

Appendix 2

Interconnection Related Services

30 JUNE 2000

**REPUBLIC OF SINGAPORE
INFOCOMM DEVELOPMENT AUTHORITY
OF SINGAPORE**

Infocomm Development Authority of Singapore

Interconnection Related Services

Interconnection Related Services (IRS) includes those telecommunication facilities and services that are required for service providers in a multi-operator environment to interconnect their respective networks. Network interconnection is necessary to provide ‘any-to-any’ connectivity, to encourage market entry and to enable service innovation. Mandating IRS will allow the market for telecommunication services to evolve toward a more competitive industry structure which will ultimately benefit the consumer in the form of lower prices, greater choice among service providers and service offerings, and improved access to innovative new service offerings.

Interconnection Related Services include the following:

- Physical Interconnection
- Origination / Transit / Termination Services
- Essential Support Facilities
- Unbundled Network Elements
- Unbundled Service Offerings

Physical Interconnection

Physical Interconnection (PI) requires the provision and maintenance of transmission links between each operators network for the purpose of exchanging traffic. PI is required to enable ‘any-to-any’ connectivity. The interconnecting transmission links must connect at mutually agreed points and support pre-defined equipment standards and transmission protocols. Each party will be responsible for the provision and maintenance of the link on their half of the point of interconnection.

Physical interconnection may take place at a number of points in the network. Traffic exchange can occur at the following points of interconnection (POI):

- Interconnect gateway switches;
- Signaling transfer points;
- Local switches – line side and trunk side.

Facilities based operators will be able to take advantage of physical interconnection (by virtue of the co-location tariffs). Service based operators will only have access to virtual co-location.

Physical interconnection may also take place to provide access to unbundled network elements, unbundled network services and essential support facilities. Access to unbundled network elements can occur at the following points of access (POA):

- Distribution frames (Exchange MDF, Building MDF, Roadside MDF);
- Fibre distribution frames;
- Digital Cross connect frames or Add / Drop Multiplexers.

Access to essential support facilities and unbundled network elements can occur at the following points of access (POA):

- Lead in ducts / manholes;
- Exchange cable vaults;
- Exchange buildings (tandem, local, international and interconnection);
- Building equipment rooms;
- Roof spaces.

Origination / Transit / Termination

Origination, Transit, and Termination (O/T/T) services involve the switching, routing, and transmission of telecommunications traffic between network operators. O/T/T services allow traffic originated on one network to terminate or transit through another network.

The dominant operator is responsible for providing origination, transit and call termination services to any licensed requesting operator (either an FBO or an SBO).

For all O/T/T services the dominant operator must also provide signaling interconnection.

The following services must be provided:

1. PSTN Voice

- Line side (local exchange) origination (includes 3 digit, 4 digit and 7 digit)
 - Priced at the dominant operator local wireline call rate
- Line side (local exchange) termination (7 digit)
 - Priced at the dominant operator local wireline call rate
- Trunk side (local exchange) origination (3 digit and 4 digit)
 - Priced either on a per trunk or a per call basis (depending on technical feasibility)

- Trunk side (local exchange) termination (7 digit)
 - Priced either on a per trunk or a per call basis (depending on technical feasibility)
- Interconnection gateway exchange origination (3 digit and 4 digit)
 - Priced at half the dominant operator local wireline call rate
- Interconnection gateway exchange termination (7 digit)
 - Priced at half the dominant operator local wireline call rate
- Interconnection gateway exchange transit
 - Priced at dominant operator's cost

It is important to note that this methodology will modify the current mobile to fixed interconnection approach. In order to ensure technical neutrality IDA wants to modify the current interconnection regime so as to conform to the symmetrical interconnection regime. Thus a fixed to mobile call will incur a termination charge when it terminates on a mobile network. This charge will be half the dominant operator's local call rate (i.e. 0.7 or 0.35 cents per minute). Similarly a mobile to fixed call will pay the same termination fee (i.e. 0.7 or 0.35 cents per minute). This new interconnection regime does not prevent the mobile operators from charging their customers to receive a call and imposes no obligations on the operators to modify their retail prices.

2. ISDN

- ISDN BRI origination at the local exchange, line side
 - Priced at the dominant operator's ISDN call rate
- ISDN BRI termination at the local exchange, line side
 - Priced at the dominant operator's ISDN call rate
- ISDN PRI origination at the local exchange, trunk side
Priced either on a per trunk or a per call basis (depending on technical feasibility)
- ISDN PRI termination at the local exchange, trunk side
 - Priced either on a per trunk or a per call basis (depending on technical feasibility)
- ISDN PRI origination at the interconnection gateway exchange
 - Priced at dominant operator's cost
- ISDN PRI termination at the interconnection gateway exchange
 - Priced at dominant operator's cost

- Interconnection gateway exchange ISDN transit
 - Priced at dominant operator's cost for PRI interfaces

2. ATM

- Traffic termination
 - Priced based on commercial negotiation or at half the dominant operator's comparable retail prices;

3. X.25

- Traffic termination
 - Priced based on commercial negotiation or at half the dominant operator's comparable retail prices;

4. Frame Relay

- Traffic termination
 - Priced based on commercial negotiation or at half the dominant operator's comparable retail prices;

Essential Support Facilities

Essential Support Facilities (ESF's) are those passive support structures, for which no practical or viable alternatives exist, that enable the deployment of telecommunications infrastructure. Essential Support Facilities form significant barriers to entry in the form of excessive costs and/or the length of time required to duplicate or provide alternatives.

