

Mesh Architecture in 802.11 Networks



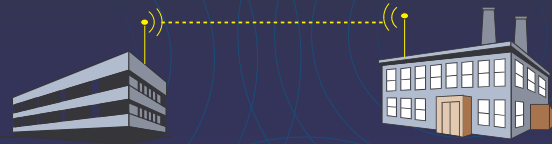
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Introduction

- 802.11 Network Types
 - Infrastructure
 - Ad Hoc
- Mesh Networks
- CRCnet

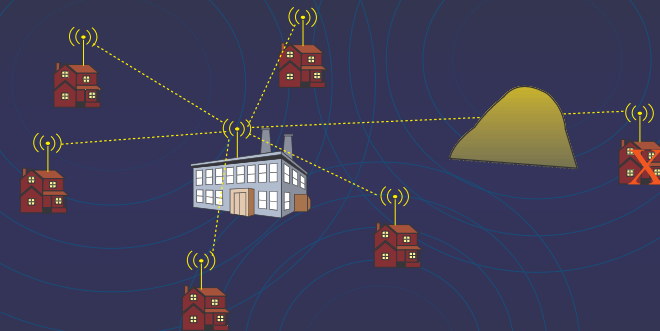


Point-to-point Networks



- Simplest Form
- Suited to high performance
- Less prone to interference if high gain antenna used

Point to Multipoint Networks

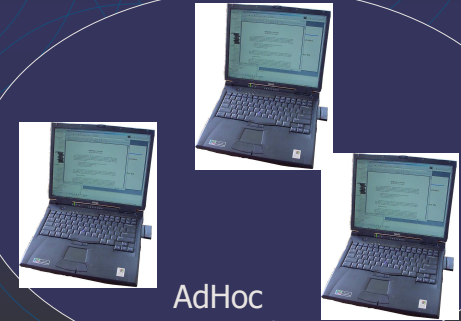


- Each subscriber must have clear line-of-sight to base station
- Deploy multiple overlapping base stations to get coverage

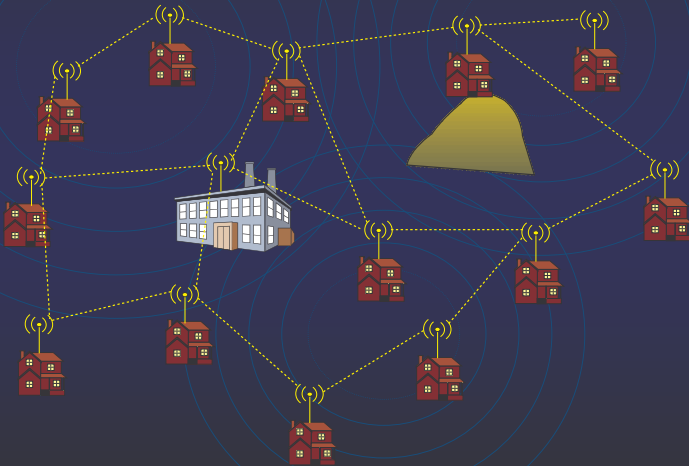


AdHoc Networks

- Stations communicate with each other on a *peer-to-peer* level sharing
- Often formed on a temporary basis



Multipoint to Multipoint (Mesh) Networks



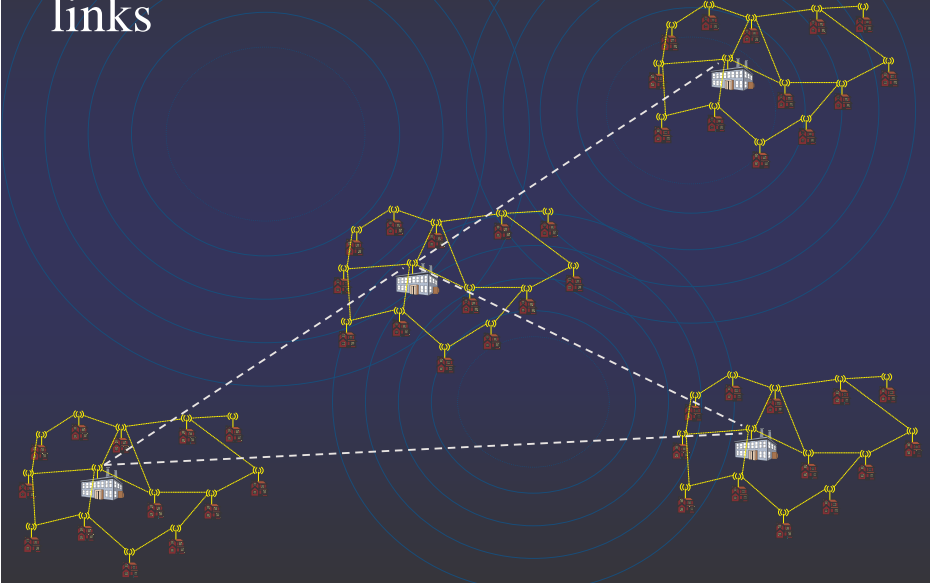
Example Mesh Network Nodes



Mesh Networks

- Advantages:
 - Self-forming
 - Self-healing
 - Self-balancing
 - Less Infrastructure required
 - Higher throughput (more efficient use of RF spectrum)
 - Good ability to follow landscape
- Have to ensure relatively high density

Mesh Networks using point-to-point links



CRCnet

- Connecting Remote Communities
- started about 11 months ago
 - Initially funded by Department
 - Now have Government funding
- Mesh Architecture

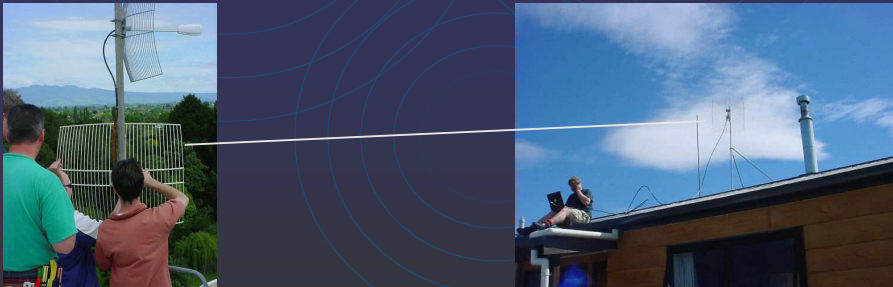


Goals

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

Mesh Structured Network

- Extensive use of point to point links
 - Develop protocols to improve efficiency

The image contains two photographs. The left photograph shows two people from behind, looking at a large, silver, parabolic satellite dish antenna mounted on a metal pole. The right photograph shows a person sitting on a roof, working on a similar parabolic antenna. A thin white line is drawn across the image, connecting the two antennas, symbolizing a point-to-point communication link in a mesh network.

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Stage 1 – Build Trial Network

- Using Orinoco 802.11b cards
- Currently have seven links in place:
 - Ranging from 300m to 17km in length
 - Three schools and three houses connected
 - One solar powered site

A photograph of a suburban street scene. In the foreground, there is a paved driveway leading to a white house with a gabled roof. A green lawn and a wooden fence are visible. In the background, there are more houses and trees under a blue sky with some clouds.

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MWP Site

A photograph of the MWP Site. In the foreground, a tall, grey metal antenna tower stands on a grassy field. The tower is equipped with several large, white, horn-shaped antennas pointing in different directions. A white rectangular equipment box is mounted on the tower. In the background, there is a single-story yellow building with a dark roof and several windows. The sky is overcast and grey. The entire image is framed by a dark blue background with faint, concentric blue circles.

Pirongia Installation



McG Installation



Hsk Site



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>

