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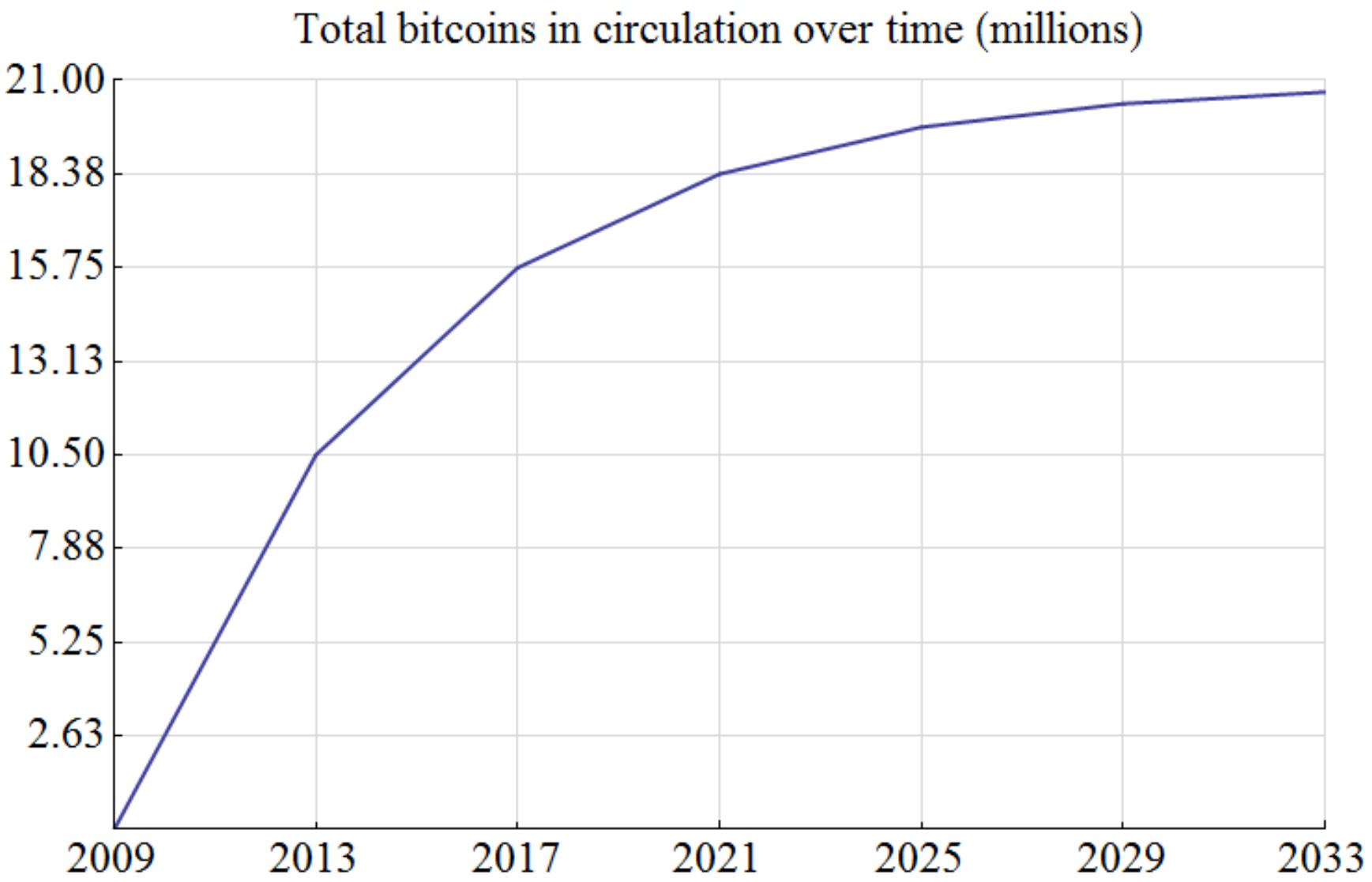
Bitcoin Mining in Pictures

