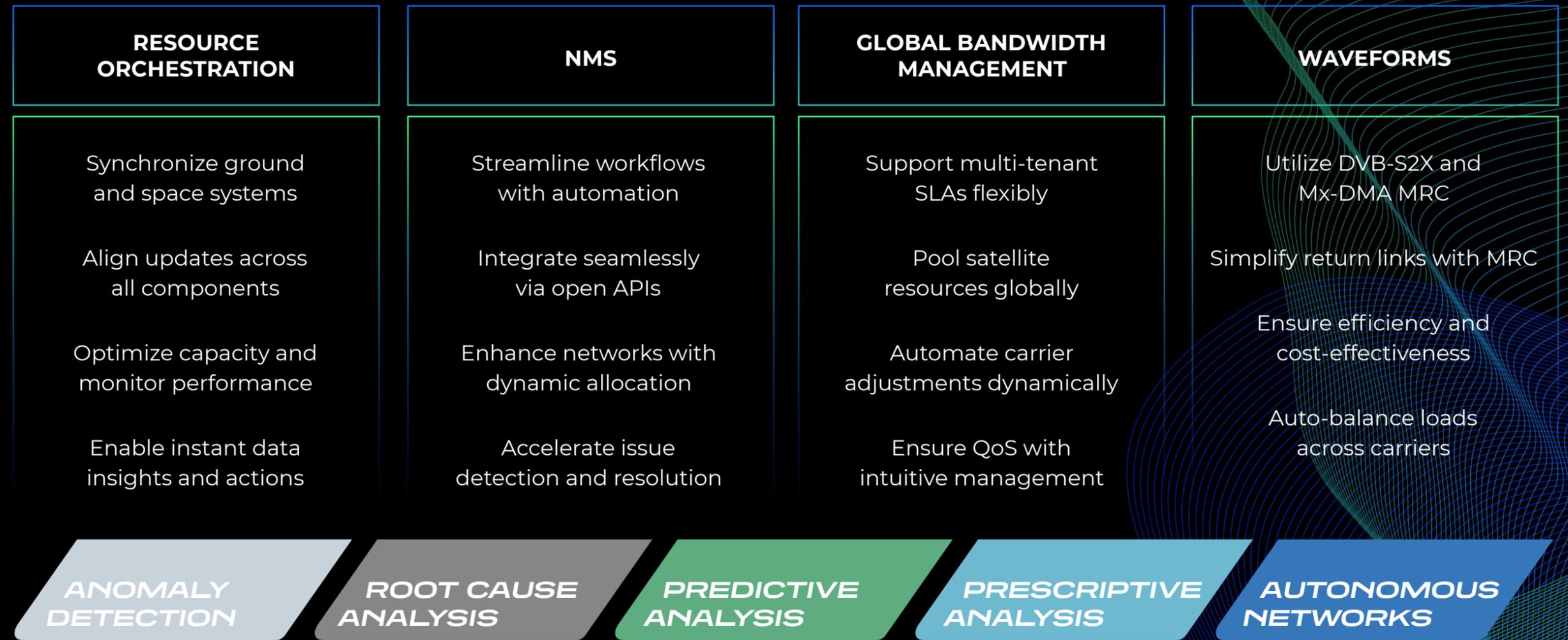| RESOURCE ORCHESTRATION	NMS	GLOBAL BANDWIDTH MANAGEMENT	WAVEFORMS
Synchronize ground and space systems	Streamline workflows with automation	Support multi-tenant SLAs flexibly	Utilize DVB-S2X and Mx-DMA MRC
Align updates across all components	Integrate seamlessly via open APIs	Pool satellite resources globally	Simplify return links with MRC
Optimize capacity and monitor performance	Enhance networks with dynamic allocation	Automate carrier adjustments dynamically	Ensure efficiency and cost-effectiveness
Enable instant data insights and actions	Accelerate issue detection and resolution	Ensure QoS with intuitive management	Auto-balance loads across carriers

ANOMALY DETECTION → **ROOT CAUSE ANALYSIS** → **PREDICTIVE ANALYSIS** → **PRESCRIPTIVE ANALYSIS** → **AUTONOMOUS NETWORKS**

