Playing chiptunes through a city-wide sensor network

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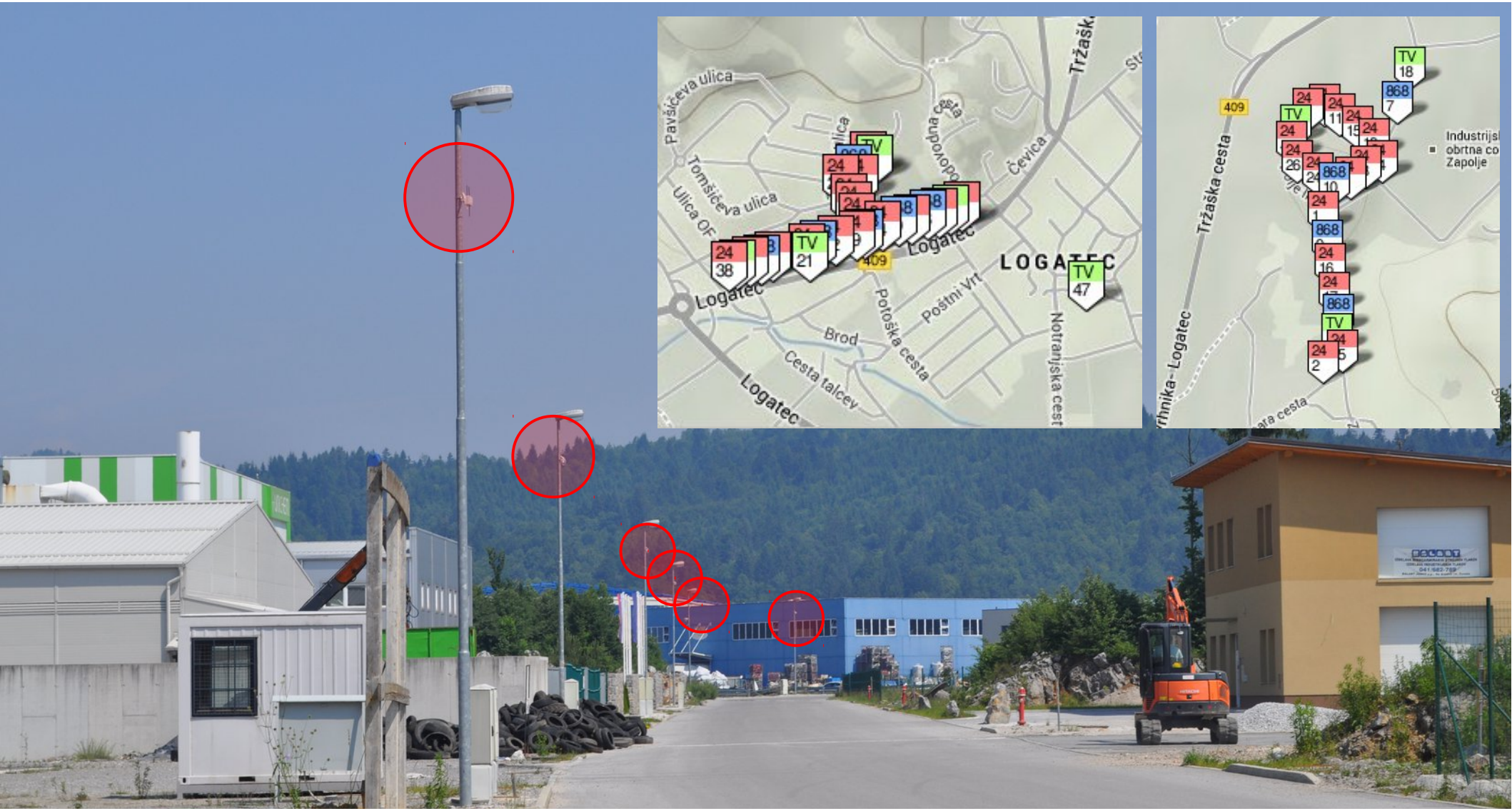
This is VESNA