Inflation schedule



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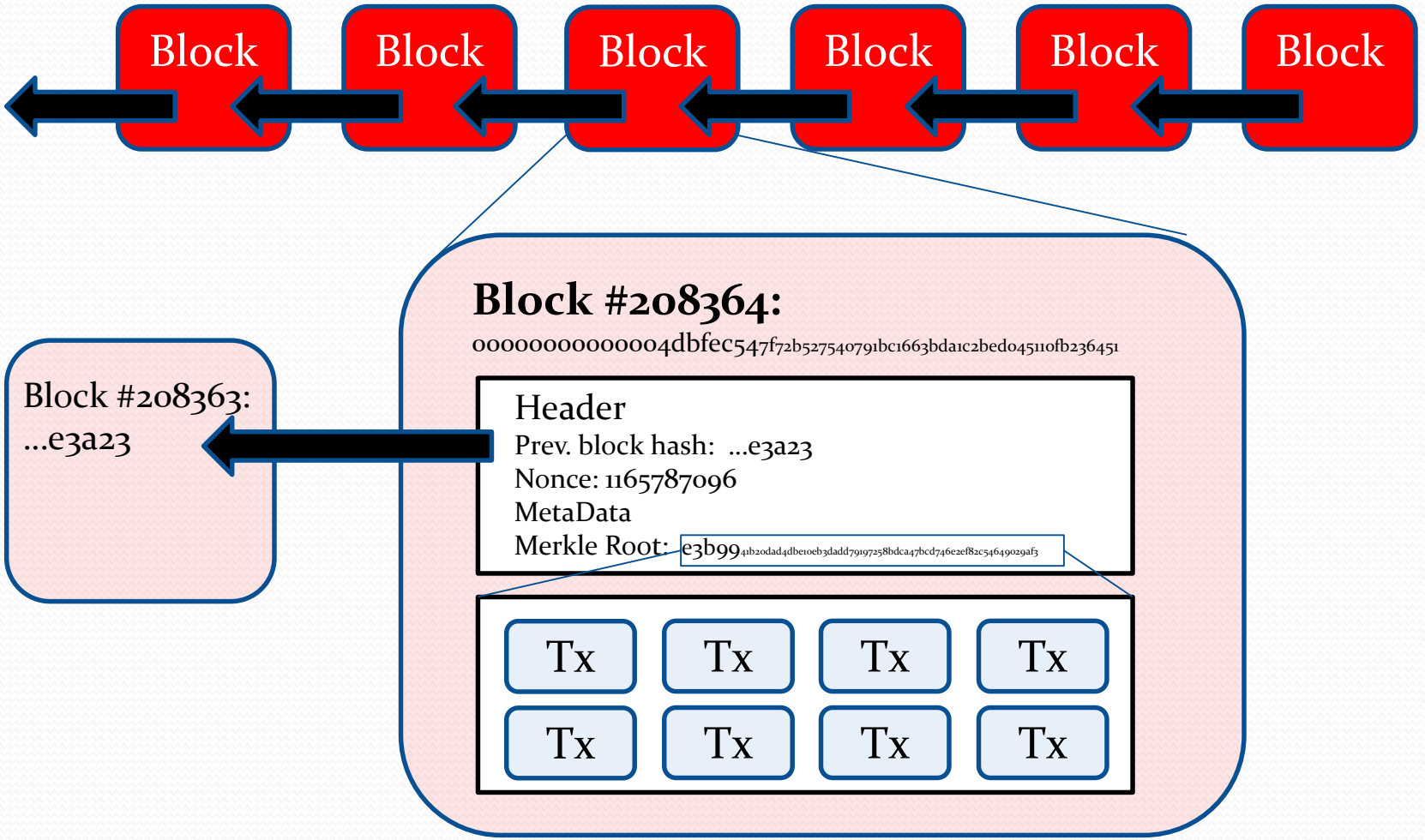
Rai stone at Yap Island

