Linzhi E1400
ETC ASIC

Werner Almesberger, Linzhi Ltd.
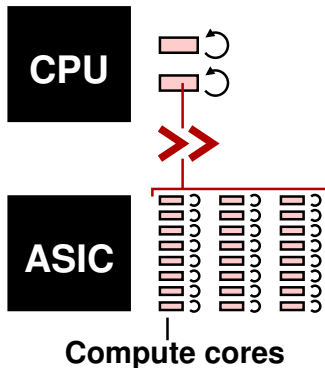werner@linzhi.io

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linzhi.io/summit2019.html

Linzhi Ltd.

- Shenzen-based fabless ASIC startup
- Design and build Ethash miner
  Announced at ETC Summit 2018 in Seoul
- Using custom ASIC
- 1400 MH/s at 1 kW (per board)

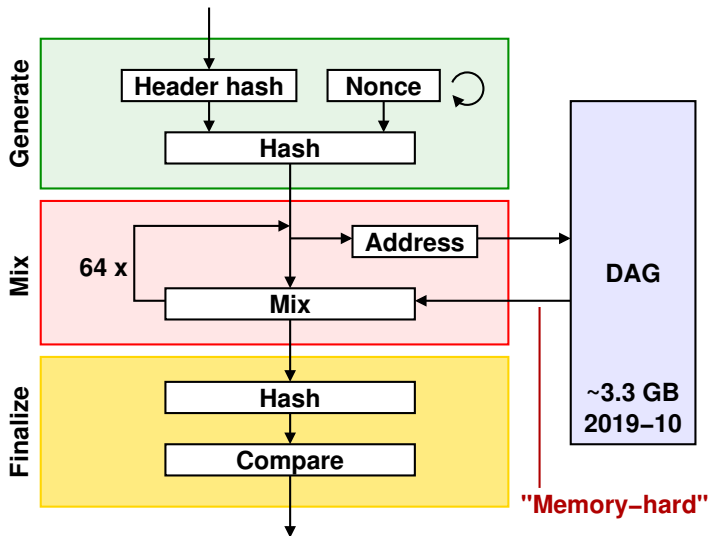# BTC: The rise of ASICs

SHA–256

CPU

~30 MH/s
(i7–990X ~2011)
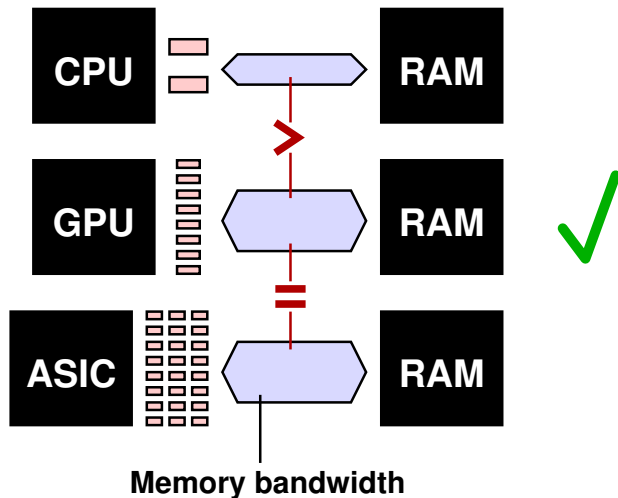
Global BTC hash rate July
2011–July 2012: ~10 TH/s

>>

ASIC

~60 TH/s
(per miner)

✓

Compute cores

$$\frac{\textbf{60 TH}}{\textbf{30 MH} \cdot \text{Moore}(8 \text{ yr})} \approx \textbf{50 000}$$

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Ethash

Generate
- Header hash
- Nonce
- Hash

Mix
- 64 x
- Address
- Mix

Finalize
- Hash
- Compare

DAG

~3.3 GB
2019−10

"Memory−hard"

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Ethash: The downfall of ASICs ?

Ethash

CPU — RAM

GPU — RAM ✓

ASIC — RAM

Memory bandwidth

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Linzhi E1400: Decentralized memory

Generators

72 mixers with decentralized memory (1 MB each)

