Computer Infrastructure for Big Data Analysis

Computer Architecture

Storage

Hard drives

Bandwidth around 200 MiB/sec

Sizes up to 14 TB

Shinkles are a game changer for performance

SSD

As fast as the bus
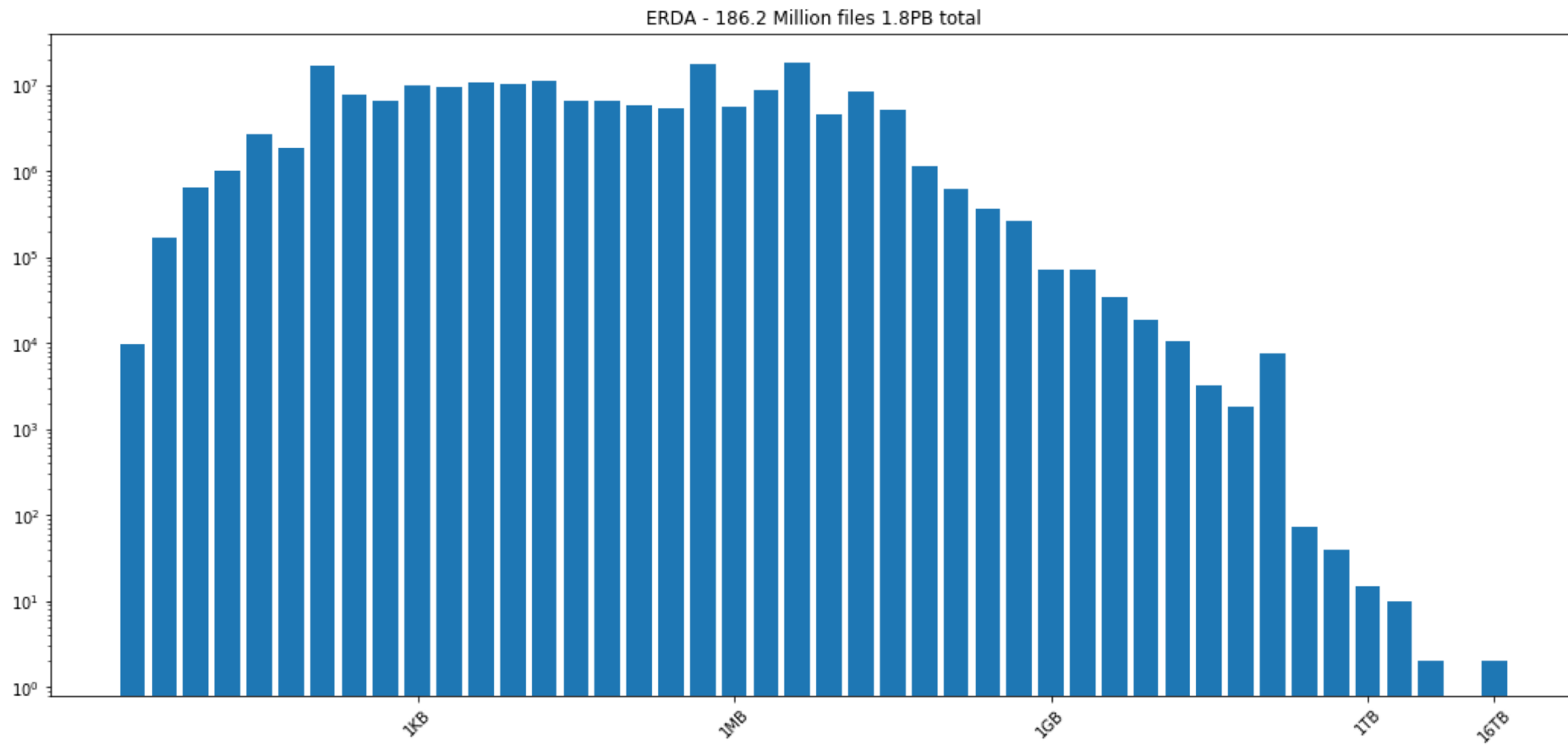SATA 500 MiB/sec
SAS 2GiB
NVME 4GiB

Sizes up to 120TB

JBODS

If you have enough data JBODS are fast and cheap

106 drives per chassis
1.7 PB

UCPH/SCIENCE – ERDA (August 2018)

ERDA - 186.2 Million files 1.8PB total

Quiz 2A

What storage parameters matters for machinelearning?

