CONCEPT PAPER

A Roadmap   for the Readiness of Future Network in Malaysia– Part-3: Recommendations

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1. INTRODUCTION

Digital transformation is upon us. Industry 4.0/5.0, 4G LTE/5G, Internet of Things, AI, Smart City to Blockchain, are initiatives, though originated from divergent techno-evolution threads, advanced by seemingly different communities- yet all are phenomena of the same underlying digital transformation. All the threads of this transformations, irrespective of their origin of drive however will require one thing at the core- a capable and robust national cyber/communication infrastructure (NCI).

Are NCIs ready for it? By design 5G will require a radically expanded edge infrastructure than needed by any previous mobile generations. IoT is expected to suddenly bring estimated 75 billion devices in next 5 years to internet. Every major public infrastructure and every private asset (not only every home but every appliances in them!) with have their pulse in the internet. Smart Communities will emerge as a new set of citizen centric digital services aimed to improve every aspect of community living. In short years, community governments around the world will be active and forceful political driver in digital eco-system. Artificial Intelligence (AI) driven networked applications will gain autonomous decision power on sensitive aspects of our life from personal safety to societal justice and equity. Blockchain is poised to disrupt too many business processes in too many sectors from banking & finance, manufacturing supply-chain, medical to voting management. Cloud infrastructure has already bifurcated world internet traffic reshaping global IT systems. Today more private traffic flows between data and computing centers than in public internet.

In this back drop, the NCI in most countries are deeply reflective of past than ready for the future. Except for the very top ones, NCCI's are built mostly around past 20th century telecommunication industries network infrastructure, TV and voice telephony dominated radio spectrum, and some infrastructure of internet service providers. The management of old world NCI is guided by old regimen of voice spectrum licensing, and weak or non-existent data usage or citizen's basic data protection policies. The telecommunication regulatory ecosystem has marginal participation by the players of the new economy if any. To take full advantage of the Industry 5.0 or as a digital nation, a country requires significant drive to update its NCI architecture and bold transformations in the management of the new eco-system.

The impending technological tsunami creates very interesting challenges for any NCIs. For Malaysia, the case is compelling. The bold 11th Malaysia Plan explicitly spells out her national aspiration- to bring her in the rank of the very advanced nations of the world. The yardstick is based on 'rakyat' i.e. the all-round wellbeing of its people and community. It's an ambitious goal for a five year plan. Whether it is achieved in 5 or 20 years, undoubtedly digital transformation will be key to achieve almost any pillar (it has six) of this grand initiative. To zero in further, the success, failure and speed of this journey will necessitate a capable national cyber/communication infrastructure (NCI) at the heart.

1.1. OBJECTIVE

The objective of this study project originally envisioned by colleagues of MCMC's TDC is to determine the current state of communication and multimedia infrastructure in Malaysia and generate recommendation for the future network readiness of the country.

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It is envisaged that the study will promote strategic assessment of networks planning, development and monitoring and enhance MCMC's Communications and Digital Ecosystem Sector's opportunities for engagement and collaboration with key stakeholders to provide greater impetus for the movement towards developing a national strategy to balance investments in technology and infrastructure with investments in the skills and knowledge Malaysian need to use ICTs to improve the quality of their lives, increase productivity throughout the private and public sectors and develop innovative products and services.

The outcome from the project is intended to form part of the collective body of knowledge   and information   resources   needed   to   support   MCMC Technology Development   Department' s advocacy role   on   emerging   and future   networks specifically, as well as MCMC's role in handling the many complex challenges in regulating and managing the ICT impacts of on society.

1.2. SCOPE

There are 4 main objectives of the project:

Assess readiness – propose methodology(s) that could assess the future readiness of our current networks platform in supporting the ubiquitous digital and electronics services.

Identify challenges and opportunities – gather information from relevant stakeholders to identify where are the gaps and challenges, and as well as new opportunities, that arises in deploying emerging technologies for the future network.

Establish future network requirements – determine the necessary elements to make Malaysia future ready towards becoming a smart digital nation.

Facilitate stakeholders – analyze how MCMC can assist the stakeholders in achieving the communication and multimedia objectives of the 11th Malaysia Plan as well as our National Policy Objectives.

2.STUDY PROCESS

The study was commissioned in the summer of 2017. The study benefits from an extensive on the ground fact finding effort. A suggested study team was formed with officers from MCMC's Technology Development Department and a national telecommunication focus group. The focus group included five leading communication provider organizations. These providers are deemed by MCMC as the main players in Malaysia's telecommunication industry. Together these companies represent 80% of Malaysia's current telecommunication industry by revenue and they also manage 80% of commercial radio spectrum. It was also participated by national research organizations MIMOS, the University Putra Malaysia's (UPM) next generation telecommunication systems research group, and Multimedia Universities Smart home group. The study team took a three pronged approach. The first instrument is the discussion and knowledge exchange. Half day meetings were conducted with the focus group organizations. The author also met area specialist from MCMC. More than 50 Malaysia experts- including executives, planners and engineers, from the regulatory experts, academics, and researchers made presentations, provided both issue specific presentations, and

participated in open format intensive discussion sessions. Each group provided their insight into the issues through discussion on topics including the a) current state of telecommunication infrastructure, b) about their vision, plan and activities on 5G, b) services for smart community, c) Internet of Things (IoT), d) network virtualization, and e) data centers and cloud services. Secondly, a national seminar on Future Network for Smart Digital Malaysia was conducted. It was participated by 200 experts from all the stakeholder organizations from industry, academia, and government. Third, a written survey instrument was designed and distributed to the focus group organizations. The focus group and organizations were asked to answer about 25 questions regarding all aspects on the study.

