

# SEVEN THINGS YOU PROBABLY DON'T KNOW ABOUT Z-WAVE

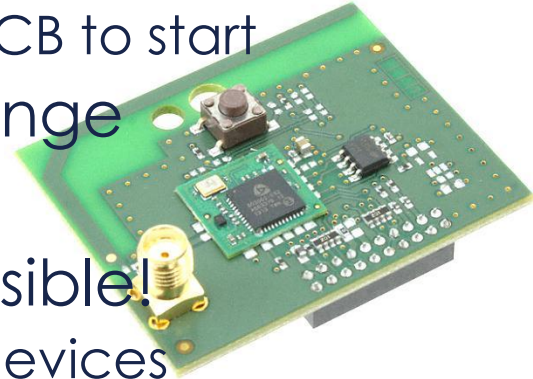
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# 1 – ANTENNAS AND RF RADIO RANGE

- ▶ “But it’s a mesh network”
  - ▶ “The Antenna doesn’t matter” - “just add a repeater!”
- ▶ Use best antenna that fits – longer is better
  - ▶  $\frac{1}{4}$  wave generally is best – Copy DevKit PCB to start
- ▶ Tuned antenna can nearly double range
- ▶ Power supply must be clean
- ▶ Direct link with as many nodes as possible!
  - ▶ Routing shortens battery life of Sleeping devices
  - ▶ Routing delays everything especially Security S0
  - ▶ Routing guarantees delivery, but direct is faster



# 2 - INTERROGATE DEVICE

- ▶ ZWave Plus Certified = Device reports capabilities
- ▶ Fingerprint uniquely identifies device
  - ▶ MFG + ProdID + ProdTypeID = 48bit unique device ID
- ▶ NodeInfo = Command Class support
- ▶ ZWave+ Info CC = Icon of primary function
- ▶ Notification CC V8 = 18 Types, 100+ Events
- ▶ Multilevel sensor V10 = 60 Types of sensors
- ▶ Other CC also include GET capabilities (config)
- ▶ Legacy Devices = Manually configure



# 3 – CENTRAL SCENE CC

- ▶ Central Scene CC is really Button Press CC
- ▶ Button presses trigger complex scenes - #taps or press
- ▶ Send ONLY to hub via lifeline
- ▶ SUPPORTED\_GET identifies # of buttons
- ▶ NOTIFICATION reports button # and EVENT
  - ▶ Single tap = on/off
  - ▶ Double tap = Inclusion/exclusion
  - ▶ Triple tap = special command like super slow dim
  - ▶ Quad tap! Quint tap! Cool but tougher to do reliably
  - ▶ Press and Hold/Release= DIM
- ▶ CAUTION - 200ms repeat FAILS if routing! V3 will fix



# 4 – ZW\_ASSIGNRETURNROUTE

- ▶ Hub must assign return routes of Routing Slaves
- ▶ Assign Return routes to ALL nodes the device is associated with, not just the hub!
- ▶ Ex: Wall Switch 03 associated with 05 and 07
  - ▶ ZW\_AssignReturnRoute(03,01,...) – back to hub
  - ▶ ZW\_AssignReturnRoute(03,05,...) – to 05
  - ▶ ZW\_AssignReturnRoute(03,07,...) – to 07
- ▶ ZW\_SetPriorityRoute & ZW\_AssignPriorityReturnRoute
  - ▶ Specify the first route routing slave will attempt

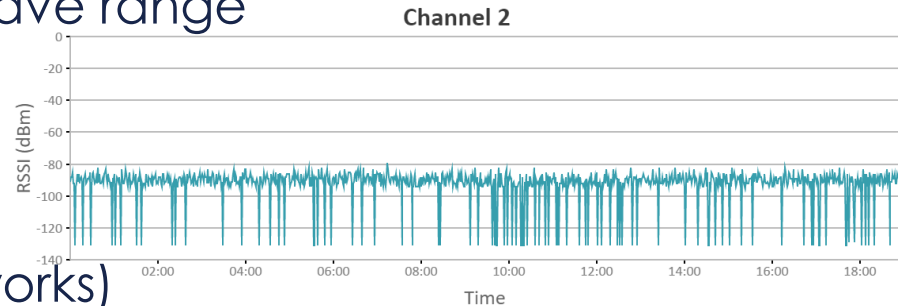
# 5 – CONFIGURATION CC V4

- ▶ NO CUSTOM CODING for parameters!
- ▶ V2 added more than 256 parameters - BULK
- ▶ V3 NAME\_GET - Name of parameter UTF-8
- ▶ V3 PROP\_GET - Size/type/min/max/default
  - ▶ Link to next parameter – may not be sequential
- ▶ V3 INFO\_GET - Several lines of text and a URL!
- ▶ V4 makes BULK optional
- ▶ Definition of Default bit is inconsistent



