Unlicensed, unlimited:
Metnet 60G

Exploring how Metnet 12Gbps 60GHz 3D SON™ mmWave access and backhaul liberates operators and new players to harness the unlicensed opportunity

3D SON™   60GHz

Introduction

Towards multi-gigabit and 5G

The mobile ecosystem is in a constant process of innovation. The market is clearly focused on the move to 5G and, while 5G is currently moving from concept to fully commercialised technology, its impact is being felt today as anticipation builds towards the promised ultra-fast speeds and ultra-high quality of service.

Although – right now – we cannot definitively say what 5G will ultimately become, a number of the key performance requirements are already known, specifically:

- Very high capacity of up to 10Gbps

- Requirement for much more spectrum with a new focus on microwave and millimetric wave frequency bands

- Very low latency for control of real-time applications as well as inter base station synchronisation

- Extremely robust communication paths for critical services

- Small cell-centric, with ease of installation and planning key

The long-term capacity requirements for both fixed and mobile access and backhaul networks will clearly be multi-gigabit. This will need to be delivered with low latency, high QOS, robust synchronisation and reliability in an interference-limited environment and be capable of being deployed with simple installation at low cost.

Although the anticipated schedule for the commercial deployment of 5G is post-2020, the increased requirement for spectrum is impacting the current decisions of both regulators and mobile operators. In July 2016, the FCC – in ruling FCC 16-89 – opened up a vast swathe of mmWave spectrum for use across a wide range of applications. This order successfully positioned the US as the first country in the world to identify and allocate a large amount of high frequency spectrum for 5G applications, both fixed and mobile. Dependent upon the frequency of spectrum allocation, the identified frequency bands are available under wide-area licensed, unlicensed and shared bases. This new framework – referred to as the Upper Microwave Flexible Use Licensing (UMFUL) – serves as the blueprint for how the FCC will pursue flexible use licensing in additional millimetric wave bands in the future.

Band identifier	Frequency range	Bandwidth	Channelisation	Licensed
28GHz	27.50GHz-28.35GHz	850MHz	2x425MHz unpaired blocks	Yes
37GHz	37.00GHz-38.60GHz	1,600MHz	8x200MHz unpaired blocks	Yes
39GHz	38.60GHz-40.00GHz	1,400MHz	7x200MHz unpaired blocks	Yes
64GHz-71GHz	64.00GHz-71.00GHz	7,040MHz	4x1760MHz unpaired blocks	No

Riding the mmWave:
the key drivers

With 60GHz formally identified by the FCC as a 5G band, there now exists a regulatory framework supporting the outdoor deployment of 60GHz units – removing significant license barriers and offering greater opportunities for both established mobile operators and new, disruptive players looking to deploy backhaul or access networks and enter the market with competing services. The proposed 5G frequency bands include the most recognised bands above 24GHz and below 90GHz, with decisions on these bands due to be made at World Radiocommunication Conference in 2019.

As a result of the clarification of the 5G spectrum allocation in the US, the market has developed world-wide. Organisations today are increasingly considering the benefits of mmWave technology for Fixed Wireless Access, wireless backhaul, and smart city connectivity. mmWave technology can now prove a cost-effective solution to meet the exponential increases in data demand – offering a much cheaper and more practical solution than deploying fibre to every premises, and delivering far higher capacity than sub-6GHz or existing microwave technology.

CCS Metnet System

CCS Metnet self-organising mmWave access and backhaul system provides many of the key requirements of 5G plus an upgrade path to true 5G, encompassing attributes including:

- Zero alignment installation process

- Zero requirement for frequency planning

- Topology that is self-organising, self-healing, self-optimising and robust

- Discreet form factor suitable for deployment at street level in a dense urban environment

- Node to node range of ~300m-250m at full data rate with the possibility of increased range at reduced data rate

- Low latency

- Distributed GPS timing protocol with ability to provide both SyncE and 1588

- Flexible network architecture with SDN features for automated provisioning and management

Now introducing:
CCS Metnet 60G

CCS Metnet 12Gbps unlicensed 60GHz mmWave backhaul system has been developed for both existing mobile operators and new entrants looking to harness the potential of the unlicensed spectrum opportunity.

Metnet 60G is the first element in CCS's new Software-Defined Network architecture, with multiple Metnet 60G nodes combining to function as a remotely managed SDN-capable networking switch.

