HOUSE OF REPRESENTATIVES

Standing Committee on Communications,
Information Technology and the Arts

Inquiry into Wireless Broadband Technologies

SUBMISSION BY:

Integrity Data Systems

INTEGRITY

Integrity Data Systems Pty Ltd

CONTENT

Introduction

This submission seeks to advise the Standing Committee on Communications, Information and the Arts on wireless broadband technologies. Integrity Data Systems is a specialist wireless networking distributor in Australia and New Zealand and has been involved in wireless technology distribution since 1996. The following submission will review the current products Integrity imports from leading manufacturers around the world, along with wireless products it assembles in Australia.

The wireless technologies referred to in this submission will be radio-based spread spectrum technology (both IEEE 802.11 and non-IEEE 802.11-based), infrared technology (free space optics) and licensed microwave. The document will review the benefits of each product, as well as their capability to economically deliver broadband services. We will also discuss lessons to be learnt from the historical use of spread spectrum radio, current community issues and spectral constraints that limit the capabilities of the technology. Finally we will discuss our vision to implement wireless multimedia and IP telephony-capable broadband technology in rural communities through the use of current products and our own product development.

Integrity Data Systems – Background

Integrity Data Systems was incorporated in 1996 by the current chief executive officer, Mr Ross Chiswell.

The company is a value-added distributor with a specific focus on wireless or wireless-related technology. As a wireless specialist, Integrity selects leading-brand wireless products from around the world, along with developing and assembling its own products. Our company motto is "We don't just stock it, we know how it works". We have achieved this knowledge through our own personal and company use of the technology. We live, breathe and sleep wireless.

While the company's first product was a next generation wireless IP router introduced into Australia in 1996, Ross Chiswell's involvement with wireless technology dates back to 1993. This year saw the first deployment of wireless LAN access points to act as ethernet bridges. Ross was first involved with wireless products from NCR WaveLAN, which became AT&T and then Lucent Technologies. The product range is now branded ORiNOCO and manufactured and supplied Agere Systems.

Since this time, Integrity has continued to distribute spread spectrum radio-based products for broadband deployment and also introduced next generation infrared and licensed microwave products to Australia.

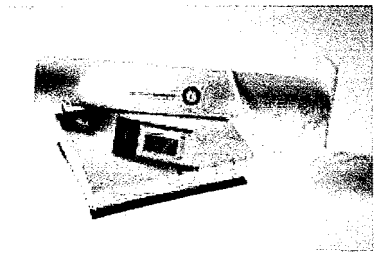
The duration and depth of our involvement with wireless technology has given us the experience and knowledge to comment on some of the current issues and mistakes of the past within this industry. Our passion for the technology ensures we have a strong vision for how the products we are involved with or have in development can change the face of broadband deployment and associated services in the bush.

Recent Company awards:

1. Wireless Link Entry Level

Based on Wireless LAN (WLAN) IEEE 802.11

The prostitution of WLAN products for use in outdoor links is how low-cost, license-free broadband products were originally conceived. Initially, WLAN access points were used with directional antennas to link ethernet LANs over distances of 10 to 20 kilometres. While some vendors still use access points, many manufacturers (including Integrity Data Systems) have developed specific wireless bridges or wireless router products (ie Agere Systems outdoor routers) for this purpose.



Currently, these products are spread spectrum radio-based, using the IEEE 802.11b 11Mbps standard that operates in the 2.4 GHz band.

The 2.4 GHz IEEE 802.11b products have been in use for some time now for entry level point-to-point and point-to-multipoint broadband deployment. The proliferation of brands now entering Australia and the use of wireless LAN cards in personal computers (PCs) and Linux boxes for community gaming is polluting the 2.4GHz band as a resource. This issue will be developed further later in the document.

We have most recently been involved with a carrier who tested Cisco and ORiNOCO products for point-to-multipoint broadband deployment. These tests found that the Cisco products did not truly support point-to-multipoint installations, and were out performed by Agere Systems' products through the use of Turbo Cell™ protocols.

