Linux for Broadband Rural Wireless
The CRCnet Experience

Matt Brown & Jamie Curtis
WAND Network Research Group
Waikato University

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This abstract describes a presentation detailing the acheivements of the CRCnet project in the WAND Network Research Group at Waikato University over the past 4 years. In particular we describe how Linux and Open Source Software have been used to develop a platform to enable community development of broadband wireless networks in rural areas of the world.

The 802.11 family of wireless protocols has grown in popularity over the past 5 years as its ability to be used in a wide range of situations has been realised. This growth has been matched by the development of Linux and Open Source Software that enable the use of 802.11 wireless with Linux systems. While this software is relatively easy to configure for home use, the required expertise is raised considerably when the technology is extended to construct large networks consisting of many nodes. This puts the technology out of reach of many rural communities where it could otherwise be used to provide relatively cheap broadband access. The CRCnet project has developed a platform utilising Linux and Open Source Software that reduces the complexity of broadband wireless networks and consequently brings the expertise required to deploy and manage them to a level suitable for community deployment.

The first component of this platform is a very lightweight custom built Linux distribution designed to run in the restricted environment provided by a Soekris Biscuit PC. The resources available to the distribution are restricted to a 486 class processor with 64MB of RAM and 64MB of read-only flash memory. The presentation will cover the evolution of this distribution. We will also describe techniques that we have used to provide reliability and functionality that is required when the administrator is many hours from the device being configured. This reliability is provided while retaining a high level of functionality and flexibility using the limited resources.

The second component is a network wide configuration and mangagement system. This system is designed to provide all of the necessary expertise to configure, maintain and monitor a broadband wireless network in rural areas. This system draws together a multitude of Open Source Software packages including Cfengine, MRTG, Nagios, Quagga and many more. We provide a consistent GUI interface usable by administrators with minimal 802.11 or network management experience. The configuration system also integrates exteremely tightly with the Biscuit PC distribution and would not be possible without it.

The presentation will conclude by describing four diverse networks that have been succesfully constructed using the CRCnet platform. One of the networks is located in the rural eastern cape of South Africa providing connectivity between a hospital and medical clinic. The network is so remote that there is no Internet access available. Closer to home, a network in the Urewera ranges provides broadband Internet access to 4 of the most challenging to reach schools in the country. This network incorporates 5 solar repeaters, including one accessible only by helicopter.