Høring av lokale 5G-nett i 3,8-4,2 GHz-båndet

Consultation of local 5G networks in the 3.8-4.2 GHz band

Comments of Cisco Systems, Inc.

Cisco Systems, Inc. (Cisco) is a global provider of networking solutions and products that support the needs of enterprise and service provider customers, including in Norway. Cisco applauds the work of Nkom in releasing this consultation document. We agree that there is growing interest and demand for spectrum resources that can be used by local 5G networks, including spectrum at 3.8-4.2 GHz that is increasingly being used in Europe for local network deployments. We provide brief comments, below.

Nkom should facilitate local networks in 3.8-4.2 GHz

Cisco agrees that the 3.8-4.2 GHz band (3800-4200 MHz) is an important 5G band with a large available bandwidth, and which will meet the need for capacity for local and private networks. The flexibility of 5G technology enables its use for more than general purpose public networking, and many enterprises and government verticals are interested in deploying local networks as part of their operations.   This band is already in use in other European jurisdictions, such as the UK, and is supported by 3GPP standards. It is adjacent to 5G pioneer spectrum in the 3.4-3.8 GHz range that is important to meet service provider mid-band requirements.

Cisco encourages Nkom to consider flexible local license conditions, and specifically, not to include restrictions on fixed or mobile use. While the large majority of enterprises would likely utilize the local network option under a fixed wireless access network topology, there are enterprises with large geographic areas that might wish to utilize the spectrum for on-premises mobile needs as well.

Nkom has indicated it will take steps in licensing local networks to protect fixed satellite downlink facilities, and we agree that such protection is both possible and necessary. Most enterprise use will be indoor, and therefore presents far less risk of interference to fixed satellite downlink facilities. Outdoor local 5G networks can also be considered, provided that they are geographically separated from satellite downlink earth stations.

Cisco is enthusiastic about Nkom's intent to open the band for local networks in the first half of 2022. We can assure Nkom that customers are highly interested in deploying local 5G and that technology will be ready to meet demand.

Local Network Permits Must Support Use Cases

Nkom has proposed a number of permit conditions that will ensure enterprises can utilize the band effectively and that the permits will result in the spectrum being utilized. Specifically, Cisco agrees:

- Permit applications can be made for up to 80 MHz for a given geography. This will ensure multiple spectrum rights holders can operate on adjacent frequency bands.
- Geographically delimited areas specifically tied to the applicant's operations are preferred. This spectrum should be operated under conditions that are differentiated from large, national public networks. This provision also ensures good spectrum re-use, enabling the maximum number of users in the band.
- A 12-month deadline from the issuance of the permit to deploy local networks is reasonable.
- A 5-year duration of the license period is reasonable. Cisco recommends that Nkom specify an expectation of renewal for all licenses in good standing.
- A low power license with the ability of the permit holder to flexibly place base stations provides the best opportunity for enterprises to configure their networks as needed, particularly for indoor operations.
- A higher power license with the requirement that the permit holder specify the location of its base station is important to protect other local permit holder operations from interference, as well as protect fixed satellite downlink.

With respect to the low power permit, the consultation provides that:

> Within a radius of 50 meters from a pre-approved center location, the holder is free to set up base stations as required, with a maximum radiated power of up to 24 dBm EIRP, and a maximum average spectral power density of 18 dBm / 5 MHz.

The consultation further provides that "several" low power permits can be granted to ensure coverage in a limited geographic area. In Cisco's view, so long as an enterprise can acquire the necessary permits needed to facilitate 5G operations on its premises, the regulations will support the use case. If that is not Nkom's intent, then Cisco recommends deletion of the 50 meter rule, and replacement with a rule that specifies that the permit can be obtained for an enterprise premises without regard to a 50 meter radius polygon.

With respect to the high power permit, Nkom has proposed that it be restricted to outdoor use including, for example, fixed, wireless broadband, and to cover larger areas such as industrial parks, ports, mining, and timber harvesting operations. As proposed, the high power permit applies to a single base station with a maximum radiated power of 42 dBm EIRP, and a maximum average spectral power density of 36 dBm / 5 MHz. Cisco suggests that Nkom consider raising these levels to 47 dBm/10 MHz. There are several reasons to support higher

power. One, the propagation characteristics of the band are such that higher power is necessary to support networking requirements. If for example the enterprise needed to use an outdoor base station to deliver connectivity to an indoor location, the power level proposed could present a challenge unless the base station is very close geographically to the building. Furthermore, massive MIMO antenna technology and beamforming are likely to be utilized in these networks. Signal strength will be compromised if power is not set above 42 dBm EIRP when multiple beams are deployed. As a result, more outdoor base stations would be required, making deployment more expensive and complex than it needs to be. Finally, an enterprise might choose to operate on a single 80-MHz wide channel. That configuration would require power higher than the proposed 42 dBm EIRP limit. A 47 dBm EIRP level is consistent with international norms, such as the US FCC CBRS Cat-B equipment.

