



fairwaves

Connectivity. Delivered.

XTRX - SDR for the real world

12 September 2017



GRCon'17

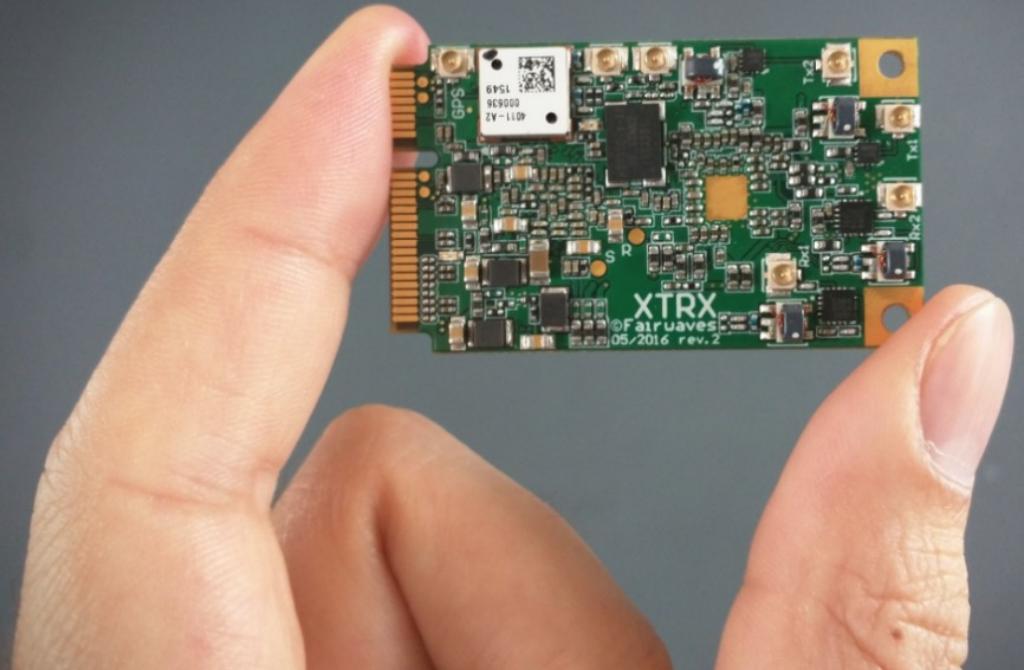


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Connectivity. Delivered.

Full stack means
from hardware to deployment from
an SDR to connected users

XTRX - SDR for the real world deployments



Find us in person or visit
Lime Microsystems booth
to see XTRX
<https://fairwaves.co>
<https://xtrx.io>



