

SAUDI TELECOM COMPANY

Reference Interconnection Offer (RIO)

Annex C Attachment 7

GSM Mobile Network Technical Information

DOCUMENT HISTORY & VERSION CONTROL RECORD

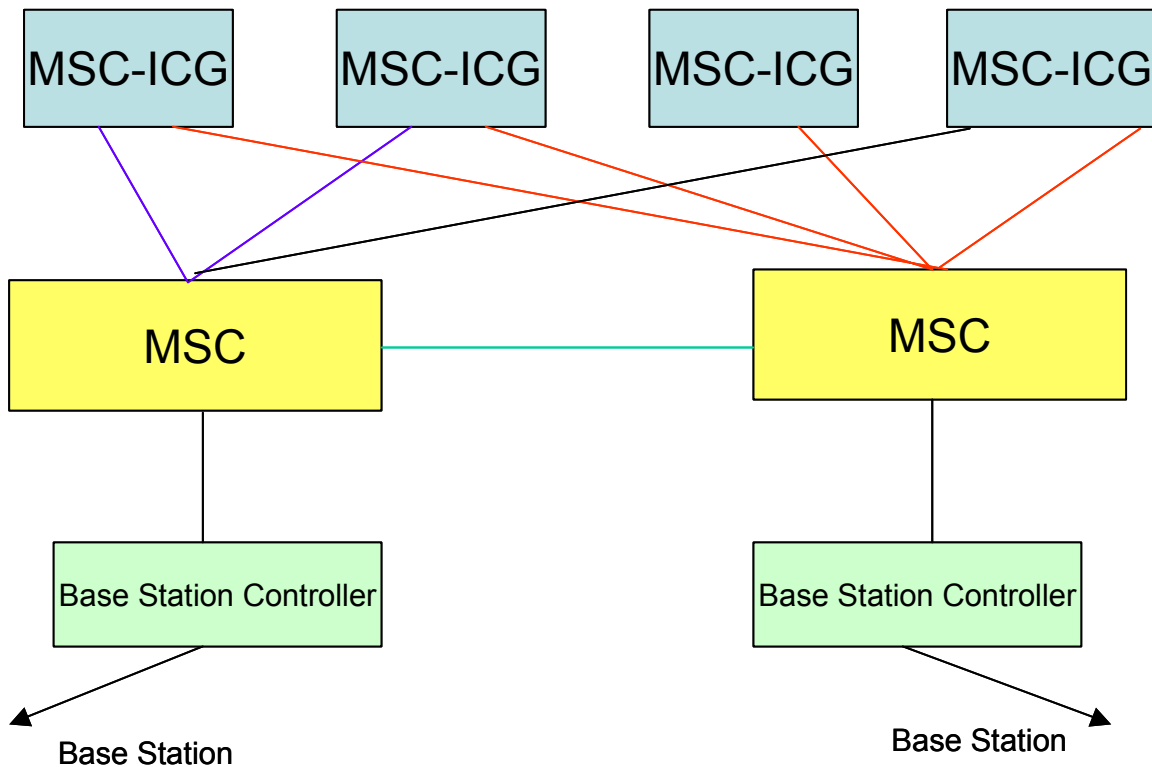
Name of document	Technical Information
Author	Director, Carrier Services
Authorised Officer	GM, Regulatory Affairs
Description of document	Contains all the Technical Information related to the Interconnection Service provided by STC to the GSM network.
Approved by	To be approved CITC
Date of approval	To be approved by CITC.
Assigned review period	Annual
Date of next review	April, 2007

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1 GSM MOBILE NETWORK

1.1 The topology of STC's GSM Mobile Network is very similar to that of STC's main core network in that it has the hierarchical structure shown in Figure 1 below. The network comprises of 8 Transit Mobile Switching Centres designated as Interconnection Gateways (MSC- ICG), 2 in Riyadh, 2 in Jeddah , 2 in Makkah and 2 in Dammam and with more than 61 Mobile Switching Centres (MSC). Additional MSCs are commissioned as required to facilitate growth in the network. The cellular Base Stations are parented on Base Station Controllers and provide the mobile connectivity within the individual GSM cells.