In any case, the test demonstrated that the maximum capability of these products in a point-to-multipoint environment is 512 Kbps, full duplex to three remote sites simultaneously. From this testing, we can see that these products are only suitable for Internet services deployment and do not offer large amounts of bandwidth.

Products complying with the IEEE 802.11a standard are also now coming to market. These products will offer an air speed of 54 Mbps and true data rates of around 18 to 28 Mbps, half duplex. While a number of licence-free bands are open to this standard (5.3, 5.4-5.6 and 5.8), most products in the foreseeable future will operate in the 5.3 GHz band. In Australia, this band is not available for outdoor use, which we believe is appropriate due to our experience with the pollution of the 2.4 GHz spectrum.

If these products and the 5.3 GHz band were our only choice, then we would push for the outdoor use of this frequency. However, we already have a product available for the 5.8 GHz band (licence free) that is capable of 100 Mbps, full duplex true bandwidth and data rate (ie 100 Mbps bandwidth provides 100Mbps data throughput).

What is really needed is less ACA power restrictions on products using the 5.8 GHz ISM band so these products can be used over the greater distances typical of rural environments.

Also, another IEEE standard with product due to ship later this year is 802.11g. This standard also has air speed of 54 Mbps like 802.11a, but it operates in the 2.4 GHz band. This band is already open for outdoor use so the 802.11g standard provides a natural growth path for services currently being deployed with 802.11b technology.

Wireless LAN IEEE 802.11 Product Summary

- Indoor application

  Agere Systems ORiNOCO client products and access points

  11 Mbps 802.11b 2.4GHz

  54 Mbps 802.11a 5.3 GHz

  54 Mbps 802.11g 2.4 GHz

- Outdoor applications (broadband delivery)

  Integrity Data Systems OB500 **(Australian Assembled)**

  11 Mbps 802.11b 2.4GHz

  Agere Systems ORiNOCO outdoor routers

  11 Mbps 802.11b 2.4GHz

  54 Mbps 802.11g 2.4 GHz - future

  Exclude 802.11a 5.3 GHz based products for outdoor use

2. Wireless Link Advanced – Point-to-point

Based on spread spectrum radio non-IEEE 802.11 products

These products are a step up from the link products that follow the IEEE 802.11 standard. They tend to offer full duplex bandwidth, which means they are suitable for carrying voice, while also being manufactured to the standard of quality and reliability expected by carriers.

In point-to-point configurations, these products offer bandwidth from 10 and 45 Mbps to 100 Mbps, making them suitable for backbone or primary link deployment as part of broadband delivery infrastructure. Most models use the 5.8 GHz ISM band, which in Australia is a license free band. However the ACA has also imposed power restrictions on this band which significantly limit link distance when compared with the distances the product is technically capable of and used for in other countries such as the USA. (i.e. ACA power restrictions limits link distances to around 20 km while in the USA the same product is used over distances of 100km or more)

Wireless Link non-IEEE 802.11 Product Summary

Proxim Corporation (Formerly Western Multiplex)

Tsunami Ethernet Bridges 10, 45 and 100 Mbps full duplex – 5.8 GHz band

3. Wireless Link Advanced – Point-to-multipoint

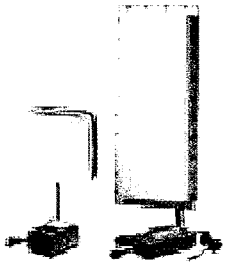
Based on spread spectrum radio non-IEEE 802.11 products

In section 1 above, we reviewed the point to multipoint capability of IEEE 802.11-based products. These products have a raw air speed currently of 11 Mbps while actual data throughput is 4 to 6 Mbps half duplex.

In one location we can deploy three non-overlapping frequencies, which means the IEEE 802.11b-based product can deliver a total raw point-to-multipoint bandwidth aggregate of 33 Mbps (i.e. 3 x 11 Mbps).

Non IEEE 802.11-based point-to-multipoint products recently released by Proxim Corporation (formerly Western Multiplex), dramatically change our ability to deploy bandwidth for wireless local loop.

