

Report on

Cannons Creek Free Wireless Community Pilot Project



Prepared for:

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E-LEARNING PORIRUA TRUST



EXECUTIVE SUMMARY

The E-Learning Porirua Trust (E-Learning) is pleased to present this report on the successful outcomes achieved through the \$20,000 grant made by Internet NZ to the E-Learning Trust for providing Public-Free Wi-Fi within Cannons Creek Porirua.

1. Purpose of Grant

The intention of the grant was to improve internet services in Cannons Creek Porirua. Introduction of free or low cost Wi-Fi services to this area would provide accessibility not only for students of e-Learning, but also the wider community. It is well known that residents of these areas have limited financial ability to purchase broadband services and are generally seen as uneconomic markets for the major telecommunication companies.

2. Proposal to Internet NZ

The proposal was to establish Wi-Fi access points for high speed Wi-Fi as widely as possible across Cannons Creek based on the use of the direct buried Porirua East Network (PEN) fibre optic multimode network that connected 9 schools within the region. The project set out to install a 3 sector aerial structure on a pole at each of the 9 schools to achieve a 100m radius at each site, provide a coverage capability for some 500 homes to be able to connect to the Wi-Fi services within 18 months, and interlink all the sites into a common Wi-Fi Management zone. The proposal was also based on the utilisation of Smartlinx3 Limited wireless backhaul assets already in the region delivering services to certain Porirua City Council assets (e.g. Library and Swimming Pool) in order to maximise the reach of the services at the front end rather than spending funding on underlying backhaul switch/router & WAN cabling infrastructure in particular the upgrading of the PEN network and connection of it to the Smartlinx3 Regional Fibre Network.

3. Cannons Creek Free Wireless Community Project

E-Learning engaged Smartlinx3 to act as the services provider on the project. The original plan as detailed in the funding submission was as described in Paragraph 2. However, upon commencement of work Smartlinx3 found that the PEN fibre optic multimode network connecting the schools had deteriorated to a level of unusability and was simply no longer connected or even present in some locations, thus removing a key part of the backhaul fibre network arrangement from use.

To achieve the project outcomes for Cannons Creek E-Learning focussed on deploying the front end Wi-Fi "Access Points" at the Cannons Creek Shopping Centre precinct [the heart of Cannons Creek North 112 hectare region housing some 3,132 residents in 980 homes] and into the Cannons Creek East region [a 139 hectare

region housing some 3,594 residents in some 940 homes] to ensure coverage of 500 homes could be achieved as originally undertaken to do.

A design to substitute the defunct PEN fibre optic multimode network with a fit-for-purpose WLAN “Mesh Network” and wireless injection layer directly connected to the Smartlinx 3 Fibre Optic backhaul network in order to establish efficient paths across the mesh to the Internet was completed and agreed by both E-Learning and Smartlinx3 in September 2012. The design made use of a Smartlinx3 established base station at Aotea Reservoir which directly overlooked the Cannons Creek North and Eastern regions and set a design capacity target of a minimum of 2 Mbps up, 2 Mbps down within the designated coverage zone at any Wi-Fi access point in the network.

The design sought to provide a potential service to all areas of the community, optimize Wireless-VoIP, have low latency and low jitter characteristics, provide Skype and SIP application support, provide a managed Quality of Service (QoS), have seamless network-wide roaming and have authentication session persistence to meet the requirements of E-Learning intentions for IT computer course graduate connectivity. A zone controller suite of software was developed specifically for Cannons Creek to meet the E-Learning Trust requirements.

Unfortunately, despite the benefits of Public Free Wi-Fi to the communities within Cannons Creek it took some 10 months of concerted effort by both E-Learning and Smartlinx3 to gain building owner consent to mount the Wi-Fi Access Points in suitable locations to gain the required coverage.