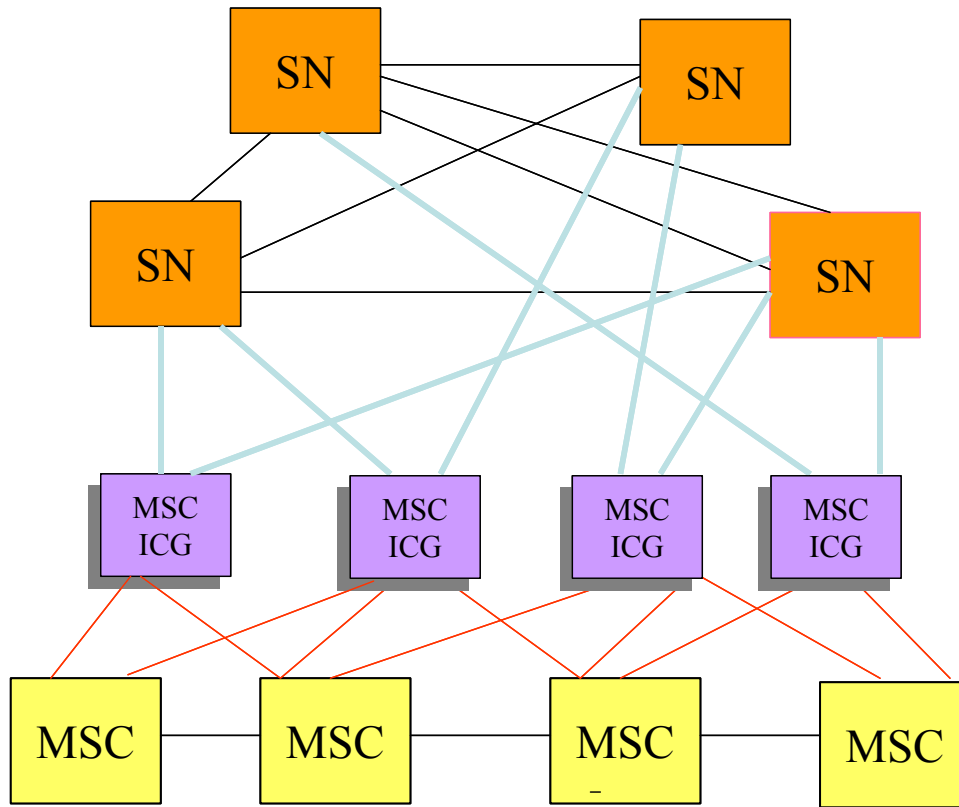


MSC-ICG : Mobile Switching Centre Interconnection Gateway

Figure 1:GSM Mobile Network Hierarchical Structure

2 CONVEYANCE OF CALLS BETWEEN STC FIXED AND GSM MOBILE NETWORKS

2.1 In order for the mobile customers to receive calls from users with geographic numbers and to send the calls from mobile customers to users with geographic & non geographic number ranges, fixed and mobile networks are interconnected. Interconnection occurs between the MSC-ICGs and the SNs as shown in Figure 2 below.



MSC-ICG : Mobile Switching Centre Interconnection Gateway

Figure 2: Overview of Fixed and Mobile Network Interconnection

3 TRAFFIC INTERCONNECTION TO THE MOBILE NETWORK

- 3.1 STC provides interconnection to Other Licensed Operators to its GSM Mobile Network at the MSC-ICG level. The interconnection shall be provided at the POIs specified in Table 1 and in accordance with the technical standards/specifications as provided in this document i.e Attachment 7 of Annex C (*Technical Information*).