This document is the third of the documents produced. The first document provides the result of the survey. The second document identifies the challenges and the opportunities [8]. This document identifies the recommendations for Malaysia to be better prepared for FN but does not establish the requirements.

3. FINDINGS AND RECOMMENDATIONS

Overall Malaysia telecommunication industry has consistently and robustly ranked in the top third tiers[1] or better in the decade in many surveys. As per the late 2018 surveys, Malaysia's mobile smartphone coverage is reported as around 66.4% of her total population (ranked in top 25) [1]. For reference UAE leads the world (with 84%), while Japan (51%) and Thailand (51%) in the region.

An increasingly important issue is internet infrastructure's quality and health. Though there is not good comparative data sets, Pinger data was evaluated as measures of Internet health. It is a live, collecting wide range of statistics 24/7 over a decade. These Pinger indicators also point to a relatively healthy Malaysian's (low communication delay, packet loss, and good overall availability of Malaysian IP sites. Its ranks are around top 20-33% among all the countries around the world). [2].

However, it is the trajectory of the indicators where Malaysia need to work on. Countries traditionally trailing are also catching up fast adopting the best practices from their advanced peers. As a result, in last few years Malaysia's, smart phone ranking has fallen off from 10th to 21st. Similarly the current Internet Penetration Rank (IPR) for Malaysia is around 84%. The number is strong but the rank is around 80th based on latest 2017 data.

While fundamentals are right, it also indicates there are potent areas for Malaysia to rethink and improve its national NCI strategy- with understanding what it achieved, what it could not, and where it need to be in the next decade. The remaining gaps are hard to crack and very likely cannot be amended simply by prevailing strategies. I will discuss the avenues soon.

More than that, Future Network (FN) would require a quantitative change in old telecommunication management plan. The change will be well beyond the deployment of

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[1] There are many organizations which track global standing of telecommunication service indicator such as Internet End-to-end Performance Measurement (IEPM), Federal Communications Commission (FCC), International Telecommunication Union (ITU), etc.

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spectrum i.e. 5G. The game changers are i) skyrocketing demand for cloud services, ii) emergence of data driven smart communities, iii) one by one flourishing of Industry sectors that embrace Industry 4.0 and 5.0 principles; iv) deployment of billions of networked Internet-of-Things. These change agents are not independent- rather will have complex synergistic interplay.

Demand for responsiveness, emergence of massive data intelligence based applications requires a highly capable and reliable cyber infrastructure where data storage and processing are increasingly deeply embedded into conventional telecommunication network making way for a new generation of digital applications beyond voice and video.

Pioneering countries to look at include US, China, Japan, Taiwan, South Korea, Singapore, Netherlands, India, Sweden, Australia, etc. There are multi-tier plans to enter into the future network fray announcing very interesting pilot programs to take the leadership in various FN areas. Many are deploying testbeds in the FN areas; there are model initiatives for smart city and smart community programs, plans for massive IoT service deployment; planning of Industry 4.0 zones. As evident in the responses in the 2017 survey Malaysia seems to be relatively inactive in these new frontiers areas in comparison.

4. RECOMMENDATIONS

What can be done to make Malaysia future ready towards becoming a smart digital nation? Based on the assessment of Malaysia and global trends as discussed the following twenty recommendations are made aimed to promote strategic assessment of networks planning, development and monitoring and enhance MCMC's Communications and Digital Ecosystem Sector's opportunities for engagement and collaboration with key stakeholders to provide greater impetus for the movement towards developing a national strategy to balance investments in technology and infrastructure with investments in the skills and knowledge Malaysian need to use ICTs to improve the quality of their lives, increase productivity throughout the private and public sectors and develop innovative products and services.

4.1. SET NEW MCMC GOAL 80% GEOGRAPHIC COVERAGE BY 2030

1. Given the lack of geo-coverage, Malaysia must complete the network! MCMC and related organizations must address the real challenge of geo-coverage[2] head-on. This is also the viable way to solve the rural population coverage problem. MCMC should commission a study specifically focusing to map the extent and severity of geo-coverage problem and draw an action plan.

2. Urgently fit the best frequencies with best technology. Lower frequencies can reach relatively longer distances with lower power. Accelerate the reallocation of lower frequency spectrums in hard-to-reach neighborhood zones. Vacate older 2G/3G technology for newer IoT capable technologies in these golden spectrums. Migrate low density 1G and 2G subscribers in small town/village/enclaves to newer technology such as 4G LTE.

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[2] The population coverage index is not reflective of the gap.

