Huawei market answer on the "Nota Mobiele Communicatie 2017"

Working together towards a

Better connected world

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1 Introduction

The world of mobile communications is making big changes every 8 to 10 years in the technology and market approach. The initial 2G and 3G networks were mainly designed for voice services, the 4G network is mainly data driven and the evolution step to 4.5G together with the revolutionary step to 5G will allow to introduce new services and applications. The major change in the network topology is the way how voice is handled in the network. Where the classic networks were voice centric, the new networks will handle voice as one of the services over the data barrier. Because of the network topology changes, the different wireless communication networks will melt together into one physical wireless network with a focus on data. This will be the foundation of the future 5G network.

In this NFO market consultation, 3 bands are considered where we see that all parties can gain from the addition spectrum and from Huawei point of view, the spectrum is the most important asset of a mobile network. The offered bands all have complete different characteristics where there is a distinction between the coverage layer supported by the 700MHz and the capacity layer supported by the 2100 MHz. Although the 700 MHz spectrum is currently appointed to the 5G technology, it will be a matter of market needs how this spectrum will be used in 2020.

When new mobile technology is introduced, this happens on average every 8 to 10 years, parties acting in this environment need to be able to plan the business models ahead. The EU is promoting an auction cycle every 25 years, which is a good target time frame to plan the necessary investments to provide the services. Besides the pure investment in network elements, the introduction of new technology like 5G means lots of innovation and because the Netherlands, as country, likes to be one of the front runners in this technology, innovations centers in these areas are promoted by all parties including the central and local governments.

From Huawei point of view it's important to be as clear as possible on all the spectrum including the 3.5 GHz (band 42 and 43) because the potential 5G parties will have to make decisions based on availability of this spectrum. The position of the Netherlands of being market innovator in technology must be supported by innovation centers. Other relevant spectra for mobile networks in both 4G and 5G is the 2.3GHz with its large eco system, as the capacity and thin coverage layer.

2 Mobile coverage and capacity layer

In MWC 2107 the Huawei Mobile strategy was presented and one of the key focus areas was the usage of the spectrum. Utilizing as much as possible the existing site infrastructure is key. By splitting the sectors in multiple sector sites and increasing the spectrum efficiency by introducing massive MiMo, the demand for more throughput/capacity can be delivered in the most efficient way. Only after optimization of the existing site infrastructure is completed, the next phase will be the introduction of the SmallCells. This technology will again optimize the use of the operator spectrum but the site acquisition and site infrastructure will become a big impact on the city environment, which causes the operators to delay this

options as much as possible. The target spectrum for this frequency optimization are focused on the capacity layers, which means the higher frequencies between 1800 and 3500MHz.

The road to 5G and providing high capacity data connections starts with the 3.5 GHz spectrum and above where the current pilots also included the usage of 6 GHz and mmWave spectrum. Because of the short range of these frequencies, the allocation will be done based on typical the focus areas.

The 5G specifications, including the current introduction of the 4.5G technology, are based on 3 key technology requirements; massive amount of connections, extreme low latency and high capacity provided in one cell. To achieve these requirements the use of the current spectrum is of vital need. Where the low frequency spectrum, i.e. 700 to 900 MHz, is taking care of the thin coverage layer, the high frequency spectrum, i.e. 1800 to 3500 MHz, is providing the needed capacity. Every 20MHz provides a maximum of 150Mbps as shared medium, where the 3GPP organization has defined a maximum of 5 carriers of 20MHz can be added together to achieve the maximum network capacity of 100MHz in total. The lower frequencies can only provide a bandwidth of 10 MHz and this is why is important that the high bands capacity layer can provide the optimized bandwidth of 20 MHz.

Huawei conclusion is that the high frequency spectrum is most valuable for the mobile network to provide network capacity in both indoor and macro network. Reducing spectrum in this capacity layer will have a big impact on the user experience and it is inefficient to recover this loss with the low frequency thin coverage bands like 700MHz. By using massive MiMo solutions in the capacity layers, the reduction of spectrum will have an even bigger effect on the capacity gain provided because of its multiplication factor.

Connectivity has become a commodity for mobile users and the expectation is that the mobile network meets the high demand of reliability, coverage and capacity anywhere in the country. In the Netherlands we can be proudly state that we currently have the best mobile macro networks in the world. At the same time the connectivity and the use of the mobile networks has moved from a nice-to-have to business critical mobile network applications. The economy of the Netherlands is benefiting a lot from these mobile networks, but still 60 to 70% of the network usage is done in the indoor environment and to get the same quality networks in these places, there is still a lot of work to be done.

Within the indoor environment two types of customer needs can be identified, the business customers and the business critical customers. Both have the same requirements of the mobile network, high capacity and high availability but for the business critical customers the availability is more important than the current operator networks are able to offer. This part can be solved with two RAN options; the first option is that the enterprise company ‘purchase’ their required SLA from the existing operator networks. This option provides the benefits of the complete set of spectrum with its high capacity available from the operator but more important the operator can provide together with the vendors all the dedicated support to maintain these networks in the most efficient way. We clearly see that where today’s mobile networks are equal for all users, the future mobile networks can provide dedication based on the market needs. This also supported by the standardization bodies and is the essential cornerstone for 5G development and business success.

