

Defining NewSpace: Standardization, Virtualization & Interoperability

The last couple of years have taught us that staying connected is more important than ever, and that's why the satellite industry is entering into its most crucial transformation yet.

Whichever way you turn, there is innovation, from the heights of space right down to the ground. Change is coming.

The foundations are being laid that will see space-based connectivity taking its place in the broader communications fabric that overlays everything we do, everywhere we go.

These changes will elevate the mobile connectivity experience to new levels. They will ensure that users, no matter where they are or how they are traveling, will be able to access the right technology for the right application,

whatever their location. It's this accessibility that is so critical for mobile users. However, for this is to be achieved, there are many different pieces that must align.

In 2021, ST Engineering iDirect launched *New Ground*, a movement that highlights the importance of ground technology in the realization of NewSpace.

New Ground aims to pioneer a fully digitized and virtualized approach to ground infrastructure, transforming the economics, engagement models, and technologies that will rapidly expand

the accessibility of satellite communications around the world. Technologies developed around a broader ecosystem will accelerate



the transformation of our global connectivity landscape. In this article, we'd like to point out the key areas of this transformation and what they mean for the industry.

Connectivity Convergence

We are going through an age of convergence that impacts the satellite sector, and this convergence is happening on three levels.

The first is terrestrial convergence. This is mainly driven by Telcos moving toward the 5G standard, driving a master network of networks architecture that is massive in scale to meet the ever-growing demand for connectivity.

In the future 5G connected world, we see it as our mandate to ensure satellite's place in a fully converged, end-to-end network. Today, it is critical that we work together to prepare the ground and determine the industry's role in this new landscape where connectivity is interconnected and seamless.

The Telco sector is also adopting critical IT advances like standardization, virtualization, and orchestration to improve the service delivery speed, scale, cost, and flexibility. These technology enablers together will be used to ensure a completely seamless end-user experience.

Then, there is space and ground segment convergence, which will demand tight integration to accommodate software-defined technological developments. This tighter integration is a big driver for convergence and for standardization.

Standardization is what will enable interoperability between different types of networks. Until now, VSAT systems have been managed as standalone systems, but this is changing as terrestrial standards are becoming increasingly dominant, such as the 5G/3GPP and the MEF standards.

The use of standards will allow our customers to integrate satellite

communications into an existing terrestrial environment rather than having to manage the satellite communication system as something on the side with its own proprietary API's and interfaces. This will allow satellite systems to be plugged into the broader ecosystem.

Finally, there is the cloud, where convergence is also happening because the industry is moving away from using very dedicated proprietary hardware to more generic cloud platforms in order to scale.

The Evolution of New Space

Satellite capabilities are changing. Previously designed to fulfil a specific purpose with beams covering certain regions with pre-determined throughput, today, they incorporate completely dynamic beams, ensuring flexibility and opening up new possibilities.

These software-defined standardized payloads mean that operators don't need to design satellites upfront and can launch satellites and configure them later to a specific use case or demand. This removes a lot of business risk for the operator. But that also means that, to unlock the capabilities that New Space offers, ground systems must be equally dynamic to match the resources on the ground with those in space and where they are needed.

The race is also on to introduce services on multi-orbit satellite constellations, the likes of which we've seen emerging over the past few years. Some are still in the design phase, some are in the process of being launched, but every single one is hotly anticipated.

Each of these orbits brings its own unique benefits such as lower latency, better performance, the ability to offer mobile connectivity, increased throughput or lower cost per bit. Every new constellation needs a ground system to match its capabilities. Without it, New Space can't be realized. The

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5G

5G capability-Proven track of record of delivering seamless 5G experience via satellite.

| Satellite Orbital Slot | 134°E | |
|------------------------|---|---------------|
| Payload | Ka/Ku HTS | |
| | User Beams | Gateway Beams |
| Number of Beams | 90 | 8 |
| Frequency | Ku-Band | Ka-Band |
| Channel Bandwidth | Maximum 468 MHz (Forward) 117 MHz (Return) | |
| Polarization | Dual Linear | Dual Circular |
| EIRP | 52~68 dBW | 64~67 dBW |
| G/T | 4~21 dB/K | 18~23 dB/K |
| Throughput | ≈50 Gbps | |



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right ground system will enable a seamless shift between orbits and networks.