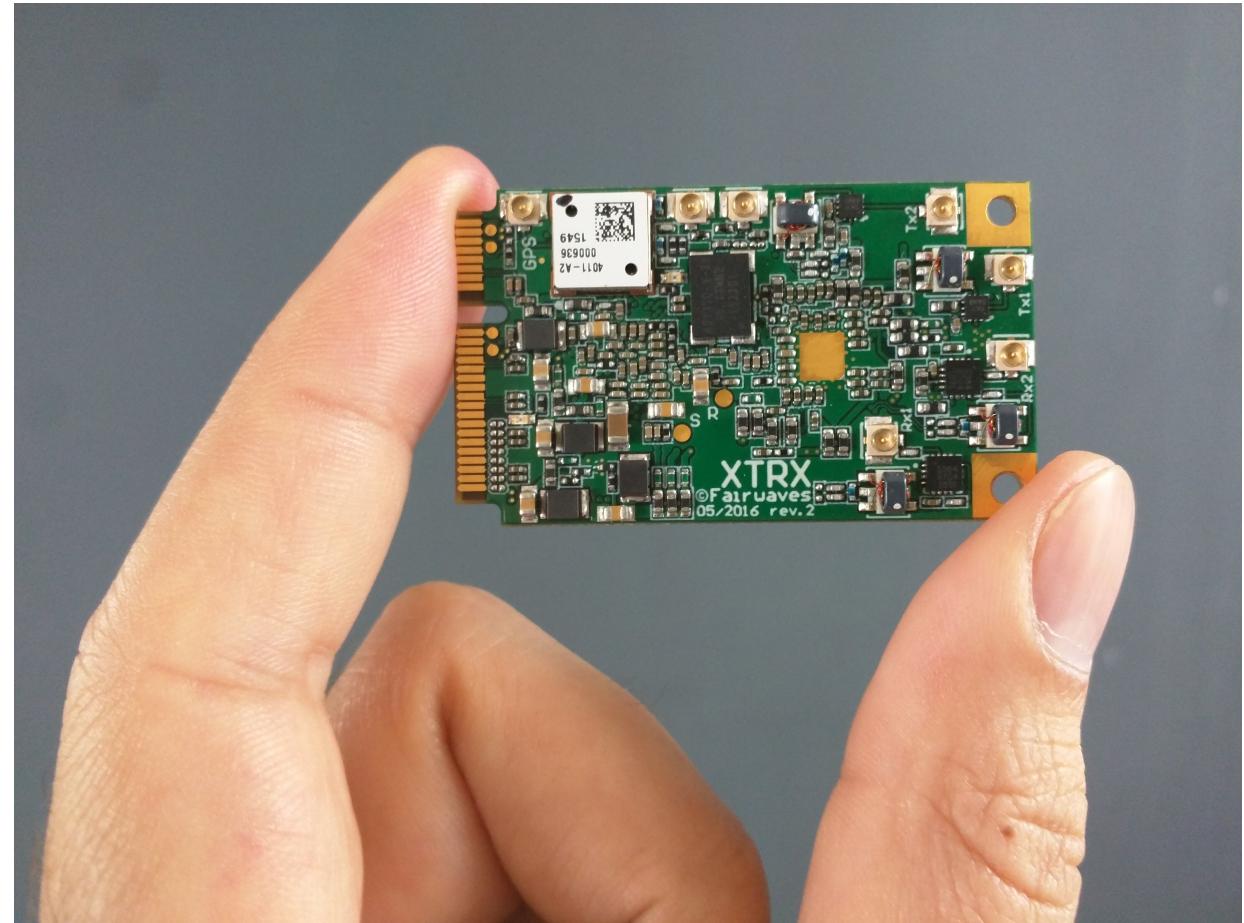
Commodity time for SDR

- Not just a lab tool
- Not a toy
- Not a custom design for every new product
- Time to become an off-the-shelf commodity



What is XTRX

- Small, inexpensive, embeddable
- IoT/LTE/5G/drones/satellites targeted
- 2x2 to 16x16 MIMO and higher with multiple board synchronization
- miniPCIe form factor
- LMS7002M RFIC
 - 30MHz-3.7GHz
 - 0.2/2.5 to 160/640 MSPS Rx/Tx
- 2x PCIe (up to 10GT/s)
- Xilinx Artix 7 25T/35T/50T
- 100ppb TCXO + built-in GPSDO
- SIM card interface
- 4x GPIO



XTRX is your **next** SDR

When your current SDR is not enough.
LOTS of features, but not for newcomers.



There should have been a demo here...

- We should have had final XTRX boards by GRCon, but...
- We selected a good fast turn CM in the SF Bay Area.
- We've sent this files to the CM for a quotation:

xtrx_rev3_05.07.2017.zip

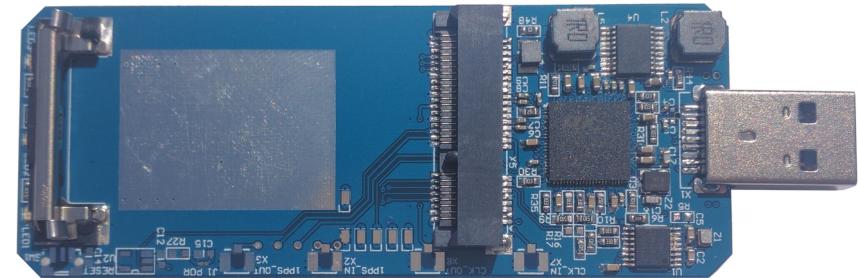
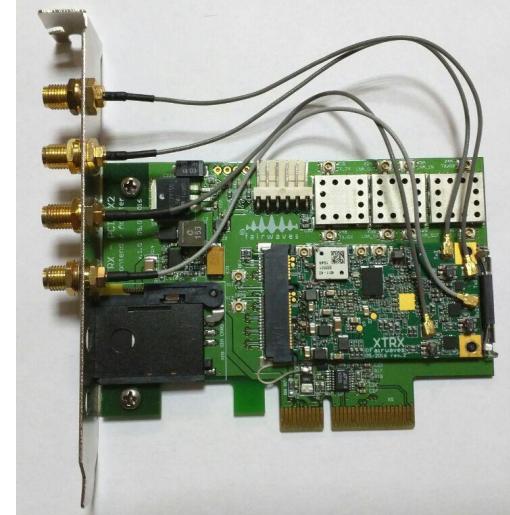
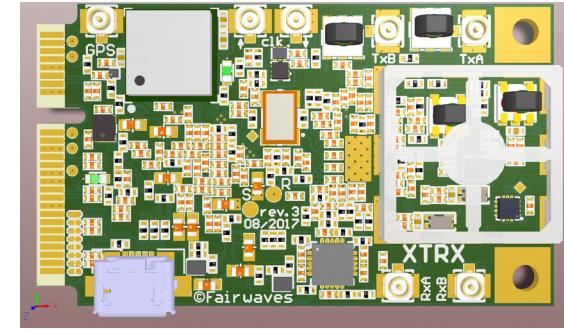
- And this file for the actual manufacturing run:

xtrx_rev3_03.08.2017.zip

- And told them to manufacture the latest.
- Guess what happened!