In that time however, Smartlinx3 upgraded its wireless backhaul antenna capacities to ensure that a full 100x100Mbps wireless path was available for use to map back into its 1G/10Gbps fibre backbone and that its 1Gbps national Internet transit and 300Mbps International Internet Transit capacities could be made available for direct injection into the Cannons Creek Wi-Fi project “Mesh Network” layer, and completed the Zone Controller software development and testing for the Wi-Fi Network.

Following building owner access approvals late August 2013, the 5.8 GHz Wireless LAN (WLAN) 100/100Mbps “Mesh Network” Radio Links to each of the four 2.4GHz 802.11b/g Wi-Fi Access Points were installed and the Wi-Fi System has been consistently in service without disruption since.

With the revised project and design the originally budgeted \$20,000+GST installation costs to achieve coverage of 500 families was able to be reduced to \$14,000 to reach some 600 household leaving the balance of \$6,000 being available for establishing additional WLAN Mesh Network Base stations and Access Points or funding backhaul costs.

Against a Smartlinx3 invoice at that time to cover progress payments for completion of design and software testing milestones, commencement of installation works and delivery of internet services, E-Learning Trust paid the full amount of the grant (\$20,000+GST) to Smartlinx3 comprising \$14,000+GST of design and installation costs for the approved “Wireless Mesh” WLAN Network and 4 x node Wi-Fi “Access Network” and \$6,000+GST to cover the first 6 months of 100x100Mbps BS2A style Internet connectivity charges.

Following installation and testing over the September/October 2013 period and commissioning the service in October 2013, an Unlimited Datacaps 100x100Mbps (blended national and international) Internet service was purchased and made available by Smartlinx3 for the use of the Cannons Creek Public Free Wi-Fi System. EIR was set at 100Mbps and has been left at that level since first commissioning. An SLA of 99.2% availability with 24x7x365 service support was set in place and has operated continuously since first commissioning.

Although no contract for service was ever put in place for consumption of internet bandwidth or for the service support by Smartlinx3 of the Public Free Wi-Fi System since first commissioning, Smartlinx 3 has been applying its standard Service Management and Network Service Delivery Service Level Agreement (SLA) support arrangements and has continued to provide internet as a token of “regional good will” to the tune of \$9,493+GST of internet charges (100x100Mbps @\$999+GST/month 3rd party costs for first 12 months, reducing to \$499+GST/month for remainder of period with renegotiated backhaul and internet transit charges) and \$3,040+GST of service support charges (\$40+GST/month per access point for Network Operation Centre Service Desk and Maintenance Staff 24x7 support costs) to date.

A suitable ongoing arrangement to cover such costs is being examined in conjunction with an expansion of the system to ensure that the financial burden currently on Smartlinx3 Ltd can be removed as a regional community expense.

Initially, the system was set to allow unlimited access to MAC address registered graduating students and 30 minute per day sessions to the general public. However, owing to the observed minimal saturation of the available bandwidth and strong interest by both e-Learning and Smartlinx3 in seeing the system fully utilised, or at least to a higher observed level than it had been over the period October 2013 to October 2014, all restrictions were lifted at the end of October 2014 in terms of access time controls, and the full bandwidth of the 100x100Mbps across the Smartlinx3 Fibre Network and Cannons Creek WLAN “Mesh Network” and Internet Injection Layer to the internet was made available for usage.

Apart from one small no coverage zone within the Cannons Creek East area the acceptable use Wi-Fi signal levels cover the majority of the Cannons Creek East area. The end result being that some 609 households and 28 businesses fall within the acceptable 2.4 GHz Wi-Fi footprint of the Cannons Creek Public Free Wi-Fi System. This coverage satisfactorily exceeds the 18 month target of 500 homes able to be connected.

Since first commissioning in October 2013, the MAC addresses of 48 Graduate Students have been registered as having logged onto the system and received internet services.

The longest continuous logged-in session recorded by the Wi-Fi system for a single user log-on is 229 days. 18 Graduate users have been observed to regularly connect and use the system, and up to 30 individual users have been recorded as being simultaneously logged onto the Wi-Fi system and actively using it. The highest download speed recorded since Oct 2013 has been 40Mbps. The highest upload speed recorded since October 2013 has been 2.5Mbps.

