The grows of the data and computing in high energy physics

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Quick Overview

- World LCH Computing Grid — WLCG
- Technology progress

The success of W-LCG

- Today:

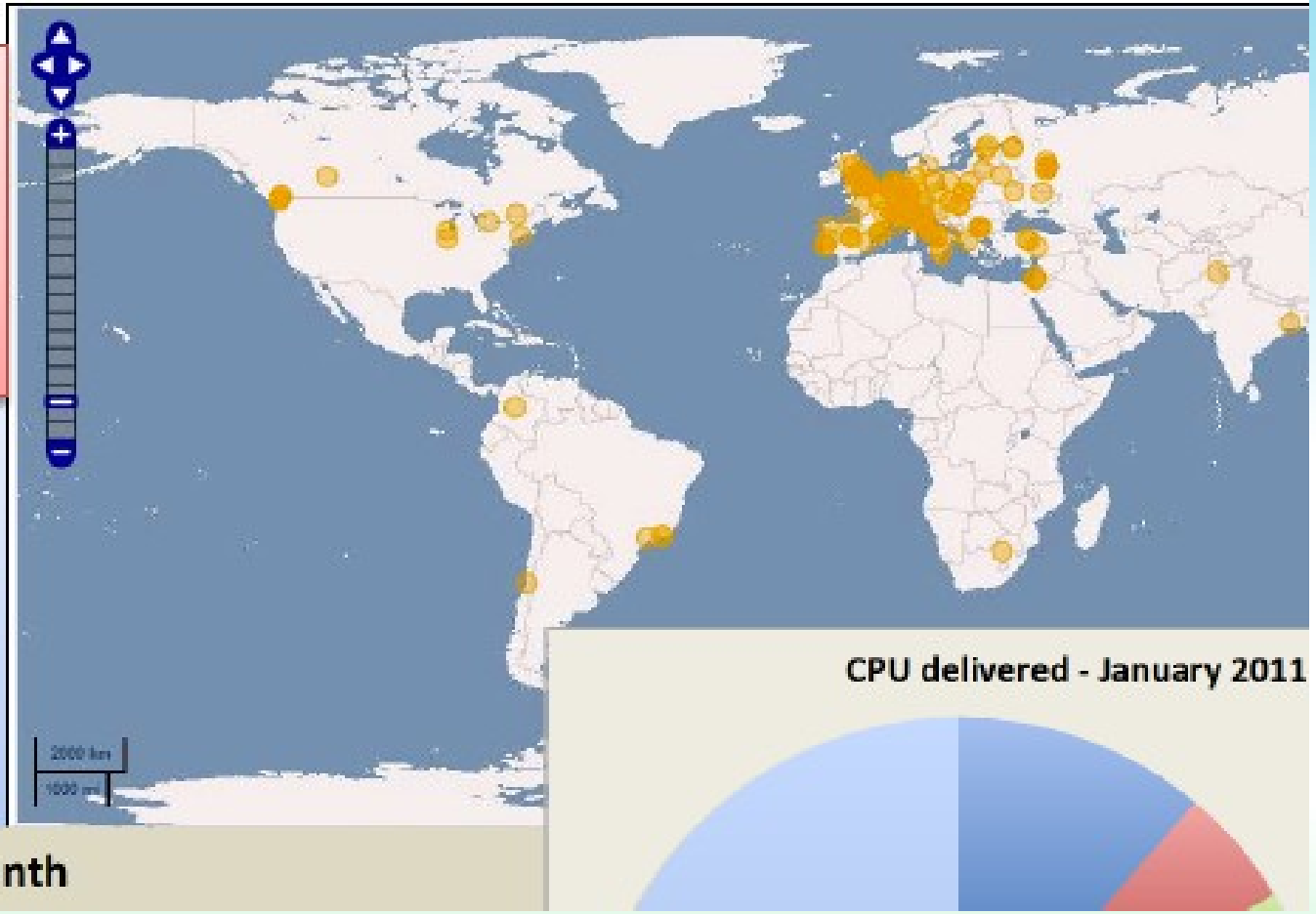
>140 sites

>250'000 CPU cores

>150 PB disk space