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3. Be a pioneer in exploring non-conventional innovative technologies for widening of geo-coverage. Engage university and innovators and setup testbeds for sky based internet/LTE technology such as Alphabet (Google) Inc's Loon, or software defined radio (SDR) for ultra-low frequency (ULF) communication that can reach country-scale distances.

4.2. MARKET PLACE FOR INFRASTRUCTURE AND EXCESS CAPACITY ASSETS

4. MCMC should urgently foster sharing arrangements of civil telecommunication related capital intensive infrastructure assets (public and private buildings, ducts, right of the way in roads and highways, rooftops, public towers, lands) so there is less administrative impediment for telecommunication companies to use them.

5. MCMC should foster a market for sharing capital expensive telecommunication assets/product between the FN companies. Encourage and ease trading of excess capacity and bulk services such as bulk-bandwidth, dark fiber strands, unused spectrum, colocation facilities, etc. Even radio equipment and expensive core switch and routers will be sharable by new technology like NFV and SDR.

6. Setup online marketplace for exchange of timely and accurate product information (what, when, who to contact) to accelerate the above trading. The transparency and ease is profoundly important for the new generation of FN startup companies and service entrepreneurs to enter into market.

4.3. FOCUS ON QUALITY AND CONSISTENCY OF NETWORK

7. Step one, commission a technical study of the current status of network consistency and user-experience, including security and privacy.

8. Step two, encourage national providers to implement subsequent technical and business measures to increase the quality and consistency of the NCI for significantly improving the user experience in Malaysia.

4.4. MODERNIZE MONITORING AND ASSESSMENT MECHANISM

9. Redesign and strengthen the reporting and monitoring instrument. Add metrics in following deficient areas[3]. At least the five monitoring areas will need immediate attention: a) network quality, b) consistency of end-to-end service, c) data services, and d) infrastructure sharing, and e) data protection and security.

10. Introduce streaming based reporting. Many data elements such as bandwidth, delay link health etc. from providers' NOCs can automatically and continuously steams into this national platform. Administrative measures should be there to ensure interchangeable format, authenticity and accuracy of reporting.

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[3] The current survey can be used as a starting model for sharing dimension- but it is inadequate as it was designed with a very limited resource and participation expectation.

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4.5.   PROMOTE CLOUD SERVICES

11.   Assess the current the current cloud market and usage by the Malaysian companies. MCMC should look for means to encourage and invigorate indigenous Cloud industry.

12.   Work for commissioning National Cloud Exchange and related protocols into its NCI to ensure seamless high performance interconnect to cloud and fog systems worldwide for its businesses.

4.6.   SPECTRUM ROADMAP

13.   Reengineer spectrum. There is a need for increasing the spectrums width by band aggregation or concatenation capabilities so small to very large data rates can be flexibly supported.

14.   Rethink spectrum allocation policy. Create space for smaller but major innovative players (universities, startups, and smart communities, etc.) for innovatively using raw spectrum.

4.7.   CITIZEN'S DATA SAFETY, PRIVACY AND ETHICAL APPLICATIONS FRAMEWORK.

15.   Prioritize implementation of Individual Digital Privacy rights frameworks [2,3] so citizens can actually and meaningfully exercise their digital privacy rights given to them in PDPA 2010. This will be essential for new generation of a more personalized data intensive FN services to flourish.

16.   Work with peer international and local bodies for **Infrastructure Data Management and Protection** policy and framework to accommodate safe rollout of IoT and machine-to-machine applications.

17.   Further move towards a regulatory framework for information management and applications such as **National AI Principles**, **Fair Information Practices Principles [6].**

4.8.   ECO SYSTEM FOR FUTURE NETWORK INNOVATION

18.   Create a **MCMC Innovation Forum** to connect university researchers, entrepreneurs, engineering from FN related telco/industry units, smart community technology units, potential new IoT companies; Provide seed funding to collaborative groups from these constituencies to perform ideation studies on various aspects of FN.

19.   Setup **TRL-6 Testbed for FN Technologies** which has exceeded TRL-6 or 7 [7], such as 5G, demonstrable Smart Community, IoT Village, Public Cloud Services Center, and flagship AI (education, public health) and Blockchain govt. applications (smart voting). Malaysian University researchers, students and innovators may participate early hands-on experimentation and development on the FN technologies.

20.   Set up TRL-8 **Future Network Innovation Demonstration Center(s)** under the direct auspices of MCMC. Invite international/national companies/vendors to showcase their newest product and technology (TRL 8 or 9) as they plan to

rollout in Malaysia or in the region; MCMC policy makers, university researchers and local innovators should seek early exposure to newest.

5. CONCLUSIONS

The implementation of the 20 recommendations are specific yet substantive when viewed as a whole. Any action plan call for delineating a road-map with substantial ground planning. Implementation of any will involve extensive participation and engagement of many players in the eco-system.

The outcome from the project is only intended to form part of the collective body of knowledge and information resources needed to support the Technology Development Department's advocacy role on emerging and future networks specifically, as well as MCMC's role in handling the many complex challenges in regulating and managing the ICT impacts of on society.

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