Malta Communications Authority

A National Internet eXchange

Consultative Paper

July 2002

Malta Communications Authority
"Il-Pjazzetta", Suite 43/44, Tower Road, Sliema SLM 16, Malta, Europe.
Tel: (356) 21 336 840. Fax: (356) 21 336 846
website: www.mca.org.mt
e-mail: info@mca.org.mt

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1 Introduction

Interconnection is the cornerstone upon which the Internet is built — it is the ability of one entity to connect to other entities. For the "network of networks" - the Internet - such interconnection isn't only vital for users, it represents the very essence for which it stands. The Internet is built upon open standards, with as little central control as is feasible. This has resulted in a situation where any network via any means of communications can access users of another network in a way that is relatively simple and inexpensive. Throughout the Internet's history, interconnections have generally occurred on a settlement-free basis either through exchange points or by direct connections (known as peering). The Internet's epic success speaks for itself.

Without interconnection, many of the benefits the Internet has so far realized as an open system could be quashed. Users on one ISP's network would not be able to reach users on another ISP's network. With interconnection terms that are commercially discriminatory, the price of Internet access could artificially skyrocket and new market entrants could be disadvantaged.

In general terms, interconnection is a sometimes complicated issue since the development of network systems has often been accompanied by the market dominance of a handful of players who abuse their position for commercial gain by restricting the interconnection of rivals.

In this document, the Authority seeks to consult with all interested parties about an ISP interconnection methodology that would ensure optimal accessibility without imposing unnecessary financial, or other, constraints on existing or prospective service providers in the sector.

This paper is not a legal document and is being published without prejudice to the legal position or the rights and duties of the MCA to regulate the telecommunications market generally.

2 Legislative Background

The Telecommunications (Regulation) Act (Cap. 399) through Legal Notice 263 of 2000, Malta Internet Exchange Regulations, 2000 states that

" It shall be the obligation of every Internet Service Provider to interconnect its computer system and to keep it interconnected at all times to an Exchange for the purpose of facilitating the efficient routing and interconnection of Internet Protocol transit network within Malta and of avoiding the use of international lines for Internet Protocol traffic between Internet users in Malta and of consequently improving the general connectivity of the Internet."

The Legal Notice also stipulates the responsibilities of the ISPs, the Telecommunications Transport Providers (TTPs) and the Exchange with respect to the operation of the Malta Internet Exchange (MIX).

3 The Internet Service Provision Sector

The Internet Service Provider (ISP) sector in Malta is healthy and thriving with 14 licensed ISPs currently in, or entering, the market. The first ISP licenses were issued in late 1995 in the first example of liberalisation within the telecommunications sector in Malta. Since then there have been a number of mergers and acquisitions while the market has remained dynamic due to the arrival of new players.

Initially, Maltese ISPs had disparate links to upstream backbone providers in Europe. This provided for a great deal of diversity and differentiation even though link speeds were relatively low, in the region of 64 – 256kbps. However, connectivity to the Internet was expensive due to the relatively high cost of these international data circuits. The lack of any form of local interconnection scheme meant that an e-mail sent from one Maltese subscriber to another had to traverse these costly international links, sometimes all the way to a top-tier provider in the United States and back.

At first, this was not a major factor since the number of Maltese subscribers was relatively small and there was little local content to be accessed. The great majority of traffic was directed to, or from, the public Internet elsewhere. However, with the growth of Internet usage in Malta, traffic patterns also began to change with more intra-island communications occurring. Many businesses also started to turn to the Net as a communications tool. ISPs realised that the situation was inefficient and some decided to set up direct links in order to effect peering. These arrangements were not extensive and were the exception rather than the rule.

Eventually, through the Maltese ISP forum – the ISP-SS – work started on the development of a Malta Internet eXchange (MIX) arrangement. This

started operations in 1999, with the Malta Internet Foundation (NIC Malta) acting as the exchange point operator. The initial participants were:

- GlobalNet
- Kemmunet
- Keyworld
- Terranet (Maltanet)
- University of Malta
- Video On Line (VOL)
- Waldonet

Subsequently MITTS (Magnet) commenced participation in the Exchange. More information about the MIX can be obtained from http://www.mix.net.mt.