The Tsunami point-to-multipoint product family consists of a 20 Mbps or 60 Mbps base station and 20, 40 or 60 Mbps subscriber units.



Each base station includes a sector antenna that provides 60 degrees of coverage. Therefore, the total bandwidth that can be delivered is up to 360 Mbps - more than a 10-fold increase on IEEE 802.11-based technology.

We have been waiting for an unlicensed band product with this capability for some time as we see it offering cost-effective bandwidth for wireless broadband deployment in the local loop to allow delivery of multimedia services.

The product is already in trial, with a number of second tier carriers in WA, SA and NSW. We now need to ensure that spectral power limits or pollution of the 5 GHz band do not prevent the maximum social benefits to be gained from the product.

Wireless Link non-IEEE 802.11 Product Summary

Proxim Corporation (Formerly Western Multiplex)

Tsunami Ethernet Point to Multipoint

Base Stations 20 and 60 Mbps – 5.8 GHz band

Subscriber Units 20, 40 or 60 Mbps – 5.8 GHz band

4. Wireless Link Advanced – Free Space Optics (FSO)

Based on Infrared Technology

FSO products offer high levels of bandwidth over short distances. The products can be installed very quickly (usually within a day), allowing the fast deployment of primary broadband pipes or links to new customers from an existing fibre tail. It is also usually far more economical than the costs associated with trenching and the deployment of inground fibre optic cable.

As products using infrared spectrum in Australia are license free, we do not have any spectrum licensing concerns. However some infrared based products on the market do not have well designed receiver circuitry, so to compensate they use high-powered infrared or laser emitters which increases the OH&S risks. While we know the ACA has already established a framework for the output power of infrared devices, we feel that a "less power the better" incentive should be established, something like the energy power rating on whitegoods.

Free Space Optics Summary

LightPointe

52 to 155 Mbps up to 4 kms

622 Mbps, 1.25 and 2.5 Gbps up to 1 km

5. Wireless Link Advanced – Licensed Microwave

Allgon, a Swedish manufacturer, has introduced a 36 Mbps capable radio that also combines a 4 port 10/100 baseT switch and E1 multiplexer. As an IP-based microwave, it can be easily incorporated into the primary infrastructure of a broadband delivery system.

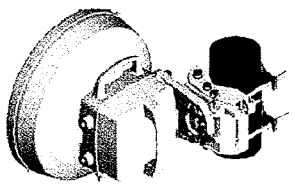
Licensed Microwave Summary

Allgon

E3 or 36 Mbps

4 x 10/100 BaseT ports

4 x E1 ports



6. Other Technologies – 3G, Bluetooth, LMDS, WLL and Satellite

We have discussed specific products in the above sections to demonstrate to the committee that the products are already available to provide economical wireless broadband delivery. As we have been involved with spread spectrum radio, infrared and licensed microwave technologies for some time we believe we can speak with some credibility. While we are not experts on some of the other technologies the committee is reviewing, we do have some brief comments to add.

- **3G -** Very expensive to implement, as it requires significant infrastructure changes. It is also targeted at high bandwidth mobile users, so we would not see it as a technology that can be cost effectively installed in rural communities.
- **Bluetooth** - A device to device networking technology for personal area networks not a broadband delivery technology, but one to allow your mobile phone to communicate with an earpiece or your personal data assistant (PDA).
- **LMDS -** A very capable wireless broadband delivery technology, but its implementation in Australia, even within the suburbs has been held back due to the expense associated with the product. It also uses very high frequencies which tend to affect it distance capability and means its reliability can be greatly affected by rain. Cost and distance limitations may mean that it is not cost effective for rural deployment that requires large cell sizes.
- **Wireless Local Loop** – Products have been available for WLL deployment for some time, however our investigations have found them to be at the low end of bandwidth capability. WLL products have typically been designed for single voice or modem line deployment not broadband delivery. Most products use a licensed band which means the technology will be limited to only a few carriers that have the funds to pay for the spectrum licensing, which in turn will slow down rural deployment. The costs associated with WLL base stations is also usually very high, which means that in many rural situations the carrier may not even be able to achieve a cost model to deploy the product.
- **Satellite** – Is a technology that does offer some remote bandwidth access capabilities, but is usually only cost effective for downstream bandwidth. We see satellite as a great technology to combine with spread spectrum based license free radio products.

