ZTE

Response to IMDA 2nd Consultation paper: "5G MOBILE SERVICES AND NETWORKS"

June 2019

Attention to:

Ms Aileen Chia

Director General (Telecoms and Post)

Infocomm Media Development Authority of Singapore

10 Pasir Panjang Road

#10-01 Mapletree Business City

Singapore 117438

Arranged by:

Mr Eric Wang Xiao Dong

CEO

ZTE Singapore Pte Ltd,

151 Lorong Chuan, Lobby A #04-01,

New Tech Park,

Singapore 556741

Contents

About ZTE

ZTE Corporation is a global leader in telecommunications and information technology. Founded in 1985 and listed on both the Hong Kong and Shenzhen Stock Exchanges, the company has been committed to providing integrated end-to-end innovations to deliver excellence and value to consumers, carriers, businesses and public sector customers from over 160 countries around the world to enable increased connectivity and productivity.

ZTE believes in technology innovation as a core value of the company, investing more than 10% of annual revenue in R&D. The company has established state-of-the-art global R&D centres in USA, Sweden, China and so forth. ZTE has filed applications for more than 73,000 patents, with over 35,000 granted. Since 2010, ZTE has been ranked among the world's Top-5 for patent applications under the Patent Cooperation Treaty (PCT) each year, according to the World Intellectual Property Organization.

ZTE is devoted to collaborate with major operators and partners to conduct "5G+" research and exploration, demo construction, as well as commercial incubation in the areas of intelligent manufacturing, new media, smart grids, intelligent ports, intelligent airports, environment protection, tourism and healthcare, thereby facilitating the digital transformation of vertical industries in the 5G era.

Moving forward, the company will continuously strengthen its investment in major businesses and key markets, constantly improving the competencies of its major products and intensifying the cooperation with third parties in the industry, so as to promote the positive development of the industry chain.

https://www.zte.com.cn/global/about/corporate_information/Introduction

Q1: Industry's views on skills requirements and the potential job demands in the future of networks and next generation of application/use-cases with 5G technology

ZTE's response:

There was a saying within the telecommunication industry back then on 5G: "when 5G is built, it is built to enhance commercial and industrial needs." Rather than satisfying consumers' throughput needs, 5G was view as an alchemy in enriching the verticals, combining 5G and the platforms, transferring concepts into reality.

When taking a closer look into the end-to-end 5G architecture: besides the familiar Base Station and the antenna system (active & passive), you'll notice that there are more and more network elements which are basically IT-centric technology, e.g. virtualized functions that make up a 5G Core, SDN connection, network slicing services, Multi-access Edge Computing for applications, A.I. in network operations, etc.

Not too-far-off comparing to the research from local job demands, Singapore would be expecting demand in:

Companies that continue in digitalization efforts, big data, digital, e-commerce and transformation with 5G

- Applications (Data Analytics) & Ecosystem:
  - ○ Analytical and data-driven in nature – such as data scientists, product managers, UX designers, and other digital roles.
  - ○ Specialists / programmers with skills and experience in applications, for developing and troubleshooting / maintenance.
- Cyber security specialists (by vendors or optimization by users)

- System Integrators, transformation of the verticals whom will be riding on the 5G waves.
- Professionals with international and cross-border experience and knowledge, that comprehends in product management, technology law and blockchain, as well as supply chain and procurement professionals;

Q2.i) The types of innovative use-cases that could capitalize and further enhance Singapore's competitive advantages, trigger new growth potential and/or strengthen Singapore's existing strategic pillars

ZTE's response:

Source from Department of Statistics, Singapore

Over the years, Singapore has been well known for her:
- Finance & Internet;
- Logistics: Sea & Air ports;
- Safety & Security;

Finance & Internet

The Internet has had a profound effect on the financial service sector, dramatically changing the cost and capabilities for marketing, distributing and servicing financial products and enabling new types of products and services to be developed.

Fastest mobile internet speeds by country		Fastest fixed broadband internet speeds by country	
Norway	63.19 Mbps	Singapore	175.13Mbps
Iceland	58.68	Iceland	153.03
Qatar	55.17	Hong Kong	138.31
Singapore	54.71	South Korea	114.67
Netherlands	53.42	Romania	109.9

Source from Ookla

The growth in Internet-enabled products and service has been rapid in some sectors and slower in others.

- o Online + Real time Video/VR/AR services

  Shopping online with VR/AR boosting the product viewing or "trying out" would definitely improve customer convenience, satisfactory and sales; Property industries have already had such service ready to be persuaded on; mBanking or eServices may have a HD customer service, instead of just "voice" support.