Operating in the unlicensed mmWave spectrum band from 57GHz to 71GHz, ultra-high capacity 12Gbps multipoint Metnet is optimised for performance today, while providing a clear path to much higher multi-gigabit capacity. Metnet 3D-SON™ delivers advanced proprietary interference avoidance utilising time, frequency and space switching agility to manage co-ordination and co-existence with other 60GHz systems. With a wide 300° field of view, Metnet 60G nodes connect autonomously to form flexible MPtMP (mesh) self-organising, self-healing networks that dynamically reconfigure to optimise performance and spectral efficiency as the physical environment or traffic levels change. Applications include small cell, 5G FWA and enterprise access and backhaul, Wi-Fi and CCTV backhaul, and fibre and G-Fast extension.

The CCS Metnet 60G unlicensed 60GHz mmWave system enables flexible deployments which can easily be adapted to match customers changing requirements. Low-cost high range Metnet 60GHz CPEs can be automatically included in the mesh to support high capacity and low-cost FWA subscribers.

Metnet currently supports Wi-Gig and will support future 5G standards for both access and backhaul. Harnessing high-capacity phased array transceivers, Metnet's next generation roadmap will provide 10's of Gbps of switching capacity. The next-generation mmWave platform can support 24GHz-42GHz, while other bands such as E-band, W-band can be supported as required. Metnet's core 3D SON™ capability drives unparalleled end-to-end QOS, interference control, synchronisation and scalability – for ultimate 5G performance and next-generation future-proofing.

Advantage over contention-based systems

Alternative 60GHz Wi-Gig systems are designed to operate in an ad-hoc environment and will have similar characteristics to Wi-Fi (at much higher capacities). Detailed frequency planning could mitigate some of the disadvantages, but in an unlicensed band the interference environment is inherently unpredictable.

Metnet uses distributed co-ordination and dynamic interference avoidance over multiple radio links to provide end-to-end quality of service level to the end user under these conditions.

In unlicensed radio system deployments, the challenges are immeasurably worse than planning in a licensed band. While it's difficult and costly to plan in a licensed band such as 28GHz, requiring people at both ends and much upfront analysis, it is at least theoretically possible. With 60GHz unlicensed WiGig based implementations, external interference from other networks becomes a critical and unpredictable factor, requiring a scalable and dynamic solution for managing the system.

Metnet 60G has been developed with a distributed awareness of the local and global interference environment, resolving issues via a co-ordinated system and schedule that overcomes the interference problems seen in other Wi-Gig-based systems. Metnet leverages proven, low-cost Commercial Off The Shelf (COTS) hardware technology, matching a Wi-Gig system from a cost perspective, but provides carrier-level quality through the distributed SON algorithms. Through this approach, the Metnet platform enables the delivery of end-to-end throughput guarantees and end-to-end QoS levels on a network-wide basis.

While traditional Wi-Gig is designed to support point-to-point or point-to-multipoint deployments, these topologies are unsuited to the dense urban deployment being targeted in unlicensed applications for small cell backhaul and access. The traditional necessity for multiple radios on a lamppost, difficulty of installation, and additional overheads in terms of alignment and frequency planning mean that traditional Wi-Gig systems simply do not offer a long-term, scalable solution. These issues are resolved through Metnet's self-organising mesh capabilities. A further advantage of the Metnet architecture is that the same equipment can be used for both backhaul and access, which is highly desirable for operators.

Metnet's discreet, de minimis form factor and single unit per lamppost satisfies most urban planning requirements. Metnet 60G nodes are uniquely self-organising, with a wide 300-degree field of view that enables plug-and-play installation in under 15 minutes, with no need for radio planning or manual alignment. Metnet's unique multipoint-to-multipoint architecture with self-healing topology offers high availability and resilience, and the system is easy to scale as existing nodes automatically re-organise and re-align as the network is expanded.

Metnet 3D SON™

Metnet SON derives its strength from interference monitoring and dynamic scheduling and routing to manage the interference environment. Metnet 60G 3D SON™ enhances the existing Metnet spatial TDMA capabilities – a space/time switching schedule that enables multiple nodes to transmit without generating interference – and enables the use of dynamically assigned frequency channels.

This distributed space, time and frequency agility creates a system that is highly robust in terms of managing interference – with now three dimensions of control that can be adapted to solve the problem. By encompassing a three-dimensional solution – time, frequency and spatial (transmitting in different directions or routes around the network in a mesh) – Metnet offers interference management capabilities, and a unique ability to adapt to external interference and environment.