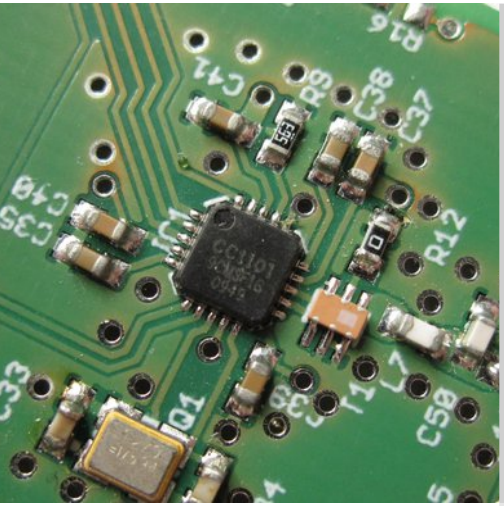
(substitute your favorite wireless sensor here)

Let's use sensors for broadcasting audio

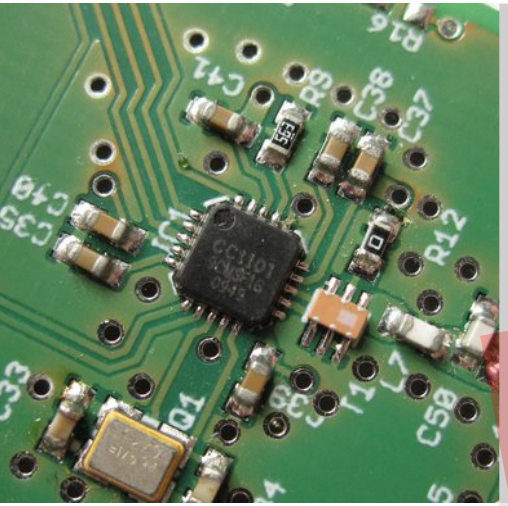


Each node should act as an FM transmitter (because *science!*)

Quick sanity check

	packet based	SRD band (868 MHz)	digital FSK
(CC1101)			
	continuous	bcast. band (<864 MHz)	analog FM

Quick sanity check

 (CC1101)	~~packet based~~	~~SRD band (868 MHz)~~	digital FSK
	continuous	bcast. band (<864 MHz)	analog FM

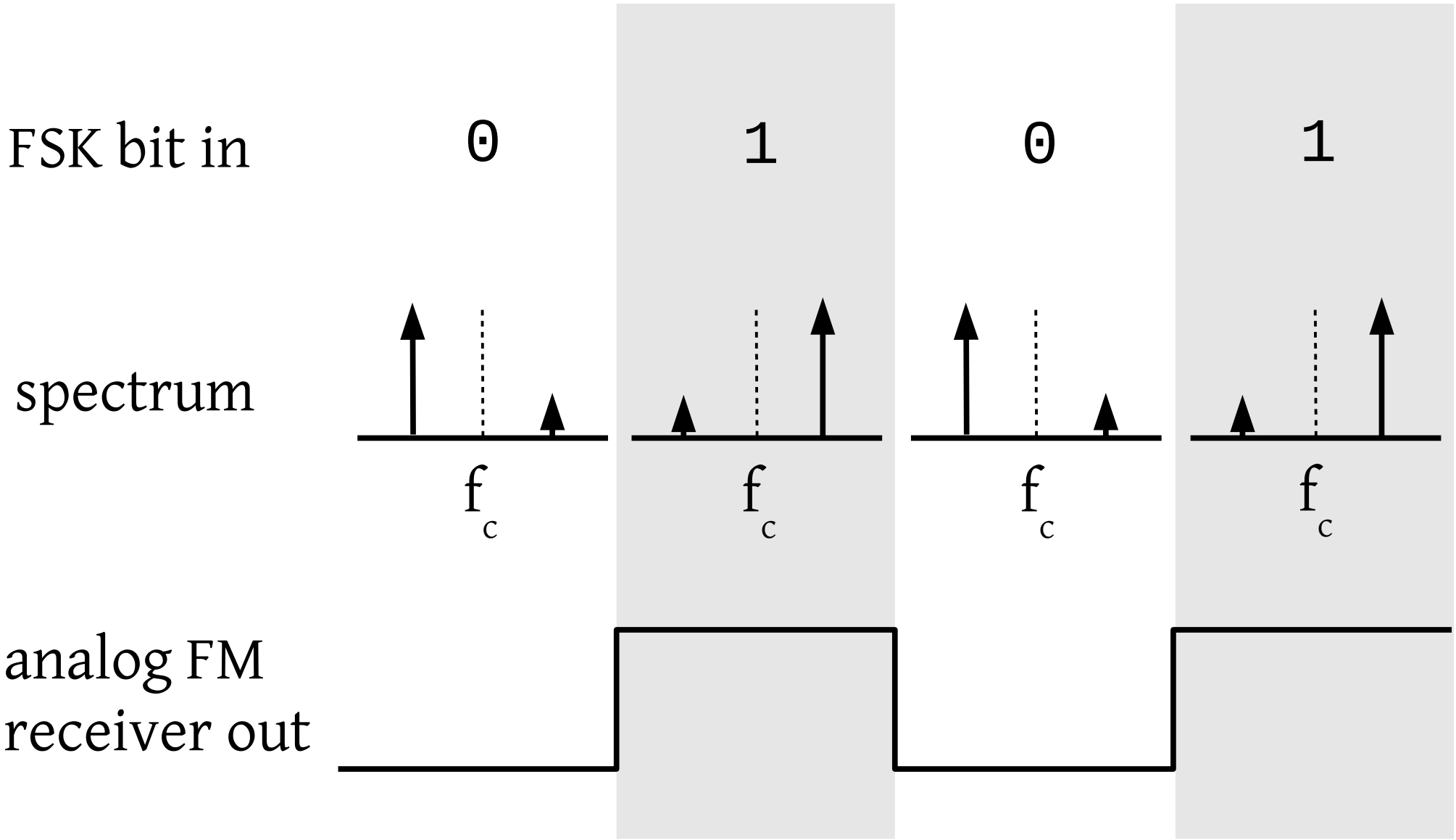
legacy transmit mode allows infinite packet length

