

Approach to a problem of mesh-connectivity between XO laptops and Nokia MAEMO devices

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Introduction



Problem definition

Nokia N8x0 and OLPC XO interaction
(heterogeneous mesh network)

Steps

- ◆ Mesh driver and kernel driver upgrade
 - in Nokia Internet Tablet
 - in OLPC XO
- ◆ Other drivers patching for mesh-interconnection enabling

OLPC XO configuration

- ◆ **Dimensions:** 242mm × 228mm × 32mm
- ◆ **CPU** x86-compatible processor AMD Geode LX-700 433 Mhz, 64KB each L1 I and D cache; at least 128KB L2 cache
- ◆ **DRAM** memory: 256 MiB dynamic RAM
- ◆ **BIOS:** 1024KiB SPI-interface flash ROM
- ◆ **Mass storage:** 1024 MiB SLC NAND flash, high-speed flash controller
- ◆ **Wireless Networking:**
 - integrated 802.11b/g (2.4GHz) interface;
 - Mesh networking is supported by
 - Marvell Libertas wireless chipset,
 - 88W8388 controller and 88W8015 radio.



Mesh network

Mesh – wireless network technology with self-organizing architecture enabling fully connected network creation.

Features

- ◆ Self-organizing
- ◆ Self-healing
- ◆ Optimal routing
- ◆ Large scaling

Types

- ◆ Infrastructure networks
- ◆ Client networks
- ◆ Hybrid networks

802.11s and OLPC-mesh

Wireless chipset: Libertas - FullMAC driver - enables Wi-Fi and mesh support.

Libertas is the Marvel 88w838X series of wireless chipsets. FullMAC drivers can't be used by the mac80211 module.

The IEEE802.11s draft is mostly followed in Libertas, but it's an old version of draft.

Differences OLPC-mesh from 802.11s standard:


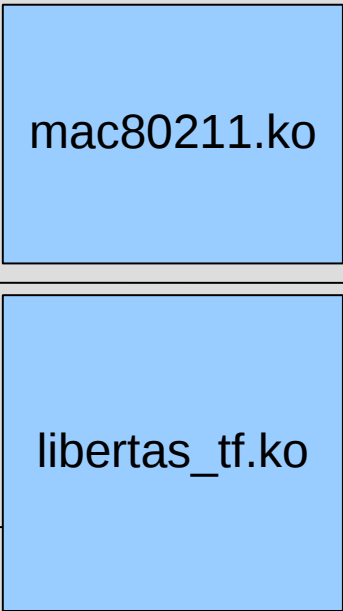
Main differences:

- Path asymmetry
- Metrics

Non implemented features:

- Link establishment
- Security
- Medium a protocol
- Congestion Control
- Power Savings mode

Libertas

Kernel	Modules	Layers
/net/mac80211/	 libertas.ko	MAC
drivers/net/wireless/libertas{_tf}	 libertas_tf.ko	PHY
		RF

Kernels' features

Nokia announced mac80211-based driver – stlc45xx.

Nokia and XO use different kernel's modules for their wireless adapters.

- old kernels:
 - missing Mesh support in Nokia N8xx kernel
 - support IEEE802.11s v0.1(current version is 2.0) in XO
- new Linux kernel of 2.6.26 version supports mesh

Plan

- Proof of concept
- Patch stcl45xx driver for Nokia N810
- Setup libertas_tf on XO
- Connect N810 and XO via mesh

Proof of concept

- Trying to connect two different adapters via wireless mesh network using 2.6.27 kernel

Result

- Two system based on kernel 2.6.27 with wireless adapters rt73usb-based and b43-based send and receive pings from each other

Patch stlc45xx-driver for N810

- Trying to include stlc45xx-driver, which was published by Maemo, in 2.6.27 kernel

Result

- Following the driver set-up instructions lead to permanent device reboot
- Installing driver in clear kernel with busybox doesn't give a working driver

Setup libertas_tf on XO

- Trying to include libertas_tf driver from wireless-testing kernel branch, in 2.6.27 kernel

Result

- libertas_tf is initialized
- mac80211 doesn't call libertas_tf

Connect N810 and XO via mesh

- Trying to connect N810 and XO, using 2.6.27 kernel and required drivers

Result

- Network didn't start as drivers didn't work
- Potentially the connection should work once drivers are tuned because of proof of concept step

Problems

- Existing mesh-drivers organization is unknown
- Network packet format is unknown

Future

Traffic control in Mesh Networks

- ◆ Mesh network infrastructure model development
 - QoS control
 - Dynamic topology reconfiguration
 - Management traffic volume control
 - Load balancing
- ◆ Routing algorithm development
- ◆ Open source implementation

Thank you!

Your questions, please.