



MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION

INVITATION TO REGISTER INTEREST

AS

UNIVERSAL SERVICE PROVIDER

Appendix 3

Technical Specifications for Part 2

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1 INTRODUCTION

- 1.1 This document outlines the technical specifications for the Radio Access Network (RAN) sharing solution to be provided under Part 2 of the Invitation.
- 1.2 Notwithstanding the above, the Interested Licensee shall evaluate and recommend any requirement that is found to be insufficient to guarantee high service quality.

2 GENERAL REQUIREMENTS

- 2.1 The Interested Licensee shall be able to understand the overall RAN Sharing system having either the Multi Operator Core Network (MOCN) or Multi Operator Radio Access Networked solution (MORAN) for 3G and 4G services with supporting multiple Public Cellular Network Providers broadcast.
- 2.2 The Interested Licensee shall provide reference network utilizing the proposed RAN sharing solutions.
- 2.3 The Interested Licensee shall state whether the deployed solution is MOCN and/or MORAN.
- 2.4 The proposed RAN sharing shall support MOCN and/or MORAN active site sharing for UMTS and LTE.
- 2.5 The Interested Licensee shall explicitly state all Base Station parameters that require mutual mobile network operator agreement in RAN sharing (as opposed to those parameters that are independently controlled by each mobile network operator).
- 2.6 The Interested Licensee shall explicitly state all Radio Network Controller (RNC) parameters that require mutual Mobile Network Operator agreement in RAN sharing (as opposed to those parameters that are independently controlled by each mobile network operator).
- 2.7 The Interested Licensee shall explicitly state all OSS parameters that require mutual Mobile Network Operator agreement in RAN sharing (as opposed to those parameters that are independently controlled by each mobile network operator).
- 2.8 The Interested Licensee shall guarantee that the user experience in the proposed RAN sharing solution is the same or better than the user experience in a non-shared network.
- 2.9 The Interested Licensee's Requirement Specifications shall comply to the following:
 - (i) 3G based on 3GPP Technical Specifications Release 8 or higher; and
 - (ii) 4G based on 3GPP Technical Specifications Release 10 or higher.

- 2.10 Interested Licensee shall clearly state which 3GPP Technical Specifications release the offered solution is compliant to.
- 2.11 Interested Licensee shall provide detailed descriptions of products. The Product descriptions shall cover both hardware and software architecture, and identify the major hardware and software components of the solution.
- 2.12 It shall be the Interested Licensees' responsibility to identify the features required and include them in the proposed solution in order to guarantee services offered by Public Cellular Network Providers in Malaysia are able to be delivered to the users.
- 2.13 The Interested Licensee shall provide hardware and software product life cycles that are within the period of the work and is capable of being modernized to meet future requirements.
- 2.14 The Interested Licensee shall give a reference list of commercially launched UMTS and/or LTE networks, with the proposed solution. The Commission reserves the right to obtain further information should it requests to do so.
- 2.15 Propose solution design considerations:
- (i) The proposed solution shall be structured such that it allows high capacity and high-speed data transmission.
 - (ii) The proposed solution shall allow linear capacity expansion by adding modules.
- 2.16 The proposed solution shall be of open architecture and open protocol, and shall be implemented to ensure interoperability between systems in a multi vendor environment.
- 2.17 The Interested Licensee shall provide list of manufacturers and corresponding equipment with whom it has completed interoperability tests.
- 2.18 The proposed RAN sharing solution shall have the capability to provide 3G services and 4G services which cover the band of Public Cellular Network Providers in Malaysia, with the capability of providing voice and data services at broadband speed.
- 2.19 The proposed RAN sharing solution shall be configured so that it can serve at least 4 numbers of carriers per sector for 3G networks and 4 numbers of carriers per sector for 4G networks to make sure 3G configuration of each Public Cellular Network Providers could be S1/1/1, 4G configuration of each Public Cellular Network Providers could be S1/1/1.