INTUITION

Multi-orbit solutions

NGSO TRACKING NOW LIVE ON ORBIT

- Industry's first multi-orbit switching tested on orbit

- Fast tracking convergence for higher performance switching across orbits

- Real-time location, velocity to keep hubs and terminals in sync

- No manual correction as remote terminals track and acquire to satellites automatically
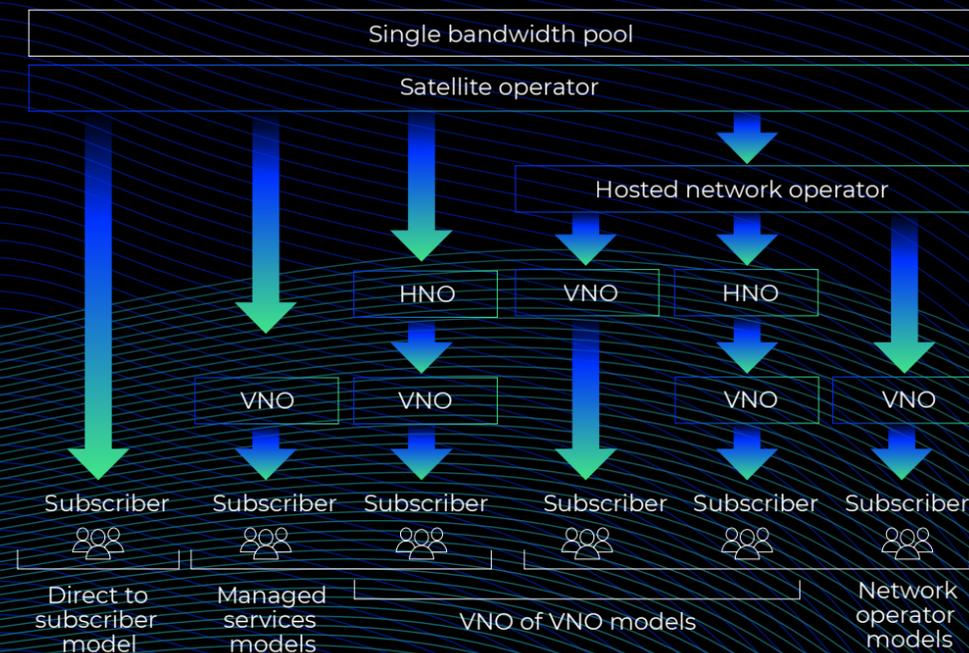
MULTI-NETWORK TRAFFIC MANAGEMENT

- Combine GEO with lower cost NGSOs or wireless

- Failover measures for mobile applications

- Stream duplication and intelligent bandwidth for traffic steering

- Automatic failover to selected or available link
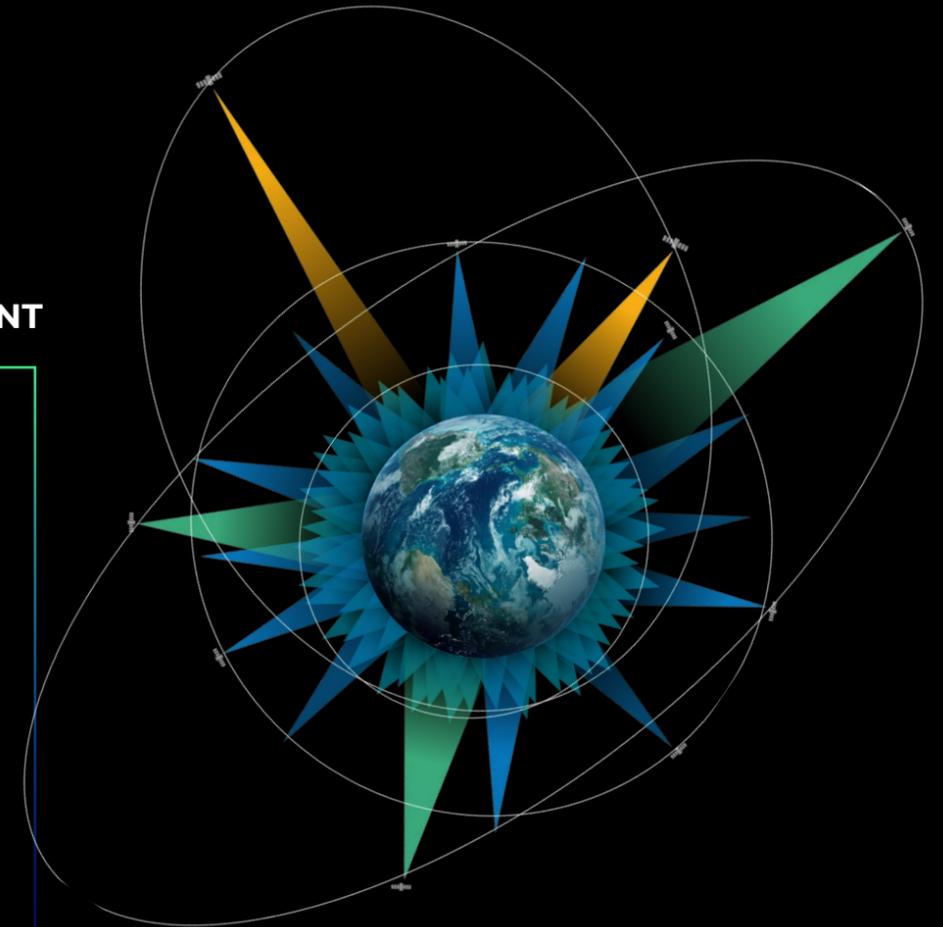
Global bandwidth management

Ideal for mobility, multi-orbit, and dynamically changing environments

GO-TO MARKET MODEL CHOICE
Multi-tenant, multi-level to support flexible requirements for all use cases

From best-effort to CIR-based SLAs

UNIVERSAL DESIGN
Combine multiple satellite resources into a single or multiple regional or global pools

No need for per-carrier QoS setup or continual adjustment

SYSTEM-WIDE ALLOCATION
Account for all available carriers at any instance

Manage MIR/CIR commitments across the system

Automatic allocation based on fluctuating demand

CONTINUOUS OPTIMIZATION
Without complex external intervention

Accommodate more terminals in the network

Maximize SLA fulfilment

More efficient use of resources

### SERVICE MANAGEMENT AND CONTROL
Eliminate beam-based QoS silos

Global QoS enforcement

Service area shaping

Granular control with Intuition NMS

Single bandwidth pool

Satellite operator

Hosted network operator

HNO | VNO | HNO

VNO | VNO | VNO | VNO

Subscriber | Subscriber | Subscriber | Subscriber | Subscriber | Subscriber

Direct to subscriber model | Managed services models | VNO of VNO models | Network operator models