The great majority of local Internet communications could therefore now be handled via the MIX, without resorting to the use of expensive international connections. The technology used to connect the ISPs to the Exchange was Frame Relay. At this time, Maltacom plc also began to offer international bandwidth in bulk via an agreement with a Telecom Italia subsidiary, SEA-Bone. A subsidiary company, Datastream Ltd., was set up to manage this. Many ISPs were attracted by the substantially improved pricing offered by Datastream and migrated to this service. So much so that today, all ISPs are connected solely to the SEA-Bone network.

In 2000, with the advent of broadband connectivity via digital subscriber line (DSL) and cable modem, there were changes to the exchange arrangements The majority of ISPs who were by now using the SEA-Bone service decided that it would be more effective to use Datastream as an exchange point since they all had high-speed ATM connections to this point anyway. The majority of ISPs listed above shifted to the new setup, leaving only VOL and MITTS on the original MIX. Unfortunately, the new arrangement resulted in

considerable interconnectivity problems. In order to resolve the issue, the regulator decided to revert to the previous arrangement in order to ensure continued local Internet communications. So as to comply with the regulatory intervention, the Datastream exchange point was directly connected to the original MIX and the appropriate routing arrangements made to ensure correct and timely delivery of local IP traffic. This situation prevails to the present day.

The ISP sector should be encouraged to grow and seek innovation and continual service improvement and enhancement. Internet Service Providers and the underlying TTPs will become vitally important channels used for the exchange of data between government and citizen and between business and client. For the e-Government and m-Government projects as well as any electronic commerce initiatives to succeed, an ISP industry that has the absolute confidence of the general public is required.

The adoption of the ISP Code of Practice was a positive first step towards achieving this. It is perceived that the presence of a central Internet exchange, operated by an operator independent of all ISPs, will reinforce the degree of confidence that the residential and business communities have with respect to electronic means of communication. Furthermore with the advent of electronic commerce, ISPs will play an even more important role in the commercial fabric of Maltese society reinforcing the requirement for a central interconnection point or points.

4 The Need For a National Internet eXchange

There are various reasons why the Authority feels that the existence of a National Internet exchange point is necessary. These are listed below:

a. **Efficiency in local communications** – while today all international bandwidth is single sourced and hence the bandwidth provider can inherently act as an exchange point, it is quite conceivable that the upcoming liberalisation of international data gateway services in January 2003 could result in a multiplicity of bandwidth sources. Therefore, various ISPs or data service network operators could opt to obtain IP transit from various international facilities (IF) operators. This would imply that the current situation would no longer be adequate since ISPs currently connected to the IF that today also provides the exchange facility could move away to another. A repetition of the situation whereby local traffic would have to traverse costly international links has to be avoided at all costs. A designated central exchange point would cater for this eventuality. Furthermore, most local traffic today traverses the networks of mainly two companies, Maltacom plc (via its Datastream subsidiary) and Melita Cable plc's Data Services Division. Should more transport network operators enter the market there could be several permutations of IF and TTP networks. The only efficient way to ensure full interconnection of all ISPs in the new, liberalised scenario would be to use a central exchange point.
b. **Independence of the exchange operator** – while the Authority has no concerns over the integrity of the operators of the current setup, however, with the advent of the possibility of multiple international data gateway operators, there could be situations where having one of the gateway providers also responsible for managing an Internet exchange would not be the optimal solution. A national exchange independent of any gateway operator would benefit from complete autonomy. This would avoid accusations, from any quarter, of conflicting interests.
c. **Quality of Internet Service –** it is the Authority's intention to determine, establish and monitor certain Quality of Internet Service levels in the near future. Measurement of some of these QoIS levels could be performed from a central point at the eXchange.
d. **Legal Intercept –** it is clear that the Internet will be subject to the same level of oversight by law enforcement agencies as any other means of electronic communications. This will eventually be the case also in Malta. The Internet exchange could serve as an ideal intercept point for local traffic.
e. **Expansion into a regional hub –** as electronic communications develop in the Mediterranean region and connectivity from Malta to other locations in Europe and North Africa improves, there could be the possibility of

positioning the island as a regional hub for data traffic. The Internet exchange could serve as the basis for any eventual regional facility.