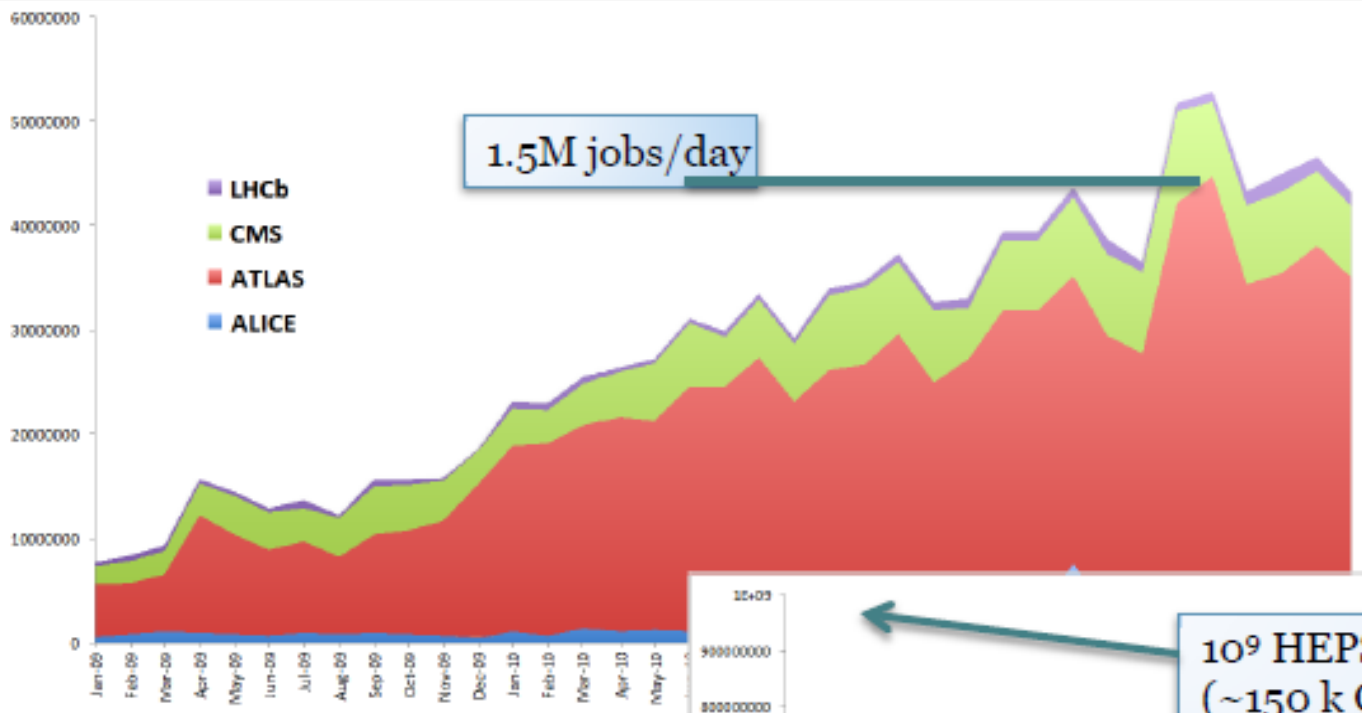
34 countries:

Australia, Austria, Belgium, Brazil, Canada, China, Czech Rep, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, India, Israel, Japan, Rep. Korea, Netherlands, Norway, Pakistan, Poland, Portugal, Romania, Russia, Slovenia, Spain, Sweden, Switzerland, Taipei, Turkey, UK, Ukraine, USA.