Essential Support Facilities will comprise the following:

1. Co-location facilities in:

- telecommunications exchanges (tandem, local, interconnection and international);
- telecommunications equipment rooms located in commercial buildings (where it is the property of the dominant operator);
- telecommunications equipment rooms located in residential buildings (where it is the property of the dominant operator);
- satellite earth stations;
- submarine cable landing stations / frontier stations;
- radio tower sites.

Each co-location site will include equipment space, power, environmental services (heat, light, ventilation, and air conditioning), security, and site maintenance.

In cases where physical co-location either cannot be accommodated due to space limitations or some other legitimate barrier the dominant licensee must take reasonable measures to find an alternative solution. An alternative solution may include options such as virtual co-location, conditioning additional equipment space, optimizing the use of existing space or finding adjacent space.

There will be no restriction on the amount or type of equipment co-located so long as it is telecommunications equipment of a type found in central office premises or performing the same function as equipment generally found in central offices.

The cost of preparing co-location space shall be incurred by the dominant operator providing the service and reasonable costs will be recovered through cost based regular recurring payments.

Operators leasing co-location space must be provided with 7 day – 24 hour access as required.

2. Manholes, cable chambers, trenches, ducts, and conduits.

Manholes, cable chambers, ducts, and conduit are the support facilities that house the copper, coaxial, and fiber cables in the backbone, inter-exchange, and access portions of the telecommunications network. These facilities may be leased by FBOs for the purpose of placing their own telecommunications transmission cable / fiber. The manhole, cable chamber, trench, duct or conduit will be maintained by the owner who will also be responsible for any right-of-way fees payable.

3. Space within cable risers in commercial and residential buildings.

Used to provide service to the buildings tenants. Must also include the use of / access to any distribution frames, cabinets or network interface devices within the building. They will be made available where they are the property of the dominant operator

4. Masts, towers and poles.

Used for the location of radio transmission or reception equipment and including space for baseband equipment (see Co-location space)

Unbundled Network Elements

Unbundled Network Elements (UNE's) include physical telecommunications plant and equipment and the associated service functionality that may be de-coupled from the dominant licensee's network and made available to an entrant for the provision of their service offerings. Similar to ESFs, Unbundled Network Elements also form significant barriers to entry if they are not made available to new entrants. Excessive cost, time to duplicate, and the feasibility or practicality of duplication have all been considered in determining which network elements will be unbundled and made available to non-dominant facilities based operators.

Unbundled Network Elements will comprise the following:

- 1. Copper loops – including feeder, distribution, drop (where applicable), distribution point, and inside wiring (where applicable).**
- 2. Sub-loops – distribution, drop (horizontals), distribution point and inside wiring portion of loop (where feasible).**

Copper loops and the associated distribution points must be made available to entrants in the form of either complete loops, or sub-loops. The dominant licensee supplying the loop to will provision the loops in a timely and non-discriminatory

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manner. Every effort should be made to provision loops that are suitable for digital signal transmission. The loop supplier will retain responsibility for the maintenance and administration of the loop.

Loop spectrum / line sharing will not be mandated, at this point in time as it is expected that if there is sufficient demand either the dominant operator or a non-dominant operator using unbundled loops will make this service available on a commercial basis.

The supplier of the loop will make every effort to provision loops that are of the same quality and capable of supporting the same transmission characteristics as those it supplies to its own customers. The supplier of the loop will also be expected to provide the equivalent maintenance and repair services on the unbundled loops as would provide on loops serving its own customers.

To maintain the integrity of the loop and associated equipment, the loop supplier should retain responsibility for performing the necessary cross-connections and circuit-grooming activities required at the distribution frames to connect the requesting operator's equipment to the access loop. However this responsibility should not be used as a barrier to restrict supply and will be included in the loop cost.

Distribution frame access must be provided in order to allow the requesting operator to place the terminal blocks and cabling required to cross-connect the subscriber loop to the entrants equipment.

Where the requesting operator plans to use the loop to provide a DSL type service the loop performance should be typical of those used by the supplying operator for its own DSL services. This requires that the supplying operator has an obligation to "condition" a loop pair. Typically this will mean the removal of any impediments to DSL service such as bridge taps and loading coils and choosing a pair that is unlikely to suffer from interference caused by other DSL services.

Sub loop and loop spectrum unbundling will require significant industry cooperation. The iDA expects that these elements will require substantive new processes to be developed in order to ensure that no network disruptions occur and that the dominant operators plant record systems are accurately updated.

3. Distribution Frame Access – main distribution frames, roadside cabinets, building distribution frames.

Pins on the distribution frames will be made available to non-dominant licensee for the purposes of connecting their cables. A process must be developed for allocating pins to non-dominant carriers and for updating plant records.

4. Dark Fibre.

Dark fiber, both domestic and international, will be made available in a timely and non-discriminatory manner, in order to make the most efficient use of the cable currently provisioned and to increase the domestic and international bandwidth capacity available. Access and inter-exchange fibre must be made available. The supplier of the fibre will also be expected to provide the equivalent maintenance and repair services as they provide for their own fibre. No devices are to be placed on the fiber to restrict the available bandwidth and the fibre loss must be typical of those experienced by the supplying operator.

Unbundled Network Services

Unbundled Network Services are those services that are either not economically feasible or logical for an entrant to replicate.

Unbundled Network Services will comprise:

1. Directory Listings.

Access to the directory listing database for the purpose of providing directory assistance services and operator handled calls.

2. Emergency Services access.

Access to the emergency services call center and the ability to add local telephone location data to the emergency services database.

3. White pages listings.

Access to the white pages for non-dominant carriers customers so that their numbers can be listed. In addition, the non-dominant carriers will be able to obtain white pages directories on a non-discriminatory basis for their customers.

Reference Interconnection Offer

Will contain all of these elements, together with the technical and operational processes to procure and the availability / reservation criteria.