ISC- HPC I/O in the Datacentre
Gerd Büttner

HPC@Airbus
I/O in an Industrial Scientific Computing Environment
Airbus is a global aircraft manufacturer

Our global workforce is united by a passion for aviation and restless desire to create better ways to fly

<table>
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<th>55,000</th>
<th>€40 billion</th>
<th>9 yrs</th>
<th>400</th>
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</thead>
<tbody>
<tr>
<td>Employees</td>
<td>Annual revenue*</td>
<td>Backlog</td>
<td>Operators</td>
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Data to end 2014

*Annual Revenue 2013
Our aircraft are a familiar sight around the world

Presence

An Airbus takes off or lands every 2 seconds

15,200+ Aircraft sold  60+ Produced monthly  8,800+ Delivered  23,200+ Daily flights

Data to end 2014
Innovation is in our DNA and has been for over 4 decades – 600 patents per year.

**3D Printing**

Image shows the 1st flying 3D printed metal part

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**Industry FIRSTS**

1st twin-engine widebody aircraft, A300

1st full fly-by-wire commercial airliner

1st double decker airliner, A380

1st manufacturer to make extensive use of composites
The most global aerospace player – close to our customers worldwide

**The numbers**

- 11 Production sites
- 4 Assembly line locations
- 5 Training centres
- 4 Engineering centres
- 3 Customer support centres
- 10 Materials & logistics centres*

*Data to end 2014
*Satair Group
Global Storage Architecture

Scientific Computing

Unified Planning

Shopfloor

PLM

LAN

SAN

´SAN Array

NAS- Filer

MS- Exchange

NASDAQ- Filer

SAN Array

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Global Scientific Computing Architecture

Airbus Group Innovation:
- Suresne
- Ottobrunn
- Hamburg
- Filton
- Toulouse
- India

Airbus Group Helicopter
- Marignane
- Donauwörth
- Ottobrunn

AECI
- Bangalore

HPC Service
- Filton
- Suresne
- Marignane
- Getafe
- AECI
- Bangalore

AIRBUS GRID SERVICE
Challenges for „Best“ Design of a HPC

• Requirements from
  • Applications
    • Application profile (CPU, Memory, I/O, Communication)
  • EndUser locations
  • System Distribution

• Constrains
  • Data distribution
  • Budget
  • Existing environment
  • Company harmonisation

„Best“ is a well balanced System
Scientific Computing Architecture

Is to build mathematical models, analyze them to simulate the reality. This requires graphic capabilities, huge data flows and massive amounts of calculations on distributed computing platforms.
HPC Capacity

Airbus HPC capacity incrementing according to needs

<table>
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<tr>
<th>Code</th>
<th>Use Case</th>
<th>Cores</th>
<th>2015</th>
<th>2016</th>
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HPC4 Global Architecture
HPC4 Functional Architecture View

Toulouse

Hamburg

10 Gb Ethernet
56 Gb Infiniband

8 x 10 Gb
4 x 10 Gb

Admin Nodes
Grid Nodes
Transfer Nodes
Visu Nodes
Login Nodes

Admin Nodes
Grid Nodes
Transfer Nodes
Visu Nodes
Login Nodes

SCRATCH

Infini-band

MIDTERM Storage

Type1 Nodes
Type2 Nodes
Catia Nodes

Type1 Nodes
Type2 Nodes
Catia Nodes

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Type2 Nodes
Catia Nodes
Storage design in HPC4

Airbus Backbone

Dev/Val

Compute Nodes

10GB

FDR

MDS

MDS

OSS

OSS

Production TLS

Compute Nodes

10GB

FDR

MDS

MDS

OSS

OSS

OSS

OSS

Production Ham

Compute Nodes

10GB

FDR

MDS

MDS

OSS

OSS

OSS

OSS

OSS

OSS
Thoughts

• System reliability/stability
  ➢ At least 2 Locations
    ➢ Electricity
    ➢ Network Load
      ➢ Multiple Enduser locations

• Enable full service contract
  ➢ Reduce number of interface points
    ➢ Split between Batch (HPC) & Interactive Environment

• Large NFS Mount table slow down the system
  ➢ No direct access to standard storage environment

• Sizing on given Application portefolio
  ➢ Application inventory with the Customer
  ➢ Agree on a load forecast

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Conclusion

The right system has to be balanced based on requirements and constrains

• There no „Best“ System or optimal solution for every one

• I/O is one important perimeter of design
  • I/O is often forgotten in design
  • I/O can slow down /limit the whole system

• Check the design with your own application portfolio
Scientific Computing

WE HAVE TWO MODELS, WHICH IS YOUR NEED?

EUHH... I JUST NEED TO FOLLOW MY BUDGET CONSUMPTION!