INTUITION

Waveforms

Mx-DMA MRC is the most advanced, self-organizing return waveform for every application in shared capacity
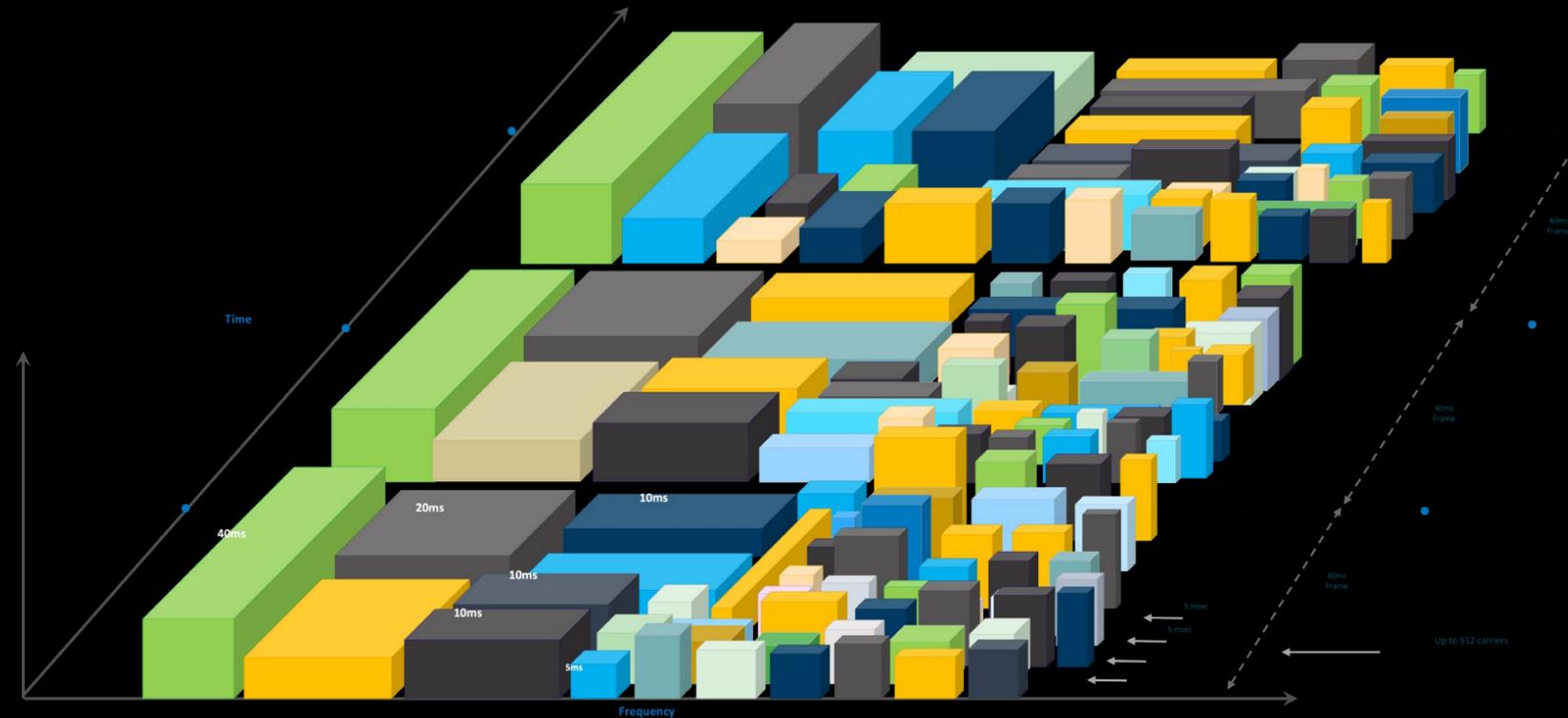
SCPC-LIKE EFFICIENCY
Intelligent, real-time bandwidth allocation up to 100 Msps

SERVICE AGILITY
Multi-service platform manages complex traffic demands and Quality of Experience

APPLICATION AND NETWORK SCALABILITY
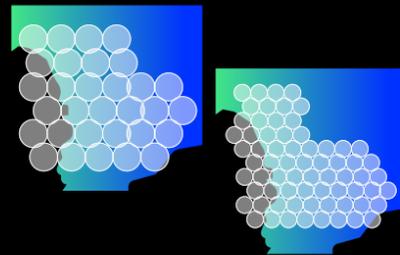A single network to support thousands of terminals for the widest mix of requirements

PERFORMANCE
300 Mbps of throughput on the return channel

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![iDirect]

Resource orchestration

Dynamically reconfigure beam maps and bandwidth

STATIC USE CASES

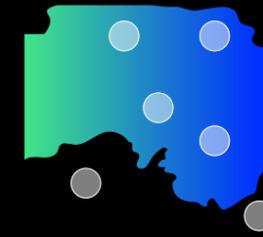### BEAM MAPS, BANDWIDTH RECONFIGURATION

- Maximize sellable capacity to fulfill services demand
- Reconfiguration of geographical or localized areas
- Develop spot beam patterns, frequency, band and carrier plans
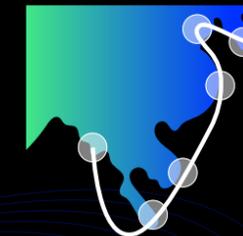
KA/Q/V GW DIVERSITY AND BACK-UP

- Rain fade diversity schemes
- 1+1 GW switchover and smart diversity
- Backup GW switching

DYNAMIC USE CASES

ON-DEMAND ORCHESTRATED BEAM / SERVICES ACTIVATION

- Resource activation at the target location
- Expand serviceable footprint without dedicated beam grid coverage
- Provide ad hoc tailored service