2.20 Minimum site configuration of the proposed RAN sharing solution is as follow:

	Requirement
3G & 4G hybrid site	Configuration of LTE: LTE S4/4/4, 10MHz bandwidth/carrier (S1/1/1 for each Public Cellular Network Provider) RRU: 2T4R DL MIMO 2x2; Power: 30W/carrier/TX antenna port; RRC Connected User: Minimum 400 per site; Throughput: <ul style="list-style-type: none"> • 20 Mbps download • 10 Mbps upload
	Configuration of UMTS: UMTS S4/4/4, 5MHz bandwidth/carrier (S1/1/1 for each Public Cellular Network Provider) RRU: 2T4R Power: 20W/carrier/TX antenna port; CE number: 1024 per site

3 BASE STATION

- 3.1 The proposed RAN sharing solution Base Station Equipment shall be divided into Base Band Unit (BBU) and Remote Radio Unit (RRU).
- 3.2 The proposed RAN sharing solution BBU and RRU shall support network topology: 'star', 'chaining', and 'star & chaining Mixture'.
- 3.3 The proposed RAN sharing solution BBU and RRU shall support CPRI interface.
- 3.4 The architecture of BBU shall comply with corresponding industry standard 19inch Rack.
- 3.5 The proposed RAN sharing solution shall support Multi-RRU for one cell function.
- 3.6 The proposed RAN sharing solution base station shall support the UMTS and LTE simultaneously.
- 3.7 The proposed RAN sharing solution shall support 2T4R minimum and additional options shall be proposed to support 1T2R, output power per carrier per TX antenna port shall be minimum 20W for UMTS.
- 3.8 The proposed RAN sharing solution shall support 2T4R minimum and additional options shall be proposed to support 2T2R, output power per carrier per TX antenna port shall be minimum 30W for LTE.
- 3.9 The proposed RAN sharing solution shall support DL 2x2 MIMO minimum for LTE.
- 3.10 The maximum number of RRU per sector shall be limited to 2 (two). Additional options can be proposed with justification.

- 3.11 The Antenna Feeder System (AFS) shall include antennas, RETs, all required RF accessories and components. The proposed antenna shall be 4 ports Dual Band Antenna.
- 3.12 The Interested Licensee shall confirm that the proposed RAN sharing solution is capable of allowing mobile network operators to share:
- (i) Spectrum
 - (ii) Node B/eNodeB Sites
 - (iii) RF sub-systems (Antennas, Feeders, Combiners, Diplexers, MHAs)
 - (iv) Node B/eNodeB Power Amplifier
 - (v) Node B/eNodeB Baseband
 - (vi) Node B/eNodeB Transport
- 3.13 The proposed RAN sharing solution shall support the ability to implement flexible base station resource reservation (e.g. Base Band, Transport, Radio etc) between the sharing Mobile Network Operators in their MORAN and MOCN network sharing solutions. Licensee shall describe any resource reservation restrictions that apply in their response to this requirement.

4 RADIO NETWORK CONTROLLER (RNC)

4.1 The Interested Licensee shall provide a general description of its Radio Network Controller (RNC). The description shall include, but not be limited to:

- (i) Functionality
- (ii) Architecture
- (iii) Configurations
- (iv) Interfaces
- (v) Capacity

4.2 The Interested Licensee shall provide the RNC capacity description in full configuration, including but not limited to Erlang, BHCA, cell number, Node B number and lub data throughput.

4.3 The traffic parameters is as follows:

Traffic Parameters	Value
eBHCA/sub	32.2
CS voice penetration ratio	100%
CS data (voice Phone 64k) penetration ratio	30%
Voice Traffic per CS voice sub in BH(erlang)	0.031
CS data traffic per CS data (video Phone 64k) sub in BH (Erlang)	0.0002
CS voice call duration (sec)	60
CS data (Video Phone 64k) call duration (sec)	60
PS (including R99 and HSPA) Penetration Ratio (% of Total	100%
Proportion of UL PS (including R99 and HSPA) throughput	20%

5 UMTS SPECIFIC

5.1 The Interested Licensee shall state the Channel Element (CE) consumption (CE Ladder) for all available and supported UMTS bearer services for both downlink and uplink (e.g. Voice, Circuit-Switched 64kbits/s, Packet-Switched 384kbits/s, different HSDPA and HSUPA RABs etc.)

5.2 The Interested Licensee shall describe, if applicable, the support of CE resource pooling feature for UMTS and HSDPA/HSUPA traffic.

