Trends in HPC

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About NICE

• Focus on Technical Computing since 1996
• Core business: HPC and Cloud for technical computing users
  • DCV (Desktop Cloud Visualization) and EnginFrame product families
• Customers all around the world
• In 2016, NICE was acquired by Amazon Web Services
• In November 2016, AWS announced the first two services based on NICE technologies:
  • Amazon Appstream 2.0, Amazon Elastic GPU
• Since then, cloud versions of EnginFrame (MyHPC) and DCV have been introduced, new features have been added to both cloud and desktop versions
HPC Market at a Glance

- **$35.4B**: 2017 HPC Market, YoY 1.6%
- **$12.0B**: 2017 HPC Servers, YoY 7.4%
- **$1.1B**: 2017 HPC on Public Cloud, YoY 44.3%
- **6.9%**: 2017-2022 CAGR
- **70%**: Industry portion of 5yr HPC incr. revenue
- **~30%**: Revenue from Fin. Services, Bio Sciences, CAE
- **Chemical Engineering**: #1 growing vertical
- **Financial Services**: #2 Financial Services
- **Machine Learning**: #1 driver of GPU and Cloud usage

Source: Intersect360 Research, IDC
Mapping HPC Use-Cases

Clustered (Tightly Coupled)

Data Light
- Fluid Dynamics
- Weather Forecasting
- Materials Simulations
- Crash Simulations

Data Heavy
- Metagenomics
- Astrophysics
- Deep Learning

Distributed/Grid (Loosely Coupled)
- Risk Simulations
- Molecular Modeling
- Contextual Search
- Logistics Simulations

- Seismic Processing
- Animation and VFX
- Semiconductor Verification
- Image Processing/GIS
- Genomics

Data Light
Minimal requirement for high performance storage

Data Heavy
Benefits from access to high performance storage

Logistics Simulations
- Risk Simulations
- Molecular Modeling
- Contextual Search
- Logistics Simulations

- Seismic Processing
- Animation and VFX
- Semiconductor Verification
- Image Processing/GIS
- Genomics
The “NICE Bundle”

- Desktop Cloud Visualization
- EnginFrame
DCV for Remote 3D Visualization

Engineers and Designers

Dynamic Quality Controls

Transfer Pixels, not Data!

DCV protocol over LAN

Encrypted stream

Virtual Workstation Server(s)

Storage

2D/3D Apps

DCV (Desktop Cloud Visualization): Feature highlights

- Supports multiple devices and operating systems, including Linux, Windows, and HTML5 clients
- Adaptive encoders automatically deliver the best possible user experience under changing network conditions
- GPU sharing across multiple sessions under Linux
- 4 x 4K monitors for 3D graphics at high framerates
- Support for a wide range of USB peripherals, such as 3D mouse
- Multi-way collaboration

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DCV + EnginFrame for HPC

Access
- Thin Client
  - Collaborators, Support staff
  - End Users

Self-Service Offering
- DCV protocol
  - SOA
  - HTTP(S)

Resources
- Visualization Servers
  - Storage
  - HPC jobs
  - HPC schedulers
- Linux & Windows 3D Applications
EnginFrame: MyHPC – Cloud Portal

Job submission

Runtime Monitoring of Results

Desktop + Remote 3D graphics
EnginFrame: *MyHPC* – Cloud Portal

**Job Management**

**Resource Management**

**Script Editor**

**Compute Configuration**
HPC and Cloud
HPC IT-Challenges

www.software.slb.com

https://www.aspentech.com/

www.software.slb.com

https://www.unisim.cepetro.unicamp.br/br/2-uncategorised/101-pesquisa

https://www.agr.com/

www.kindermorgan.com

www.software.slb.com

https://www.streamsim.com/
Deploying HPC on AWS

On AWS, secure and well-optimized HPC clusters can be automatically created, operated, and torn down in just minutes.

- 3D Graphics Virtual Workstation
- License Managers and Cluster Head Nodes with Job Schedulers
- Cloud-Based, Auto-Scaling HPC Clusters
- Shared File Storage
- Storage Cache
- AWS Batch
- AWS Snowball
- AWS Direct Connect

Machine learning and analytics
Amazon S3 and Amazon Glacier
Third-party IP providers and collaborators

Corporate Datacenter

Amazon S3
Amazon Glacier
Third-party IP providers and collaborators

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Ultra-scale Workflows on AWS 
Field Development Optimization

J N Carter, Coventry University; M A Christie, Heriot-Watt University; J Talbot, Heriot-Watt University; D Eydinov, Heriot-Watt University; M Turner, Zenotech Ltd

“The mean net present value of the optimised result is twice that of the plan proposed by a reservoir engineer with more than 25 years experience. “

“Since each development plan was optimised over approximately 30 distinct cases, the results reported here required in excess of 55,000 simulations. The final run was completed in less than two days and the total cost of the cloud computing was less than one day of an external consultant’s time.”
Other HPC Trends

• Physics-based Simulators train Deep Learning Models
• Re-engineering of traditional HPC codes to take advantage of modern concepts & technologies
  - Microservices
  - Containers
  - Resilient architectures
• Hybrid Workflows
• Use on-premise infrastructure for base loads, use cloud for large scale-out workflows
Thank You!