At the time of drafting this report the following observations are made:

- The longest time a user has been continuously logged in the same access session is 229 days.
- 11 users have been continuously logged on for more than 40 days.
- In the past six hours 59 devices of members of the public have been connected to the network.
- 4 graduates (registered MAC addresses) and 13 members of the public are logged on and actively using the Internet services.
- Peaks of 20Mbps are regularly observed.
- Average utilisation sits just below 5Mbps.

4. Conclusion

The Project to provide Public-Free Wi-Fi within Cannons Creek Porirua successfully achieved its outcomes albeit using a WLAN “Mesh Network” and Internet Injection Layer vice the originally envisaged use of the PEN Multimode Fibre Optic network as a Fibre Metropolitan Area Network (FMAN) for delivering the local “Mesh Network”.

However, with the unique challenges of high tree lines and foliage density around housing area perimeters and the deeply crevassed terrain in the Cannons Creek area, the internet injection layer technology becomes the bottleneck for delivering bandwidth to the user in Cannons Creek, and unless fibre optic cabling is readily available to the specific geographic points where the WLAN “Mesh Network” and internet injection points need to be in order for the Wi-Fi “Access Points” to satisfactorily reach end point customers, the use of wireless “Mesh Networks” is the only practicable way of traversing the region and delivering backhaul bandwidth and internet access to where it needs to be. It is envisaged that any expansion of the current Public Free Wi-Fi capabilities will by necessity involve an expansion of the currently installed “Mesh Network” WLAN radio system.

Smartlinx3 have advised that our WLAN “Mesh Network” can be extended relatively economically if further hosting sites can be found for the 5.8GHz WLAN Mesh Radio nodes. At each node with a clear LOS coverage of some 200-400M at each “Access Point”, near full Wi-Fi coverage of the Cannons Creek and Porirua East area is practicably possible.

Without Internet NZ’s funding the E-Learning Trust would not have been able to take this significant step for our community by deploying Community Broadband into Cannons Creek. We hope that this will be the first step in ensuring digital inclusion for all low-decile communities in Porirua.

Connectivity for our city and our citizens, especially those that are already somewhat disadvantaged, is one of the E-Learning Trust’s top goals.

5. The Future.

Our leadership of this project has rekindled the interest of the Porirua City Council to develop wider coverage through Porirua to those areas that have not yet received high speed fibre rollout from Chorus, or who may wait for several years yet to gain access. The Porirua City Council is also interested in the use of Community Broadband Wireless Mesh Network Design as a means by which to facilitate business development in the region.