4 LOCATION OF POINTS OF INTERCONNECTION

- 4.1 The locations of the MSC-ICGs where interconnection is available are listed in Table 1.

Site No	JV Code	Exchange Name	City	Exchange Location / Address	Exchange Location / Address	Switch Type	Vendor	Signaling Point Code
304-00	TSD1	Khobar TMSC-1	Dammam	Al Khobar, Dammam	شارع الظهران خلف بريد الخبر المركزي	IC Gateway	Huawie	3019
302-00	TSD2	Lasilki TMSC-2	Dammam	Lasilki , Dmmam	شارع الاتصالات شرق مجمع الاتصالات	IC Gateway	Huawie	3030
202-00	TSJ1	Rowais TMSC-1	Jeddah	Rowais, Jeddah	تقاطع طريق المدينة مع شارع فلسطين بجوار مكتب وزير الداخلية	IC Gateway	Huawie	2039
214-00	TSJ2	Mujamma Jeddah TMSC-2	Jeddah	Mujammah, Jeddah	حي البلاد-شارع الكورنيش خلف محطة سابنكو	IC Gateway	Huawie	2041
224-00	TSK2	Mansour TMSC-2	Makkah	Mansour, Makkah	حي المنصور-شارع المنصور	IC Gateway	Huawie	4019
223-00	TSK1	Aziziyeh TMSC-1	Makkah	Aziziyah, Makkah	شارع العزيزية العام خلف مسجد الشيخ عبد العزيز	IC Gateway	Huawie	4018
108-00	TSR1	Mather TMSC-1	Riyadh	Mather, Riyadh	حي ام الحمام- شارع ام الحمام	IC Gateway	Huawie	1116
101-00	TSR2	Murabba TMSC-2	Riyadh	Murabba, Riaydh	حي المربع- شارع الملك فيصل	IC Gateway	Huawie	1117

Table 1 - Location of Points of Interconnection in GSM Mobile Network

STC REFERENCE INTERCONNECTION OFFER - ANNEX C

- 4.2 The list of MSC-ICGs provided in Table 1 will be updated periodically. Additional POIs will be determined by agreement between STC and the Other Licensed Operator as part of the Network Plan and will be consistent with Clause 4.2 of Annex C (*Technical Information*).
- 4.3 In order for the Other Licensed Operator to interconnect with the STC GSM Mobile Network it shall:
- a) Establish interconnection with STC at Points of Interconnection offered by STC at the MSC-ICG exchanges.
 - b) For Interconnect with a Kingdom wide OLO Public Network, the initial requirement is to establish interconnection at a minimum of two (2) of the Points of Interconnection in each of the 4 (four) identified cities (Riyadh, Makkah, Jeddah and Dammam) to ensure diversity and resilience. (The details of the initial interconnection arrangement will be agreed during the initial network planning process.)

5 INTERCONNECTION LINKS AND ROUTING

- 5.1 Interconnection Links will be used as necessary to provide interconnection routes for the conveyance of the Other Licensed Operator's traffic into the STC GSM Mobile Network. Routes will be established in accordance with the Other Licensed Operator's agreed Network Plan and capacity forecasts as stipulated in Annex E (*Forecasting*).
- 5.2 Until routes are mature and traffic volumes become stable, interconnect routes will be uni-directional. At a later stage, bi-directional operation of these routes will be considered.

- 5.3 The Other Licensed Operator shall deliver only traffic which will terminate on the STC mobile number ranges (050 xxxxxxx and 055 xxxxxxx with the exclusion of the ranges 055543xxxx and 055563xxxx) at the Points of Interconnection at the MSC-ICG exchanges. Also, traffic to STC ported subscribers, which will be preceded by the routing number prefix 1545 can be delivered to Points of Interconnection at the STC MSC-ICG exchanges.
- 5.3.1 The Other Licensed Operators shall be responsible for querying, routing and termination of the calls to the numbers that have been ported out of STC GSM Network.
- 5.4 The Other Licensed Operator will be responsible for those routes on which it sends traffic to the STC GSM Mobile Network and will dimension the routes to meet the target Quality of Service measures stated in Annex I (*Quality of Service Measures*).

