Mesh 202 – Adding Services

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Ad Hoc Mesh Network – Defined

Ad Hoc (adjective) = Created on the spur of the moment; impromptu

Mesh (noun) = A communications topology with at least two pathways to each node (member), and where all nodes cooperate in the distribution of data

Network (noun) = Multiple computers and other devices connected together to share information

Ad Hoc Mesh Network – Features

- Decentralized (peer-to-peer)
- Does not rely on a pre-existing infrastructure
- Wireless (typically)
- Self-forming and Self-healing
- Data forwarding decisions made dynamically
- Highly Scalable (example: 2,000 nodes, Athens)

Ad Hoc Mesh Networks – Recent Etymology

- 2004 – Andreas Tønnesen writes s thesis for his master degree in Computer Science at the University of Oslo and defines OLSR (Optimized Link State Routing) protocol
- 2006 – OLSR is used for routing in OpenWRT v0.9 firmware for Linksys WRT54 series wireless units
- 2006 – Glenn/KD5MFW and Rick/NG5V use Linksys WAP11 gear for development and testing
- 2007/8 – Dave/AD5OO takes OpenWRT and develops a custom GUI for the Linksys WRT54 series

Ad Hoc Mesh Networks – Recent Etymology

- 2009 – Jim/K5KTF borrows van with 41' pneumatic mast from Glenn/KD5MFW and uses mesh to coordinate local foot race
- 2010 – Jim/K5KTF establishes HSMM-Mesh™ website and firmware is made available to other amateur radio mesh aficionados beginning January 26th
- 2012 – Version 0.4.3 firmware (based on OpenWRT v7.09) for WRT54 series units is released by HSMM-Mesh™
- 2012 – Version 0.4.3-063a firmware (an update to v0.4.3) is released by NW-Mesh

Ad Hoc Mesh Networks – Recent Etymology

- 2012 – OpenWRT v10.03.1 firmware for WRT54 series units is released by NW-Mesh
- 2013 – OpenWRT v12.09 firmware for Ubiquiti Bullet units is released by NW-Mesh
- 2013 – HSMM-Mesh™ is renamed to Broadband-Hamnet™
- 2013 – Version 1.0.0 firmware (based on OpenWRT v7.09) for WRT54 series units is released by Broadband-Hamnet™
- 2014 – Version 1.0.1 firmware for Ubiquiti Bullet units is released by Broadband-Hamnet™

Which Firmware Should I Use?

Answer: That Depends ...

Firmware for WRT54-Series

HSMM-Mesh™ v0.4.3 (deprecated)
NW-Mesh v0.4.3-063a
Broadband-Hamnet™ v1.0.0
OpenWRT v10.03.1

Firmware for Ubiquiti Bullet M2

Broadband-Hamnet™ v1.0.1
OpenWRT v10.03.1
OpenWRT v12.09

Firmware for Ubiquiti AirGrid, Bullet M5, PicoStation

Broadband-Hamnet™ v1.1.0 (in testing)
OpenWRT v10.03.1
OpenWRT v12.09

Interoperability

Gulliver's Travels (1726), by Jonathan Swift

Royal edict in <u>Blefuscu</u> required cracking open one's soft-boiled egg at the big end

They were the Big-Endians

Royal edict in <u>Lilliput</u> required cracking open one's soft-boiled egg at the small end

They were the Little-Endians

Interoperability

In the computing world:

Big-Endian = systems that internally store data beginning with the most-significant byte in the smallest address

Little-Endian = systems that internally store data beginning with the least-significant byte in the smallest address

Interoperability

In the computing world:

Big-Endian = used by main-frame computers and many wireless devices (including the Atheros chips in Ubiquiti products)

Little-Endian = used by some microprocessors (including the Broadcom chips in Linksys products)

Interoperability
Why should I care?

The security module of OLSR was little-endian up through version 0.5

The security module of OLSR is big-endian beginning with version 0.6

They don't talk to each other!

Just Give Me the Bottom Line!

Little-endian security module:
  HSMM-Mesh™ v0.4.3

Big-endian security module exists (but is disabled):
  Broadband-Hamnet™ v1.0.0 (but not in v1.0.1)

Big-endian security module:
  NW-Mesh v0.4.3-063a
  OpenWRT v10.03.1
  OpenWRT v12.09

Mesh Software Compatibility

Interoperability	HSMM-Mesh™ v0.3.x	HSMM-Mesh™ v0.4.x	Broadband-Hamnet™ V1.0.0	Broadband-Hamnet™ V1.0.1	NW-Mesh v0.4.3-063a	NW-Mesh v10.03.1	NW-Mesh v12.09
Supported hardware:							
Linksys WRT54G/GL/GS	yes	yes	yes	no	yes	yes	no
Ubiquiti product line	no	no	no	yes	no	yes	yes
OpenWRT version	7.09	7.09	7.09	10.03.1	7.09	10.03.1	12.09
OLSR daemon		0.6.0	0.6.4.1		0.6.3	pre-0.6.5	0.6.5.1
olsrd_secure.so plugin	none	0.5	none	none	0.6	0.6	0.6
byte ordering (endian)	n/a	little	n/a	n/a	big	big	big
Graphical interface	HSMM	HSMM	BBHN	BBHN	HSMM	LuCI	LuCI
Compatibility (without mods):							
HSMM-Mesh™ v0.3.x	yes	no	yes	yes	no	no	no
HSMM-Mesh™ v0.4.x	no	yes	no	no	no	no	no
Broadband-Hamnet™ V1.0.0	yes	no	yes	yes	no	no	no
Broadband-Hamnet™ V1.0.1	yes	no	yes	yes	no	no	0
NW-Mesh v0.4.3-063a	no	no	no	no	yes	yes	yes
NW-Mesh v10.03.1	no	no	no	no	yes	yes	yes
NW-Mesh v12.09	no	no	no	no	yes	yes	yes
Compatibility (with mods):							
disable olsrd_secure.so	n/a	yes	n/a	n/a	yes	yes	yes
enable olsrd_secure.so 0.6	n/a	n/a	yes	n/a	yes	yes	yes

Which User Interface Is Best?

Answer: That Depends ...

Ease of Use vs. Features

Easy to Use (less features):
    HSMM-Mesh™ firmware
    Broadband-Hamnet™ firmware
    NW-Mesh (v0.4.3-063a) firmware

More Features (challenging to use):
    LuCI (Lua Configuration Interface)
    NW-Mesh OpenWRT firmware

What Are Services?

IP Camera
Web server
IRC
VoIP

ssh is Your Friend

Command level control of the device
Ability to alter settings the GUI doesn't contain

But, you need to learn basic unix commands

Questions

Firmware Downloads   (updated June 2017)

Broadband-Hamnet™
   http://www.broadbandhamnet.com/software-download.html

NW Mesh
   http://public.randomnotes.org/openwrt-mesh/brcm-2.4

AREDN
   http://www.aredn.org/content/software

OpenWRT
   http://downloads.openwrt.org