ADVANCED MOBILITY DYNAMIC RESOURCE ALLOCATION

- Spot beam utilized to follow mobility platforms
- Update resource allocation in the beam grid
- Fulfill traffic demand

INTUITION

Advanced mobility networks

HEO
GEO
MEO
LEO

NGSO OPERATIONS

Tracking and networking to support new multi-orbit operations

ADVANCED BEAM SWITCHING

Optimized beam selection for the most seamless connectivity

BANDWIDTH & QOS OPTIMIZATION

Network-wide allocation, universal configuration, and continuous optimization

SATELLITE NETWORK RESOURCE ORCHESTRATION

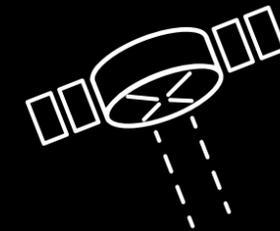Enabled through partnerships and technology for dynamic control

MAP INNOVATIONS

Optimal for software-defined satellites and NGSOs

INTUITION

Advanced mobility use cases

HEO
GEO
MEO
LEO

MULTI-ORBIT NETWORKS

Global and regional satellite network operators need to hybridize their capacity to differentiate their offerings

LEGACY & NEXT-GEN SATELLITES

As new satellites add complexity, network operators need to switch between these and older assets

COMMERCIAL & GOVERNMENT SYSTEMS

Set and manage domains to adhere to regulations or policies not required for commercial network traffic
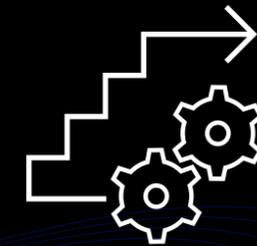
CONSOLIDATION SCENARIOS SYSTEMS

Operators in the process of consolidation need to enable switching between disparate networks

NATIONAL, REGIONAL DOMAINS

Define country, regional or global satellite network domains

MIGRATION TO INTUITION

While deploying Intuition, switch between networks and pool bandwidth on current and new platforms

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Intuition security

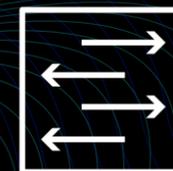Secure-by-design approach embedding security throughout from coding to deployment

KEY BENEFITS

- Ensures a reliable and resilient ground system
- Provides secure operations
- Results in continuous improvement and protection
- Instills customer confidence

