

Connecting Remote Communities in the Waikato



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The WAND Group

- World leaders in Passive and Active Network Measurement
- Research and Consultancy in protocol simulation
- Strong Collaborative links with NLANR and CAIDA in the US
- Endace is spin off company producing measurement boards including OC-48 and Gigabit Ethernet

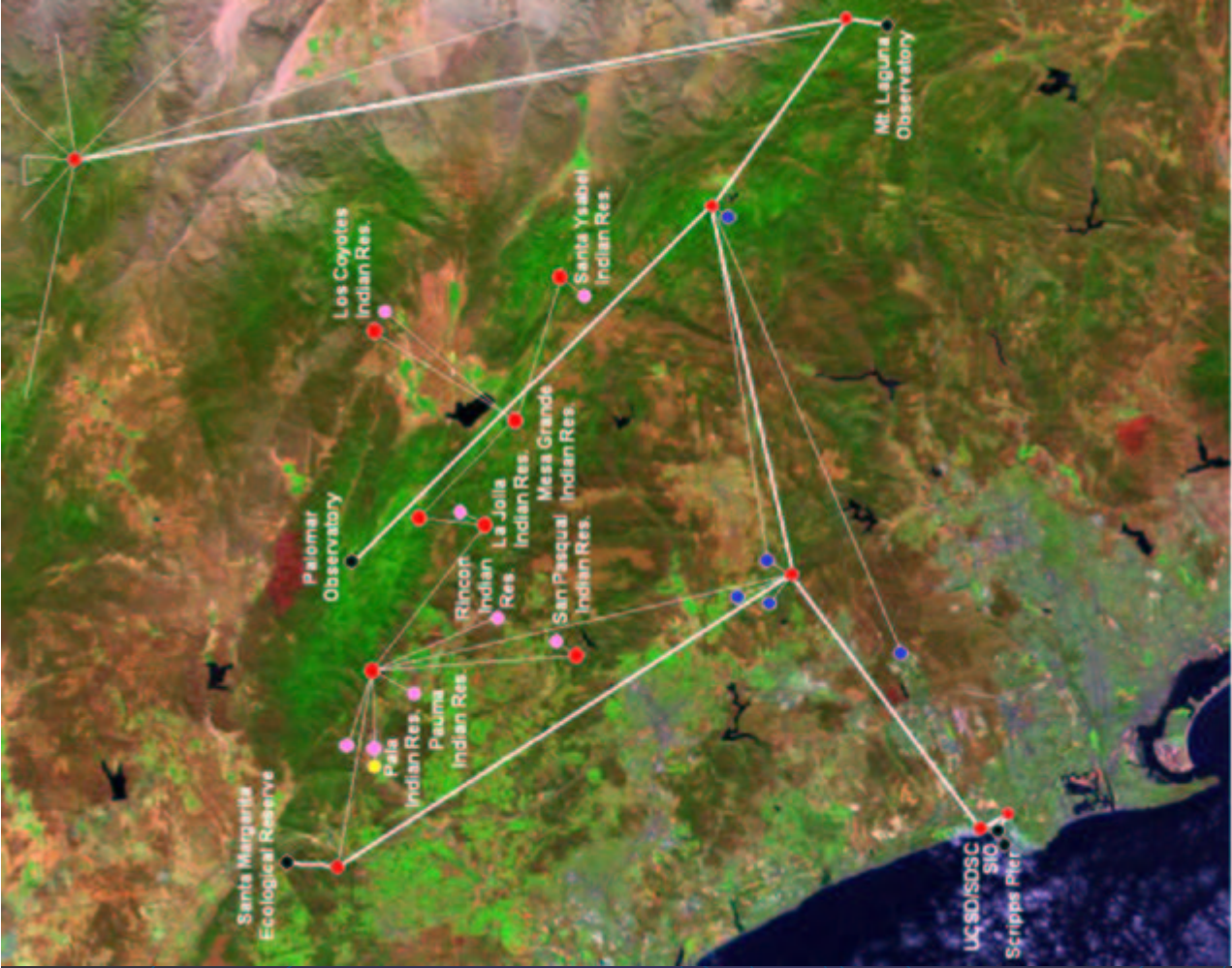




HPWREN

- <http://hpwren.ucsd.edu/>
- creating, demonstrating, and evaluating a high-performance, wide-area, wireless network in San Diego county.