works reasonably well down to 780 MHz

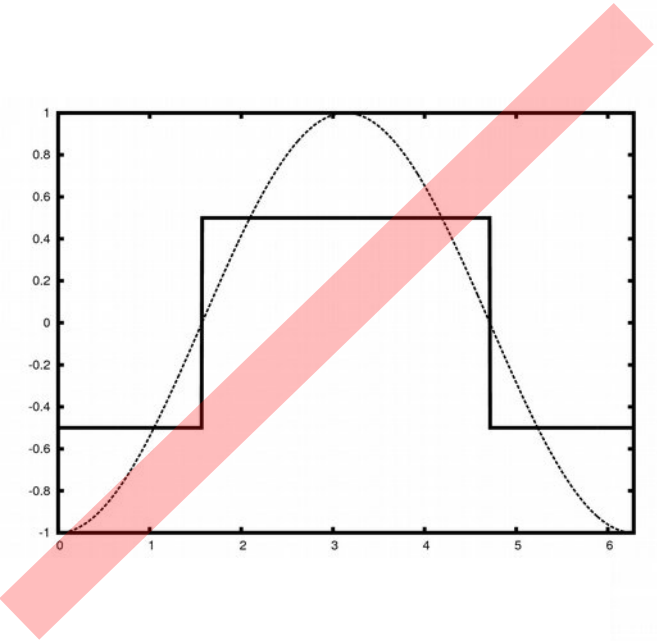
(covers channels used by studio microphones)