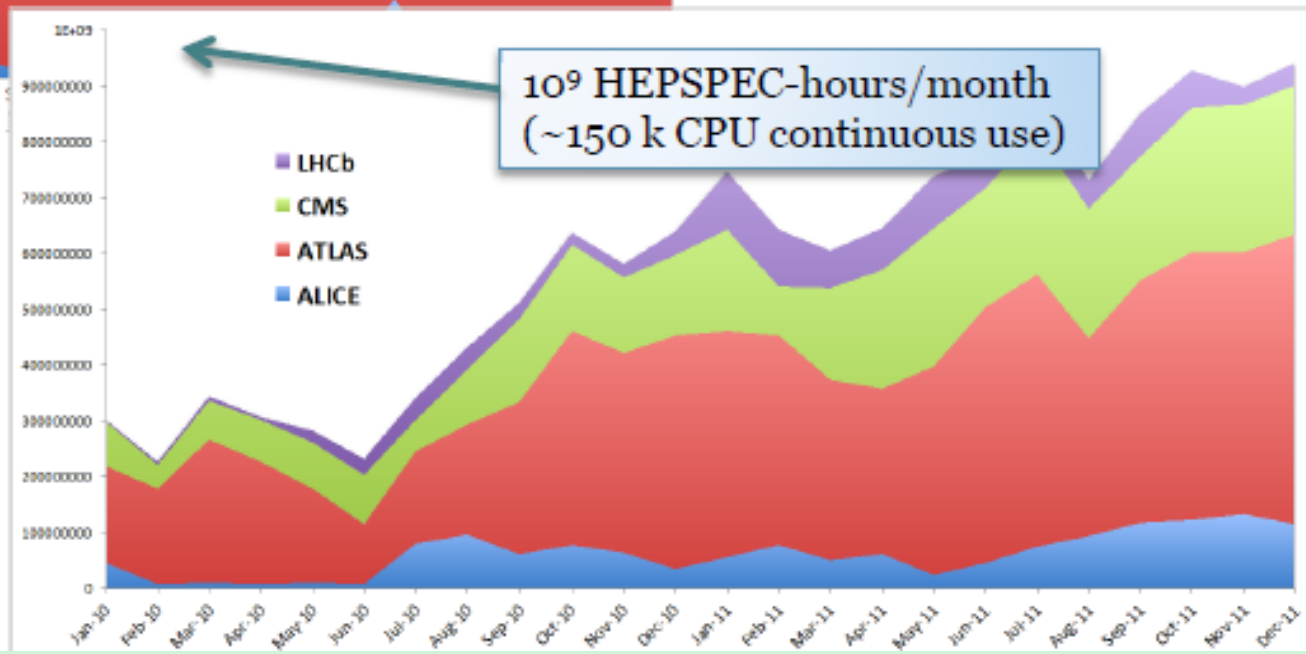


From Sverre Jarp on ACAT 5th Sep 2011

WLCG usage: continues to grow



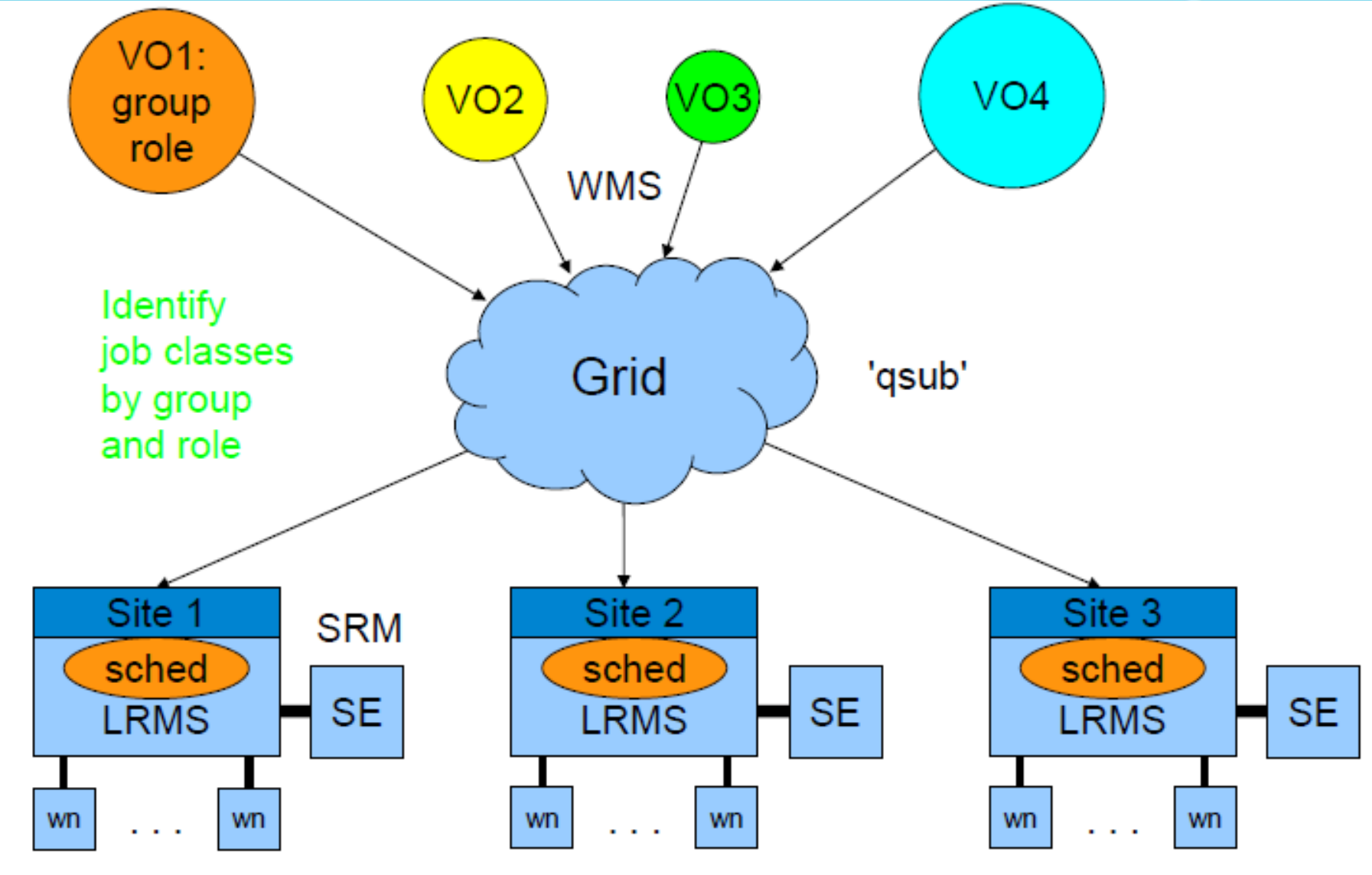
- WLCG usage pattern:
  - Continuous
  - Ever increasing load
  - Some spikes
  - Mirrored by contributing national Grids



- Evolution:
  - Being discussed by *Technical Evolution Groups*
  - Operations is one of concerns