Consultative Question 1:

Do you agree that there is, and will increasingly be, a need for a central, national Internet exchange for the reasons mentioned above? If not, please list your reasons for disagreeing.

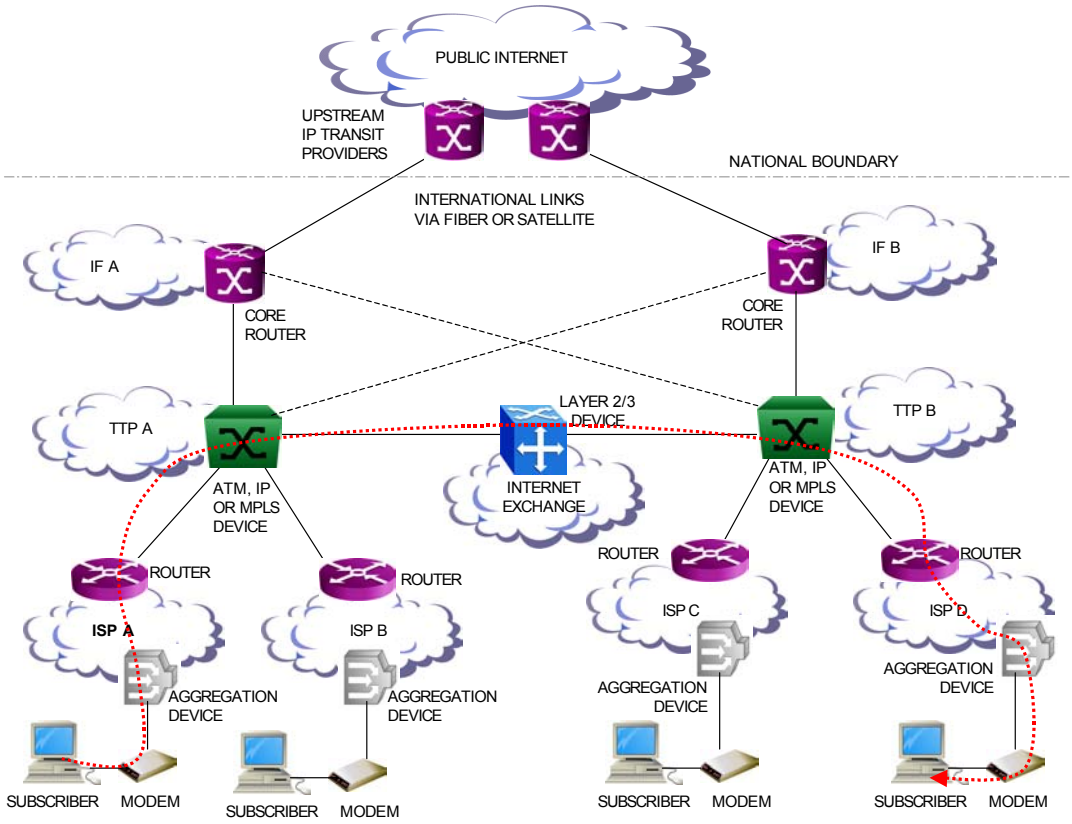
5 Operational Framework for the National Internet eXchange

The exchange structure suggested would use the concept of a single point as a mutual exchange entity, allowing each party to participate in a fully connected exchange environment with a single external connection. The word "point" is perhaps misleading in a physical sense, as the exchange "point" is in effect a single coherent layer 2 or layer 3 (as defined by the OSI 7 Layers) point, or a single coherently presented common transit domain, and as such can exist within a single physical location, or can be implemented with distributed access points. The essential attribute of this entity is the ability to execute a comprehensive set of agreements with all ISPs using a single external connection for each.

Consultative Question 2:
Do you agree with the proposed format for the operational framework for the national Internet exchange? If not, please provide reasons and alternatives.