Introduction

- CRCnet project started about 8 months ago
 - Initially funded by Department
 - Now have FRST funding



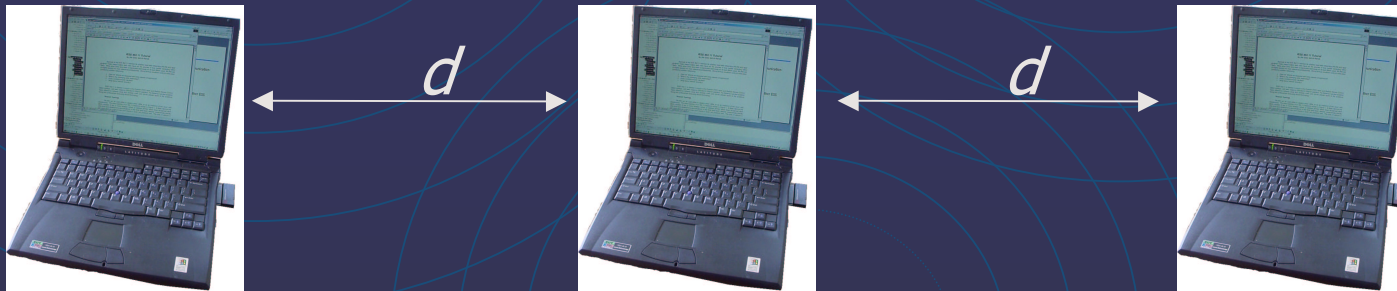
Goals

- Develop a platform suitable to deploy future generation ($>>10\text{Mbps}$) wireless networks in rural and remote areas
- Build Test-bed Network
 - Understand issues with deploying wireless networks
 - Level playing field for trail deployments
- Leveraging Community goodwill to extend network



802.11b MAC

- Cannot use same CSMA/CD mechanism as Ethernet:
 - Cannot detect collisions when transmitting
 - Also consider:

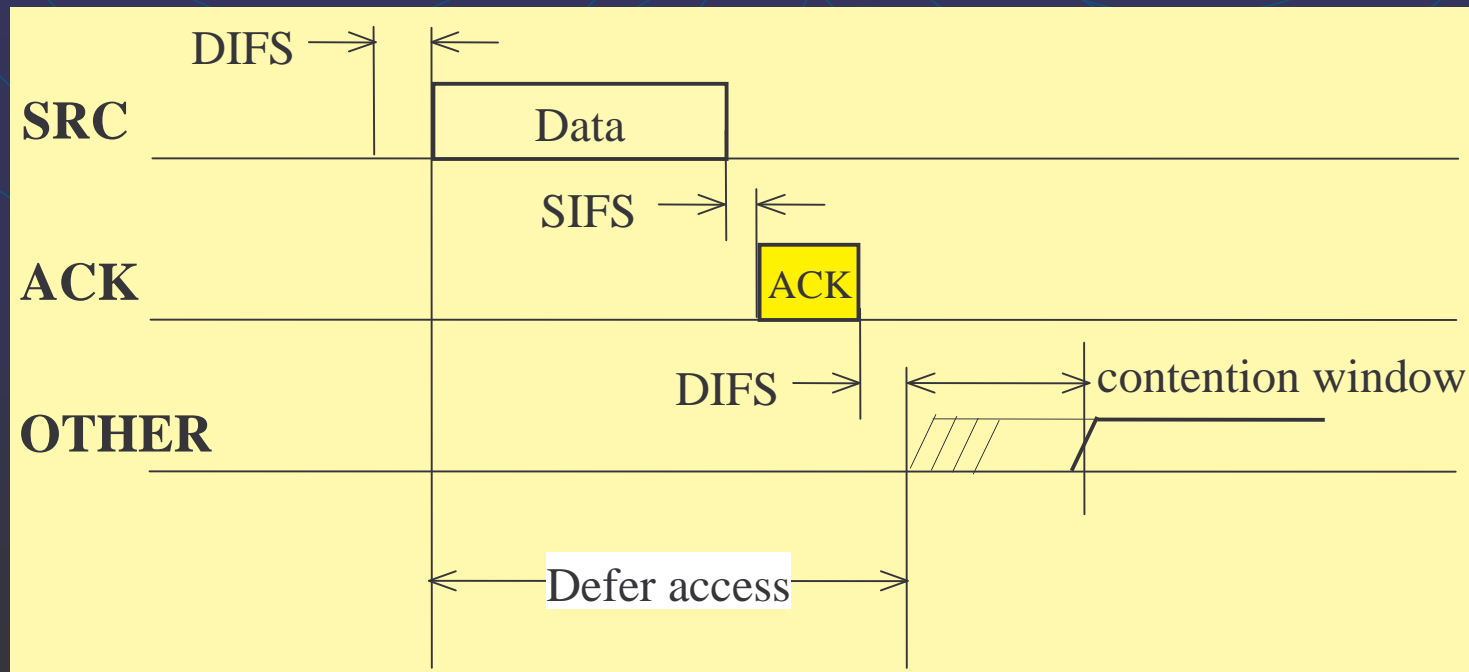


- Where d = max distance
- Computers 1 & 3 too far apart to receive each others transmissions