SECURE DEVELOPMENT LIFE CYCLE

SECURE ARCHITECTURE
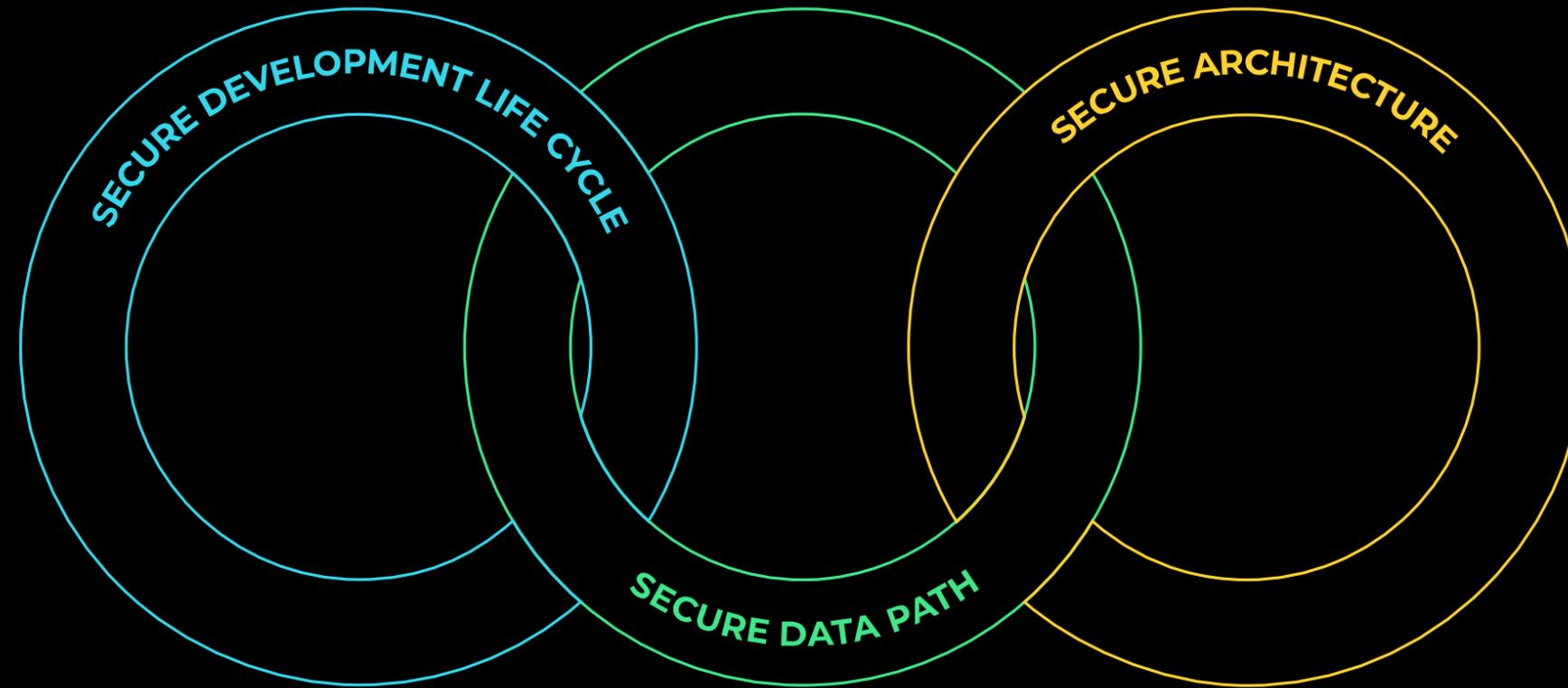
SECURE DATA PATH

FEATURES

SECURE DEVELOPMENT LIFE CYCLE

- Industry standards & regulations
- Comprehensive DevSecOps

SECURE DATA PATH

- AES encryption
- Dynamic key exchange

SECURE ARCHITECTURE

- OWASP and NIST frameworks
- AAA, RBAC, SSO, and MFA

INTUITION

Architecture

Cloud-native architecture

Offering unmatched flexibility, scalability, and resilience for satellite networks

FLEXIBILITY WITH MODULAR ARCHITECTURE

Containerized microservices design supports independent updates, reducing risks and streamlining operations

DYNAMIC WORKLOAD MANAGEMENT

Kubernetes-style orchestration dynamically allocates resources across servers for optimal performance
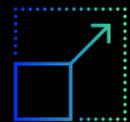
REAL-TIME SCALABILITY AND CENTRALIZED DESIGN

Scales capacity in real time across centralized data centers reducing hardware footprints by up to 70%

RESILIENCE WITH SELF-HEALING AUTOMATION

AI/ML-driven automation redistributes workloads and resolves issues during failures for uninterrupted service

EMBEDDED SECURITY

The system integrates proactive security measures to safeguard satellite operations against emerging threats

USE CASE **LARGE SCALE DEPLOYMENT**

NETWORK PROCESSING

80% SAVINGS

OF DEVICES

DENSITY

INTUITION TRADITIONAL PLATFORM

BASEBAND PROCESSING

90% SAVINGS

OF DEVICES

DENSITY

INTUITION XBB TRADITIONAL PLATFORM
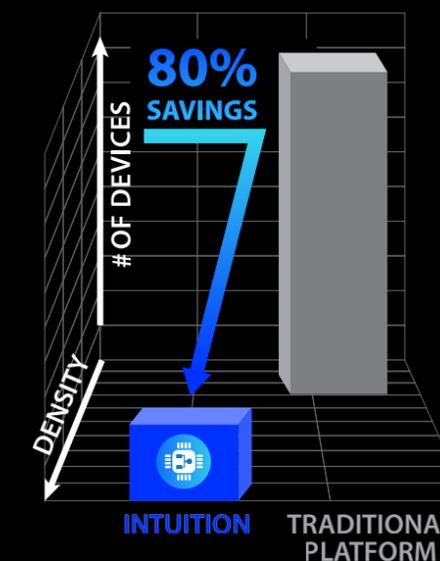
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Intuition NMS

Streamline network management and unlock the full potential of satellite communications

KEY DIFFERENTIATORS

• Built on a cloud-native, microservices-based architecture

• Achieves very high network scale

• Offers flexible deployment options

INTUITION

Cloud-native NMS

Enables operators to streamline reliable and secure operations, quickly detect and resolve issues, and provision services efficiently at scale

REAL-TIME MONITORING & OPERATIONAL CONTROL

Built to deliver continuous visibility, accelerate fault resolution, and streamline network operations

INTELLIGENT CONFIGURATION & NETWORK OPTIMIZATION

Designed to accelerate service readiness, dynamically allocate resources, and maintain optimal network performance

SEAMLESS INTEGRATION & ECOSYSTEM INTEROPERABILITY

Designed to simplify integration, accelerate automation, and improve operational efficiency

SCALABLE & FLEXIBLE OPERATIONS

Enable growth, adapt to evolving customer demands, and deliver differentiated services across global networks

