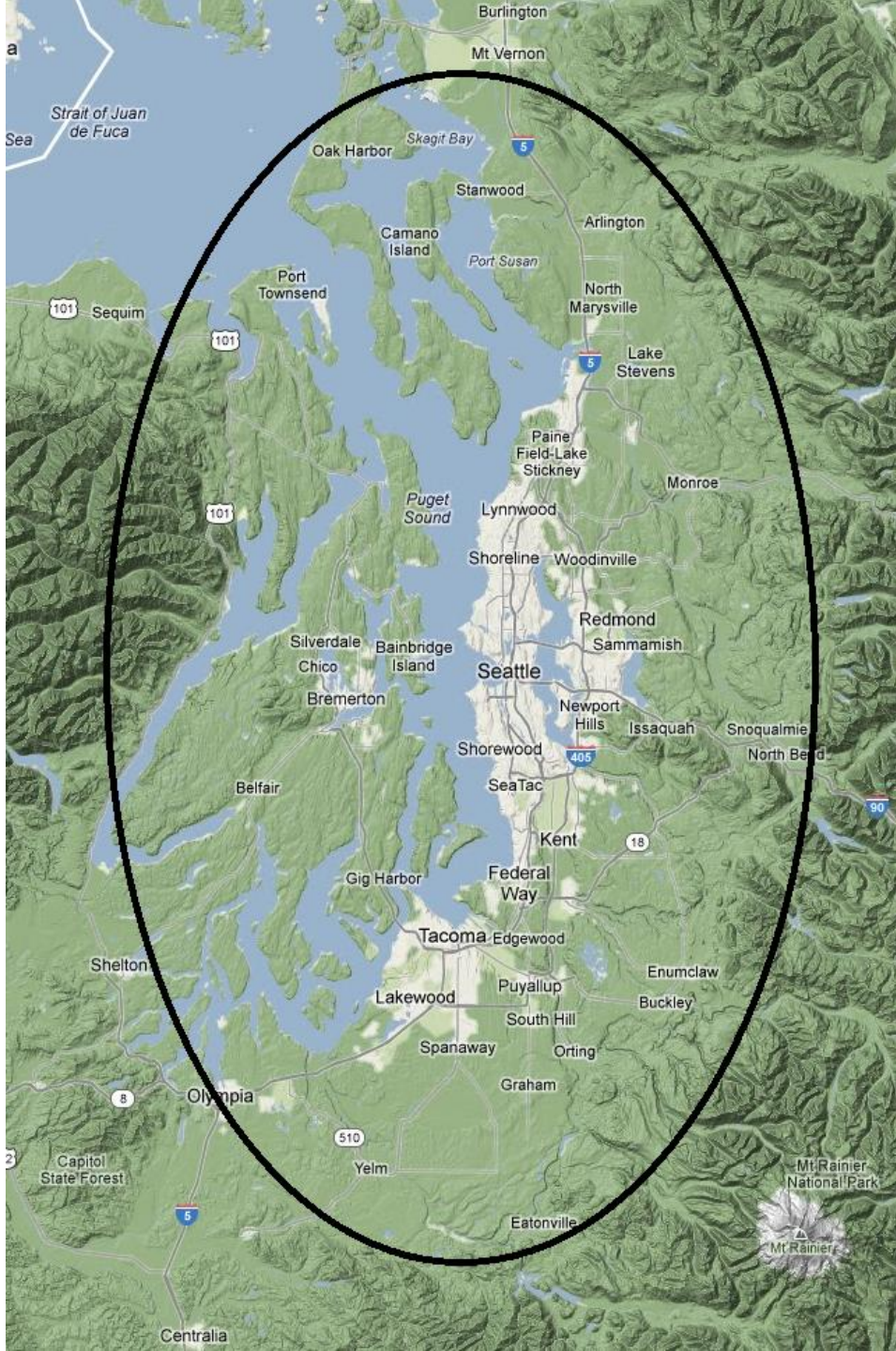


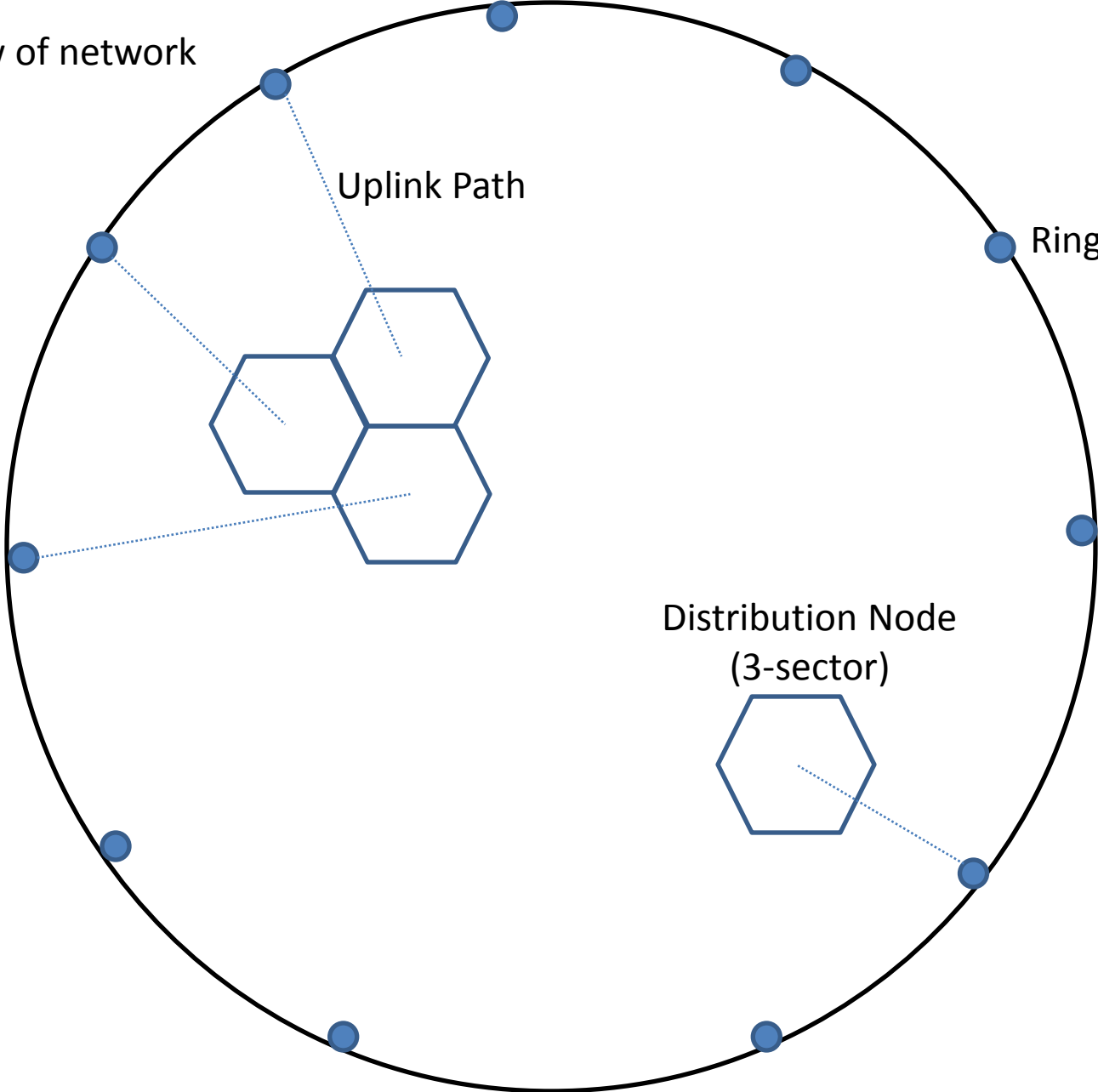
Puget Sound Data Ring

Bart Kus – AE7SJ - me@bartk.us

HamWAN.org



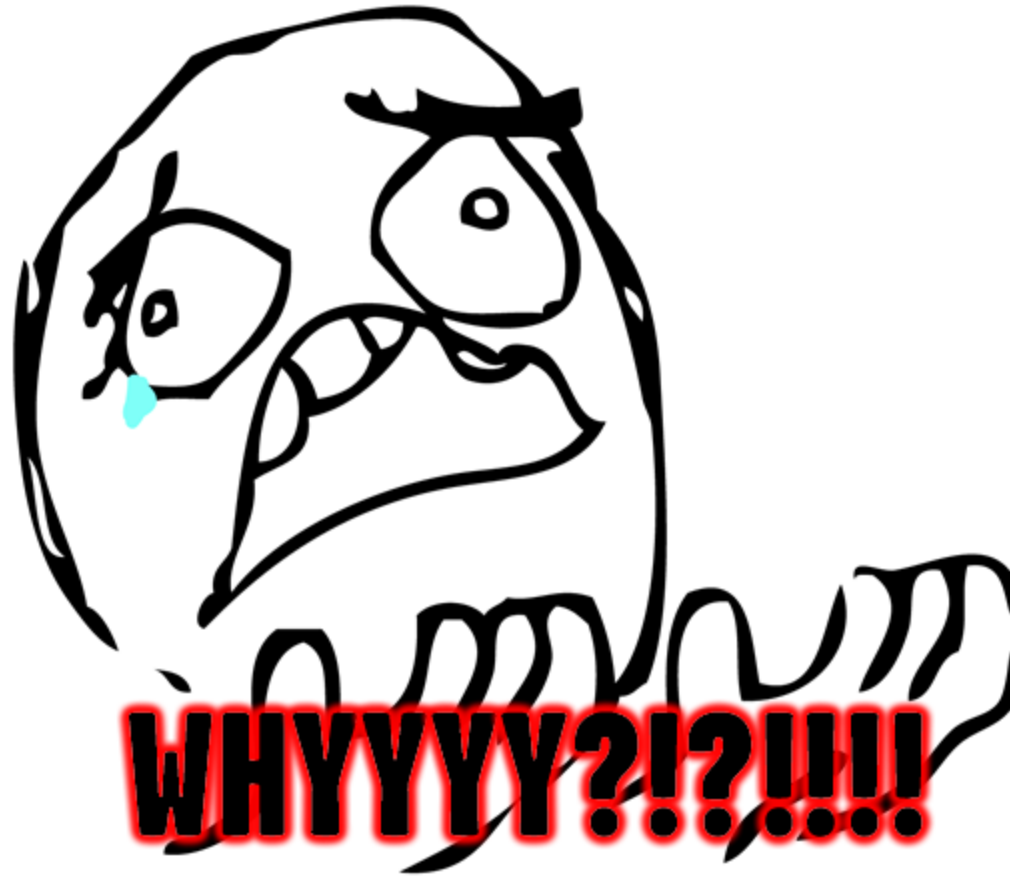
Logical view of network



Uplink Path

Ring Node

Distribution Node
(3-sector)



Why?

- Why do you use FM repeaters when you have a cell phone with you?
 - They connect you to a different community
 - In a lower pressure way
 - Do not require contracts or corporations
 - It's interesting to play with their features
 - They're available when other services fail
 - Those who build them love the challenge

Why?

- Life has advanced into the digital domain
- Amateur Radio should be leading technology, not lagging! Remember the early days?
- Do I really need to convey the value of all the IP-based software out there?
 - Telephony
 - Text messaging
 - File sharing and everything else!

Why?

- Amateurs are in a uniquely good position to be successful at pulling this off!
 - Leverage existing repeater sites
 - Existing club infrastructure to rally for the cause
 - Some existing financial systems to fund it
 - Access to non-ISM frequencies
 - Existing expertise in running radio systems
 - A pool of tech-savvy early adopters / beta testers

Why?

Here's the future of radio communications, and amateurs can be on the other end of that device



How?

- 5GHz band
 - Plenty of spectrum
 - Easy to achieve spatial diversity
 - Low atmospheric attenuation
 - Cheap and available hardware
- The Puget Sound has a unique geometry
- By using a ring design, coverage comes from all angles – obstacles less of a problem

How?