CSMA/CA – physical carrier sense

- Before a channel transmits it listens to the channel
 - If free it waits a DIFS period before sending frame
 - ACKs at a higher priority (SIFS)
- Preamble at 2Mbps



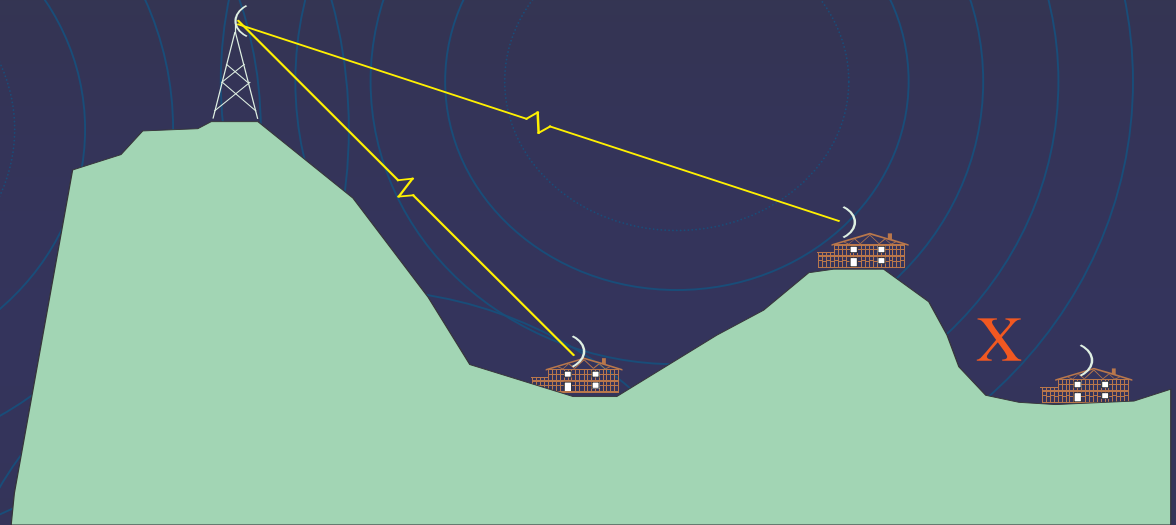
Mesh Structured Network

- Extensive use of point to point links
 - Develop protocols to improve efficiency
- Mesh structure
 - Routing issues

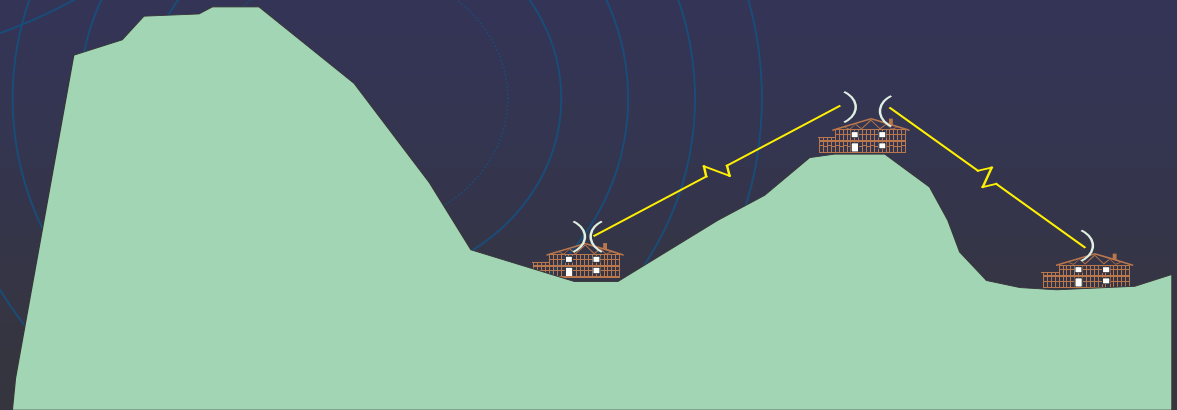


Mesh Structured Networks

Traditional:



Mesh:

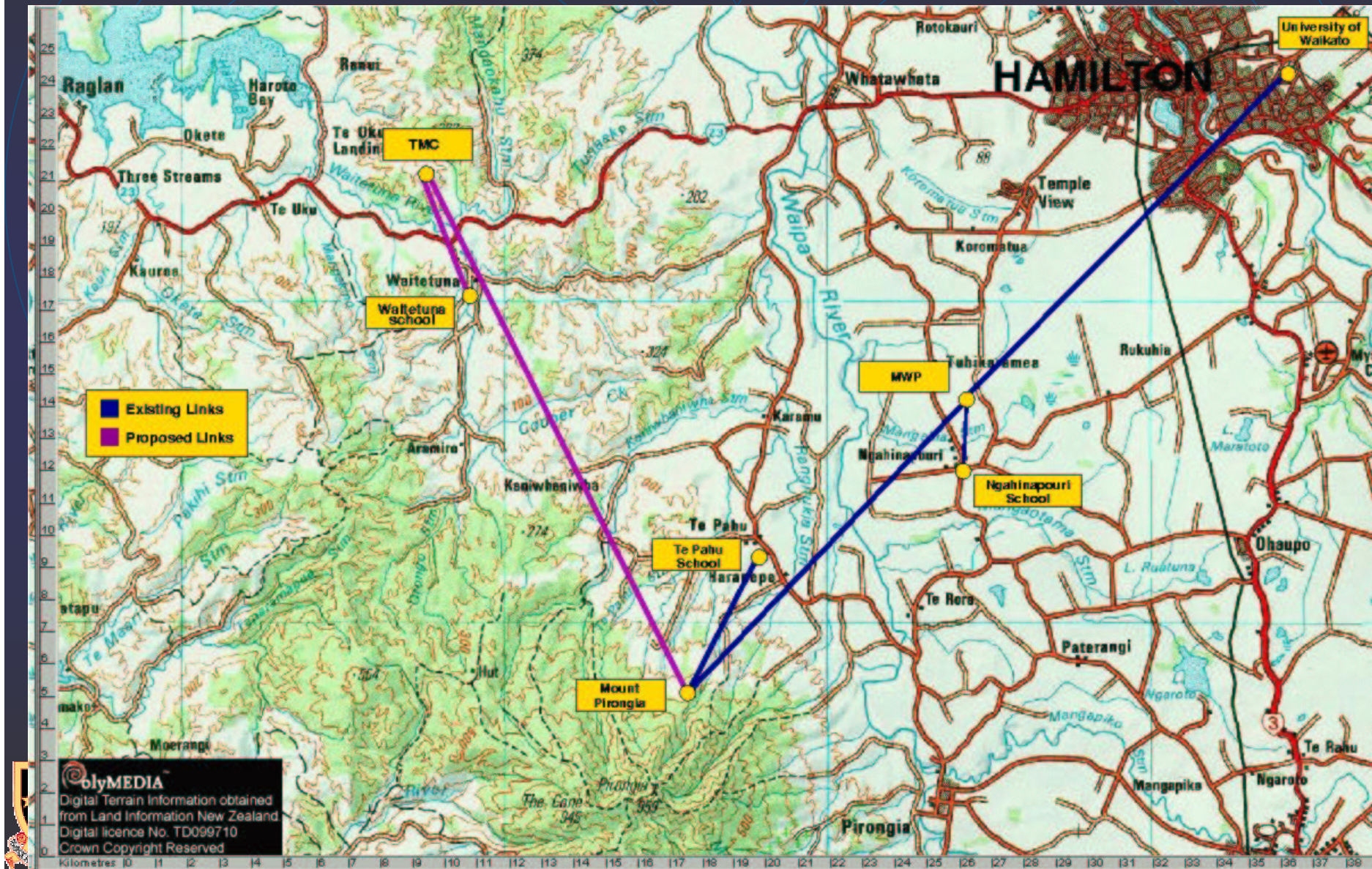


Stage 1 – Build Trial Network

- Using Orinoco 802.11b cards
- Currently have four links in place:
 - Ranging from 2.5km to 13.5km in length
 - Two schools and one house connected
 - One solar powered site



CRCnet Topology



MWP Site

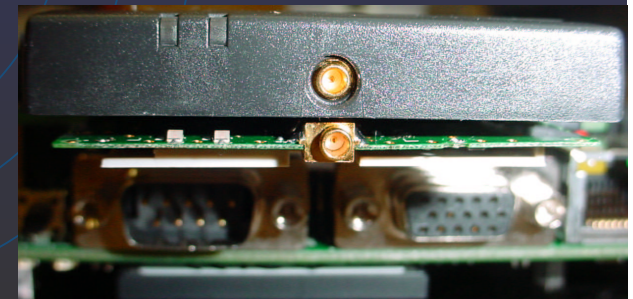


Pirongia Installation



Experiences to Date

- Importance of groups working together
- Many Practical issues
 - Huge Learning curve
 - Time to build a site
- Importance of monitoring
- Don't underestimate things like the weather



Applications

- Internet access
- VOIP
- Remote monitoring
 - E.g. weather, earthquake, ecological
 - Security
- Video Conferencing
 - E.g. between schools and marae



Further Information

- CRCnet Project:
 - <http://www.crc.net.nz>
- WAND group
 - <http://wand.cs.waikato.ac.nz>