This evolution in space means big changes on the ground. The ground segment will need to evolve to be virtual, digital and dynamic enough to support any space configuration by utilizing real-time resource orchestration. It will also require a multi-orbit ground portfolio from vendors with NGSO-capable modems, multi-link or even multi-orbit antennas, seamless satellite hand-offs, and end-to-end resource orchestration between hub, baseband and modem.

We have talked about how tighter integration is necessary and this is demonstrated in the case of O3b mPOWER, SES' upcoming MEO constellation. As a ground systems partner, our dynamic, open ground system and standardized platform APIs combined with SES' Adaptive Resource Control (ARC) resource management capability will enable the dynamic control and optimization of power, throughput, beams and frequency allocation across the entire system.

The Move to the Cloud

The migration towards virtualization and the cloud is being undertaken across every industry and region as businesses look to accommodate the surge in bandwidth demands. At ST Engineering iDirect, we are also moving towards infrastructure virtualization and the Cloud. This will ultimately allow our customers to scale faster without the need for additional cap-ex investments.

Virtualization and cloudification will reduce overall operational complexity, enabling a fully digitalized ground network that can integrate within the telecom 5G fabric and provide access to Cloud-based applications and management tools and improved performance and security.

To provide this access, the satellite industry can work in unison with Cloud Service Providers, providing reliable connectivity to virtually anywhere on the globe and delivering satellite services in a

space where their common enterprise clients are increasingly operating.

To achieve this level of services, the ground segment needs to embrace virtualization technologies to carry out the modulation and processing within the satcom infrastructure. Virtualization needs to be achieved through the abstraction of the software functionality from the hardware and the adoption of standardized interfaces for easier interoperability of virtualized components in the cloud.

To that end, ST Engineering iDirect started an open collaboration with ecosystem partners through the Digital IF Interoperability Consortium (DIFI) to define the Digitized Interface between modulator/ demodulator, modem, and RF components as a standard. Furthermore, we are adapting our NMS and hub deployment architectures to enable more cloud-based deployment options.



Our partnership with Microsoft Azure represents another major step in our strategic direction that will lead to the virtualization and cloudification of our satcom platform. Starting with our modem, we are working on a virtualized modem that can be deployed on a Microsoft Azure HCI Stack-based solution.

Dealing with New Complexities through Service Orchestration

These new communications networks are getting more complex and need to be managed from multiple perspectives to meet dynamic customer demands.

Thus, networking and orchestration technologies must work in unison across multi-orbit satellite, terrestrial and mobile networks to enable a truly seamless service offering. End-to-end service orchestration can achieve exactly that as they match software-defined satellite constellations with software-defined networks.



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¹ Lower than that of traditional maritime VSAT integrators

² K4's Kapture App

³ When making the network selection



By way of analogy, I would describe us as Amazon and the competitors you mentioned as brick and mortar retailers. We don't have long-term satellite contracts, and we don't invest in data centers or teleports, and other physical infrastructure."

— Michael Small, K4 Co-Founder

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Open architectures and standardized platform APIs, ensure that services are implemented in an automated, seamless manner and orchestrated across the entire network including hub, baseband and modems, reducing overall operational networking complexities and expediting time to market.

New Era, New Opportunities

Every mobility sector will benefit from the changes happening across the satellite industry. However, it's up to the ground infrastructure providers to ensure that the technological advancements and standards are in place to expedite these capabilities. This will happen through collaboration, not just industry-wide, but across technologies. These coming months and years will see new partnerships driven by innovation blossom, opening up opportunities to entirely new markets that had not previously considered satcoms before.

More about [New Ground](#)



About Frederik Simoens:

Frederik Simoens is the Chief Technology Officer at ST Engineering iDirect, where he is responsible for the oversight of all technology decisions and serves to drive the strategic direction for product development, technology roadmap and technology alliances.

Previously, Simoens worked at Newtec where he worked on physical layer technologies, launched the DVB-S2X standard within Newtec's platform, and in 2015, became VP of product management, which led to a promotion to CTO.