- MikroTik - Metal 5SHPn
- Up to 115Mbit aggregate
- Up to 1.3W transmitter
- Solves hidden node problem
- Only 11.5W consumption
- Only \$99
- Serious features



A Sweet Control UI

The screenshot displays the RouterOS WinBox interface. The top window shows the 'Bridge' configuration page with a 'Log' tab active, displaying a list of wireless interface events. Below this, the 'Wireless Tables' window is open, showing a table with columns for Radio Name, MAC Address, Interface, Uptime, AP, W..., Last Activit..., Tx/Rx Signal..., and Tx/Rx Rate. The 'Interface List' window is also open, showing a table with columns for Name, Type, L2 MTU, Tx, Rx, Tx Pac..., Rx Pac..., Tx Drops, Rx Drops, Tx Errors, and Rx Errors. The bottom window shows a log of system events, including user logins and wireless interface status changes.

RouterOS WinBox

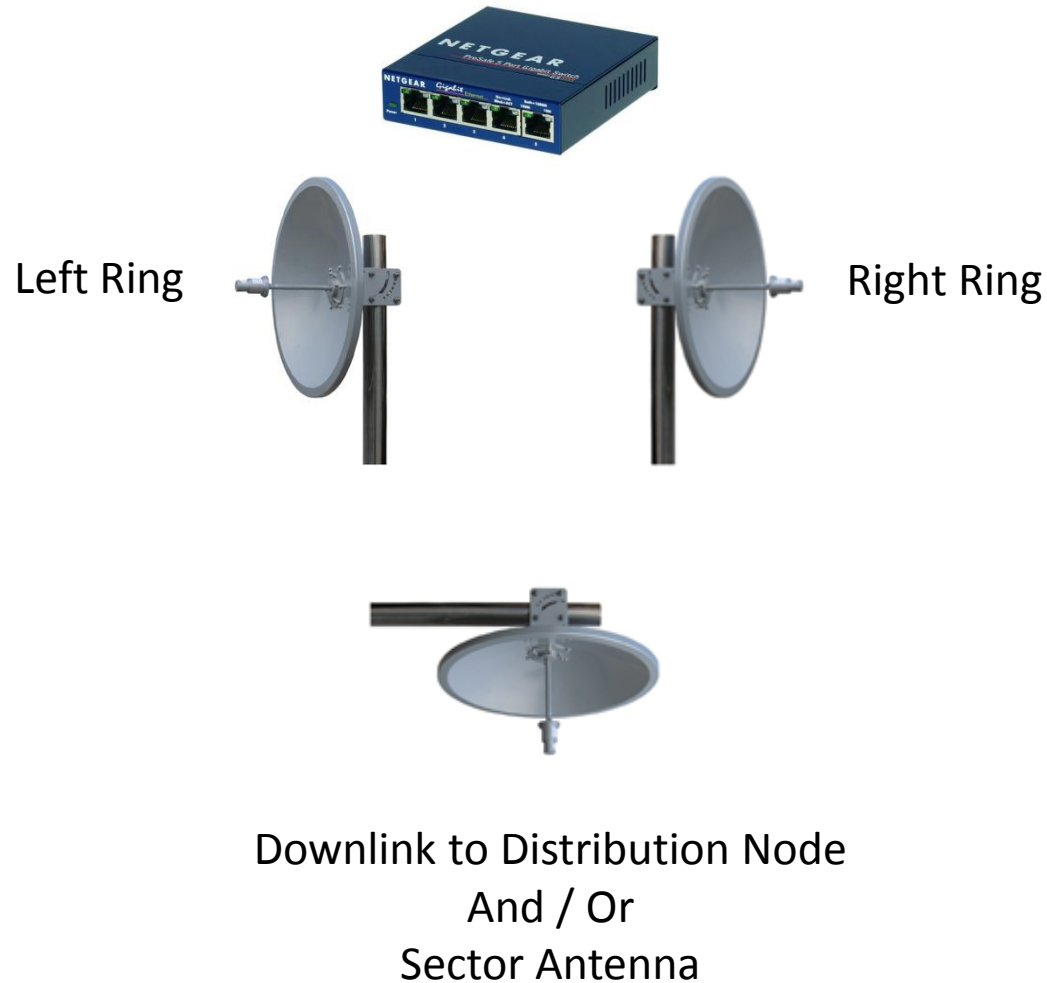
Radio Name	MAC Address	Interface	Uptime	AP	W...	Last Activit...	Tx/Rx Signal ...	Tx/Rx Rate
♦ wlan1	00:15:00:27:0D:5F	wlan1.1	00:51:05	no	no	0.980	-89	9.0Mbps/...