Spectrum Considerations and Recommendations

1. 2.4 GHz ISM band

While the use of this band for deployment of point-to-point and point-to-multipoint links started in 1993, the past three years has seen explosive growth. This is due to an increase in the number of vendors bringing products to market and the increasing mainstream use of the technologies.

Our experience has shown that some organisations installing the product pay little regard to the ACA's class license for this band, which has a 4-watt EIRP restriction. In some instances we have found links that have an output power of 40 to 70 watts EIRP.

Of even more concern is the number of importers and installers of 2.4 GHz product that have nil radio experience or knowledge. These companies are combining the 2.4 GHz products with directional, omni antennas and amplifiers that in many cases breach the ACA's class license. Many of these companies are not even aware of the conditions around the use of products in the 2.4 GHz band.

Also 2.4 GHz products are typically used by free community networks or gaming groups who again may not care or know if they exceed the 4-watt limit.

When combined, all of these activities increase the amount of noise in the band and have in some locations meant that the band is unusable. If everyone worked within ACA's guidelines, all links should be able to co-exist due to the nature of the underlying spread spectrum transmission method.

If however, an omni-directional antenna and an amplifier are used, then anyone else trying to use the band in the same area will have their signals swamped.

Currently, the regulatory approach has been self-regulation which history has clearly shown does not work, as it has already allowed the spectral resource to be polluted.

We recommend that steps be taken to protect the resource so it is available for use by everyone. Any vendors or importers selling the product in Australia should undertake an accreditation process, which involves educating their channel on the class license.

All installed links should be registered with the ACA by the installer, end user or both and must supply, as a minimum, a link budget which clearly shows the product, RF cable, and antennas used, as well as the EIRP level for the link. The ACA could then issue a certificate of compliance.

We also believe that retrospective steps be taken to clean up the band by ensuring current links comply with the class license conditions. After an amnesty or grace period, sites without a certificate of compliance could be fined.

This should not only remove the "cowboy" element of some suppliers and resellers, but allow more second tier carriers to look at using the technology, which is still the most economical way to distribute Internet services.

This would still allow the technology to be used for gaming purposes, but minimise the risk of interference with a second tier carrier who is deploying a suburb-wide wireless broadband service.

Using the analogy of the spectrum resource as a river, there would be an uproar over the lax way we allow some to pollute it. We must protect it from the reckless or ignorant behaviour of a few so broadband is cost-effectively available for all.

In regard to free community wireless networks, they again should not only register their links, but be excluded from using amplifiers. This should not be an issue, as community links ares typically point to point and cover short distances.

2. 5 GHz band

We believe that products currently available for use in this band offer the greatest opportunity to address broadband delivery at a very economical rate. Wireless products operating at 5 GHz will overcome the last mile or local loop issues.

Therefore, we strongly recommend that the 5 GHz band be managed in a way that prevents pollution by either reckless or inexperienced organisations, which could render it unusable for the deployment of wireless broadband services.

The biggest single threat to the pollution of this band is the outdoor use of IEEE 802.11a based products. The bands being discussed around the world for use by this standard are:

5.150 to 5.350 GHz
5.470 to 5.725 GHz
5.725 to 5.825 GHz

Our recommendation is that IEEE 802.11a products should be restricted to only indoor use in the 5.150 to 5.350 GHz bands. The 5.725 to 5.825 GHz bands can be used for outdoor products that are spread spectrum radio-based but do not use the IEEE 802.11 based protocol.

This means that the high capacity point-to-point products currently capable of 10, 45 and 100 Mbps full duplex and the point-to-multipoint product capable of 20 - 60 Mbps wireless broadband, are at less risk from a small backyard operation that imports a IEEE 802.11a product they purchased over the internet.