Any afinity wrt the sort of algoritm you use?

Networks

Interconnect approaches

WAN

- 'infinite distance'

LAN

- Few kilometers

SAN

- Few meters

Backplane

- Not scalable

Infinite☺

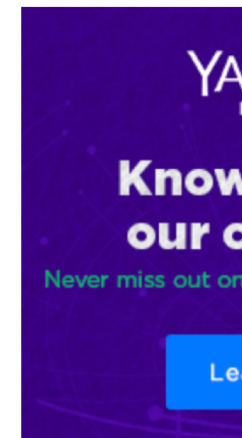# Nokia and Vodafone will bring 4G to the Moon

The network will allow for HD video streams of the lunar surface.

Rob LeFebvre, @roblef
02.27.18 in Internet

8
Comments

1618
Shares

f

Physical Cluster Interconnects

Gigabit EtherNet

10 Gigabit EtherNet

- 25
- 40
- 100

Infiniband

Omnipath

10 Gb Ether Spring

Switch (8 port)
- 5.248 kr

NIC

- 2652 kr

Cable 30 kr
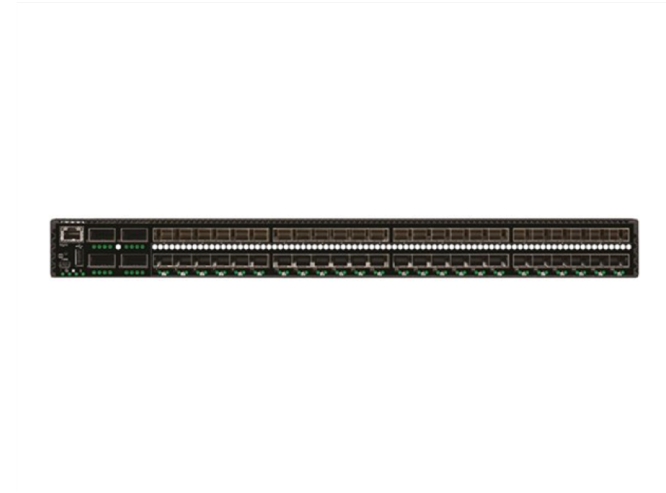Per node: app 3500 kr

40 Gb Ether

Switch (4 port + 48 10Gb)