REAL-TIME MONITORING & OPERATIONAL CONTROL

INTELLIGENT CONFIGURATION & NETWORK OPTIMIZATION

INTUITION

NMS

SEAMLESS INTEGRATION & ECOSYSTEM INTEROPERABILITY

5G

SCALABLE & FLEXIBLE OPERATIONS

INTUITION

Network and baseband processing

Scalable cloud-native software functions with various deployment options ensuring robust and efficient performance
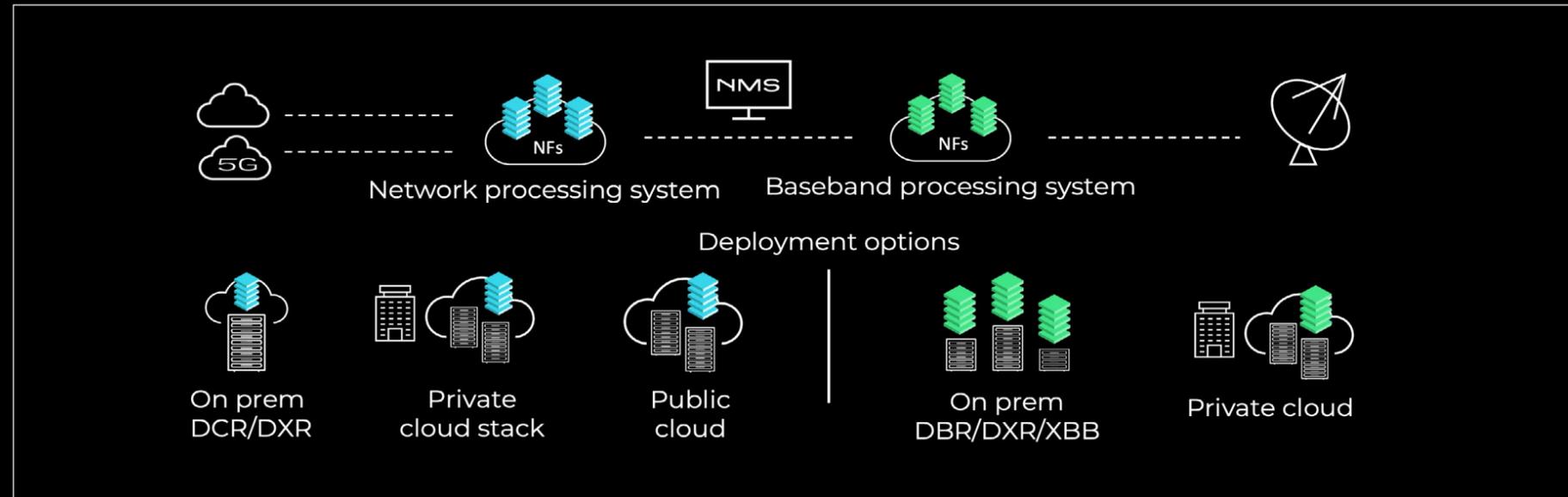
Networking: Layer 2/3 processing, acceleration, QoS, mobility control

Baseband: Modulation and demodulation in the most efficient waveforms DVB-S2X and Mx-DMA MRC

CIDI framework: Kubernetes-driven virtualization orchestration of network functions

Deployment: On-premises with iDirect DIFI-enabled hardware, on COTS in private datacenter clouds, or in the public cloud

Intuition modem portfolio

The right modem for every market and application

A wide range of modem capabilities and form factors efficiently operating in single bandwidth-sharing networks

High availability and mobility focus, featuring dual radio interfaces for seamless handover

Next-gen software-defined, multi-waveform modems and edge-cloud deployment options

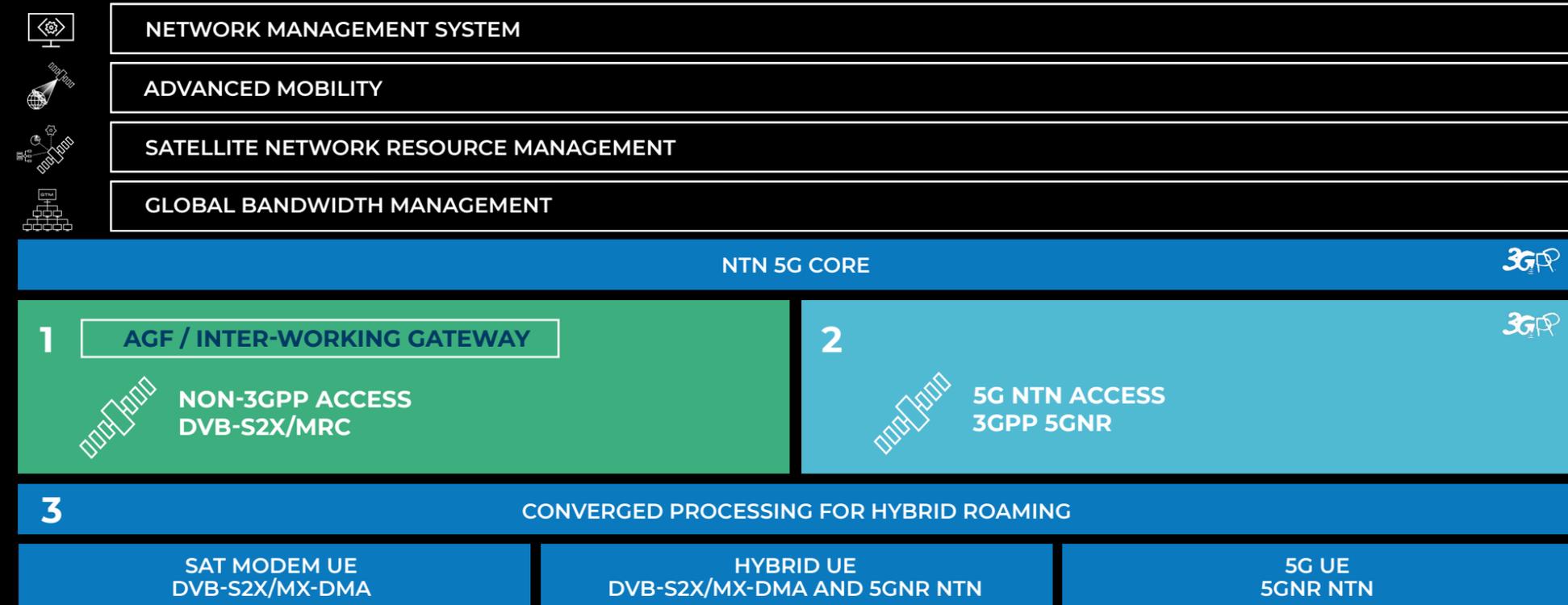| INT2000 | MDM2010 | IQ SERIES | MDM2510 | MDM3315 | MDM5010 | IQ 800 | 450SDM |

5G NTN

Enable 5G NTN capabilities on our multi-orbit, cloud-native Intuition ground system equipped with industry-best technologies

1

NON-3GPP ACCESS TO 5G NETWORK

Enable existing satellite networks to tie into a 5G operating environment via Interworking Gateway Functions connected to the 5G Core