The Blockchain



Bitcoin Mining Hardware

- Development and manufacturing of specialized hardware accelerated computers (“Mining Machines”) has huge Capex requirement (Example: 28nm “Tapeout” cost - $2.5M, 16nm - $6M)
- Operating those “Mining Machines” has huge Opex requirement (electricity, cooling and space)
- Two sources of incentives to offset the Capex and Opex
  - Minting of new Bitcoins (currently 25) per transactions block signing (~10 mins)
  - Sum of all the transactions fees in the signed block
- The miners has dual role:
  - Authorizing and synchronizing transactions on the Blockchain
    This is the miners main role – distributed clearing of transactions
  - Minting of new Bitcoins, according to pre-determined inflation schedule

Block Example

Block 277583

Short link: http://blockexplorer.com/b/277583

Hash: 00000000000000005bee6554b482505af391989921f7612fa79b4949197c646d

Previous block: 000000000000000005913284 69b75dcecfeba375b9592ac45dea97f290b2b702f

Next block: 00000000000000030f56bd01baffc1c2cc2b679db2b23ad0a75bbd54b9a4d0f9

Time: 2013-12-29 17:23:13

Difficulty: 1 180 923 195.258026 ("Bits": 1903a30c)

Transactions: 939

Total BTC: 21915.11261698

Size: 403.303 kilobytes

Merkle root: 59b9b949f8d9639e8c3a39db54848c1fa19a0bc60d3347ad232241b8481c4884

Nonce: 1963506763

Raw block

Transactions

Transaction	Fee	Size (kB)	From (amount)	To (amount)
0be6185894...	0	0.168	Generation: 25 + 0.30871887 total fees	14cZMQk89mRYQkDEj8Rn25AnGoBi5H6uer: 25.30871887
261ed16575...	0.0005	0.258	1A1TR1KAibjq1iscDewtnkmnniwfJg36DM: 47.9365	1LCkpCdvQJLBvBscYsafwXf6nBxGRYtxwG: 0.01 13G4MGj3GJ3U84sH8CMzV3d7yJmXRBreSG: 47.926
e9a73dcb10...	0	0.258	1PNTiJvK3jThKg1FJyN5Ds3HtRs89jTpTw: 32.62079019	15hHsQD6wG8UmNpRrnQ5fbVAZFWxXQm4X5: 32 1PNTiJvK3jThKg1FJyN5Ds3HtRs89jTpTw: 0.62079019
ea5b2b76e5...	0.001	0.259	1KA5wpcSCopi4pWnGrwuBuwYCGWZpSAWm3: 6.92017047	17CBm9MYALotSgR7C72YiyngCfzUbd39Gb: 0.92 1KA5wpcSCopi4pWnGrwuBuwYCGWZpSAWm3: 5.99917047

The “difficulty”

- The mining problem adjustment factor is called “Difficulty”
- The mining power of each miner (and the entire network) is called Hash-Rate. It is currently being measures by Peta Hash / Sec (PHs)
- The difficulty is being adjusted (recomputed by all the miners) every 2016 blocks (usually less than 2 weeks)
- If the network hash-rate will remain constant, the Difficulty will remain constant as well – it’s never the case

6 months Difficulty and Hash Rate

Date	Difficulty	Change	Hash Rate
May 03 2015	47,643,398,018	0.07%	341,044,727 GH/s
Apr 19 2015	47,610,564,513	-3.71%	340,809,696 GH/s
Apr 05 2015	49,446,390,688	5.84%	353,951,052 GH/s
Mar 22 2015	46,717,549,645	-1.50%	334,417,246 GH/s
Mar 08 2015	47,427,554,951	1.59%	339,499,662 GH/s
Feb 22 2015	46,684,376,317	5.01%	334,179,783 GH/s
Feb 09 2015	44,455,415,962	7.71%	318,224,263 GH/s
Jan 27 2015	41,272,873,895	-6.14%	295,442,739 GH/s
Jan 12 2015	43,971,662,056	8.20%	314,761,417 GH/s
Dec 30 2014	40,640,955,017	3.00%	290,919,288 GH/s
Dec 17 2014	39,457,671,307	-1.37%	282,449,013 GH/s
Dec 02 2014	40,007,470,271	-0.73%	286,384,627 GH/s
Nov 18 2014	40,300,030,328	1.76%	288,478,854 GH/s
Nov 05 2014	39,603,666,252	10.05%	283,494,086 GH/s
Oct 23 2014	35,985,640,265	2.81%	257,595,247 GH/s
Oct 09 2014	35,002,482,026	0.98%	250,557,526 GH/s