Name	Type	L2 MTU	Tx	Rx	Tx Pac...	Rx Pac...	Tx Drops	Rx Drops	Tx Errors	Rx Errors
R ♦ br_closed	Bridge	1522	44.5 kbps	1440 bps	5	2	0	0	0	0
R ♦ br_open	Bridge	1522	0 bps	0 bps	0	0	0	0	0	0
R ♦ ether1	Ethernet	1526	44.6 kbps	1728 bps	5	2	0	0	0	0
R ♦ wlan1	VLAN	1522	44.6 kbps	1504 bps	5	2	0	0	0	0
R ♦ wlan4	VLAN	1522	0 bps	0 bps	0	0	0	0	0	0
R ♦ wlan1	Wireless (Atheros AR5...	2290	0 bps	0 bps	0	0	0	0	0	0
R ♦ wlan1.1	VirtualAP	2290	0 bps	0 bps	0	0	0	0	0	0

Time	Info	Source
Sep/07/2012 15:19:17	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 15:36:31	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 15:36:32	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 15:40:22	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 15:40:24	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 15:54:25	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 15:54:26	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 15:54:27	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 15:54:29	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 16:01:26	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 16:01:27	wireless info	00:15:00:27:0D:5F@wlan1.1: connected

Time	Info	Source
Sep/07/2012 23:24:54	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 23:29:08	system info account	user admin logged in via winbox
Sep/07/2012 23:46:05	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 23:46:06	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/07/2012 23:53:02	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/07/2012 23:53:04	wireless info	00:15:00:27:0D:5F@wlan1.1: connected
Sep/08/2012 00:00:00	wireless info	00:15:00:27:0D:5F@wlan1.1: disconnected, received disassoc: unspecified (1)
Sep/08/2012 00:00:01	wireless info	00:15:00:27:0D:5F@wlan1.1: connected

A Typical Ring Node Design



A Typical Distribution Node Design

Ring Uplink



Three 120deg
access sectors



A Typical Client Node Design

Distribution Uplink



A Typical Ring Node Cost

Description	Price	Quantity	Cost
Metal 5SHPn	\$99	3	\$297
5GHz 28dBi Dish	\$75	3	\$225
5-port GigE Switch	\$40	1	\$40
Networked PDU	~\$150	1	\$150
CAT5 Cabling	~\$50	1	\$50
		TOTAL	\$762

A Typical Distribution Node Cost

Description	Price	Quantity	Cost
Metal 5SHPn	\$99	4	\$396
5GHz 28dBi Dish	\$75	1	\$75
120deg Sector	\$180	3	\$540
5-port GigE Switch	\$40	1	\$40
Networked PDU	~\$150	1	\$150
CAT5 Cabling	~\$50	1	\$50
		TOTAL	\$1251

A Typical Client Node Cost

Description	Price	Quantity	Cost
Metal 5SHPn	\$99	1	\$99
5GHz 21dBi Dish	\$45	1	\$45
CAT5 Cabling	~\$10	1	\$10
		TOTAL	\$154

Other units exist: 16dBi dish integrated with 1.25W TX for \$94. Just add CAT5!



3 Node Ring + Distribution Cost

Description	Price	Quantity	Cost
Ring Node	\$762	3	\$2286
Distribution Node	\$1251	3	\$3753
		TOTAL	\$6039

That's less than a single IC-7700 →
And you get to bootstrap the future!



DO YOU
CARE?

I Want YOU To Help

- Scout sites
- Donate money
- Raise money
- Talk to your radio club
- Volunteer your expertise
- Help deploy equipment
- Educate those new to IP