# 6 – RSSI – RECEIVED SIGNAL STRENGTH INDICATOR

- ▶ ZW\_GetBackgroundRSSI
  - ▶ Is Bad Actor trying to jam Z-Wave network? Security breach!
  - ▶ Other Z-Wave networks interfering?
  - ▶ Noisy environment – poor Z-Wave range
- ▶ ZW\_GetNetworkStats
  - ▶ Total TX/RX
  - ▶ CRC errors
  - ▶ Foreign HomeID (nearby networks)
- ▶ IMA libraries return RSSI with each ACK
- ▶ PowerLevel CC TEST\_NODE\_SET



# 7 – ZW\_SENDDATA

- ▶ BYTE ZW\_SendData(BYTE nodeID,
  - ▶ BYTE \*pData,
  - ▶ BYTE dataLength,
  - ▶ BYTE txOptions,
  - ▶ VOID\_CALLBACKFUNC(completedFunc)(BYTE txStatus, TX\_STATUS\_TYPE\* txStatusReport ))
- ▶ SerialAPI
  - ▶ HOST->ZW: REQ | 0x13 | nodeID | dataLength | pData[] | txOptions | funcID
  - ▶ ZW->HOST: RES | 0x13 | RetVal
  - ▶ ZW->HOST: REQ | 0x13 | funcID | txStatus





# 7 – ZW\_SENDDATA – TX\_OPTIONS

NAME	DESCRIPTION	HEX	TIMING
NONE	Send Direct Once	00	0.02@100K
ACK	LWR once Send direct 3 times	01	0.02-0.5
NO_ROUTE	Send direct 3 times only	10	0.02-0.5
AUTO_ROUTE	LWR once Send direct 3 times 5 routing table routes	04	0.02-5.0
EXPLORE	Adds Explorer frames to Auto	20	0.02-7.0

Use ACK | AUTO\_ROUTE | EXPLORE most of the time

# 7 – ZW\_SENDDATA – TIMING

- ▶ Send a GET command (BASIC\_GET)
- ▶ When can you send the next command?
  - A) Immediately
  - B) After the RetVal
  - C) After the Callback
  - D) After the REPORT
  - E) After Security Nonce
  - F) 10 seconds

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HUB	ZM5x0x	Time
BASIC_GET		0
BASIC_GET	RetVal	0.001
BASIC_GET	CAN	0.002
BASIC_GET	CAN	0.003
BASIC_GET	CAN	0.004

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  - ▶ F) 10 seconds

HUB	ZM5x0x	Time
BASIC_GET		0
	RetVal	0.001
BASIC_GET		0.002
	CAN	0.003
BASIC_GET		0.004

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  - ▶ F) 10 seconds

HUB	ZM5x0x	Time
BASIC_GET		0
	RetVal	0.001
	CALLBACK	10
BASIC_GET	REPORT?	10.002
	RetVal	10.003

# 7 – ZW\_SENDDATA – TIMING

- ▶ Send a GET command (BASIC\_GET)
- ▶ When can you send the next command?
- ▶ A) Immediately
- ▶ B) After the RetVal
- ▶ C) After the Callback
- ▶ **D) After the REPORT**
- ▶ E) After 10ms
- ▶ F) 10ms after the next BASIC\_GET



HUB	ZM5x0x	Time
BASIC_GET		0
	RetVal	0.001
	CALLBACK	10
	REPORT	10.1
BASIC_GET		10.101

# CONCLUSION

1. Use the BEST antenna available and tune it
2. Z-Wave Plus - Interrogate the device
3. Central Scene CC triggers complex scenes
4. Assign Return Routes of ALL Associated nodes
5. Configuration CC V3 – parameter info from device
6. RSSI for Security and network management
7. SendData timing – one frame at a time

# QUESTIONS?

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