Previous 6 months Difficulty and Hash Rate

Date	Difficulty	Change	Hash Rate
Oct 09 2014	35,002,482,026	0.98%	250,557,526 GH/s
Sep 25 2014	34,661,425,924	16.20%	248,116,151 GH/s
Sep 13 2014	29,829,733,124	8.75%	213,529,547 GH/s
Aug 31 2014	27,428,630,902	15.03%	196,341,788 GH/s
Aug 19 2014	23,844,670,039	20.86%	170,686,797 GH/s
Aug 08 2014	19,729,645,941	5.30%	141,230,307 GH/s
Jul 25 2014	18,736,441,558	8.08%	134,120,673 GH/s
Jul 12 2014	17,336,316,979	3.08%	124,098,191 GH/s
Jun 29 2014	16,818,461,371	24.93%	120,391,236 GH/s
Jun 18 2014	13,462,580,115	14.51%	96,368,902 GH/s
Jun 05 2014	11,756,551,917	12.44%	84,156,677 GH/s
May 24 2014	10,455,720,138	18.10%	74,844,960 GH/s
May 12 2014	8,853,416,309	10.66%	63,375,223 GH/s
Apr 29 2014	8,000,872,136	14.64%	57,272,474 GH/s
Apr 17 2014	6,978,842,650	14.04%	49,956,502 GH/s
Apr 05 2014	6,119,726,089	22.23%	43,806,706 GH/s

1 year Hash Rate Graph (7 days average)

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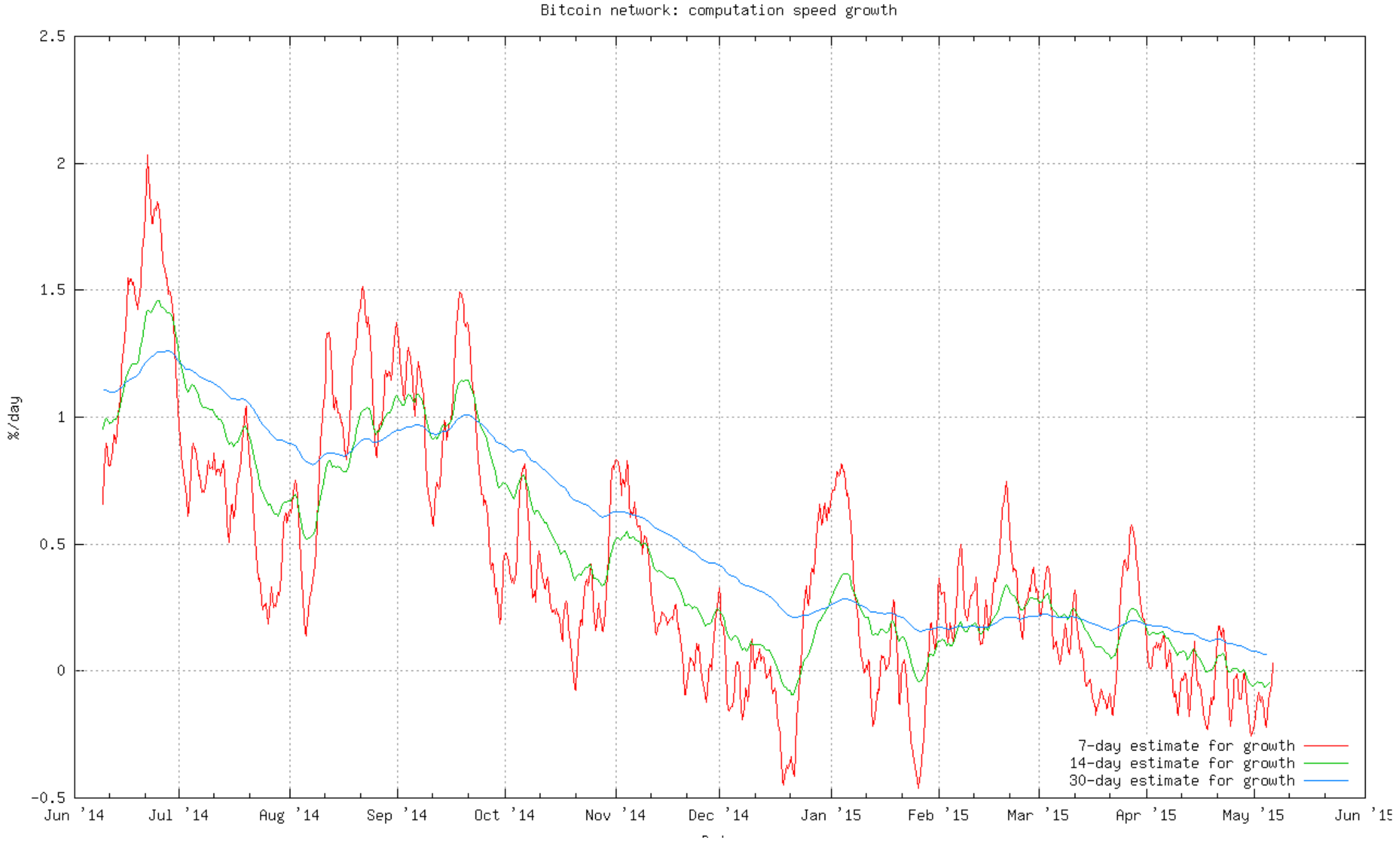
Hash-rate daily growth (%/day)