Interfaces supported

- Native miniPCIe x1/x2 Gen2
- Native USB2 (planned)
- Adapter to PCIe x2 Gen2
- Adapter to USB3
- Adapter to Thunderbolt3



Software support (as of Sept 12, 2017)

Platform	PCIe/TB3	USB3
Linux x86_64	full	full
Linux i386	needs testing	needs testing
Linux arm (32bit)	needs testing	full
Linux Aarch64 (ARM 64bit)	needs testing	needs testing
Windows i386	planned	needs testing
Windows x86_64	planned	full
Other	no	no

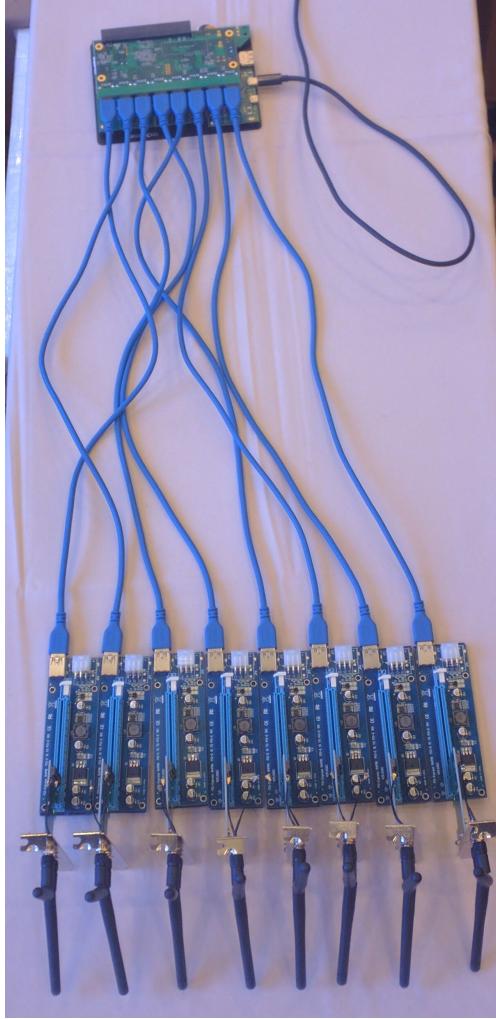
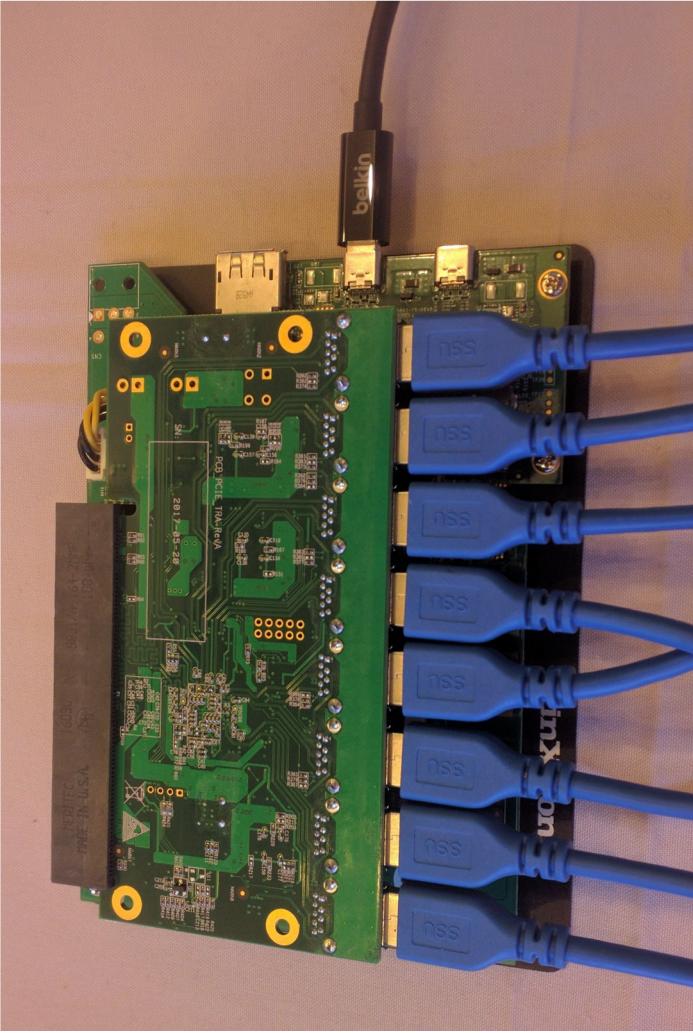
- GNU Radio
 - Native gr-osmosdr
 - gr-osmosdr via SoapySDR
- gqrx (via gr-osmosdr)
- SoapySDR (limited features)
- osmo-trx
- Amarisoft LTE (only FDD for now)
- kalibrate
- srsUE/srsLTE (in progress)



