

AccelerComm, Radisys, RFDSP and TTP Partnership Offers 5G LEO Regenerative Base Station Solution to Deliver High-Performance Cellular Service from Space

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Companies unveil a LEO Regenerative 5G RAN reference solution architecture.

UK – 20th September 2023: AccelerComm, the Layer 1 5G IP specialists, Radisys® Corporation, a global leader of open telecom solutions including 5G RAN, RFDSP Lower-Phy IP specialists and TTP, an independent technology and product development company based in the UK, today announced that they are jointly formulating a high-performance Regenerative 5G RAN reference solution and architecture based on 3GPP for deployment on low-earth orbit (LEO) satellites. The partnership combines expertise and IP from these companies, together with additional technology from partners, to propose a 5G regenerative gNodeB solution that is tailored to support high-performance 5G services in the challenging environment of a Non-Terrestrial Network (NTN).

In a typical LEO deployment, a constellation of fast-moving satellites covers a wide geographical area using a large number of beams per satellite to cover a multitude of subscribers. The 5G Regenerative NTN solution includes Option-2 split gNB with a distributed unit (DU) on the satellite payload with a ground-based centralized unit (CU) and 5GC. The solution handles unique regenerative NTN-specific requirements of extremely high mobility with frequency re-association between the DU, GW and CU serving a region and large-sized cells spanning multiple countries requiring country-specific CN routing. Moreover, any gNodeB platform for space applications will be highly constrained in size, weight, and power, and must be able to work in a hostile space environment.

The joint LEO Regenerative reference solution will be designed to meet the growing demand for satellite-based eMBB (enhanced Mobile Broadband) and IoT (Internet of Things) services. This makes it an ideal solution for businesses and organizations that need to connect people and devices in remote locations, or for governments looking to provide internet access to all citizens. The solution will support a large number of beams and high subscriber density and will be delivered on a space-hardened platform optimised for low power and size. It includes a range of advanced developments in the areas of beam-to-cell mapping, beam forming, NTN beam management and well-defined interfaces to SATCOM infrastructure.

The O-RAN compliant gNodeB leverages Radisys' split NTN-capable CU, DU software with AccelerComm's LEOphy and RFDSP's Low-Phy, a Layer 1 modem that delivers enhanced performance for low-earth orbit satellite communications combined with TTP's DFE and Beam Scheduler. Radisys' CU/DU supports optimized mechanisms for handling signaling load due to high mobility, along with a power-optimized scalable software that manages the varying system requirements of beams and users. LEOphy boasts the lowest error rates, with dedicated features to overcome the specific challenges of NTN channels, such as high path losses, differential delays, Doppler shift, long propagation delays, and rapid fluctuations in signal amplitude and phase caused by atmospheric effects. As a result, it ensures a high-reliability link without having to resort to lower coding rates and low-order modulation schemes, thereby maximising spectral efficiency. TTP's DFE supports Crest Factor Reduction (CFR) to improve the efficiency of the

RF power amplifier and its Beam Scheduler enables optimized beam hopping and switching functionality to maximize network capacity based on real-time traffic demands.

The 5G Regenerative gNodeB is combined for an end-to-end NTN solution, with Radisys' 5GC, available on Kubernetes container platform and small form-factor x86, ARM, and which can handle both NR-NTN and IoT devices.

"Deploying 5G gNodeB on a LEO satellite payload, brings a unique set of challenges for satellites passing over at extremely high speeds, including large cell coverage optimization, high doppler handling and users' mobility," said Munish Chhabra, SVP and General Manager, Software and Services at Radisys. "With onboard regenerative deployments, the complexities compound. Onboard power and resource constraints require low compute, storage footprint CU, DU software and performance-efficient beam hopping that goes beyond 3GPP specifications. Radisys is excited to partner with AccelerComm, RFDSP and TTP to define and develop an NTN solution addressing the regenerative gNodeB challenges and enable their customers to deploy LEO constellation satellite services."

