

FINAL

AARNet Microwave Proposal for the QUESTnet Region

This proposal is presented by the QUESTnet Management Committee on behalf of all AARNet Members in the QUESTnet region of AARNet.

Executive Summary

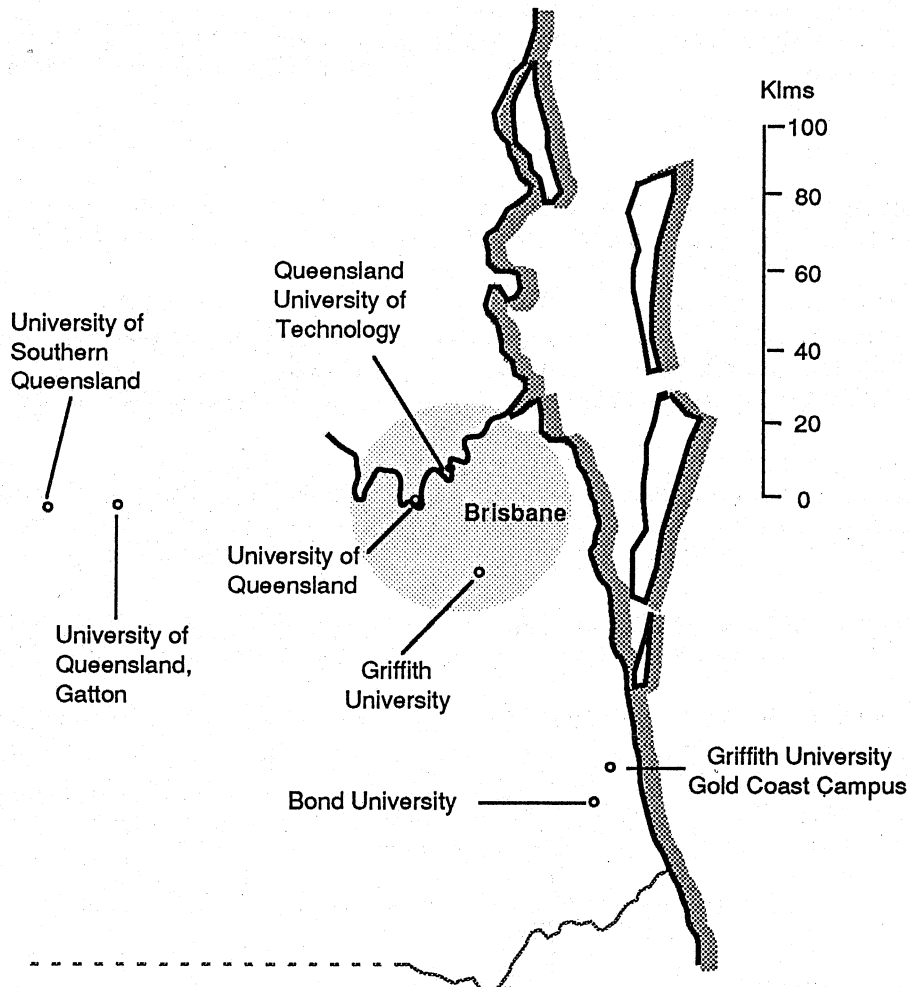
In response to a request from the AARNet Board of Management, this proposal considers probable developments in the Queensland region of AARNet over the period 1993 to 1997.

It is proposed to replace, where possible, AARNet links, which are presently leased from Telecom, with microwave links. An expenditure of \$561,000 in equipment will reduce the present recurrent cost of links from \$170,000 pa to \$23,400 pa. This expenditure also includes an increase in capacity from 2 Mbps to 34 Mbps to cater for growth requirements to 1997.

Dial-up ISDN services at an additional cost of \$28,000 with a recurrent of \$4,000 pa will provide low speed (64 Kbps) backup links in event of a major microwave failure. This will provide a very high availability network.

Because of the distances involved, it is not economic to link James Cook University or the University of Central Queensland by microwave in the foreseeable future.

The University of Queensland (Prentice Centre) is nominated as the lead institution for this proposal.