- 43.464 kr

NIC

- 2.976 kr

Per node: app 3500 kr

100 Gb Ether

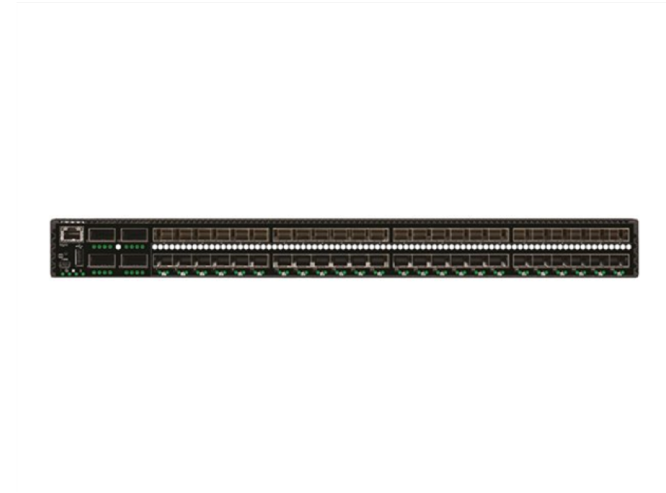Switch (32 x 100Gb)
- 55.000 kr

2m cable
- 1000 kr

NIC
- 4000 kr

Per node: app 7000 kr
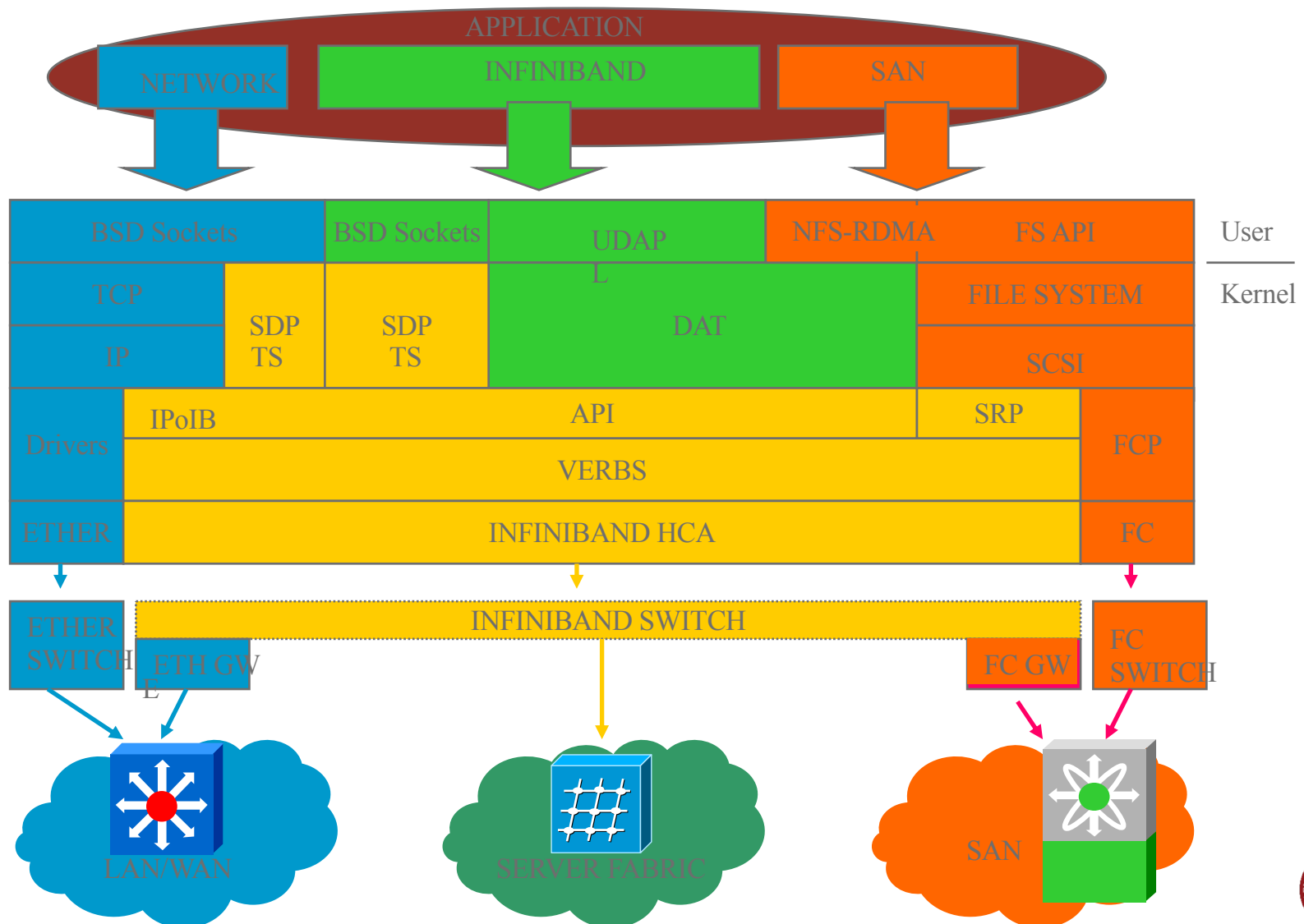
Infiniband

New standard

An extension of PCI-X

SDR/DDR/QDR/FDR/EDR

- 1x = 2 / 4 / 8 / 13.64 / 24.24 Gbps
- 4x = 8   / 16 /   32 / 54.54 / 96.97 Gbps
- 12x = 24 / 48 / 96 / 163.64 / 290.91Gbps

The InfiniBand Driver Architecture

InfiniBand Price / Performance

	InfiniBand PCI-Express	10GigE	GigE	Myrinet D	Myrinet E
Data Bandwidth (Large Messages)	950MB/s	900MB/s	100MB/s	245MB/s	495MB/s
MPI Latency (Small Messages)	5us	50us	50us	6.5us	5.7us
HCA Cost (Street Price)	$550	$2K-$5K	Free	$535	$880
Switch Port	$250	$2K-$6K	$100-$300	$400	$400
Cable Cost (3m Street Price)	$100	$100	$25	$175	$175