ISP customers may connect to their access node across a variety of transport mechanisms (dial, cable, ISDN, DSL, leased line and eventually wireless or satellite). These use the telecommunications transport providers' access networks. There could be cases where a TTP is also an IF but there could be IFs that are not TTPs. A multi-layered approach has thus been taken.

The diagram below outlines how the local Internet backbone architecture, including the Internet Exchange, would be formed.



National Internet Infrastructure

The diagram illustrates a possible national Internet infrastructure post-liberalisation with multiple international facilities (IF) and multiple (TTPs) – showing two of each for simplicity's sake. At that point ISPs may decided to dual or multi-home themselves to several upstream IP transit providers for reasons of resiliency or diversity. The MIX would sit centrally in the infrastructure, allowing all ISPs to be connected to it regardless of access, edge, core or connectivity technologies and providers. As the dotted red arrowed line indicates, a correctly set up routing/switching scheme will allow the seamless exchange of local Internet traffic via the MIX's switch/router. Traffic destined for off-island destinations can be accommodated via the ISP-

TTP-IF links. In the case of a Layer 2 (switch) implementation, all routing decisions will be taken at the corresponding router interface at the connected ISP network. In the case of a Layer 3 (router) system, this router could take on all necessary routing tasks.

As the Internet infrastructure continues to evolve, there could be a decision to move to a scenario where there would be not one but two central Internet exchange points, obviously for redundancy, capacity and resiliency reasons.

Feedback Request 1:
Please provide your comments as to the pros and cons of having a National Internet Infrastructure as outlined in the diagram.

Feedback Request 2:
Please provide your comments as to what switching or routing scheme should be applied at the central exchange point.

6 Guidelines & Policies for eXchange Operation

The MIX is a Layer 2/3 settlement-free multilateral exchange point mainly for routing of intra-Malta Internet traffic. The peering model suggested for the MIX is SKA (Sender Keep All). In an SKA scheme, it is assumed that the value of a packet does not change as it moves from one network boundary to another and therefore no payment is effected for traffic exchanged between ISPs.

The **requirements** for participants to join the MIX are suggested to be as follows:

1. They must be licensed Internet Service Providers as defined by existing legislation. Exceptions could be made for specific governmental, educational and research networks as approved by the MCA.
2. They must have global Internet connectivity independent of the MIX facility.
3. They must be self-sufficient. For example, they should have their own DNS, SMTP, POP and HTTP servers.
4. Their connections to the MIX must be at least E1 (2Mbps). For ISPs with larger international connections it is suggested that the ISP should have at least 2Mbps local connectivity per 10Mbps of international bandwidth. This requirement will be revised as technologies progress.
5. The links to the MIX must be provided via a TTP and funded by the ISP.

Consultative Question 3:
Do you consider these requirements to be reasonable and fair on ISPs?

Guidelines & Policies

1. Any Internet access provider joining the MIX, has to order a leased line (or equivalent) to the location specified by the MIX operator. Specifications for router or switch interfaces will be as provided by the MIX operator.

2. The purpose of the MIX is for routing of intra-Malta traffic.

3. The MIX is a settlement-free interconnection point. In other words, no settlement is to be paid by the participants for the incoming and outgoing traffic.

4. All participants should not filter traffic or routing table entries to or from any other participants unless it is clearly and verifiably justifiable. (e.g. denial of service attacks, mail bombs etc). The MIX operator and the MCA are to be immediately informed of any filters being imposed in routing tables by participants.

5. The data links to MIX must be paid for by the corresponding participants.

6. The routers and/or switches located at the MIX will be managed by an entity termed the “MIX operator”. The operator will have its own website and will continuously publish status reports of connectivity and traffic. Each ISP will be able to monitor its link/s in real-time. The MCA will have global access to all link statistics.

7. Each participant MUST have its own global Internet connectivity independent of MIX facilities and hence this MUST NOT be used as the primary connection to the global Internet. In the eventuality of a

MIX failure, routing policies must be such that local connectivity is still maintained by diverting traffic over international links.

8. Participants must peer at the MIX. They can also peer with other participants directly as long as the arrangement does not violate any of the guidelines/policies stated here (see peering guidelines).