Introduction

The proposal is made to cover the period 1993 to 1997. It is difficult to forecast bandwidth requirements over such a long period. Therefore, this proposal recognises the need for any major infrastructure to be flexible, to allow for expansion and to be compatible with future broadband technology such as ATM and DQDB.

There is no doubt that microwave provides the lowest recurrent cost for the long term. There are only two methods available for privately owned communications links to replace rented facilities from the carriers. These are optical fibre, which can only be used for distances under 500 metres and radio (microwave) links. The only option for the QUESTnet region is microwave. Ownership of these links represents continued long term recurrent savings of about \$150,000 per annum for the south eastern corner of Queensland.

The AARNet hub in Queensland is located at The University of Queensland with 2 Mbps links (Telecom Megalinks) radiating to all other institutions with the exception of Bond University which operates at 48 Kbps. It is expected that AARNet will upgrade the Bond 48 Kbps link to 128 Kbps during 1993.

It is expected that link speeds will need to be increased significantly over the specified period. Factors which are additional to normal growth and which will influence the need for very high bandwidth include high performance computing and the transmission of video and voice over the network.

It is proposed to install 34 Mbps (E3) links between the universities within the Brisbane metropolitan area and 2x2 Mbps links to the University of Southern Queensland and Bond University to carry telephone voice traffic in addition to data.

It is recognised that the reliability and availability of the microwaves may not be as high as for Telecom services and so ISDN Basic Rate services have been included to provide backup.

Proposal

Brisbane Metropolitan Universities

Interconnection of the three universities (The University of Queensland, Griffith University and the Queensland University of Technology) will require three links because of the topology. The proposed bandwidth of the links is 34 Mbps (E3) links.

The present AARNet network configuration in Queensland is a star network, with the hub located at The University of Queensland. The proposed upgrade is logically identical with the links from the hub to Griffith University and to the University of Technology being upgraded to E3 speed links.

The exact topology of the microwave links would need to be determined at installation time. Current installations and planning may provide more effective alternatives at that time.

The future plans for QUESTnet include the development of a broadband network within and between the institutions. This proposal is compatible with this planning. There is the possibility that the E3 microwave links would eventually be terminated on broadband ISDN switches (for example, ATM) to enable better use of this bandwidth for a variety of purposes, including video and audio transmission.

University of Southern Queensland

It is proposed to link the University of Southern Queensland to The University of Queensland, Gatton campus with a 2x2 Mbps microwave system. The University of Queensland Gatton and St Lucia campuses are already linked by microwave. The link to USQ will require a two hop system because of topography.

Should traffic grow at an unexpectedly high rate, this link could be upgraded to an 8 Mbps (E2) link later.

Bond University

It is proposed to connect Bond to Griffith University, Gold Coast campus. Griffith University already has a 2 Mbps Megalink to the Gold Coast and is investigating upgrading this to a higher capacity microwave link.

James Cook University and the University of Central Queensland

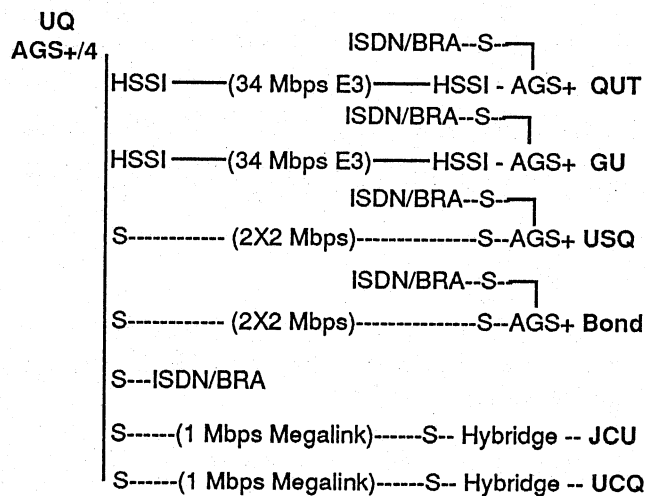
No action can be taken in this proposal for these institutions. It is likely that bandwidth requirements will exceed the present 1 Mbps links to these institutions within the 1993 to 1997 period.