- *Myrinet pricing data from Myricom Web Site (Dec 2004)*
- ** *InfiniBand pricing data based on Topspin avg. sales price (Dec 2004)*
- *** *Myrinet, GigE, and IB performance data from June 2004 OSU study*

- *Note: MPI Processor to Processor latency – switch latency is less*

InfiniBand Cabling

CX4 Copper (15m)

Flexible 30-Gauge Copper (3m)

Fiber Optics up to 150m

Infiniband

Interface adapter (100 Gbs)

- 4000 kr

Swich (36 ports)

- 63.000 (135.000 kr last year)

Cable
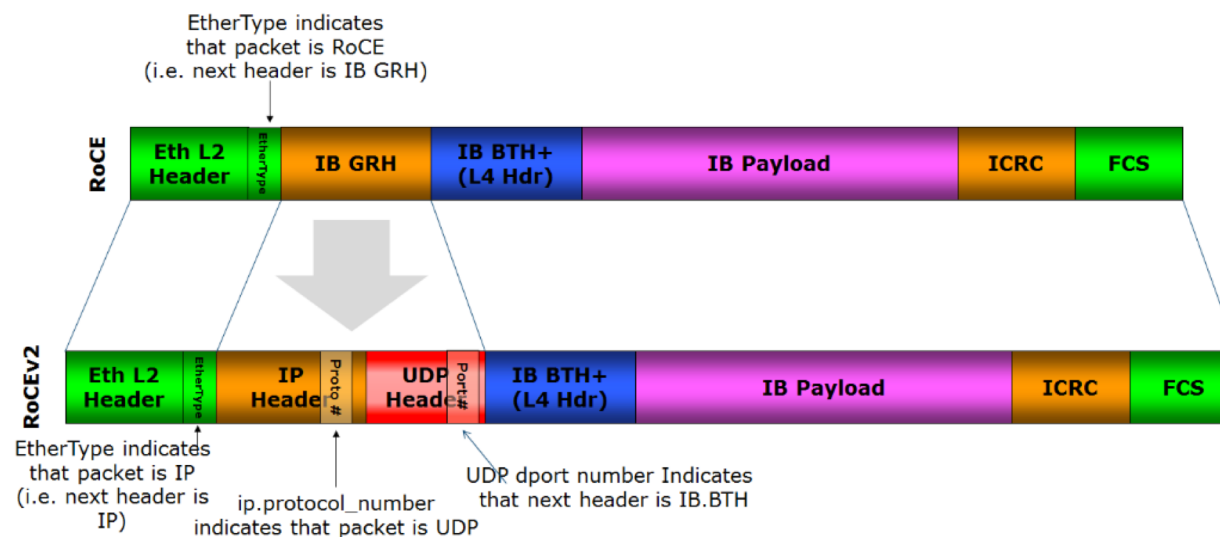
- 500 kr (was 1000 kr last year)

App 7.000 kr per node

RoCE

Ethernet is not bound to the IP protocol

- • We used to make all kinds of protocols on Ethernet

RoCE is a standard for low latency communication over ethernet

25 Gb Ether Spring 2020

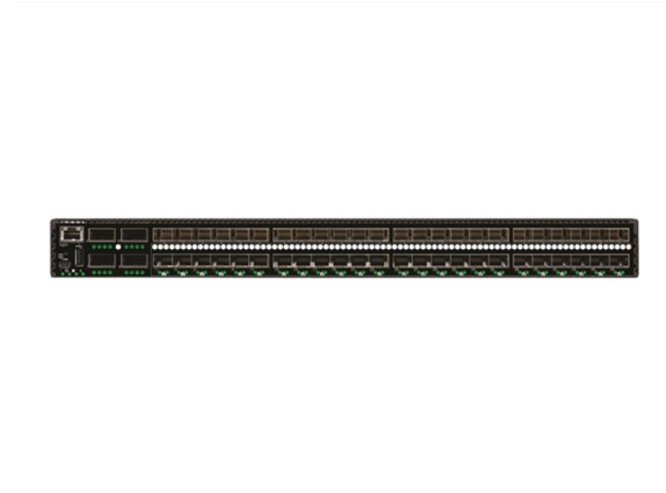Switch (72 x 25Gb)
- 35.000 kr

2m cable
- 300 kr

NIC
- 900 kr

Per node: app 1700 kr

Quiz 2B

What would you like from an interconnect for machine learning?

Any afinity for algorithms?