9. All MIX participants will be accorded equal status.

10. The MIX is an exchange point and not a transit provider. Each participant should preferably be an Autonomous System (AS) with a globally unique AS number assigned by ARIN, APNIC or RIPE or their sub-registries.

11. The Internet Protocol addresses of the data traversing the MIX must be provider-independent and officially assigned by a regional Internet registry such as ARIN, APNIC or RIPE or their sub-registries.

12. The MIX Operator will provide space, electricity, air-conditioning and all active devices necessary for correct MIX operation. The Operator will also provide adequate operational support including a 10 hour (0800 to 1800) on site presence Monday to Friday. A telephone (fixed or mobile) number that provides 24-hour access to MIX technical support staff must be made available to ISPs, TTPs and the MCA. Similarly, all participants must likewise provide contact details to the MIX operator and the MCA.

13. The Operator will manage the MIX on a non-profit basis and can charge cost-based and non-discriminatory charges for administration and management purposes, subject to MCA approval.

14. The MIX will also provide connectivity to MAGNET and any other government, research or educational network as long as these conform to the guidelines and policies laid out in this document.

15. The MIX operator will not be responsible for any loss and damages to the participants caused by the operations of MIX.

16. The MIX Operator is not responsible for any illegal activities performed by any of the MIX participants or users of their networks.

17. The MIX Operator can have no commercial ties (except for customer-client relationships) to ISPs, TTPs or IFs.

Consultative Question 4:
Do you feel that the above guidelines are reasonable and adequate? If not please provide reasons, referring to specific guidelines by their number.

7 Right Of Internet Service Providers to Peer

Peering agreements are bilateral agreements between individual ISPs. Each ISP must negotiate peering arrangements independently and needs to contact every ISP they wish to peer with individually. In these arrangements, one ISP grants another ISP access to its network in exchange for the first ISP also gaining access to the second ISPs network. In theory, peering arrangements could take a number of forms; in practice, however, peering is generally done without settlement, and hence can be considered a barter transaction – with each ISP bearing the cost of the other ISP's use of its network in exchange for the benefit of the use of the other's network. Therefore, peering is an arrangement in which parties provide each other with un-metered access to one another's resources. From an economic point of view, it transforms each of the networks being thus connected into a common property resource for the others.

Peering is classified as a relationship between two or more ISPs in which the ISPs create a direct link between each other and agree to forward each other's packets directly across this link instead of using the standard Internet backbone. For example, suppose a client of ISP X wants to access a web site hosted by ISP Y. If X and Y have a peering relationship, the HTTP packets will travel directly between the two ISPs. In general, this results in faster access since there are fewer hops.

Requirements for Peering:

Peering entities must:

1. Be Internet service providers and be correctly licensed as such

2. Have primary or secondary global Internet connectivity independent of the peering facilities.
3. Typically run BGP4 to peer. This is for better management of routing though other routing or switching mechanisms may be acceptable.
4. Be self-sufficient, i.e. they should have their own primary DNS, SMTP, POP and HTTP servers.
5. Peer at not less than E1 (2Mbps)
6. Provide for links and router equipment.
7. Peer on a settlement-free basis
8. Not filter traffic or routing table entries to or from any other MIX participants.
9. Still be connected to the MIX in accordance with established guidelines.

Peering models:

The business model and technical characteristics of the Internet are such that to date, only two stable interconnection models have emerged. They are:

Sender-keep-all - this usually applies when two ISPs agree that the value of connecting their networks is roughly equal and they therefore interconnect on a payment-free basis. Thus, traffic may be exchanged between their networks, with each bearing its own costs.

Customer/supplier - this usually applies when the value of interconnection for each of two networks is disparate, for instance, when a small ISP connects to a larger ISP that operates a national Internet backbone. In this circumstance, the small ISP is the customer acquiring Internet connectivity from the larger ISP, and it pays for that service.

In the case of Malta it is expected that the majority of any peering arrangements will operate under the SKA model. However, in cases where it is clearly demonstrable through detailed traffic statistics that there is a great imbalance in traffic volumes (typically greater than 10:1) over a sustained period of time, then it will be acceptable for the ISP receiving the greater volume of requests to request that all costs in relation to peering are borne by the other party.