6 SIGNALLING NETWORK

- 6.1 The STC GSM Mobile Network utilises Signalling System No.7 (SS7) in accordance with ITU-T Q.7xx series standards with options as adapted to the Kingdom of Saudi Arabia, as described in Attachment 3 (*Saudi Arabia SS7 Signalling Standard*) of Annex C (*Technical Information*), which provides the standard specifications for Layers 1, 2 and 3 of the Message Transfer Part (MTP). This Attachment 3 also provides the standard specifications for the ISDN User Part (SA-ISUP). The Signalling Point Codes (SPCs) for the POI Service Nodes are provided in Table 1 of this Attachment.

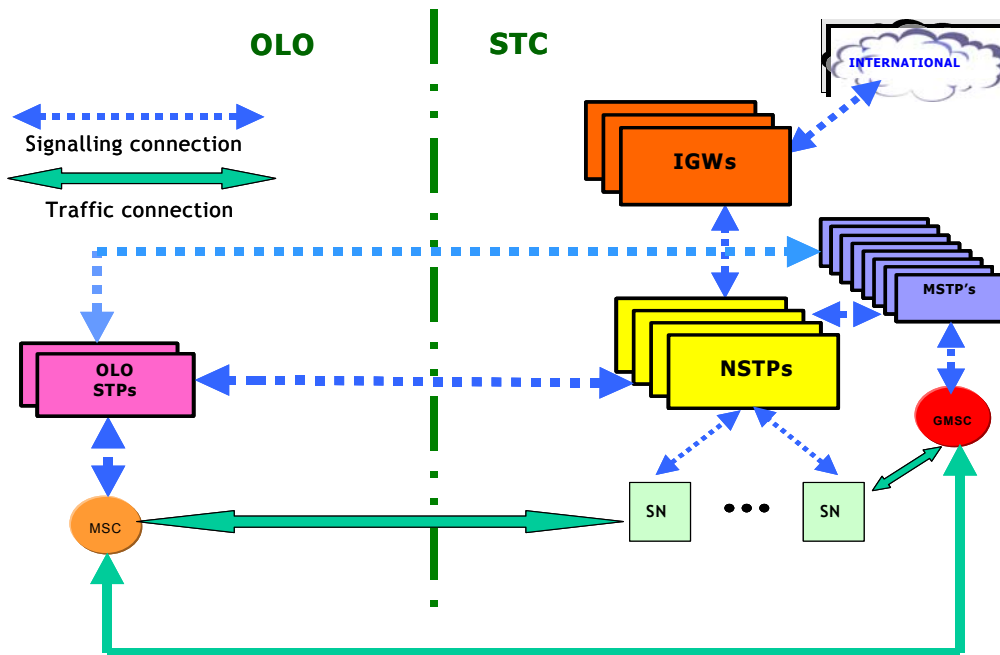


Figure 3 : Signalling Interconnection

- 6.2 The utilisation of SS7 links shall be maintained within the guidelines of ITU-T Q.706 Recommendations of 0.2 Erlang under normal load and 0.4 Erlang under high load (e.g. change over of a parallel link). However, higher loads such as e.g. 0.3/0.6 normal/high may be permitted as appropriate.
- 6.3 As a part of the Network Plan, referred to in Annex-H (*Operations and Maintenance Manual*), a set of SS7 signalling tests will be performed in order to insure the compatibility and interoperability between STC and the OLO networks at the 3 MTP levels as well as ISUP & Supplementary Services levels. These tests are extracted from the ITU-T Q.780, Q.781, Q.782, Q.784 and Q.785 Recommendations.