With Metnet 60G 3D SON™, operators gain the ability to deploy quickly and cost-effectively, benefitting from high-quality of service, end-to-end backhaul and access, robustness and resilience, with the ability to scale and grow the network flexibly to densify or change elements as required.

Another important advantage of Metnet 60G is distance covered. By using silicon germanium based (SiGe) technology, Metnet is able to achieve high EIRP (radiated power) with its phased array antennas, giving a longer range than conventional Si based transceivers for equivalent throughputs. Moreover, the Metnet 60GHz system couples its high capacity with very low latency – significantly better latency and jitter than with a 60GHz Wi-Gig system, and actually exceeding the requirements for next-generation radio and 5G.

CCS Metnet 60G datasheet

Metnet 60G	
Frequency band	60GHz mmWave unlicensed Full 57GHz to 71GHz band
Topologies	MultiPoint-to-MultiPoint (MPtMP) mesh Point-to-MultiPoint (PtMP) Point-to-Point (PtP)
Capacity	12Gbps per Node
Radio access	Metnet SON utilizing S-TDMA Dynamic TDD Self-organising zero frequency planning, interference aware with time and frequency switching agility
Beamwidth	Wide 300° field of view
Antennas	Beamforming Phase array 16x2 element arrangement 20dBi gain per antenna
Channels	Multiple 2160MHz wide channels 802.11ad Wi-Gig compliant
Modulation and coding	13 levels of adaptive encoding
Transmitter	20dBm SiGE based
Effective radiated power	40dBm per sector
Range	300m at MCS10 (3Gbps)
Interfaces	Up to 4 Ethernet interfaces 2 x fixed RJ45 100/1000 Base-T 2 x optional 10Gbps SFP (Optical or Electrical)
Ethernet services	Native Ethernet 802.1Q (VLAN tagging) 802.1p (Class of service) Differentiated Services Code Point (DSCP) 802.1ad (QinQ)
Power	100V - 240V AC / 50 - 60Hz 48V DC and PoE (1 x PD interface IEEE 802.3bt)
Dimensions	Height: 265mm, Diameter : 150mm (Max)
Weight	3.5 kg

Software-Defined Networking

Metnet 60G mmWave is the first product release within CCS's new Software-Defined Network architecture, and part of the evolutionary roadmap towards next-generation radio. Multiple distributed Metnet 60G nodes combine to provide an SDN-capable networking switch, which can be managed either through the Metnet Element Management System (EMS) or a third-party management system acting as an OpenFlow SDN controller.

Metnet's SDN architecture enables the intelligence of the network to be abstracted, centralised and standardised. The network elements are configured automatically – often via the cloud – according to the network plan that has been built. This eases the deployment of complex network architectures, as all learning and configuration is removed from local switches and instantiated in the network from a coherent, centralised plan as part of the operators existing management platform. There is no requirement for network provisioning of individual network elements in the Metnet system as each node is immediately provisioned via the SDN.

Although providing a coherent standards-based network management interface, multiple Metnet radios are connected in a true mesh, with traffic that can be routed through different radio paths, and the ability to use multi-path routing within the mesh for load-balancing and resiliency. This innovation provides significant improvements.

As the industry progresses towards 5G, the Metnet system and software-defined network architecture seamlessly support the move to large-scale software-defined networks.

Applications: unlicensed spectrum, unlimited opportunity

CCS Metnet 60G access and backhaul offers a compelling solution across a variety of unlicensed deployment opportunities for:

- Traditional mobile network operators

- Disruptive new entrants to the MNO market via the 3.5GHz CBB shared spectrum market

- Enterprise or residential access and backhaul providers

- First responder operators

- Smart City, CCTV backhaul, and IOT network operators

Summary

" Metnet 60G is the first product release within the CCS Software-Defined Network architecture, and part of our evolutionary roadmap towards 5G next-generation radio.

With this new product, CCS is leveraging the low cost base of proven component technology and combining it with the unique Metnet self-organising mesh architecture, to deliver a vastly superior solution that guarantees end-to-end capacity and quality of service and resolves the issues around point-to-point network alternatives.

Metnet's co-ordinated, 3D SON™ interference-aware technology and ability to organically scale makes it a truly ideal solution for new entrants looking to take advantage of the exciting unlicensed 60GHz and 3.5GHz shared spectrum opportunity. For existing mobile operators, Metnet 60G provides a robust and future-proof platform for network densification via small cells and, ultimately, the widescale roll-out of 5G.

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Speak to our team
To arrange a free consultation with our dedicated experts, please get in touch.

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