Consultative Question 5:
Do you agree with the SKA peering model?

Consultative Question 6:
Does your organisation consider peering in addition to connecting to the MIX?

Transit:

Transit, or passing traffic across one ISP network to another ISP, is not considered to be peering. Typically, rather than seeking a bilateral peering agreement, smaller ISPs may offer to pay larger ISPs for transit. As with peering, these agreements must be arranged by the ISPs themselves. In this arrangement, a local ISP pays another ISP for use of the second ISP's network to provide the local ISP with connectivity to both the second ISP's clients and to the wider Internet. Transit functions are generally provided by service providers who operate backbone networks – that is, the links connecting networks located in different places.

8 Approved Internet Exchange Point Facility

The approved Internet Exchange Point (or MIX Operator) will be

NIC(Malta)
University Campus
Msida MSD 06
MALTA (Europe)

Fax number (marked Attn: NIC(Malta)):
(+356) 21 343 397

E-mail address:
Info@mix.net.mt

Following, and dependent upon the outcome of, the consultation process a contractual agreement outlining the role and responsibilities of the MIX operator will be negotiated.

Consultative Question 7:
Do you have any objection to the selection of NIC Malta as the MIX Operator? Please list the grounds of any objections and suggest possible alternatives.

9 Conclusion

The resultant environment of the Internet today is one where there are three basic means of interconnection between two ISPS: firstly where there is no direct interconnection, in which case the mutually exchanged traffic uses the services of intermediaries to act as transit providers, secondly where one ISP acts as the supplier and is funded in this role by the other ISP assuming the role of customer, and, lastly, where the ISPs undertake a peering arrangement and no financial exchange takes place. This document seeks to define an optimal methodology for supporting ISP interconnection. The implementation of a central Internet exchange point is expected to be greatly beneficial for a number of reasons including

- cost reductions
- network efficiencies
- improved subscriber access to local resources
- enhanced subscriber usage experience
- ability to monitor ISP availability

Although some form of local Internet traffic exchange is already present, it is universally felt that its current format is of limited scope, especially in a post-liberalisation scenario, where the possibility of conflict could arise.

The Authority is also anxious, following the consensual adoption of the Code of Practice, to have ISPs continuing to demonstrate that they can function in a self-regulated environment with minimal external regulatory intervention. It is hoped that the successful implementation of the Internet Exchange will further contribute to achieving this goal. A review of the relevant, current legislative framework could then be undertaken.

Due to the increasing growth in Internet usage, fuelled by the introduction and encouraging rollout of broadband, it is envisaged that the role of the MIX will become ever more important. Furthermore, with the possibility of multiple international connections, this importance will increase further – perhaps eventually to a point where the Maltese exchange could act as a regional hub for traffic traversing between Southern Europe and North Africa.

It is therefore vital for Malta's e-economy to have in place an interconnection infrastructure that can facilitate and support the growth of a sophisticated Information Society.

It is the Malta Communications Authority's intention therefore to obtain feedback from all interested parties as part of a consultative process. All inputs will be carefully considered and a decision on the final format of the Internet exchange taken on the basis of the received information.

10 Proposed Timeframes

The MCA is of the opinion that the new MIX entity will have to be operational by the end of 2002 so as to be in a position to respond to the market changes that are expected to occur in the following year.

Consultative Question 8:
Do you agree with the proposed timeframes? If not, how should they be modified?

11 Consultation Framework

The MCA wishes to invite comments from interested parties in relation to any of the issues raised in this document. The consultation period will run until 12.00pm on Friday 9th August 2002.

Comments in response to this document should be sent (preferably **in electronic format)** to:

Colin Camilleri
Chief Technical Officer

Malta Communications Authority
"Il-Piazzetta" Suite 43/44
Tower Road
Sliema SLM 16
MALTA
Tel: +356 21 336 840

E-mail: ccamilleri@mca.org.mt

Receipt of comments will be confirmed. Comments will be made publicly available at the MCA unless declared confidential. Respondents are therefore asked to separate out any confidential material into a clearly marked annex. Respondents are also kindly requested to refer their comments to the specific sections of this document.