6.4 Figure 3 above, shows an architectural schematic diagram of the STC signalling network, which supports the STC network. In addition, the necessary connections of the OLO Signal Transfer Points (OLO STPs) and International Gateways (IGWs) to the STC National STPs (NSTPs) are shown. The SPCs for the NSTP's are (1000, 1001, 2000, 2001). In addition, the list of M-STPs and their location along with their SPCs are provided in following Table 2 :

Site Number	JV Code	Exchange Name	C7 Point Codes	STP Type
121	STG1	Deerah	1002	M-STP
121	STG2	Deerah	1003	M-STP
119	STG3	Nasiriyah	1004	M-STP
119	STG4	Nasiriyah	1005	M-STP
202	STG5	Rouwais	2002	M-STP
204	STG6	Nazlah	2003	M-STP
211	STG7	Saheefah	2004	M-STP
212	STG8	Sharafiyah	2005	M-STP
103	STG9	Shimeisy	1008	M-STP
105	SG10	Makkah Road	1009	M-STP

Table 2 : List of STGs, their Location and Signalling Point Codes

7 SYNCHRONISATION

- 7.1 The STC network synchronisation is generally in line with relevant ITU-T recommendations. In order to establish interconnection, the Other Licensed Operator will fulfil the timing performance requirements of ITU-T recommendation G.811. This can be achieved for Plesiochronous Mode by deriving reference timing from OLO's own Stratum-1 clock or the OLO will receive the Master timing signal from STC.
- 7.2 The specification of the timing system that is required in order to ensure proper operation of the interconnected networks is given in Annex C, Attachment 5 (*STC Synchronisation Scheme*).
- 7.3 Licensed operators are responsible for the management of synchronisation on their respective networks.

8 INTERFACE STANDARDS

8.1 Electrical E1 Interfaces

- 8.1.1 STC will only consider interconnection with equipment approved by CITC.
- 8.1.2 The Interconnection Link will be a 2 Mbit/s (E1) path having Electrical Interfaces as specified by ITU-T G.703, as follows:

- Bit rate (synchronous) 2048 kbit/s \pm 4.6 ppm
- Nominal value of pulse amplitude
 - Symmetrical connectors 3 V \pm 10 %
 - Coaxial connectors 2.37 V \pm 10 %
- Attenuation 6 dB at 1024 kHz
- Impedance (adjustable with a jumper on the module)
 - Symmetrical connectors 120 Ω
 - Coaxial connectors 75 Ω

- G. 704 Framing structures
- G. 823 Jitter requirements

8.2 Electrical STM-1 Interfaces.

8.2.1 If an electrical STM-1 interface is provide it shall be to the following ITU-T G.703 specification:

- Bit rate 155,520 kbit/s \pm 20 ppm
- Nominal value of pulse amplitude 1 V
- Attenuation 12 dB at 77,760 kHz
- Impedance (coaxial connectors) 75 Ohms
- Reflection attenuation (8 MHz to 240 MHz) 15 dB

8.3 Optical STM-1 Interfaces

8.3.1 If an optical STM-1 interface is provide it shall be to the following ITU-T G.957 specification:

(i) 155 Mbit/s STM-1 Interface (Application Class S-1.1 for Short Hauls)

- Bit rate 155,520 kbit/s \pm 20 ppm
- Code binary (NRZ)
- Wavelength range 1261 nm to 1360 nm
- Attenuation 10 dB to 28 dB

(ii) 155 Mbit/s STM-1 Interface (Application Class L-1.1 for Long Hauls)

- Bit rate 155,520 kbit/s \pm 20 ppm
- Code binary (NRZ)
- Wavelength range 1285 nm to 1330 nm
- Attenuation 10 dB to 28 dB

(ii) 155 Mbit/s STM-1 Interface (Application Class L-1.2 for Long Hauls)

- Bit rate 155,520 kbit/s \pm 20 ppm
- Code binary (NRZ)
- Wavelength range 1480 nm to 1580 nm
- Attenuation 10 dB to 28 dB