2

FULL 3GPP ACCESS TO 5G CORE, 5G NR AND 5G UE

Access to a fully native 5G NTN / 5G NR solution with satellite-optimized gNodeB (CU/DU/RU), 5G NR waveform

3

HYBRID ROAMING

Enable network roaming across Non-3GPP, 5G NTN and 5G TN networks for full interoperability

INTUITION

| NETWORK MANAGEMENT SYSTEM |
| ADVANCED MOBILITY |
| SATELLITE NETWORK RESOURCE MANAGEMENT |
| GLOBAL BANDWIDTH MANAGEMENT |

NTN 5G CORE   3GPP

1   AGF / INTER-WORKING GATEWAY

NON-3GPP ACCESS
DVB-S2X/MRC

2   3GPP

5G NTN ACCESS
3GPP 5GNR

3   CONVERGED PROCESSING FOR HYBRID ROAMING

| SAT MODEM UE
DVB-S2X/MX-DMA | HYBRID UE
DVB-S2X/MX-DMA AND 5GNR NTN | 5G UE
5GNR NTN |

INTUITION

Intuition go-to-market options

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YOUR GO-TO-MARKET STRATEGY

Technology innovation is important to position satellite communications within the greater telecommunications ecosystem. Today, however, there is another burgeoning requirement being vocalized by satellite operators and service providers; our customers are seeking expanded go-to-market flexibility to face new and continuing commercial challenges.

From restrictive hardware and complex deployments to less risk and an accelerated path to revenue, our customers want to reduce operational learning curves and implement new technologies faster.

ST Engineering iDirect introduced Intuition Unbound to alleviate these challenges, creating opportunities for increased market access and allowing operators to confidently pursue new business goals.

Cynthia Harty
SVP, CORPORATE DEVELOPMENT, ST ENGINEERING IDIRECT

INTUITION

INTUITION
unbound

Transform the way you manage your ground network

Build on the latest technologies and capabilities—without the complexity

unbound OPERATIONS

unbound CAPABILITIES

Intuition Unbound redefines how satellite operators and service providers approach ground segment technology, unlocking them from traditional infrastructure business models and driving the shift to consumption-focused solutions tailored to the operational demands of a fast-changing market.

YOUR GROWTH, **DELIVERED AS A SERVICE**

Unbound Operations

Transform the way you manage your ground network

SERVICE FEATURES

24/7 OPERATIONAL MANAGEMENT

Complete oversight and optimization of ST Engineering iDirect platforms and solutions

CONFIGURATION MANAGEMENT

Establish and control network configurations and alarms to maintain service availability

EVENT MANAGEMENT

Monitor, manage, and respond to network alarms to ensure reliability

REPORTING & ANALYTICS

Access detailed, data-driven insights through a customer portal offering visibility into performance metrics

CUSTOMER EXPERIENCE MANAGER

A dedicated point of contact for end-to-end service delivery and engagement

Consumption-based model designed to ensure frictionless operations

✓ Free your team from the complexity of network management while aligning operational costs with revenue

✓ Minimize operational burden so your team is free to focus on customer service and business growth

Adaptable solution for streamlined network management and enhanced business focus

✓ Proactive monitoring of network attributes for early detection of performance deviation reduces configuration management time

✓ Flexible service plans tailored to network size and complexity to ensure seamless scalability and optimized performance

Trusted ground system specialists for network optimization and service assurance

✓ Leverage iDirect's experience across thousands of networks to ensure optimal performance

✓ Eliminate long-term investments in retraining, skills gaps, and attrition

INTUITION

Intuition go-to-market options

Unbound Capabilities

Build on the latest technologies and capabilities – without the complexity

SERVICE FEATURES

INFRASTRUCTURE OWNERSHIP

iDirect owns the ground system equipment, which means we take responsibility for all aspects of hardware and software maintenance

IMPLEMENTATION, INSTALLATION & DEPLOYMENT

Our expertise in setting up and configuring the network infrastructure ensures your specific operational needs are met

LIFECYCLE MANAGEMENT

As the architects of the ground system, we are aware of each component's lifecycle, allowing us to optimize service availability

NETWORK AUTONOMY

Flexibility to establish service plans, service levels, QoS, and more while utilizing all the best technology applications

Predictable consumption-based model enables frictionless transitions to new services

✓ Easily expand capabilities via a modular service model that enables frictionless upgrades

✓ Predictable costs aligned with expansion of existing services or introduction of new services

Scalable architecture adapts to your evolving network needs

✓ Flexible, consumption based subscription model allows you to scale your network as needed, only paying for what you use

✓ Modular sevice plans enable activation of only relevant capabilities, empowering you to explore new market opportunities

Expand services with confidence, free from the risks of up-front investment

✓ Access the latest innovations on the Intuition ground system without the complexities of technology refresh planning

✓ Leverage reduced implementation times to speed time to revenue

INTUITION

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Your journey to Intuition

Steps to network convergence

Leveraging standards
to enable integration
into global telco

5G NETWORK-OF-NETWORKS CONVERGENCE WITH 5G NTN

HEO
GEO
MEO
LEO
EVOLUTION TO NEXT-GENERATION SATELLITE NETWORKS

VIRTUALIZATION OF THE GROUND SEGMENT IN HYBRID DEPLOYMENTS

BUILD ON TRUSTED INDUSTRY-BEST TECHNOLOGIES AND A FOUNDATION OF COLLABORATION

3GPP

MPLIFY
FORMERLY MEF

WAVE
Standardize, Virtualize, Revolutionize

DIFI

DVB S2X

INTUITION

Demos and proof-of-concepts

Contact your iDirect Sales Representative to EXPERIENCE INTUITION today!