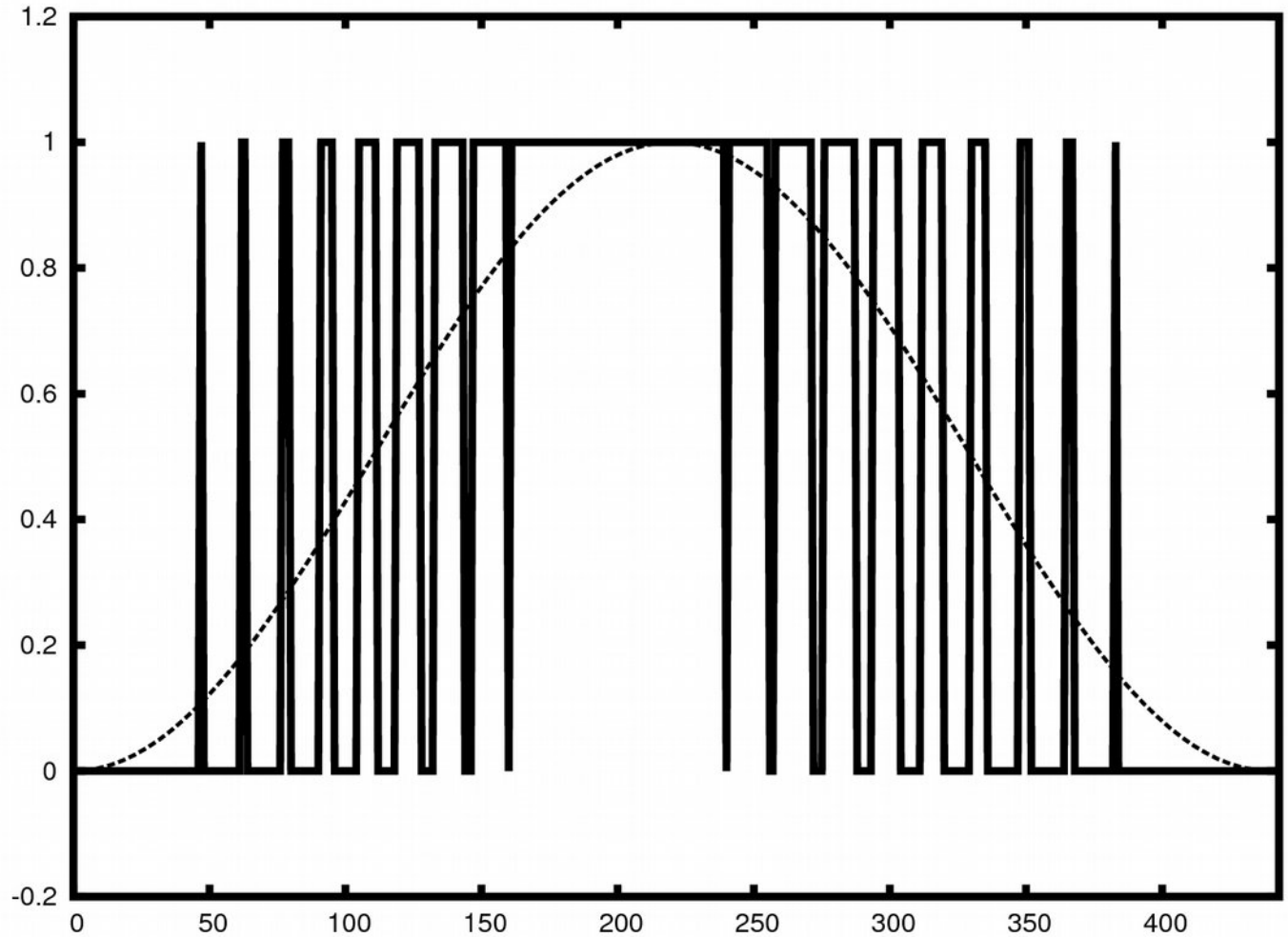
Frequency Shift Keying

as received by an analog FM receiver



Exploit high bit rate to gain effective bits with oversampling

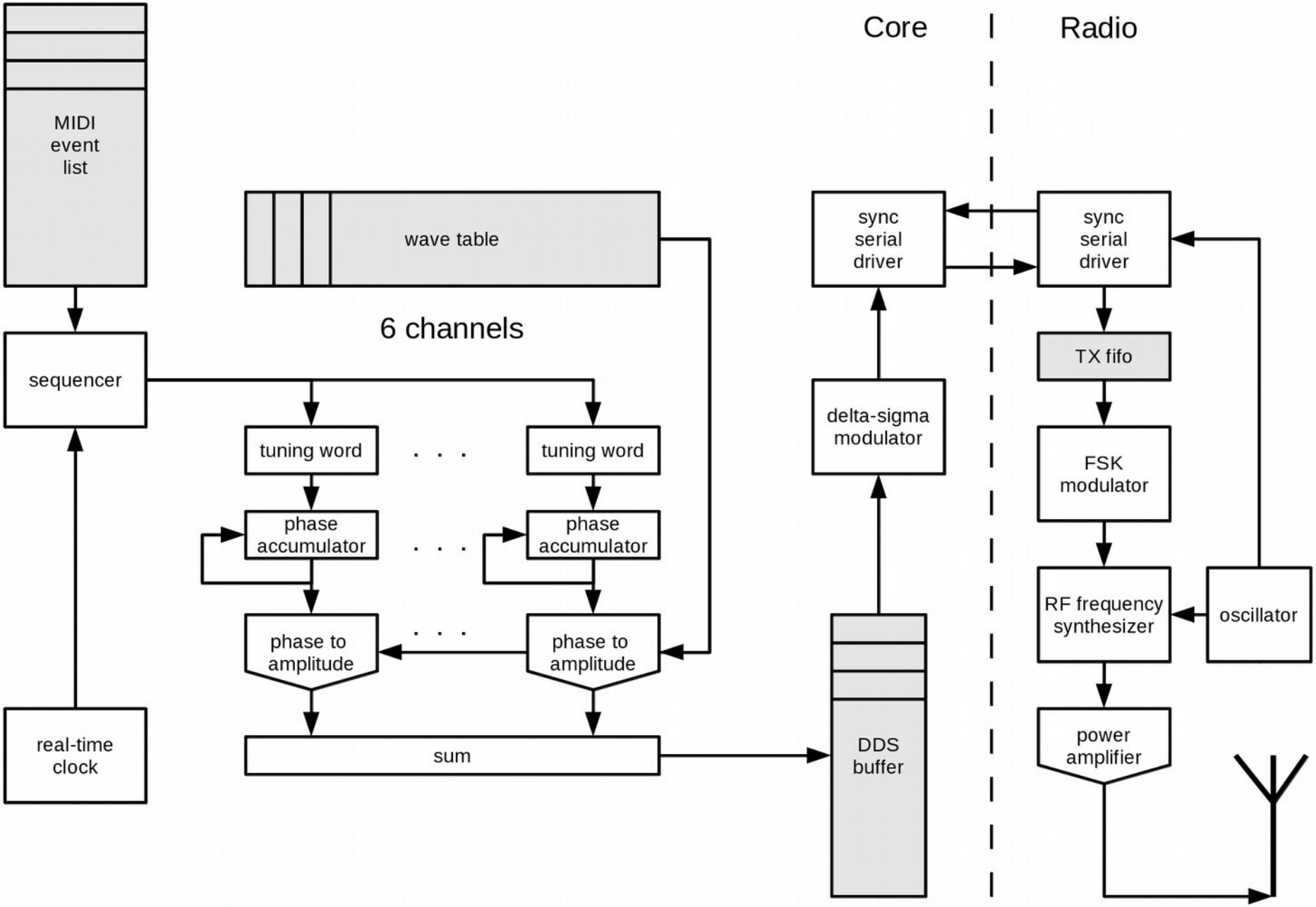




(delta-sigma modulation)

Add a wavetable synthesizer

(valid scientific reasons end somewhere around here)



ARM Cortex M3 (72 MHz, 96 kB RAM) can currently do

2	simultaneous MIDI tracks
3	channels per track
25 kHz	audio rate
16x	delta-sigma oversampling
4	effective bits

Limits

- interrupt load because bit-banging baseband bus
- running out of RAM for audio synthesis buffer
- missing 32 kHz pilot tone for some studio microphone receivers

Plan

1. Reprogram nodes in a sensor network.
2. Studio receivers in the area start playing a chiptune.
3. ???
4. ??? (possibly a hefty fine if you didn't talk this through with the right people first)

Video

https://www.youtube.com/watch?v=gwk1oZbig28

Source

https://github.com/avian2/vesna-audio-synthesis

More info

http://www.tablix.org/~avian/blog/archives/2013/06/playing_the_smile_song_on_vesna/

Microphone photo credit: ChrisEngelsma, CC BY-SA 3.0, https://en.wikipedia.org/wiki/File:SennMicrophone.jpg

Evil looking pink pony credit: http://ask-thecrusaders.tumblr.com