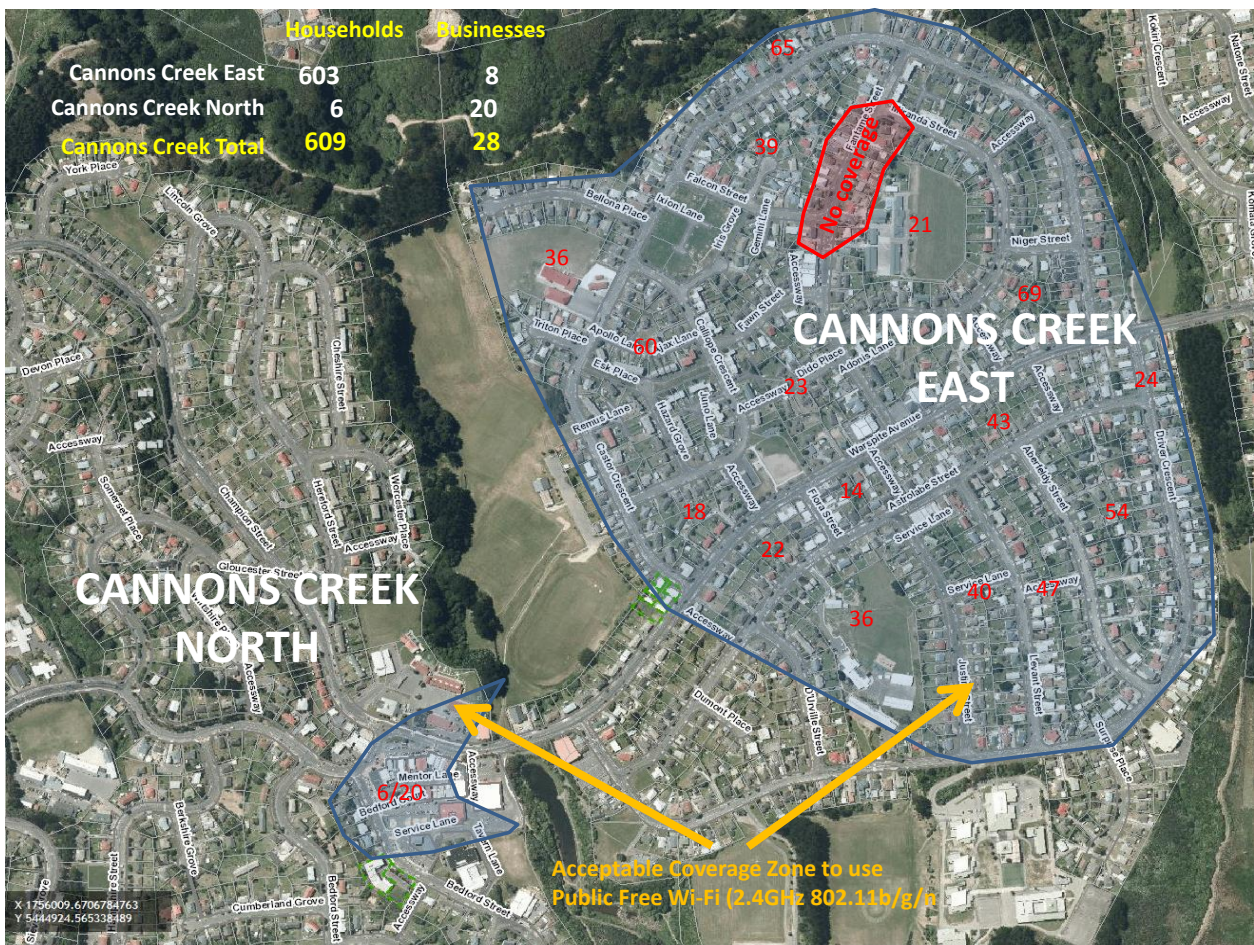
The Council is currently in the process of deploying Gigabit Wi-Fi based on direct FMAN connectivity to host the Mesh Network and will be using IEEE 802.11ac Wave 1 protocols as a means by which to significantly increase the end point download and upload speeds able to achieve its community connectivity based outcomes.

A meeting with the Council officers and other interested parties has been held to see how our initiative can be developed within the Porirua East and Waitangirua regions, and further meetings are planned.

The E-Learning Trust believes the deployment of IEEE 802.11ac Wave 1 Access Point Radios to each of the current four 802.11b/g/n Access Points on a 1 for 1 basis with very little capital outlay will provide an

immediate and easy boost to bringing realistic end user access download and upload speeds to “5G like” standards – namely in excess of 200-300Mbps. The cost to upgrade the existing Mesh Network to an equal standard to support “5G like” performance at the front end is minimal with the significant drop in market pricing for high capacity radios over the past 5 years.

The E-Learning Trust also believes that the deployment of 802.11ac Wave 1 Access Point Radios and additional Mesh Radios to extend the Wi-Fi coverage within the Porirua regions of interest is very predictable with regard to cost and performance and should be vigorously pursued as a means by which to facilitate education, business and social development in the region.



Cannons Creek Wi-Fi coverage area.