Finalizers   NoC   Communication

Hashing with the E1400

Generate

0

DA

1

Mix, DA

2

DA = DAG address calculation

3

Mix, DA

64

Mix, DA

65

Finalize
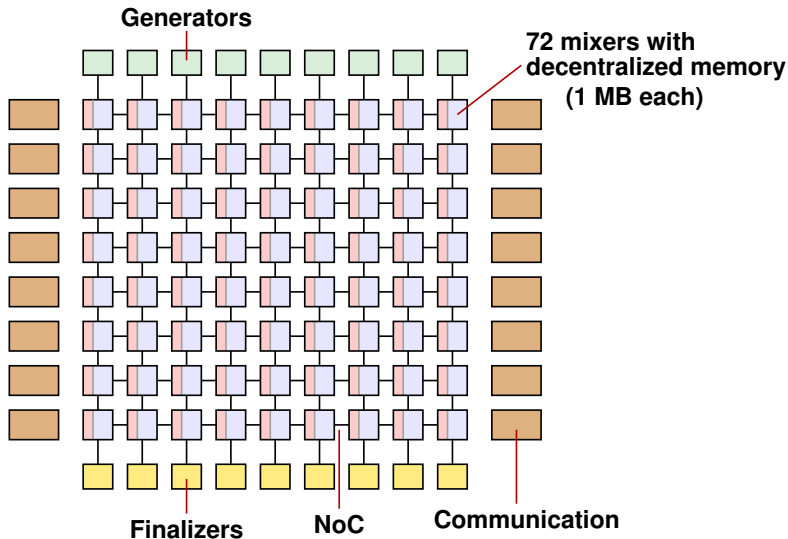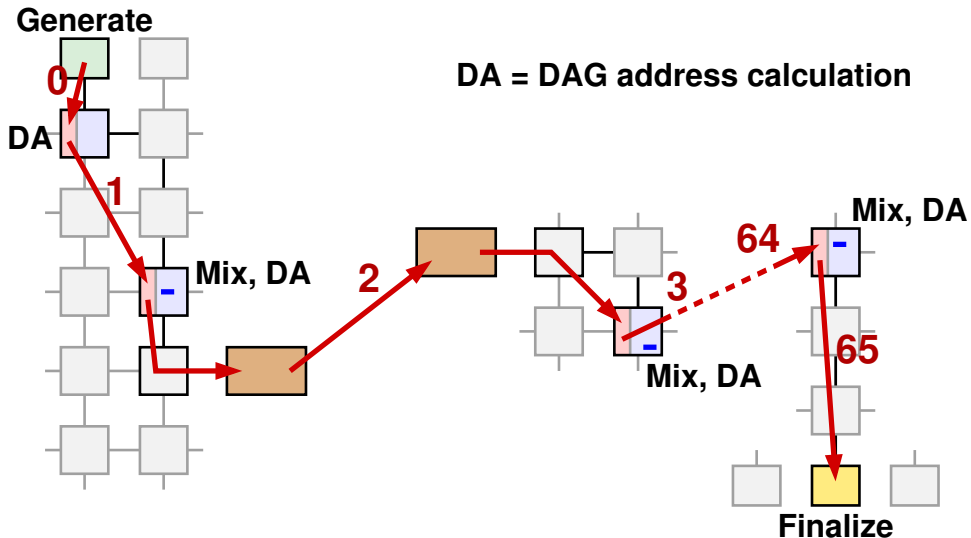
Memory bandwidth

GPUs:

- AMD Radeon RX 5700[1] (256 bits width): **448 GB/s**
- Nvidia TITAN RTX[2] (384 bits width): **672 GB/s**

Linzhi E1400:

- 600 MHz memory clock, 2 cycles per access
- 1024 bits memory width
- 38.4 GB/s peak (per mixer)
- 72 mixers per chip
- 2.8 TB/s per chip
- 64 chips per board
- **177 TB/s** per board

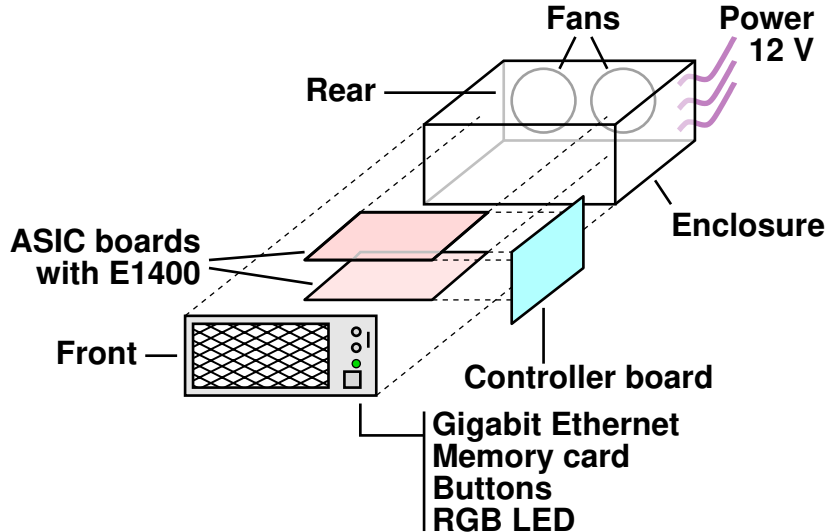[1]https://en.wikipedia.org/wiki/AMD_Radeon_RX_5000_series
[2]https://en.wikipedia.org/wiki/GeForce_20_series

Communication bandwidth

Our <u>real</u> bottleneck is communication:

- up to 32 Gbps per link and direction
- 64 chips, fully connected, bidirectional
- **129 Tbps** per board (peak)
- $\approx$ 75 kbits per hash (all rounds)
- 1.7 GH/s (theoretical limit)
- **1.4 GH/s** (expected performance)

Linzhi Phoenix Miner 凤

Fans

Power 12 V

Rear

Enclosure

ASIC boards with E1400

Front

Controller board

Gigabit Ethernet
Memory card
Buttons
RGB LED

What's next ?

- Tape-out: 2019-09-11
- Chips back from fab: mid-November
- Open bring-up, testing, and integration process
- Sales start: Q1/2020

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Would you like to know more ?

- Linzhi Ltd.
  `linzhi.io`
- This talk:
  `linzhi.io/summit2019.html`
- Telegram:
  `t.me/LinzhiCorp`