"There has been an explosion in interest around combining satellite and traditional mobile communications systems," said Rob Barnes, Chief Marketing Officer at AccelerComm. "However, for satellite 5G to be truly successful there are a number of performance and efficiency challenges which have to be overcome. Solving these requires building on the existing 3GPP technologies to create a tailored solution built to deal with the unique challenges of operating around a thousand kilometres from Earth at speeds of over 7km per second, all while dealing with power and resource constraints. We are delighted to be working with our partners Radisys, RFDSP and TTP to develop this high-performance solution which will open-up a whole new market for delivering 5G services from space."

"A 5G NTN LEO regenerative gNodeB deployment presents unique challenges when compared to Terrestrial gNodeB. In order to serve the number of beams and support the density of subscribers required, the gNodeB will have to be heavily optimised and tightly integrated with the overall payload functionality." Said Peter Kibutu, TTP's Advanced Technology Lead NTN. "TTP is pleased to partner with AccelerComm, RFDSP and Radisys to define a highly scalable and low power gNodeB solution, that will enable LEO operators to efficiently deliver 5G NTN services."

"Recognizing the growing demand for 5G physical layers for non-terrestrial applications and their unique requirements, based on our conformance-tested 5G NR low PHY for terrestrial networks, we built a fully-featured 5G low PHY solution for NTN including a unified interface with high PHY for both options 6 and 7.2x, Doppler shift compensation, digital front-end design, beamforming, and control of multiple simultaneous beams for maximal spectral efficiency," said Prof. Ping Liang, founder and CEO of RF DSP Inc. "We are happy to be a part of the 5G NTN ecosystem."

About TTP

TTP provides independent system's expertise to enable Satellite operators to adopt the 5G NTN technology, covering areas such as end to end system specification, and the development, integration and testing of key components for both the 5G radio access network and user terminal ecosystem.

TTP has been a trusted partner in wireless technology and connected product innovation since the development of the first digital mobile phones. Today, we help our customers to create new products and technologies that enable connected enterprise, technologies that enhance mobility through connectivity, new interfaces between humans and technology, and technologies that learn and communicate.

From understanding a market opportunity, through concept generation to detailed realisation, we undertake all stages of technology, product and service development. Our customers benefit from the experience gained through 30 years of successful project delivery in fields as diverse as body-implanted devices; critical communications for emergency services; IoT solutions for industry transformation; broadband to aircraft and satellite communication systems. Visit www.ttp.com

About AccelerComm

AccelerComm provides complete physical layer IP solutions which enable optimal performance of 5G radio access networks and solves the challenges that would otherwise limit the throughput, latency, and spectral efficiency of 5G, by mitigating the effects of noise, interference and poor signal strength. The company is active in a number of industry associations including the O-RAN ALLIANCE and Small Cell Forum. Visit www.accelercomm.com or follow @AccelerCommon Twitter.

About Radisys

Radisys is a global leader in open telecom solutions and services. Its disaggregated platforms and integration services leverage open reference architectures and standards combined with open software and hardware, enabling service providers to drive open digital transformation. Radisys offers an end-to-end solutions portfolio from digital endpoints, to disaggregated and open access and core solutions, to immersive digital applications and engagement platforms. Its world-class and experienced network services organization delivers full lifecycle services to help service providers build and operate highly scalable and high-performance networks at optimum total cost of ownership. Visit www.Radisys.com.

About RF DSP

RF DSP Inc provides high-performance 5G and 4G low PHY, O-RAN eCPRI fronthaul, complete NB-IoT PHY (high and low PHY) FPGA IPs for terrestrial and non-terrestrial networks (NTN), O-RAN M-plane software, and design services to enable customers to quickly bring to market split 6 or 7.2x Open RAN products. Our O-RU IP includes O-RAN CUS-planes supporting multiple bands, multiple component carriers, mixed numerologies, and MIMO beamforming. Our O-RU reference design includes M-plane software and a PHY-layer end-to-end System Development Environment for O-RAN (O-RAN SDE) to support the development and conformance testing of O-RU products. We also provide optimized NTN solutions that support large Doppler frequency shift compensation, beam control and management for maximal spectral efficiency through spatial multiplexing. Visit www.rfdsp.com.

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