From Oxana Smirnova CHEP 22d May 2012

WLCG

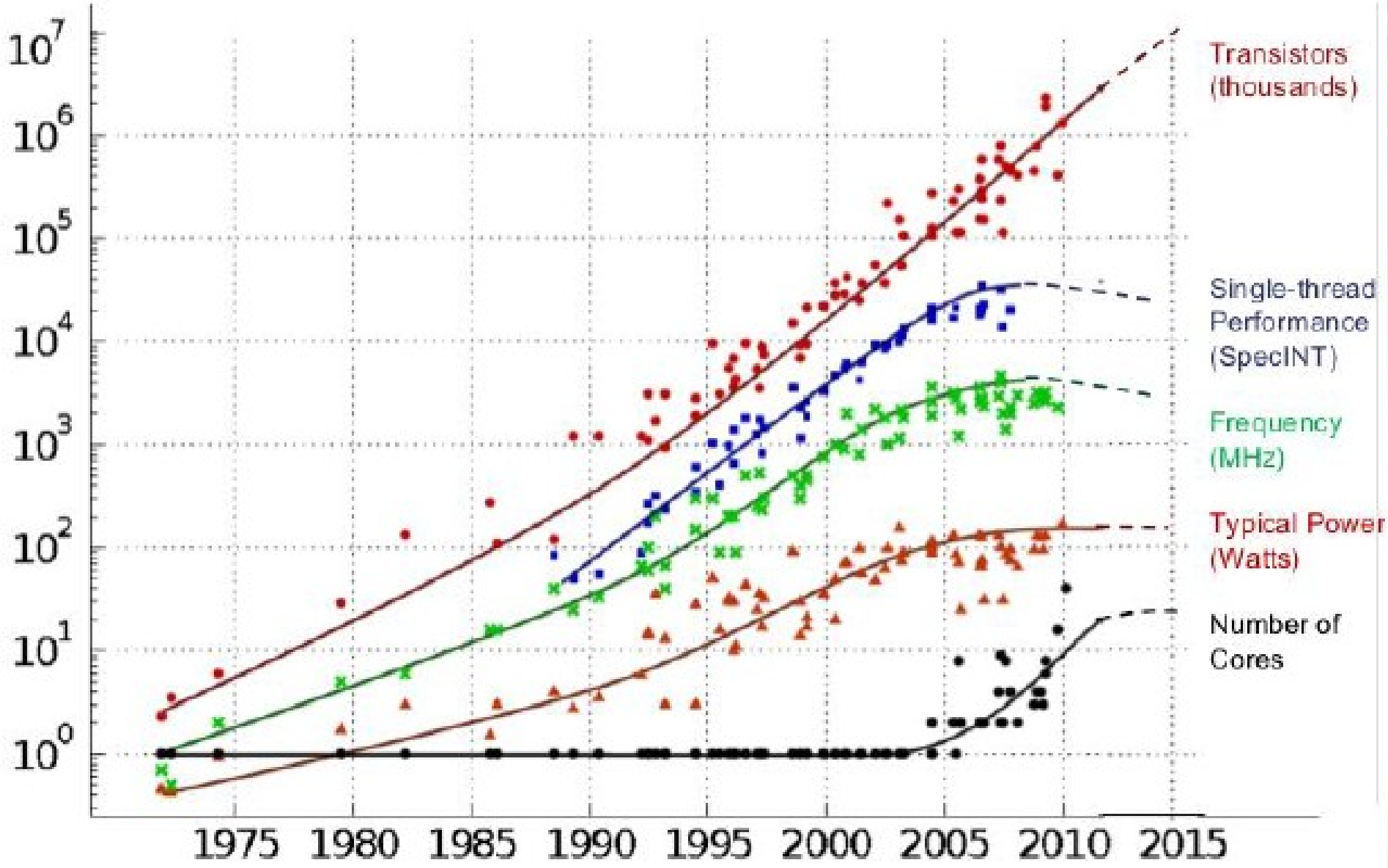


Andreas Gellrich, Birgit Lewendel

Facts about data from LHC now and beyond 2015

- ~130PB/year is expected in 2020
- The storage is largest computing cost (in ATLAS 60% more than CPUs)
- «In general it is much cheaper to transfer data than to store it»