Microwave to these regions is not possible and alternatives will have to be sought. These may include sharing of high speed links with the State Government.

Backup Links

It is proposed to include an ISDN Basic Rate service at each location in case of failure of a microwave link. While these links will only be 64 Kbps they will enable a *keep alive* situation in event of a major microwave outage.

Proposed QUESTnet Regional Links



Costing Estimates

In the following costing estimates no allowance has been made for the sale of equipment (Cisco) surplus to requirements.

Summary

Item	Capital Cost	Annual Recurrent Cost	
		Equipment	Links
1 Microwave Links UQ, QUT & GU	\$260,000		\$15,000
2 Upgrade Cisco Routers	\$81,000	\$3,400	
4 Microwave Link USQ	\$100,000		\$4,200
6 Microwave Link Bond	\$120,000		\$4,200
TOTAL	\$561,000	\$3,400	\$23,400

Backup Link Costs

Item	Cost	Recurrent pa
3 Backup ISDN Links UQ, QUT & GU	\$12,000	\$2,400
5 Backup ISDN link and equipment USQ	\$8,000	\$1,000
7 Backup ISDN link and equipment Bond	\$8,000	\$1,000
TOTAL	\$28,000	\$4,000

Cost Details

Brisbane Universities

1.1 E3 Microwave systems, 34 Mbps E3 systems operating at 18 GHz with a 15 Km range.	\$80,000
1.2 Microwave installation cost estimate	\$20,000
1.3 Recurrent for operating the microwave links, including licencing, tower rental and maintenance is estimated at 6% of equipment costs	\$15,000 pa
2.1 Upgrade Cisco AGS Router at UQ to AGS+/4	\$13,000
2.2 Upgrade QUT Hybridge to AGS+/4	\$13,000
2.3 Upgrade Cisco Hybridge at GU to AGS+/4	\$13,000
2.4 High Speed Serial Interface modules for E3 Operation. Two required at UQ, one each at QUT & GU @ \$10,500 each	\$42,000
2.5 Retain existing serial line modules at QUT & GU for ISDN backup links	-
2.6 Increase in recurrent cost of operation of Cisco equipment is estimated at 5% of upgrade costs	\$3,400 pa
3.1 ISDN BRA Link for backup. Only one required	\$4,000
3.2 ISDN Link recurrent	\$800 pa

University of Southern Queensland

4.1 Two hop 2x2 Mbps Microwave. UQ, Gatton campus - Mt Lofty (Channel 0 tower) - USQ	\$70,000
4.2 Installation	\$10,000
4.3 Contribution to UQ toward equipment cost of the UQ microwave link from the Gatton campus to the St Lucia campus	\$20,000
4.4 Recurrent for operating the microwave link, including licencing, tower rental and maintenance is estimated at 6% of equipment costs	\$4,200 pa
5.1 Serial Card for ISDN link backup	\$4,000
5.2 ISDN BRA link for backup	\$4,000
5.3 ISDN link recurrent	\$800 pa
5.4 Increase in maintenance of Cisco Router estimate	\$200 pa

Bond University

6.1 Two hop 2x2 Mbps Microwave.	\$70,000
6.2 Installation	\$10,000
6.3 Contribution to GU toward equipment cost of the GU microwave link from the Nathan campus to the Gold Coast campus	\$40,000
6.4 Recurrent for operating the microwave link, including licencing, tower rental and maintenance is estimated at 6% of equipment costs	\$4,200
7.1 Install AGS Chassis from UQ	-
7.2 Serial Card for ISDN link backup	\$4,000
7.3 ISDN BRA link for backup	\$4,000
7.4 ISDN link recurrent	\$800 pa
7.5 Increase in maintenance of Cisco Router estimate	\$200 pa

Recurrent Costs of Current AARNet Links

Link	Recurrent pa
Megalink UQ to QUT	\$35,000
Megalink UQ to GU	\$35,000
Megalink UQ to USQ	\$82,000
ISDN 128 Kbps link UQ to Bond	\$20,000
TOTAL	\$172,000