- o Lifestyle / Entertainment

  It's a default feature on OTT services nowadays, where user paused or watching portion of the HD/4K show on the move, make it possible reason to continue to download and watch them on-the-go. Similar to services like HD Movie Trailers, making them more interesting and attractive; Online HD/AR/VR games on-the-go, etc.

Seaports

Being categorized & labeled as 2nd busiest sea port in the world, is not because of the flourish-ness of Singapore's economy, but on the efficiency of Port Singapore Authority (PSA) in handling the ships and the cargoes. From clearance, docking, offloading, on-carriage, etc, which all these aspects had gone through countless cycles of optimization process & scrutinizing as to reach the level of standards of what they are today. And not forgetting aspects on security & surveillance.

ZTE
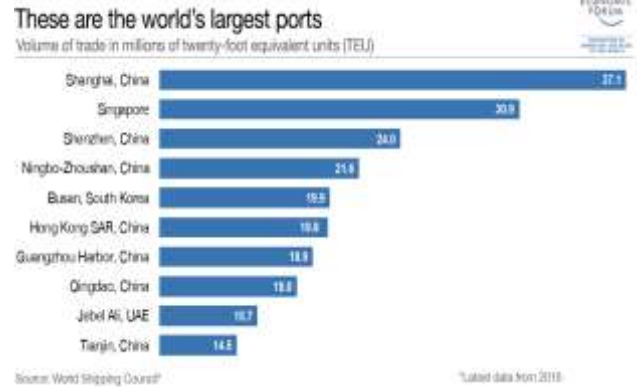
Source from World Economic Forum

Technology has definitely played a part in these improvement, till today. Some of available technology today were hindered by mobility, bandwidth, or even both. With 5G coming on board soon, we would see a true smart port emerging in coming years.

- o promotes Internet of Things and realize a variety of interconnection of mechanical equipment, sensors, tagging, etc., real-time feedback of procedures and making adjustment to improve port operation efficiency.
- o makes wireless HD video data transmission possible, with real-time people AI analysis, such as face recognition, container number recognition, combining computing and communication capabilities, port security management capabilities.
- o the low latency and high bandwidth of 5G will provide guaranteed communication for the introducing auto-driving for haulers within ports. Remote or assisted operation of cranes through videos and sensors would also improve efficiency.

Safety & Security

Singapore is considered to be one of the safest cities in the world, which crime rates are consistently low. Nevertheless, security threats are evolving (physical & cyber) and becoming more complex.

SG Defence Spending as % of Govt Expenditure
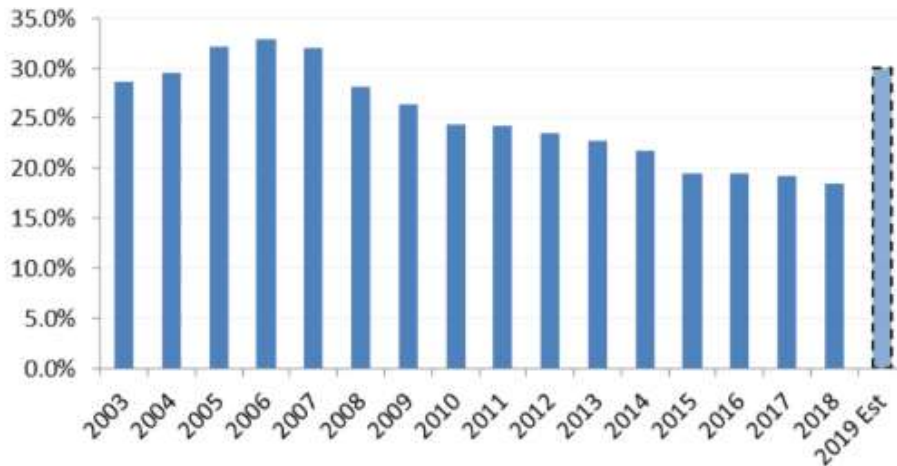
Source from OCBC Treasury Research

With the budget set apart for Home Affairs, the ministry could riding on the Smart Nation drive, step up the effort to harness on the digital advantage, widen the usage of technology on domestic / civil defense purposes.

- o Facial recognition and video analytics on-the-go and for crowd control
  With the ability to transfer HD graphics to improve the accuracy on facial recognition, it would helped in identify threats more efficiently, whenever needed.

- o Fire Fighting system, air-drone, fire-fighting android, feedback to command center
  Further improvement on already available fire-fighting system, where more drones & androids could be deployed (depending on situation), assisted by common command center. To improve the efficiency, and most of all, to cut down unnecessary injuries & reduce casualties during the process.