5.3 The maximal CE provided by one NodeB shall up to 1024 for both Uplink and Downlink to meet the requirement of High data rate services.

5.4 The Node B shall support the full AMR (Adaptive Multi Rate codec) standard for voice.

- 5.5 The Node B shall support full HSDPA (High Speed Downlink Packet Access) features and functionalities.
- 5.6 The Node B equipment shall support full EUL (Enhanced Uplink), also known as HSUPA (High Speed Uplink Packet Access) features and functionalities.
- 5.7 The proposed RAN sharing solution shall support multi carrier power optimization function which can reduce the transmission power of non-camping cells to save energy and improve system capacity.
- 5.8 The proposed RAN sharing solution shall be capable of supporting Mobile Network Operator specific Flexible Iu
- 5.9 The proposed RAN sharing solution shall be capable to give full flexibility for each operator to plan their location area independently.
- 5.10 The proposed RAN sharing solution shall be capable to give full flexibility for each operator to plan their scrambling code independently.
- 5.11 The proposed RAN sharing solution shall allow each operator to deploy their own radio capacity management strategies.
- 5.12 The proposed RAN sharing solution shall support admission control for the UE which is in the DCH status in the shared network or on the boundary of the shared network and unshared network, according to the subscription relation with the operator.
- 5.13 The proposed RAN sharing solution shall support the following functions:
- (i) Operators of the shared RAN can configure relevant features operation parameter separately.
 - (ii) Quality of Service (QoS) priority can be configured based on Public Cellular Network Providers so that each operator can have individual QoS strategy.
 - (iii) The Iub/Iur transmission resource can be reserved for different operators.
 - (iv) RNC capacity of CS traffic volume and PS throughputs can be separated and reserved to different operators.
 - (v) Providing the cell-level FM (Fault Management)/PM (Performance Management)/CM (Configuration Management) for specific operator.
 - (vi) Supporting baseband CE resources sharing by different operators when they sharing RAN. And the proportion occupied by each operator can be configured by OMC.

6 LTE SPECIFIC

- 6.1 The Interested Licensee shall provide a description of the baseband capacity for eNodeB.
- 6.2 The Interested Licensee shall state multi-Licensee compatibility for their implementation of the X2 interface.
- 6.3 The Interested Licensee shall state needed interworking functionality to support interworking with GSM in eUTRAN, BSS, CS core, PS core and OSS.
- 6.4 The Interested Licensee shall state needed interworking functionality to support interworking with UTRAN in eUTRAN, CS core, PS core and OSS.
- 6.5 The proposed RAN sharing solution shall support 1.4 MHz, 3 MHz, 5 MHz, 10MHz and 20MHz system frequency bandwidth.
- 6.6 Each site with any bandwidth, the number of supported RRC-connected users shall be no less than 400 users.
- 6.7 Each site shall support at least 100Mbps throughput in DL and at least 50Mbps throughput in UL.
- 6.8 The proposed RAN sharing solution shall be capable of supporting different voice strategies for the different Mobile Network Operators (e.g. CFSB for MNO A and VOLTE for MNO B).
- 6.9 The proposed RAN sharing solution shall be capable of sharing all elements of eNodeB and the transport network but maintaining totally independent Core Network Elements (MME/SGW, Billing, PCRF etc).
- 6.10 The proposed RAN sharing solution shall be capable of supporting Mobile Network Operator specific S1 Flex.
- 6.11 The proposed RAN sharing solution shall support separate X2 and S1 interfaces for each of the sharing operators in a single Baseband and RF module.
- 6.12 The proposed RAN sharing solution shall ensure that the eUTRAN is capable of supporting fully pooled signaling capacity allocation between the sharing operators in their MOCN and/or MORAN network sharing solution.
- 6.13 The proposed RAN sharing solution shall be capable of supporting intra-frequency S1 based inter-operator handover between shared and non-shared cells from different operator.
- 6.14 The proposed RAN sharing solution shall allow each operator to deploy their own radio capacity management strategies.

