Fortissimo

HPC and SMEs: The Fortissimo Initiative

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The (known) situation

- Customers, especially those with really limited budget (e.g. SMEs) need as simple access to HPC as possible
- This includes
  - Understanding of the benefits of HPC
  - Finding partners to perform HPC activities
    - HPC Resource Providers
    - ISVs
    - Consultants
  - Simplified Execution of Jobs
    - Ideally: Login, click and get results
Fortissimo Goal & Ambition

• **Goal:** provide SMEs with easy and cost-effective access to advanced simulation services through a Cloud infrastructure consisting of HPC resources, software applications, expertise, and tools.

• **Ambition:** become *THE* portal of choice for HPC expertise and service provision, delivered by Europe’s major HPC technology providers.
Members of the Value Chain

- End user
- HPC Service Provider
- Independent Software Vendor
- Research Software Provider
- Application Expert
- HPC Expert
Fortissimo Marketplace

End User

FORTISSIMO Cloud of HPC Resources

FORTISSIMO Experiments

End User

Bringing together all components
BUSINESS CONTAINERS
Business Containers

- Offering of pre-defined services
- May provide
  - choice of different providers (with different prices)
Business Containers II

- Allows for quick and mostly automated access to services
- But limits the users in the flexibility of the service
  - Take it as it is

But I want E!!
Example: Same Pre-Defined Service on different Providers

AVL :: CO² Emission Prediction for Automotive ESnines

<table>
<thead>
<tr>
<th>#</th>
<th>Status</th>
<th>HPC-Provider</th>
<th>Front-end Type</th>
<th>Front-end (link/image)</th>
<th>Costs Estimation (node/h)</th>
<th>Action</th>
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<td>HLRS, Stuttgart</td>
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<td><a href="https://cruise01.cloud.avl.com">https://cruise01.cloud.avl.com</a></td>
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Total: 5 Offers
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Total: 6 Jobs
SIMULATION AS A SERVICE
Simulation as a Service Offering

- For those use cases which cannot benefit from an existing business container
- Brings together the stakeholders of the value chain to provide a cloud-like access to a joint service
Base Idea

• Provide a tailored virtual environment as VM, which
  – is adapted to the end users need
  – contains all necessary support services
  – is available through a single entry point (e.g. login into a marketplace)
  – is created by the stakeholders of the respective service

• Hide the direct access to HPC Resources
  – through a GUI-like interface
Implementation

• Automated & Integrated Job Submission
  – Hybrid Cloud solution
    • OpenStack Cloud Middleware
    • Configurable cluster job management

• Requirements
  – Single Entry point is available (e.g. a marketplace account)
  – Local provider account (agreement to policies etc..)
High Level View – Implemented Fortissimo Job Submission

User → Internet → VM Frontend → FORTISSIMO Middleware → Cluster

- User submits a job through the Internet.
- The job is processed by the VM Frontend.
- The FORTISSIMO Middleware manages the job submission.
- The job is executed on the Cluster.

12.04.2016
IDC HPC User Forum - Tuscon
Benefits

• No changes for the cluster infrastructure required
  – Login to frontend still possible
  – Complete separation of used infrastructures

• Configurable
  – Various on-purpose images
  – Various different instances

• Flexible
  – Different Operating Systems possible
  – Images can be exchanged between providers
  – Remote visualization possible
  – Technical match-making
Web-based front-end workflow

- Model selection
- Component/parameter input
- Starting single or multiple simulation in the cloud
- Selecting the best variant
- Detailed result analysis
What does Fortissimo success look like?

• Two levels:
  1. 50-60 successful ‘experiments’ with SMEs delivering **real business impact** through HPC
  2. Well-managed successful project delivering Core Services, Open Calls and working Marketplace

• Vital statistics:
  – €22m costs / €16m funding
  – Approx. 130 partners (14 core – remainder experiment partners – many SMEs)
  – 53 experiments – €180,000-€250,000 / 3-5 partners
Successful Open Calls – lots of demand

• Two Open Calls
  – Call 1: 65 proposals – funded 22 new experiments
  – Call 2: 82 proposals – funded 11 new experiments
  – All run as per EC best practice

• Optimised arrangements for SMEs
  – Protecting their IPR through experiment ‘IP bubble’
  – Dealing with cash-flow within EC grant constraints
Pipistrel success story

- SME based in Slovenia
- Light aircraft manufacturer
- New aircraft design
  - Wind tunnel too expensive
  - CFD on HPC Cloud solution
- Large detailed models
  - 20-30 days in-house
  - 2-3 days in HPC Cloud
- Design cycle transformed
- 10x cheaper and 10x faster
Ergolines success story

• SME based in Italy
• Speciality steels technology
• Simulation of slag carry-over from ladle to tundish
  – New monitoring system developed
  – Better overall steel quality
  – Reduced re-melting
• On average 6,000 tonnes of lost steel per year saved
• Saving between €420,000 - €600,000 per year
Extending the application areas

• Fortissimo focus
  – Advanced simulation and modelling services
  – Specific focus on manufacturing SMEs

• Fortissimo 2 (just started) extends original focus
  – Advanced simulation and modelling services are extended to include coupled applications
    • Example: FEA coupled with CFD
  – Big Data analytics
    • High Performance Data Analytics
Looking ahead... Fortissimo-2

Focus: adoption of next generation ICT advances in the manufacturing domain with as specific focus on Big Data analytics and coupled HPC simulations

2 Open Calls for additional experiments.
First Call announced in Q1 2016, submission deadline Q2 2016
Thank You!

Any Questions?