We agree with Nkom that high power outdoor operations will require greater co-channel geographic separation or frequency separation in the planning and permitting process. The higher power levels we propose will have an impact on that analysis and require greater separation. The trade off, however, is a more useful and efficient network for the enterprise user.

In its consultation, Nkom suggested that, within the 3.4-3.8 GHz band, synchronization of high power outdoor base stations between operators will not be necessary. Depending on future demand, however, synchronization could open the opportunity to more intensive use of the spectrum resources. Rather than declaring synchronization unnecessary, Cisco recommends that Nkom encourage stakeholders to themselves coordinate their systems as necessary, using synchronization to best facilitate maximum use of the band. Cisco agrees that no requirement for synchronization is needed now.

With respect to synchronization with national networks in the 3.4-3.8 GHz range, Cisco urges Nkom to ensure that national operators will be able to take full advantage of their spectrum licenses to provide public services. We encourage Nkom to consider how to ensure that, particularly for licenses in the lower part of the 3.8-4.2 GHz band, synchronization and coordination with the adjacent service provider network can be supported.

In the consultation, Nkom observed that a 10 MHz frequency separation may be desirable for frequency-adjacent local networks. Cisco urges an alternative approach. If local network permits become so concentrated that adjacent channel operation is needed to accommodate demand, then permit holders should synchronize network operations. Nkom can therefore expect to issue permits to a minimum of five permit holders per geographic area where those permits can be up to 80 MHz in size. A requirement for a 10 MHz separation wastes spectrum and results in smaller allotments of spectrum in use or fewer permit holders per geographic location.

Use of numbering resources

The consultation document also asks about use of numbering resources, the use of MCC 242, MNCs and the use of numbering resources for completely closed and delimited networks. In Cisco's view, our customers want the flexibility to be able to deploy both local networks that interconnect with public communications networks and local networks that are not connected. For example, industrial Internet of Things networks are far less likely to be interconnected with public communications networks. However, there are many use cases where interconnection with public communications networks would be beneficial, for voice, data and video.   In addition, enterprises rely heavily on inter-enterprise communication for applications and continue to migrate some of the applications to a hybrid cloud strategy which requires enterprise traffic to traverse public communications networks for day-to-day operations of their industry. The choice is highly dependent on the enterprise and the benefits that the enterprise seeks to obtain from the locally licensed network.

Cisco recommends supporting the use of both MCC 999 (provided by the ITU for private networks) and MCC 242 for the private networks. MNCs should then be assigned to local networks.

Based on discussions with enterprise customers and certain service provider partners, Cisco understands there are specific use cases which require seamless mobility and roaming capabilities of enterprise devices from (a) a private network to a public network or (b) coverage for a private network owned by the same enterprise in different countries. For example, an enterprise might need to track inventory or an asset that is moving from one facility where the transmitter is connected to the private network, then migrates to a public network as it is in transit, and eventually connects to the private network of the same enterprise but in a different location.

In this example, if the initial and new private network location are within Norway, use of MCC 242 could be a good option, as the enterprise could negotiate one roaming agreement with a Norwegian service provider. But if the radio is moving between countries, then use of MCC 242 is less desirable, and MCC 999 becomes a better option. With MCC 999, this issue could be resolved with a unified roaming agreement across macro networks and supporting private networks in other countries beyond Norway.

Based on engagements with various enterprises, Cisco believes the enterprise facilities tend to be distributed beyond a single country and hence support for MCC 999 will allow for less cumbersome ways of managing devices. In general, Cisco recommends allowing both MCC 999 and MCC 242 support for private networks and the choice could be driven by specific enterprise use cases.

In addition, based on discussions with enterprise customers and understanding of use cases, Cisco recommends enabling support for E.164 number routing on private networks. Devices connecting to the private network are expected to roam and connect to public networks in

certain cases. For example, a tablet or a smart device might be enabled with a "dual persona" to communicate with both a private network and a public network at the same time. Having to enable a different identity for the device while on private and public networks poses operational challenges. Cisco believes enterprise customers will benefit from allocation of E.164 numbers when needed to be able to perform device management operations or specific use cases that require private and public collaboration and communication.

Nkom proposes allocating two MNC codes, where Nkom assigns underlying MSIN series upon application to players who need their own dedicated IMSI resources. Cisco supports the proposal. As we understand it, this approach will facilitate roaming between a private enterprise footprint and service provider footprint with EPLMN features. For those enterprise customers who prefer not to interconnect with service provider infrastructure, eSIM capability can be used to access service provider network. Voice can also be supported as over the top application.

Cisco thanks Nkom for the opportunity to comment. If you have further questions, please contact Monica Sylvander at msylvan@cisco.com