Challenges in Compute Management and Provisioning

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What Happened Last Time?

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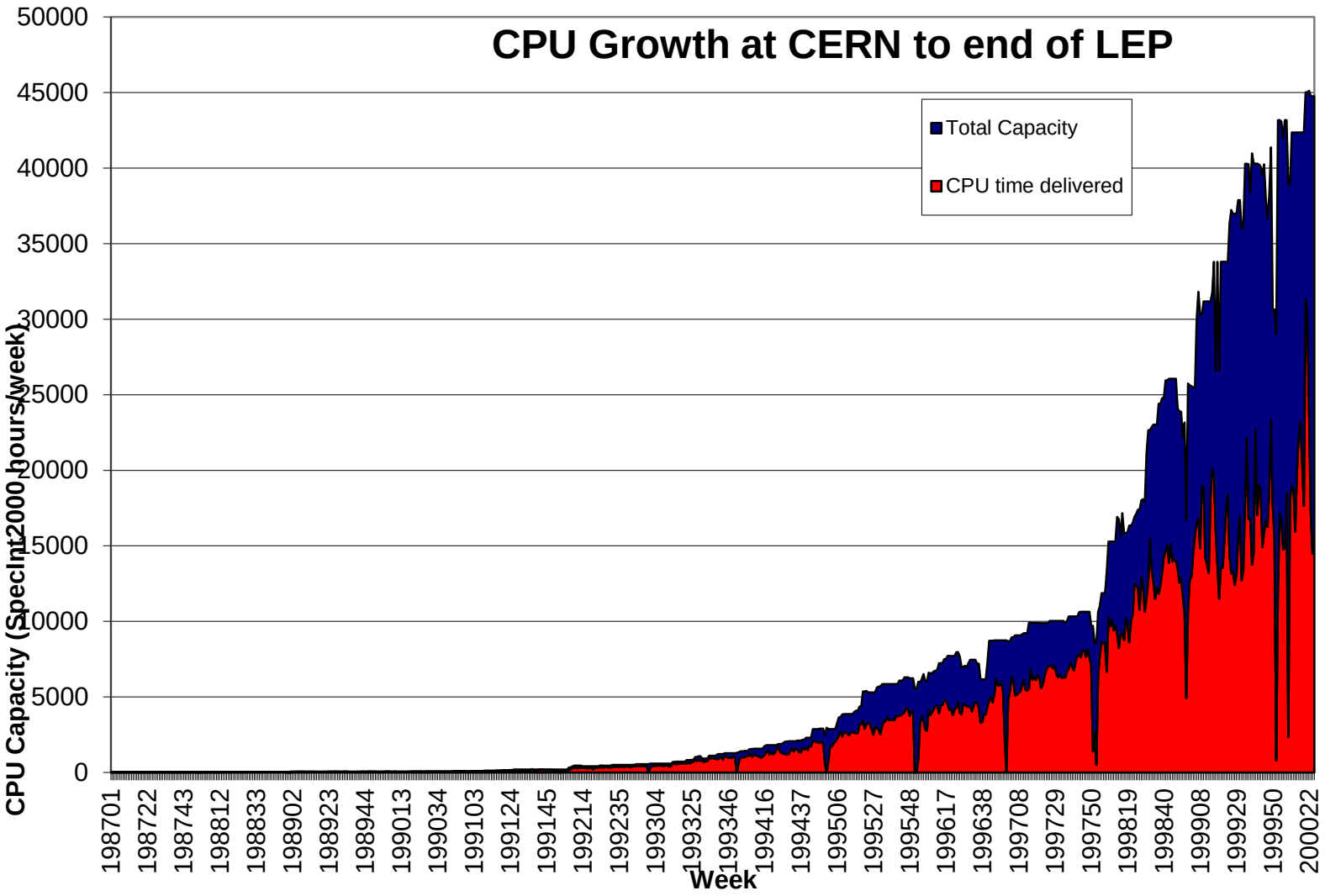

Now–Worldwide LHC Computing

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Typical simultaneous jobs: more than 250,000
Global Transfer rate: 12-15 billion bytes per second

Current Models

- Software limits are being reached
  - Scheduling–7K workers handing 100K jobs
  - Flexibility–Linux migrations
- Staffing limits
  - Significant effort to maintain code base
  - Operations cost is high
  - Migrations require major team effort
- Expect continued growth of compute
  - 300,000 cores by 2015

Learn from Others

- Move towards a cloud model
  - OpenStack based IaaS
  - PaaS and SaaS to come
- Exploit open source software
  - Strong communities
  - Staff motivation
  - Replication to other labs

Challenge: Scale

- Running OpenStack with 300,000 cores will be non-trivial
- Simple operations become major
  - Upgrading while running production workloads
  - Deploying kernel upgrades on hypervisors
  - Installing the latest hardware deliveries

Challenge: Efficiency

- Need to measure efficiency
  - Get the most out of what we've got
  - Analytics for low efficiency identification
- Minimise overhead
  - Containers
  - Hypervisors
- Maximise usage
  - Quota vs spot market
- Minimise cost
  - Pricing services (Private, Public)
  - Optimise for performance
  - Optimise for power

Challenge: Management

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- Service Levels
  - What is affordable and achievable ?
  - How can we measure it ?
- Capacity Planning and Quota
  - Elastic resources
  - Delegation of resource management
  - Fair share allocation
- Process optimisation
  - Hardware repair window vs redundancy

Challenge: Research Usability

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- Choose my service
  - Single federated account
- Flexibility
  - OS version, CPUs, RAM, Disk
- Self-Service
  - No tickets
  - CLIs and one-click interfaces
  - Support sharing of applications
- Transparent costing
  - Simple model

Conclusions

- Compute Management and Provisioning is undergoing dramatic transformation
  - Agility
  - Scale
- Many challenges ahead for CERN
  - These are common with others
  - Solve them together