iDirect
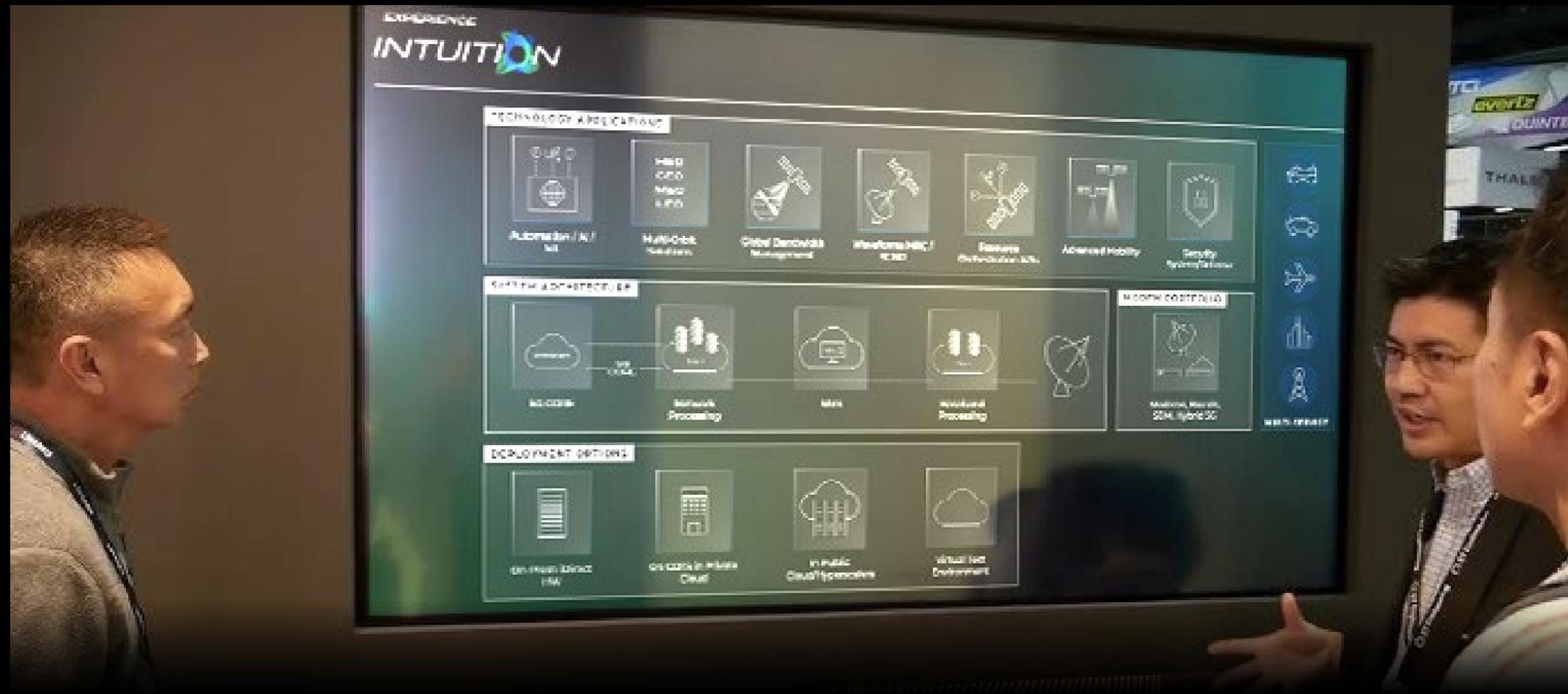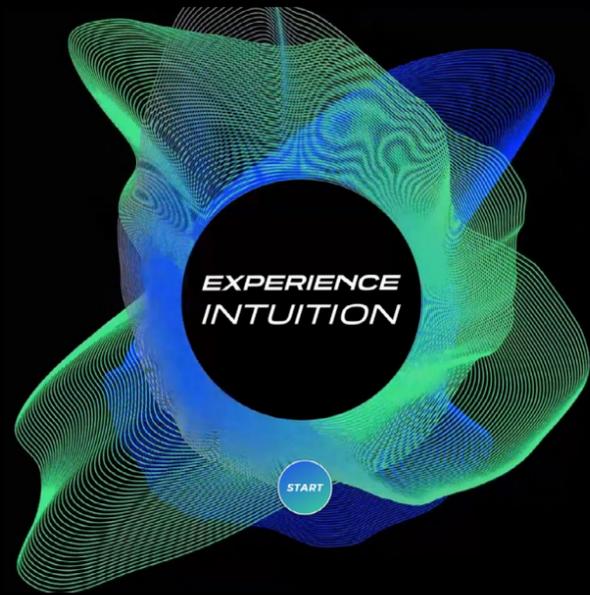
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PAVING THE WAY TO SUCCESS

The satellite communications industry is at a critical turning point, and the message is clear: businesses that embrace change and act decisively will be better positioned to meet customer demands, capitalize on new opportunities, and stay ahead of the competition.

The market is moving fast, and there's no time to hesitate. As an industry, we must come together to innovate, collaborate, and succeed. By breaking down barriers and amplifying customer value, we can usher in a new era of satellite communications.

At iDirect, we're ready to lead this transformation with you, our partners. Together, we can accomplish far more than we ever could alone.

Here's to the exciting opportunities ahead.

Sincerely,

Don Claussen
CEO, ST ENGINEERING IDIRECT

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AT EVERY STEP

ST Engineering

iDirect