Ultimate is that the mission critical communication specification like defined by parties like TCCA are adopted by the 3GPP standardization and will be fully available in 3GPP release 14, which will be available within the coming 2 years. Starting from this year, priority between users can be set per event in different steps. This allows business critical communications in events even when large crowds can be expected like airports or train stations. The most important technical factor of the business critical networks is that the enterprise customer is able to change its priority of its users instantly based on demands and in this way secures the required services at any time. This technology improvement will allow more and more business critical connectivity over the operator networks. The second option is that the enterprise company builds its own private network and create full dedication based on its own business needs. With this private owned network the enterprise customer is in full control of the network and its resources but more important the responsibility lays with the enterprise customer.

Huawei conclusion is that the mobile networks for enterprise purpose can be very high demanding and in some cases have different priority settings over the regular users of the mobile network. Because of the new network capabilities where critical communications is supported by the mobile operators, more enterprise market requests can be fulfilled by the commercial mobile network. The operators will use these network capabilities towards the enterprise market as differentiator and will let the customers instantly change their user settings within their boundaries of their SLA.

To allocate 2100 MHz spectrum as dedicated low power network, in order to enable a complete eco system to build a private owned enterprises mobile networks is a valid idea. Question here is whether this usage of 2100 MHz is in line with the goal of spectrum efficiency usage. Huawei's understanding at this moment is in very few cases the spectrum efficiency will be reached and this automatically means no gain on the efficient usage of the spectrum for the Dutch economy in total. The main reason is that multiple options are open to utilize private network. For example a technology like LAA where the 2* 5MHz in the 1800 MHz band can be combined with 4 * 20 MHz in 5.8 GHz to build dedicated mobile network solutions in the coming year. Unexplored spectrum in the indoor environment are the 2.3GHz and 3.5GHz, both spectrum with lots of capacity and with a wide range in eco system including the handsets. In combination with LSA the 2.3GHz can also provide an interesting alternative without touching the current spectrum allocations of the mobile operators.

Huawei's point of view is that if enterprises do need private own mobile network. It is already possible with today's available spectrum and technology. The biggest drawback for them is the investment they have to do to build such private networks. Compared to what can and soon will be provided by the mobile networks, the choice for dedicated own network can be challenging for enterprises. The trend in enterprise networks is the use of the 3.5GHz because of the availability on devices including handsets and tablets.

Building mobile networks that can provide the high capacity data demands means lots of coordination even for an own dedicated indoor environment. To make efficient use of the spectrum by the radio access network, the coordination need to be done by one core network or from a network were different core

networks are connected. In practice it means when an enterprise company wants to build its own network in its office, the coordination with the neighbors is mandatory to avoid radio interference.

In the current setup for the 3.5 – 3.8 GHz spectrum, geographical spacing is used between locations to avoid interference issues. This is possible because the total available spectrum is 400MHz.

3 More than only voice and data

Next to the efficient use of the spectrum, Cloudification of the mobile and fixed networks is one of the key aspects to introduce dedicated services that future networks need to provide. This means that where today's networks are providing one-size-fits-all, future networks will be tuned towards the market needs. This means that the radio and core networks will become cloud based so it can be optimized to the customer's needs. More interesting becomes when services engines can provide the required services for the use cases and from Huawei point of view this will become the key factor for the 5G networks. Examples are already introduced in the current mobile network, also known as 'network slicing'. Internet of things networks and critical communications networks are slices that will be introduced this year to provide dedicated services over existing mobile networks. Where the mobile operators will use these network slices to increase the value of their assets, it will be an alternative option for single enterprises to deliver similar type of services.

4 Summary of the Huawei recommendations

From Huawei point of view it's important to be as clear as possible on all the spectrum including the 3.5 GHz (band 42 and 43) because the potential 5G parties will have to make decisions based on availability of this spectrum. The position of the Netherlands of being market innovator in technology must be supported by innovation centers. Other relevant spectra for mobile networks in both 4G and 5G is the 2.3GHz with its large eco system, as the capacity and thin coverage layer.

Huawei conclusion is that the high frequency spectrum is most valuable for the mobile network to provide network capacity in both indoor and macro network. Reducing spectrum in this capacity layer will have a big impact on the user experience and it is inefficient to recover this loss with the low frequency thin coverage bands like 700MHz. By using massive MiMo solutions in the capacity layers, the reduction of spectrum will have an even bigger effect on the capacity gain provided because of its multiplication factor.

Huawei conclusion is also that the mobile networks for enterprise purpose can be very high demanding and in some cases have different priority settings over the regular users of the mobile network. Because of the new network capabilities where critical communications is supported by the mobile operators, more enterprise market requests can be fulfilled by the commercial mobile network. The operators will use these network capabilities towards the enterprise market as differentiator and will let the customers instantly change their user settings within their boundaries of their SLA.

Huawei's point of view is that if enterprises do need private own mobile network. It is already possible with today's available spectrum and technology. The biggest drawback for them is the investment they have to do to build such private networks. Compared to what can and soon will be provided by the mobile networks, the choice for dedicated own network can be challenging for enterprises. The trend in enterprise networks is the use of the 3.5GHz because of the availability on devices including handsets and tablets.