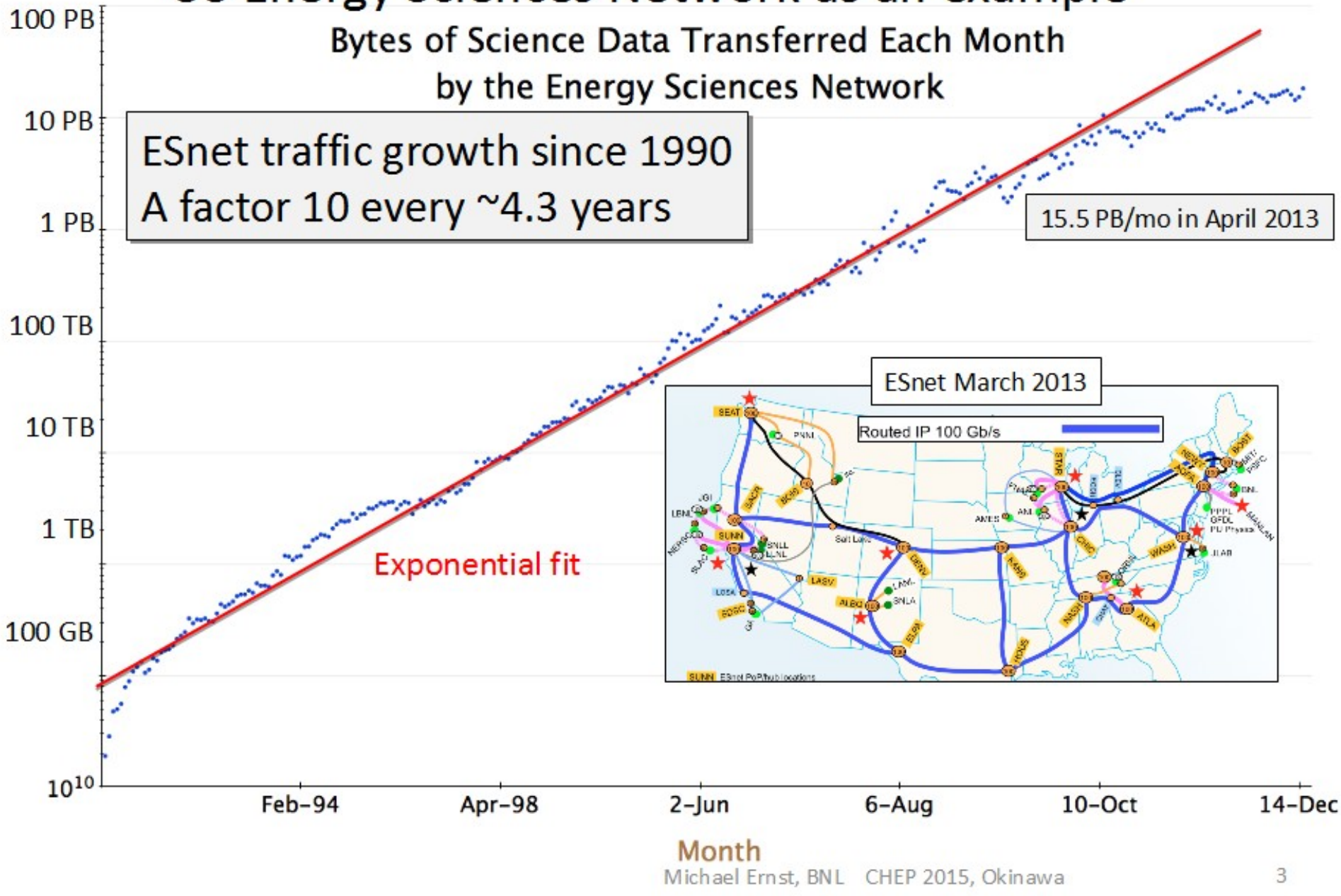
35 YEARS OF MICROPROCESSOR TREND DATA

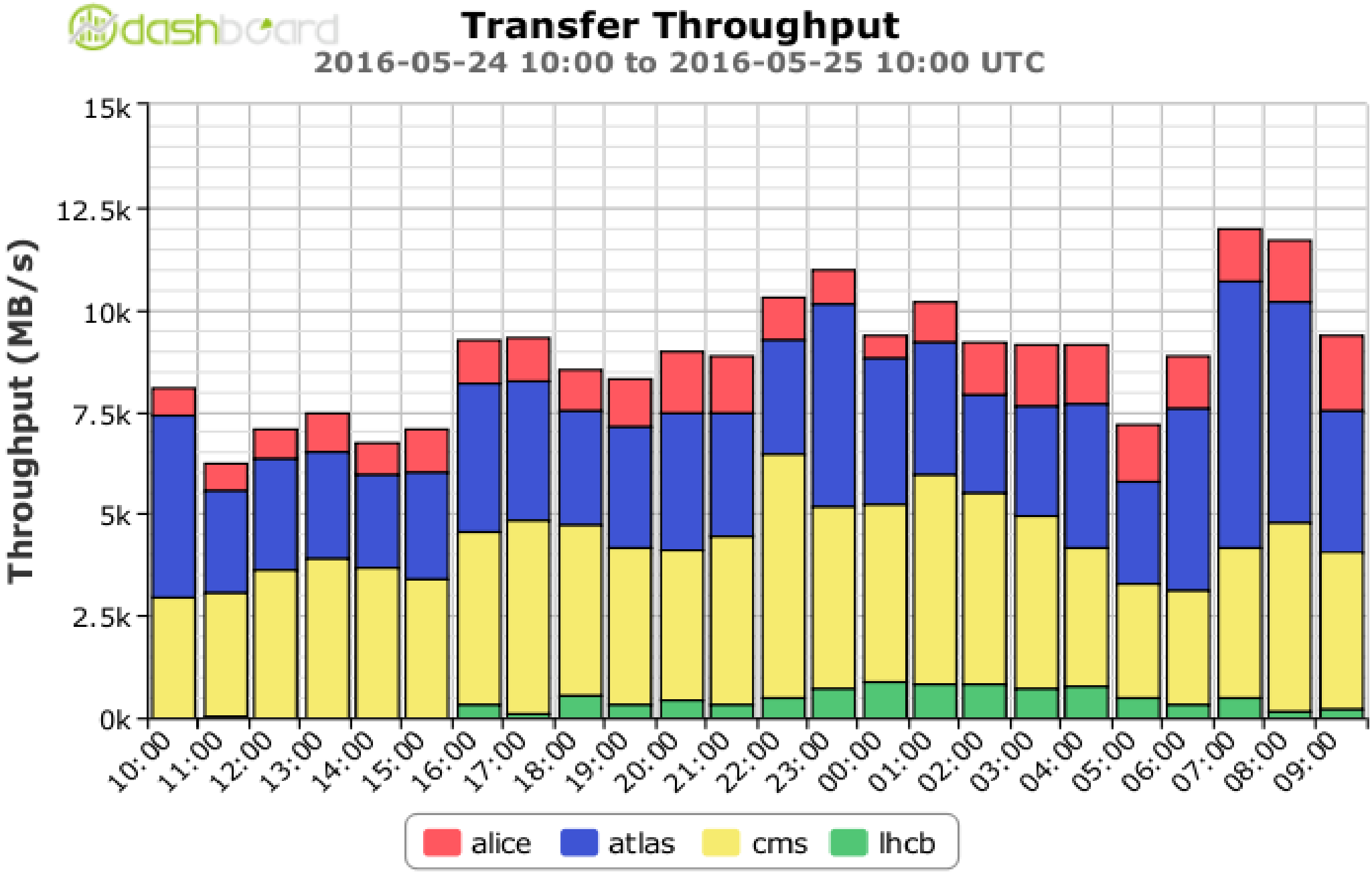


Original data collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond and C. Batten
Dotted line extrapolations by C. Moore

Networking growth has been dramatic

US Energy Sciences Network as an example




dashboard
Transfer Throughput
2016-05-24 10:00 to 2016-05-25 10:00 UTC
Throughput (MB/s)
15k
12.5k
10k
7.5k
5k
2.5k
0k
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
alice
atlas
cms
lhcb

Technology: Baseline Boundary Conditions in 2025

Technology	Growth in 10 years
CPU Servers	x4 - 14
Disk Capacity	x4 - 10
Tape Capacity	x10 - 30
Network Capacity	x30 - 200