

The Changing Landscape of Supercomputing Architectures, Applications, and Interfaces

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Context

- History
 - **Brief** history of supercomputing
 - TACC ecosystem: exemplar for the evolving supercomputing center
- The Present
 - Linux cluster entrenched
 - Microprocessors, accelerators, and such
 - Memory, I/O, networks...
 - Diverse applications!

A Brief History of Supercomputing

1929:
Term
invented
(for IBM
tabulator)

1940s:
computers
invented

1956:
“Preliminary”
super-
computers

1964:
CDC 6600 –
first super-
computer

**1970s,
1980s:**
Cray PVPs

1990s:
Massively
parallel
processors

2000s:
Clusters

2010s:
Petascale,
GPUs

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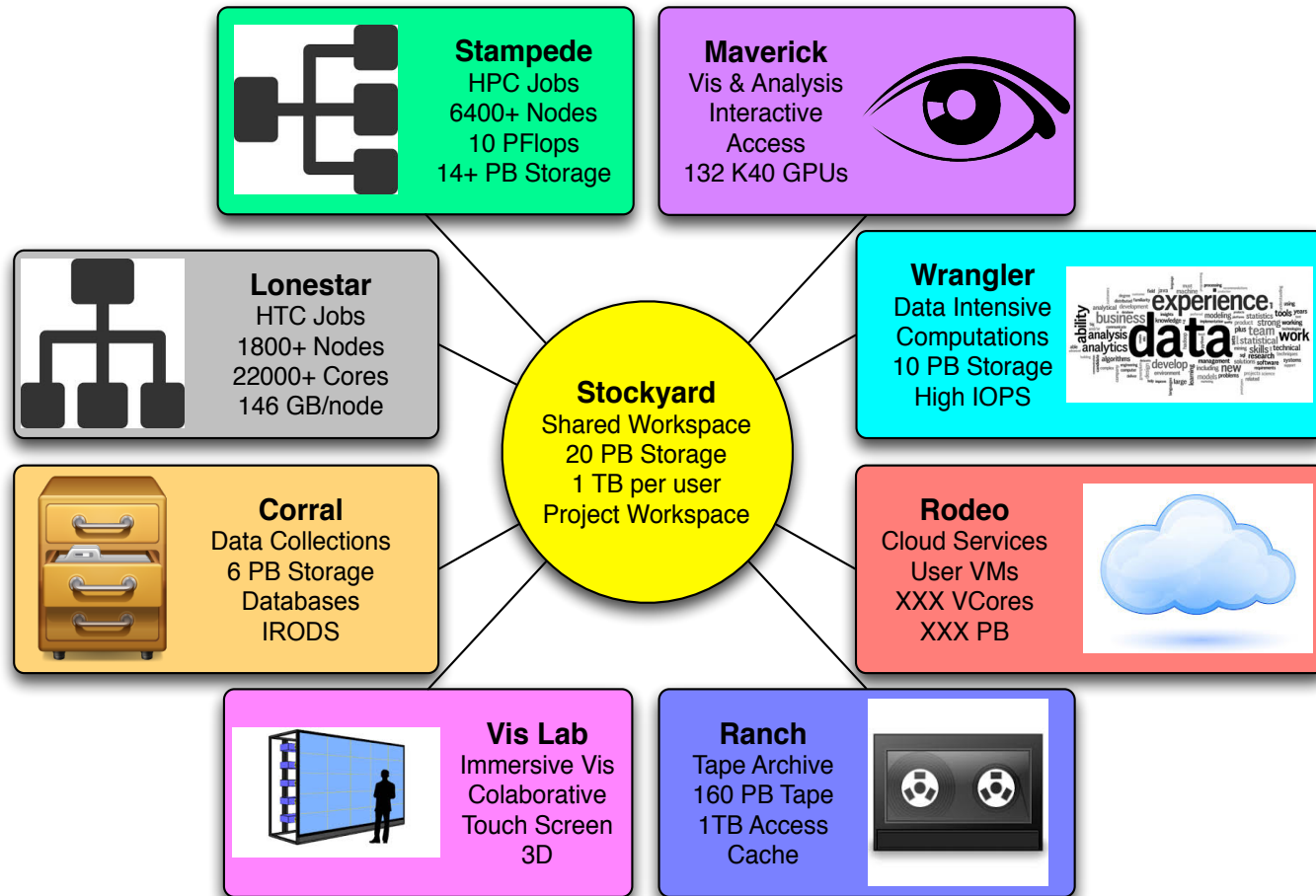
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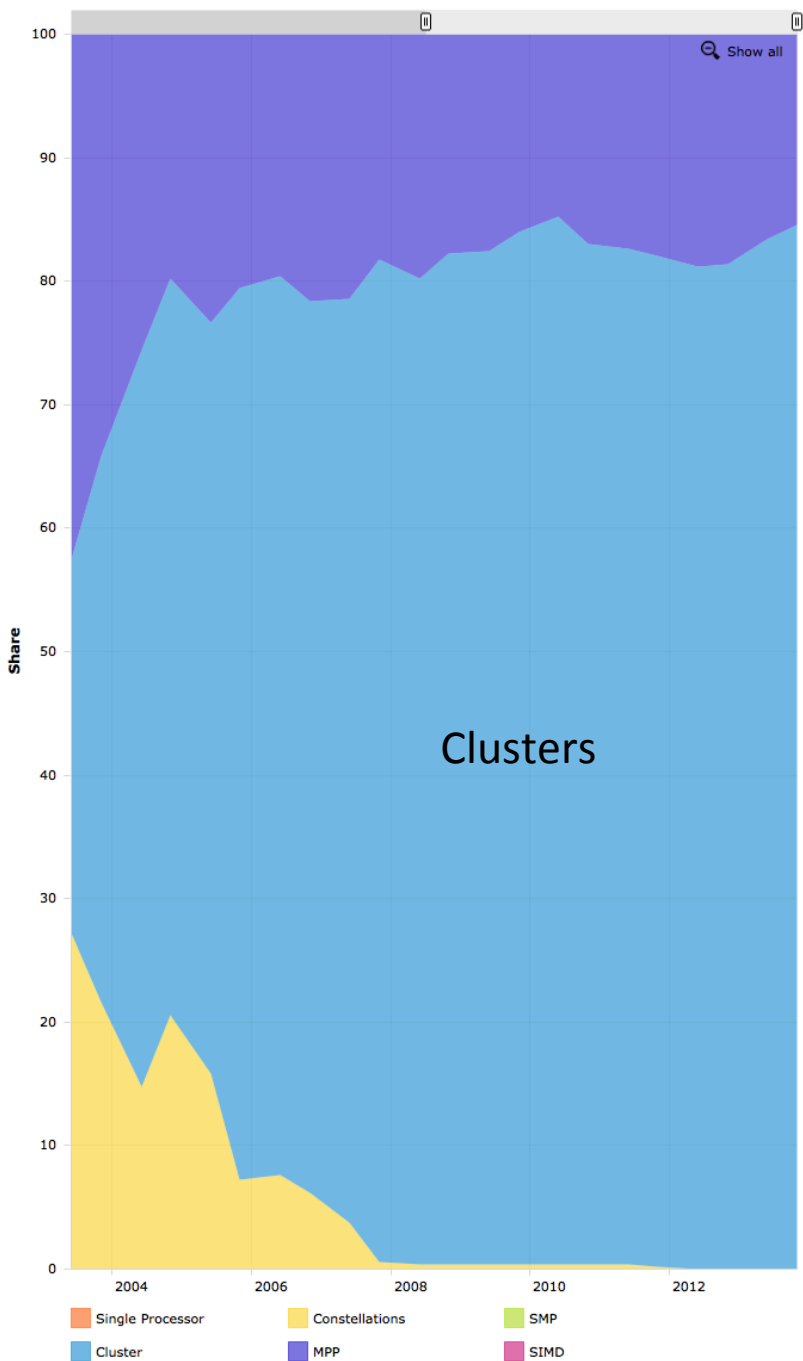
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web Big Data
 mobile cloud