The all important formula – Miner's revenues

Miner's daily revenues ($) ≅

$$\frac{Miner's\ hash\ rate}{Network\ hash\ rate} \times 3600^{(*)} \times BTC\ Price\ (\$)$$

(*) 3,600 until ~ July 2016, 1,800 afterwards

Daily Miners Revenue ($) in the last 2 years

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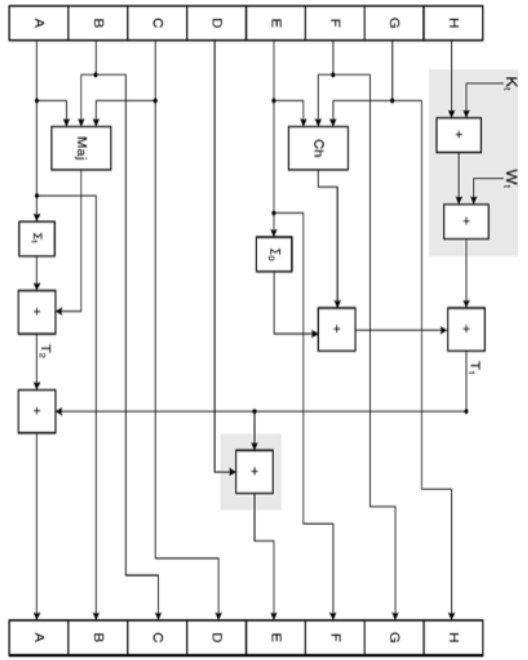
Mining with specialized ASICs

- Architecture
  - Bitcoin calculation is based on double SHA256
  - Many 128-stage pipelined engines, each generates a result every clock
  - Random data: high toggle rate
- Optimization: system cost/performance
  - Chip cost/performance: mostly silicon area
  - Power/performance: power affects system cost
  - Dynamic power is dominant
  - Performance: GigaHash/sec
- Short lifetime: a new generation every 6 months