9 NUMBERING

9.1 Number Ranges

9.1.1 Only traffic to the STC owned mobile number ranges (050 xxxxxxx and 055 xxxxxxx with the exclusion of the ranges 055543xxxx and 055563xxxx) can be delivered to Points of Interconnection at the STC MSC-ICG exchanges. Also, traffic to STC ported subscribers, which will be preceded by the routing number prefix 1545 can be delivered to Points of Interconnection at the STC MSC-ICG exchanges. For the avoidance of doubt, such routes cannot be used for the delivery of traffic to STC geographic national number ranges, STC non-geographic number ranges, international number ranges or any other number ranges even as an overflow route. STC will not onward route any calls to such number ranges, which are delivered, to the POI on the MSC-ICG.

9.1.2 In case of National Roaming into STC GSM Mobile Network, the Mobile Subscriber Roaming Numbers shall be treated as Geographic Number Ranges. In such a case, it will follow the principle of Far End handover as referred to in Clause 6.5 of Annex C, *Technical Information* document.

10 ENVIRONMENTAL AND POWER REQUIREMENTS FOR COLLOCATION

10.1 Environmental Requirements

10.1.1 All equipment provided by the Other Licensed Operator within collocated facilities supplied by STC will comply with the environmental requirements given in Annex C, Attachment 6 (*Environmental & Power Requirements for Collocation*).

10.1.2 All electrical equipment will comply with EN60950 or IEC 950 and will be supported by a valid certificate of compliance issued by a recognised organisation.

10.2 Power Requirements

10.2.1 48 V DC Sources:

- a) The equipment will operate from a no-break 48V battery supply, with the positive pole earthed. The earth bus will be directly connected to the battery pole.
- b) The guaranteed performance of the equipment will be maintained for variations of the supply as defined in ETS 300 132-2.
- c) The equipment will make provision for reverse polarity protection.

10.2.2 110 or 220 V AC Sources

- a) The guaranteed performance of the equipment will be maintained for variations of the supply as defined in ETS 300 132-1.
- b) The Other Licensed Operator will state the power consumption of the equipment in the idle (no-traffic) state. The maximum power consumption will also be stated.
- c) The Other Licensed Operator will state the ability of the proposed equipment to operate from power supply sources other than the ones stated above. Where optional converters or inverters are offered to cover other primary power supply sources, the additional power consumption that is attributed to these devices will also be stated.

10.2.3 Power System Earthing of the OLO shall be in accordance with TSP 2547 Issue 1 and all the references mentioned therein.

10.2.4 Safety

- a) The power system shall be designed and manufactured in a manner that presents the minimum possible safety hazards to operation and maintenance personnel.
- b) All conductors shall be adequately insulated to minimize the risk of inadvertent contact by personnel.

- c) All equipment using AC voltages shall be clearly marked to indicate the various voltage levels.
- d) All distribution fuses, Main Circuit Boards (MCBs) and protection devices shall be clearly marked to indicate the AC or DC voltage levels being present.
- e) The equipment design shall allow maintenance and testing of parts, including the replacement of faulty items, without the risk of contact with dangerous high voltages.
- f) Cables shall be adequately shielded and protected to minimise mechanical damage to the conductors or the insulation.
- g) All exposed metal parts, cabinets, cable trays, cable ladders etc. shall be bonded to the building earth for the protection of the operation and maintenance personnel.
- h) All DC power cables and bus-bars shall be identified at the point of termination by color coding or polarity marking/identification:
 - Positive conductor Red.
 - Negative conductor Blue.
- i) All cabling for multiple AC and/or DC system voltages shall be clearly segregated and terminated. System voltages shall be clearly labelled in English and Arabic.
- j) UPS systems employing a high voltage battery greater than 200 V DC, shall be securely constructed to prevent accidental contact with the battery.