XTRX (planned) flavors

	Light	Pro
Temperature	0 – +75C	-40C – +85C
GPSDO/GNSS	No	Yes
FPGA	Artix7 25T	Artix7 50T
DSP FPGA acceleration	No	Yes
TCXO stability	0.5ppm	0.1ppm
GPSDO resolution	8ppb or 2ppb*	0.5ppb
PCIe speed	x2 Gen1 or Gen2*	x2 Gen2
Ext temperature sensor	No	Yes
RF screening	No*	Yes
Flash size	64/128Mbit*	256Mbit
External board sync	Yes	Yes

Massive MIMO at home on the go



Ever wondered is there anything useful coming out of crypto mining?

8x PCIe hub (**\$232**)
+ 8x XTRX
+ PCIe to TB3 converter (**\$290**)
= a portable massive MIMO

Clock and time synchronization

- XTRX to XTRX - massive MIMO
 - Reference clock + isochronous 1pps
 - Works with and without GPS
- XTRX to PC - distributed MIMO
 - GPSDO with 0.5ppb accuracy
 - Low jitter PCIe interface
 - Linux KPPS interface (best source for time syncing)

Native USB support

Why?

- MiniPCIe slot != PCIe support
- Many routers have miniPCIe with USB2 lanes *only*
- Not every application needs high bandwidth
- USB2 PHY is power efficient (~140mW during active transfer compared to ~500mW PCIe)

PCIe

pin	Signal	pin	Signal
1	D00	2	D15
3	D01	4	GND
5	D02	6	D14
7	D03	8	D13
9	GND	10	D12
11	D04	12	D11
13	D05	14	D10
15	GND	16	D09
17	D06	18	GND
19	D07	20	D08
21	GND	22	RESET
23	TX-	24	IOWR
25	TX+	26	CSEL
27	GND	28	IORD
29	GND	30	DMACK
31	RX-	32	DMARQ
33	RX+	34	GND
35	GND	36	USB D-
37	A00	38	USB D+
39	A01	40	GND
41	A02	42	IORDY
43	NC	44	INTRQ
45	PDIAG	46	CS0
47	VCC	48	CS1
49	VCC	50	GND
51	VCC	52	DASP

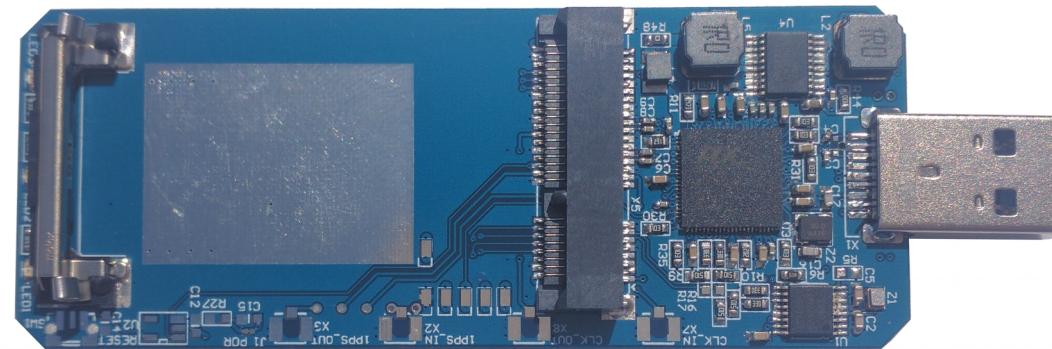
USB2

Status

- Supported in hardware, needs FPGA code

USB3 adapter

- Can't support natively due to LFPS, no space for USB3 PHY
 - USB3380 protocol converter for rescue
 - + SIM card slot
 - + high efficient DC/DC 5v → 3.3v+1.0v (1A)
 - + 1pps+RefClk for multiple boards sync
 - + no kernel mode driver
 - - extra ~700mw of power consumption
 - - 10-15% lower bandwidth than original PCIe



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