One Pipeline stage
768 bits width



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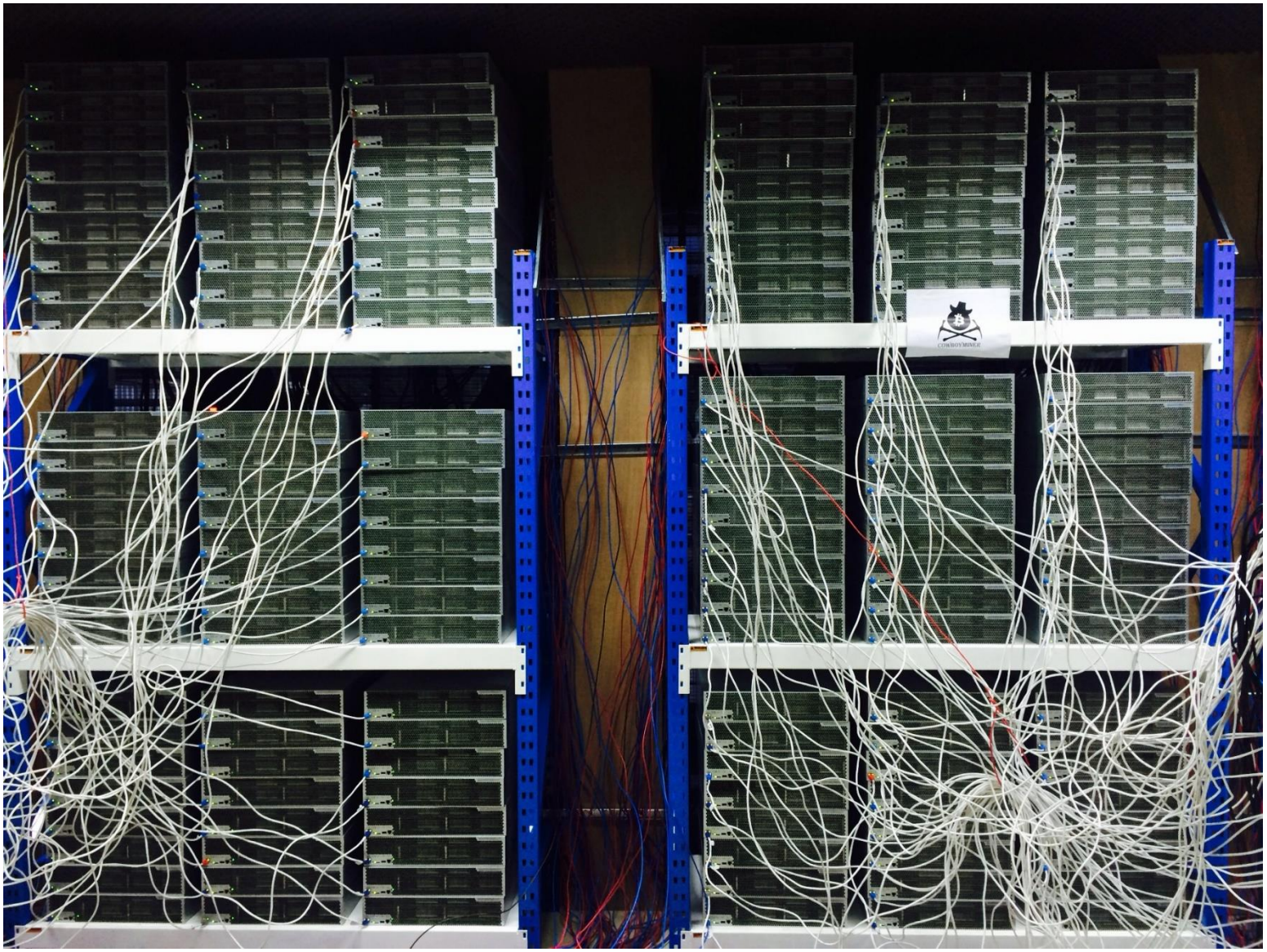
Some Pictures – SP30