To maximise the commercial use and flow-on social gains from the products that operate in the 5.725 to 5.825 GHz bands, we believe there also needs to be some changes to the ACA's current power restrictions.

In Australia this band is restricted to one watt EIRP, while in New Zealand it is 4 watts EIRP. Within the USA the Federal Communications Commission (FCC) follows its own rules on power restrictions, as covered by part 15 of its ruling which results in the product able to be used over significant distances.

Our recommendation is that power restrictions should be governed according to spectral density zones.

High density:	2 to 4 watt EIRP
Low & medium density:	Follow FCC Part 15 approach or minimum 4 watts

Our preference is that we be able to follow the FCC approach for external high-density city zones. This will allow us to cover far greater distances (of which the products are capable), which is required for Australian rural conditions.

Young second tier carriers desperately require long-distance, low-cost bandwidth for use as part of a broadband infrastructure, which is exactly what these products can provide if their power restrictions are lifted.

Cost example:

Current licensed microwave 36Mbps = $60,000 (typical installed cost)

Tsunami unlicensed 45 Mbps = $35,000 - $40,000 (typical installed cost)

(25% more bandwidth for at least 40% less cost. This example would be even more significant if we compared with the 100 Mbps product)

Vision

1. Wireless Broadband for IP Telephony and Multimedia Services

With products from companies like Proxim Corporation, we now have the capability to deliver enough bandwidth to change the type of services made available to rural communities. Tsunami Ethernet Bridges can deliver 45 to 100 Mbps bandwidth pipes into the community, which can then be distributed wirelessly using the Tsunami point-to-multipoint systems. Subscriber units offering 20, 40 or 60 Mbps can be installed in residential or rural business centres.

Once we have an IP port and bandwidth in the home or business we can then offer the next generation of services, even leap-frogging analogue and digital services currently available in the suburbs such as:

- IP telephony with associated interactive web services
- Online full-time Internet services
- Potential for streaming video

IP telephony has so much more intelligence than a standard analogue phone service that it opens up so many new applications which really will change the face of rural communications.

2. Wireless Internet services in remote rural communities

We have developed our own product called SatPOP which combines satellite technology, an Internet point of presence and a wireless Internet delivery system for remote rural locations.

This unit can be deployed where there are limited or even no terrestrial services available, as it uses satellite for the initial bandwidth down feed that is then dispersed to different buildings within the community using spread spectrum-based radio technology.

This device not only has Australian rural applications but also export opportunities throughout Asia where terrestrial services are limited and unreliable.

Summary

Integrity Data Systems was founded specifically to distribute products that deliver higher bandwidth services more economically than traditional carrier services through the use of a range of wireless technologies.

Since those beginnings in 1996, we are now at a point where the products available are more economically capable of meeting the technical capacity requirements needed to address last mile broadband solutions wirelessly in rural or regional centres.

In this submission, we have referred to commercially available products as we want the committee to understand that cost-effective and high bandwidth broadband delivery is possible now.

Importantly many of these products use unlicensed bands which further contains the ongoing cost to deliver the services. However, as presented from the historical look at the use of the 2.4GHz band, we must better manage and protect this finite spectral resource. If we don't then we loose the most economical way to deliver wireless broadband services currently available and force rural communities into potentially paying more than they should have.

We must also look at how we can make sensible spectrum regulatory changes that allow these unlicensed products to overcome the tyranny of distance associated with rural deployment.

Finally, Integrity Data Systems, as Australian company would like to have a voice, by further sharing the knowledge we have through a verbal presentation to the committee. We also seek the committee's assistance and guidance so we are able to take our Australian ideas in the SatPoP to a product realisation suitable not only for rural use but export potential into the Asian market place.

Please direct any enquiries to:

Ross Chiswell
Chief Executive Officer
Integrity Data Systems
456 Cross Road
Glandore SA 5037

Ph: 08 8351 1911

Fx: 08 8351 1911

Email: rchiswell@integritydata.com.au