- o Medical Support Vehicle
  While sending the injured to the hospital, the live-communication between the vehicle and medical support team at the hospital may help to improve the survival rate; beside, the A&E department will be more aware of the condition, where helps on the preparation prior to the arrival of the injured.

Q4.ii : Whether current deployments in the 2.5 GHz FDD spectrum band (based on 3GPP Band 7)

and in the 2.5 GHz TDD spectrum band (based on 3GPP Band 38), should be refarmed to 3GPP

Band 41 for future 5G services in Singapore, and the views on the associated cost and challenges.

ZTE's response:

This year, in Singapore, Band 7 had entered into its 7th to 8th year of its operation, but Band 38 was only being in operation for about 2 years now. The equipment deployed here may still be considered fairly new. It may be hard to convince such spectrum "free-up", if there's no synergy behind such exercise.

At this current communication timeline, the adoption rate for LTE is expected to be much higher than UMTS. Looking at local UMTS spectrum would be recalled or expired by mid-2021, operators may consider refarming / redeployed them as LTE (10 or 15MHz), with minimum 1 carrier of UMTS left for basic function purposes. Then freeing up a full 200MHz of n41, could be sufficient and efficient enough to be shared by the available operators.

With our neighbors like Japan & China whom are band 41 (TDD) ready, there should be sufficient demands for terminals to incorporate n41 into their design. Not to mentioned, 2.6GHz may also has its advantages in terms of characteristics over 3.5GHz. In terms of the infrastructures, we may see the possibility of "reuse" some of them for n41 deployment.

Q5.iv) The value, if any, in assigning the remaining 50 MHz restricted 3.5 GHz spectrum in the same

assignment exercise as the unrestricted lots;

ZTE's response:

Should the remaining 50MHz be allowed to use, even if it's only meant for indoor scenario (lesser interference to "radiolocation" deployment), it would be good suggestion if it's lumped together with Lot B. This would at least putting Lot B operator, on certain extend, promotes competitions among Lot A & Lot B. A concern for Lot B operator is that the 5G terminal will need to support Intra-band CA function in order to enjoy such privilege.

On the other hand, should there be demands from non-mobile operator / industry-player, a portion of the spectrum can be opted for their requirement (or may be on mmWave). Their requirement are usually deployed within controlled coverage area. Similar to some of the idea to solution provider for Narrow Band-LTE in Singapore;

Q9.ia) Synchronised networks: the required frame alignment, compatible frame structures and

BEM specifications for AAS and non-AAS base stations;

ZTE's response:

Comparing to LTE, the definition and length of NR's frames and sub-frames remain unchanged. Nevertheless, they become more flexible, in terms of:
- length of slot and symbol;
- uplink and downlink slot configuration

Typical slot configuration

Depending on the deployment / purpose, different frame structure have their own unique strength.

Key factors in Frame Structure Selection

The table below summarize:

Parameter		2.5ms Dual Period	2ms Single Period	2.5ms Single Period
Uplink Ratio		32.9%	28.6%	22.9%
Coverage ability	Coverage	+1.8dB	+1 dB	x (Baseline)
	Uplink Capacity	+50%	+25%	x (Baseline)
	Downlink Capacity	-13%	-8.8%	x (Baseline)
Latency	HARQ latency (DL)	Equivalent	Reducing 0.275ms	x (Baseline)
	HARQ latency (UL)	Increasing 0.2ms	Reducing 0.5ms	x (Baseline)
	PDCP latency	Reducing about 0.1ms	Reducing 0.5ms	x (Baseline)
Atmospheric Waveguide		Has little effect	Has little effect	Has little effect
Overhead		x (Equivalent)	x (Equivalent)	x (Baseline)
Special Application Scenario		Better	x (Equivalent)	x (Baseline)
Adjacent Frequency Coexistence		Time slot alignment	Time slot alignment	Time slot alignment
Harmonic Interference and Intermodulation Interference		Better	Better	x (Baseline)

Q9.iii) The need for IMDA to mandate a regulatory requirement for synchronisation across the 5G TDD networks or leave it to operators to co-ordinate their network deployment and parameters in order to reduce interference between networks.

ZTE's response:

The operators had been doing well with their co-ordination on their LTE TDD network. IMDA will be playing a vital role in ensuring a certain degree of co-ordination, not only among operators inland, but across the coastline as well. Even if guard band is introduced to mitigate the interference issues for Lot A & Lot B operators, operators still need to worry about the co-channel deployment from the neighboring countries.

It's without doubt that mandating policies may hinder operators' planning and solution needs. Inter-Operators & Inter-Countries strategy alignment may still need to be led by policies maker.