Traditional DC with SP30

Cowboy Miner cooperative – world record density

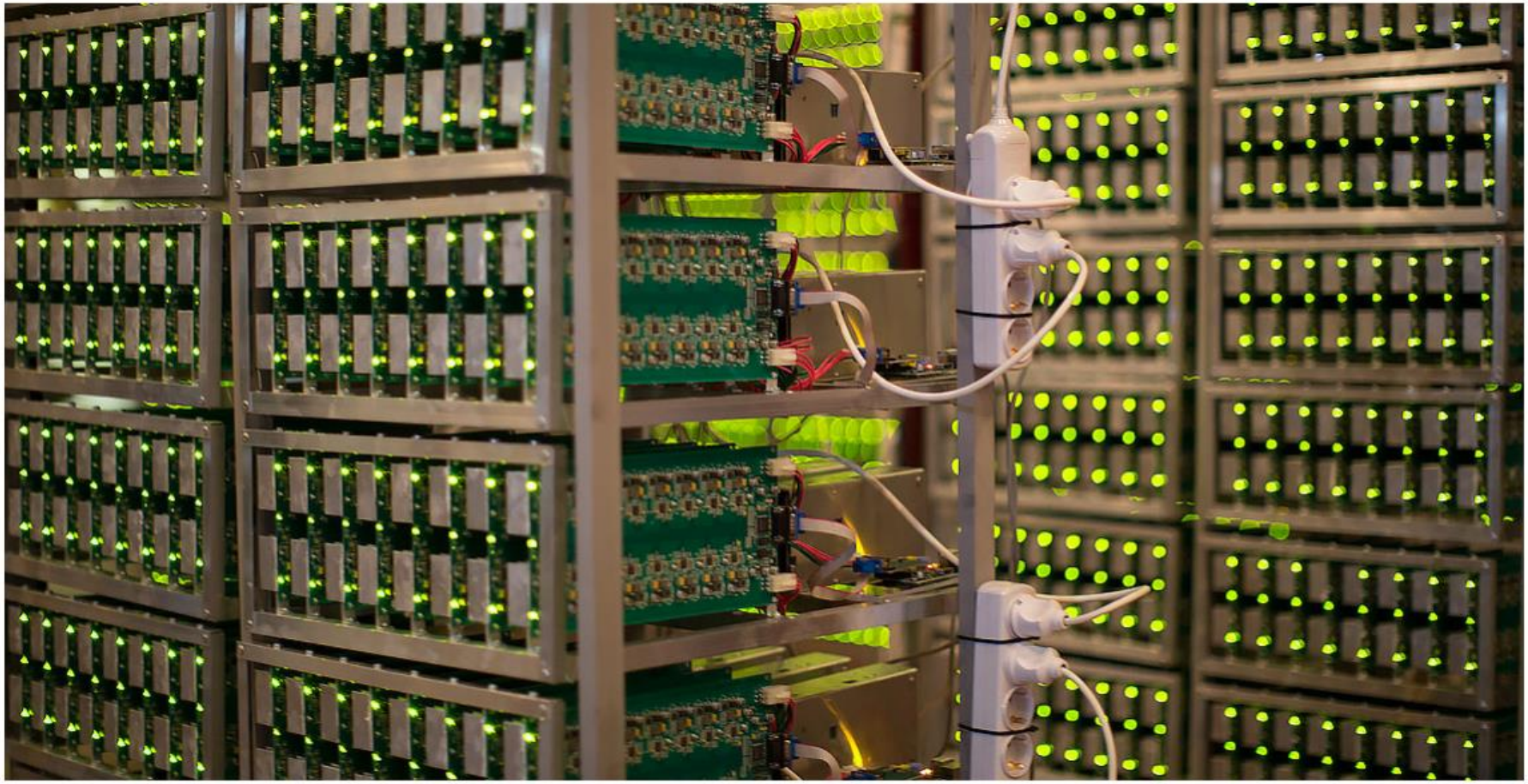


BitFury rev 0.5 in the old days (CEX.IO)

Redeem Hardware

BitFury Inside

Even though we provide great support and maintenance for our GH/s, you are still able to redeem your hardware, and get it delivered right to your doorstep!



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BitFury Icelandic buildup by Advania (1)

BitFury Icelandic buildup by Advania (2)

KNC “Chicken Farm” in the Node Pole (1)

KNC “Chicken Farm” in the Node Pole (2)

Old Chinese Mining farm

New Chinese Mining farm at Inner Mongolia (1)

New Chinese Mining farm at Inner Mongolia (2)

New Chinese Mining farm at Inner Mongolia (3)

New Chinese Mining farm at Inner Mongolia (4)