7 MOBILITY

- 7.1 The proposed RAN sharing solution shall support Mobile Network Operator specific intra-frequency, inter-frequency and inter-RAT neighbors for idle and connected mode.
- 7.2 The proposed RAN sharing solution shall support Mobile Network Operator specific absolute priority levels for inter-frequency & inter-RAT neighbors.
- 7.3 The proposed RAN sharing solution shall support Mobile Network Operator specific idle & connected mode mobility thresholds between layers (LTE inter-frequency LTE-GSM, LTE-W-CDMA).
- 7.4 The proposed RAN sharing solution shall be capable of supporting Mobile Network Operator specific intra-frequency, inter-frequency and inter-RAT handover neighbor definition when the mobile network operators operate in a shared carrier configuration.
- 7.5 The proposed RAN sharing solution shall be capable of supporting Mobile Network Operator specific intra-frequency, inter-frequency and inter-RAT cell idle mode cell.
- 7.6 The proposed RAN sharing solution shall be capable of IMSI based Handover to direct Mobile Network Operator's users connected to the shared carrier in Licensee's MOCN based network to the Mobile Network Operator's dedicated carrier in a standalone network at the border between shared and non-shared part of the network.

8 QUALITY OF SERVICE

- 8.1 The proposed RAN sharing solution shall support different QoS mapping for different Mobile Network Operator's users to priorities based on user type, service type or device type in both shared and in dedicated carrier configurations.
- 8.2 The proposed RAN sharing solution shall be able to link QoS QCI value for a Mobile Network Operator with the resource reserved for that Mobile Network Operator to priorities resource allocation for that Mobile Network Operator's users based on that reserved resource.

9 OSS AND COUNTERS

- 9.1 The Interested Licensee shall describe all counters that are shared between the Mobile Network Operators and all the counters that are dedicated to each Mobile Network Operator in the proposed RAN sharing solution.
- 9.2 The proposed RAN sharing solution shall be capable of reporting Mobile Network Operator specific busy hour traffic values for data and voice in a MOCN shared carrier operation.

- 9.3 The proposed RAN sharing solution shall be capable of online data forwarding to exchange network performance, network configuration and fault management information between the sharing Mobile Network Operators.
- 9.4 The proposed RAN sharing solution shall be capable OSS Management System shall be capable of preventing both read and write access of network data belong to the other sharing Mobile Network Operators in their MOCN and MORAN network sharing solution.

10 TRANSPORT

- 10.1 The Interested Licensee shall state the maximum transmission capacity per Node B type.
- 10.2 The Interested Licensee shall state the maximum transmission capacity per eNode B type.
- 10.3 The Interested Licensee shall state the capacity of the X2 interface and information exchanges across the X2 interface to maintain mobility and connectivity, e.g. functionalities regarding optimize the performance and cost per bit.
- 10.4 The Interested Licensee shall state the capacity of the S1 interface.
- 10.5 The Interested Licensee shall design and implement the Access and Metro Network transport from the end site towards the controller (RNC/EPC).
- 10.6 The Interested Licensee is free to design the transport configuration that is technically more efficient and realistic, while ensuring highest service quality.
- 10.7 The Interested Licensee shall clearly describe on the assumptions made to the transport solution and architecture used.
- 10.8 The proposed RAN sharing solution shall be capable of supporting Mobile Network Operator specific bandwidth reservation in the transport layer.
- 10.9 The proposed RAN sharing solution shall be capable of supporting operator specific QoS class definitions within the Mobile Network Operator reserved bandwidth in the transport layer.
- 10.10 The proposed RAN sharing solution shall be capable of supporting different IP addresses at the Base Station for different Mobile Network Operators.
- 10.11 The proposed RAN sharing solution shall be capable of supporting VLAN based traffic separation between the sharing Mobile Network Operators at the Base Station.
- 10.12 The proposed RAN sharing solution shall be capable of supporting separate configuration and management of separate IP networks between the sharing Mobile Network Operators in their MOCN and MORAN sharing solution.

11 POWER SUPPLY REQUIREMENTS

- 11.1 The Interested Licensee is responsible to provide grid power facility to each site.
- 11.2 The Interested Licensee is responsible to provide on-site power distribution system at each site.
- 11.3 The Interested Licensee shall ensure the power supply is sufficient to power up each sites.
- 11.4 Each site shall have a battery backup supply that is able to run for at least 8 hours in the event there is a grid power failure.
- 11.5 The switch over between grid power and battery power shall be seamless and will have no effect to the telecommunication service.