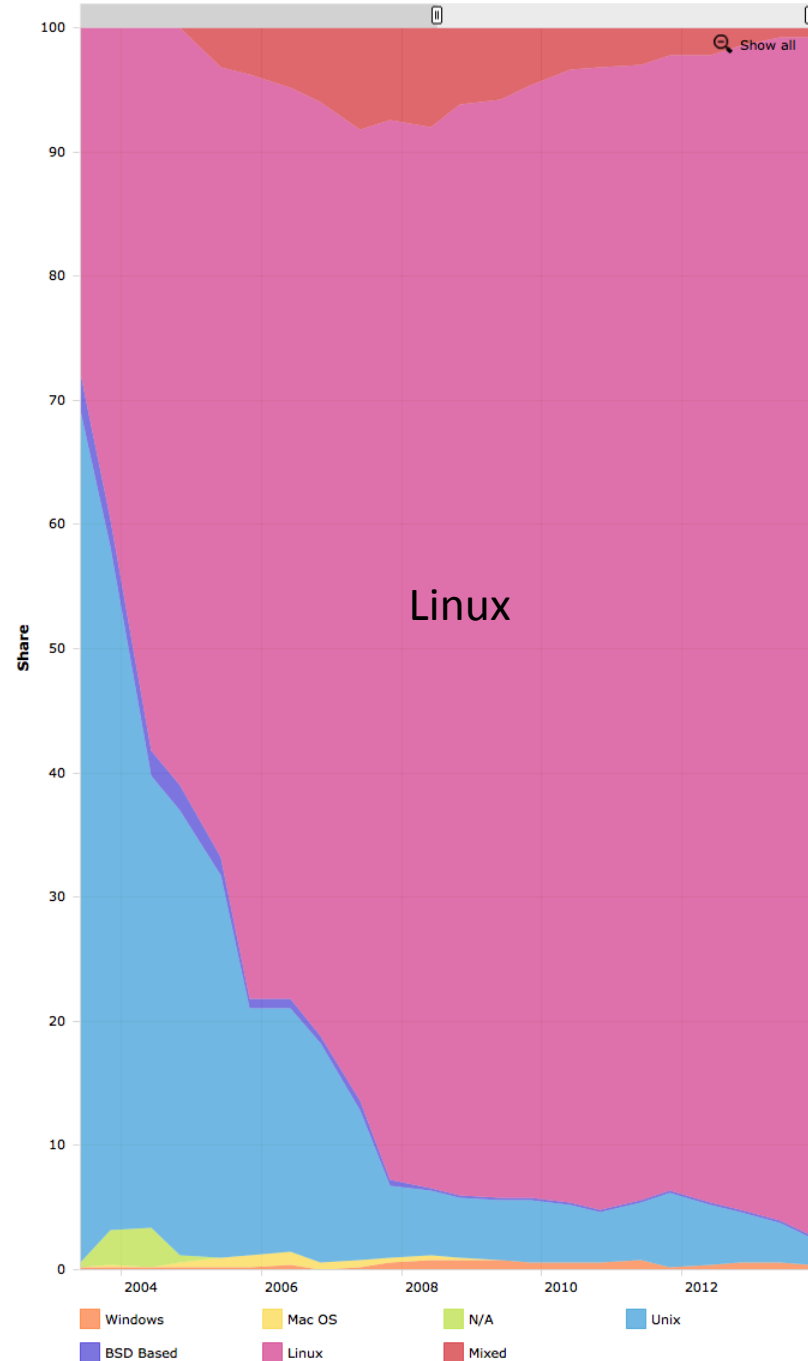
TACC Ecosystem



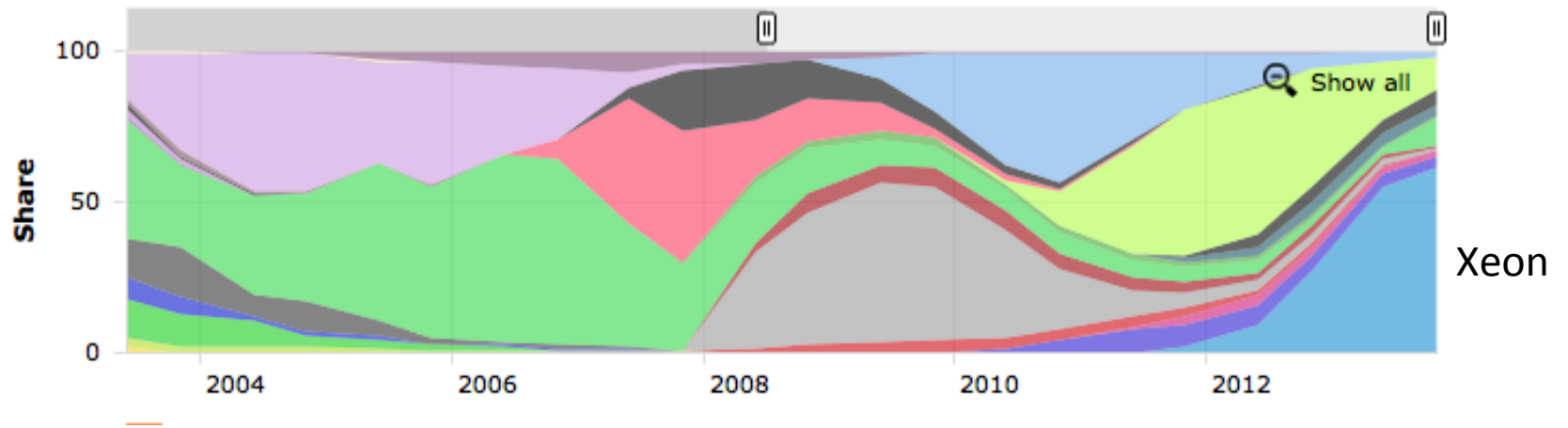
Architecture - Systems Share



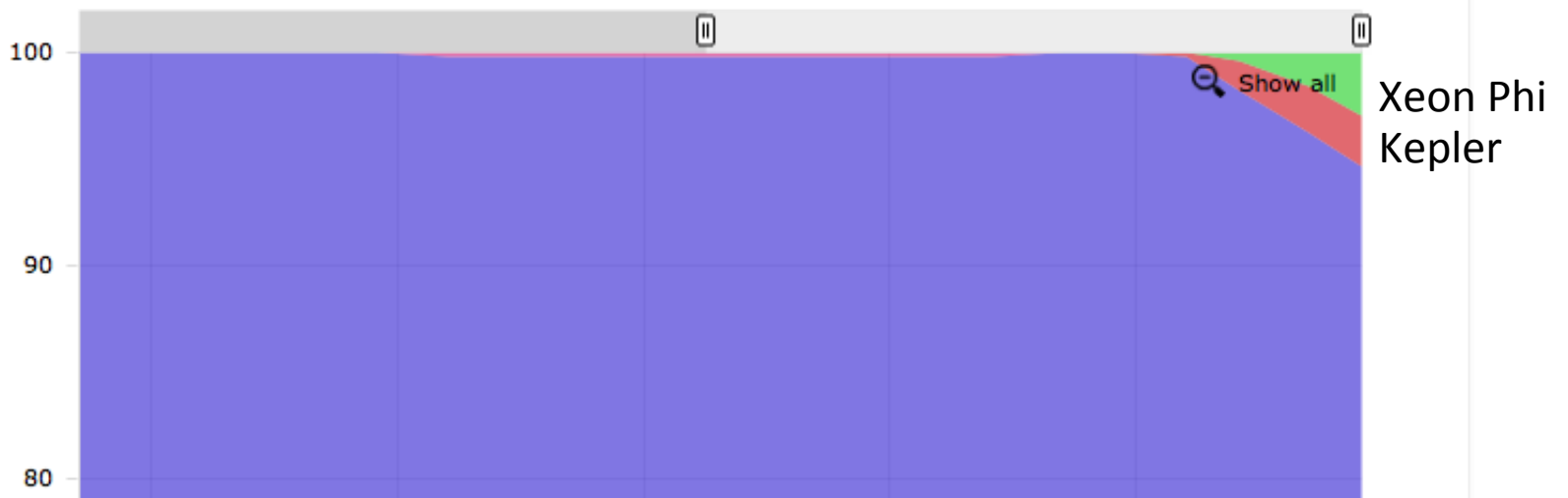
Operating system Family - Systems Share



Processor Generation - Systems Share



Accelerator/CP Family - Systems Share



Topics

- Recent Evolution of Large systems
 - Driven by scaling in face of system imbalances
 - Driven by power (cost to operate)
 - Driven by expanding applications space, especially in data intensive applications
- Data: It's not just for breakfast any more
 - The data deluge is here to stay, and the rate is much faster than Moore's Law
- Cloud Computing
 - It's Not Grid Computing
 - It's Not in Opposition to HPC
- Mobile: it's the new web!
 - But does it have a place in science/research?

So Our Challenges Are...

- Grow systems larger to do new problems (duh)
- Build more, diverse systems to support expanding applications space
 - More data intensive applications means researchers from more domains (and new subdomains in old domains)
 - Even social sciences, arts & humanities, etc.
- Make it all work
 - Reliably: must deal with fault tolerance
 - Together: Network bandwidth/shared data access and I/O, etc.
- Make it all more usable
 - Community apps
 - Cloud/web services/mobile

Recommendations

- Systems evaluations even more important
 - More choices of processors, configurations, etc.
- System diversity necessary for university research
 - HPC, HTC, data, vis, global file storage, etc.
- Helping users analyze data even more important
 - Analysis comes first for data driven applications
- Don't dismiss 'the cloud'—embrace it
 - Seriously. You're already using it every single day.

Final Thoughts

- Thank you for your time, and for putting up with my ‘vision’ of supercomputing 😊
- Texas A&M is a remarkable research institution, with growing engineering and with proximity to Houston/petro/medical
- This new IBM deal is exciting—build on it!
- Questions? Always feel free to email me:
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