The UberCloud

Simulations and High Performance Technical Computing in the Cloud

Wolfgang Gentzsch
President, The UberCloud

Burak Yenier
CEO, The UberCloud

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Ter@tec

Product innovation and scientific insight **require** computing

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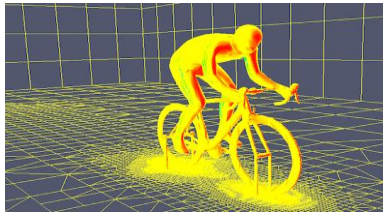


Engineers & scientists computing tools: workstations, servers, clouds

3 options to use technical compute power

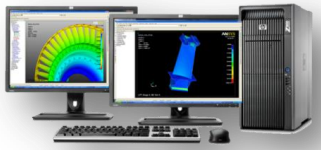
Benefits of HPC **in the Cloud**

Continue using your workstation for your daily design, and use Cloud resources with **additional** benefits:

+ An HPC system at your finger tip, **on demand**
+ **Pay per use** (no CAPital EXpenditure)
+ **Scaling resources** up and down (business flexibility)
+ **Low risk** by working with multiple cloud providers.

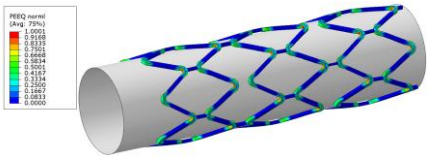
The challenges

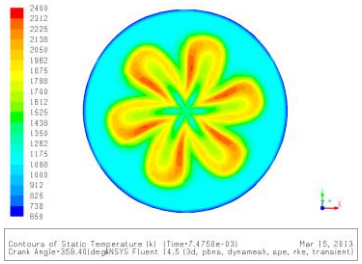
- **Workstation:** slow, limited capacity

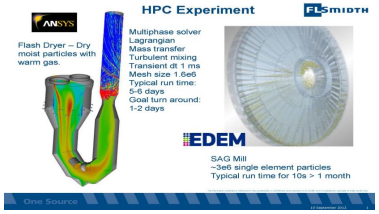


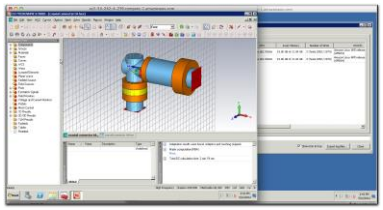
- **HPC server:** expensive (TCO!), complex

- **HPC in the Cloud:** security, licensing, data transfer, expertise, and …
- … a very crowded cloud services market, difficult to find **your** ideal service

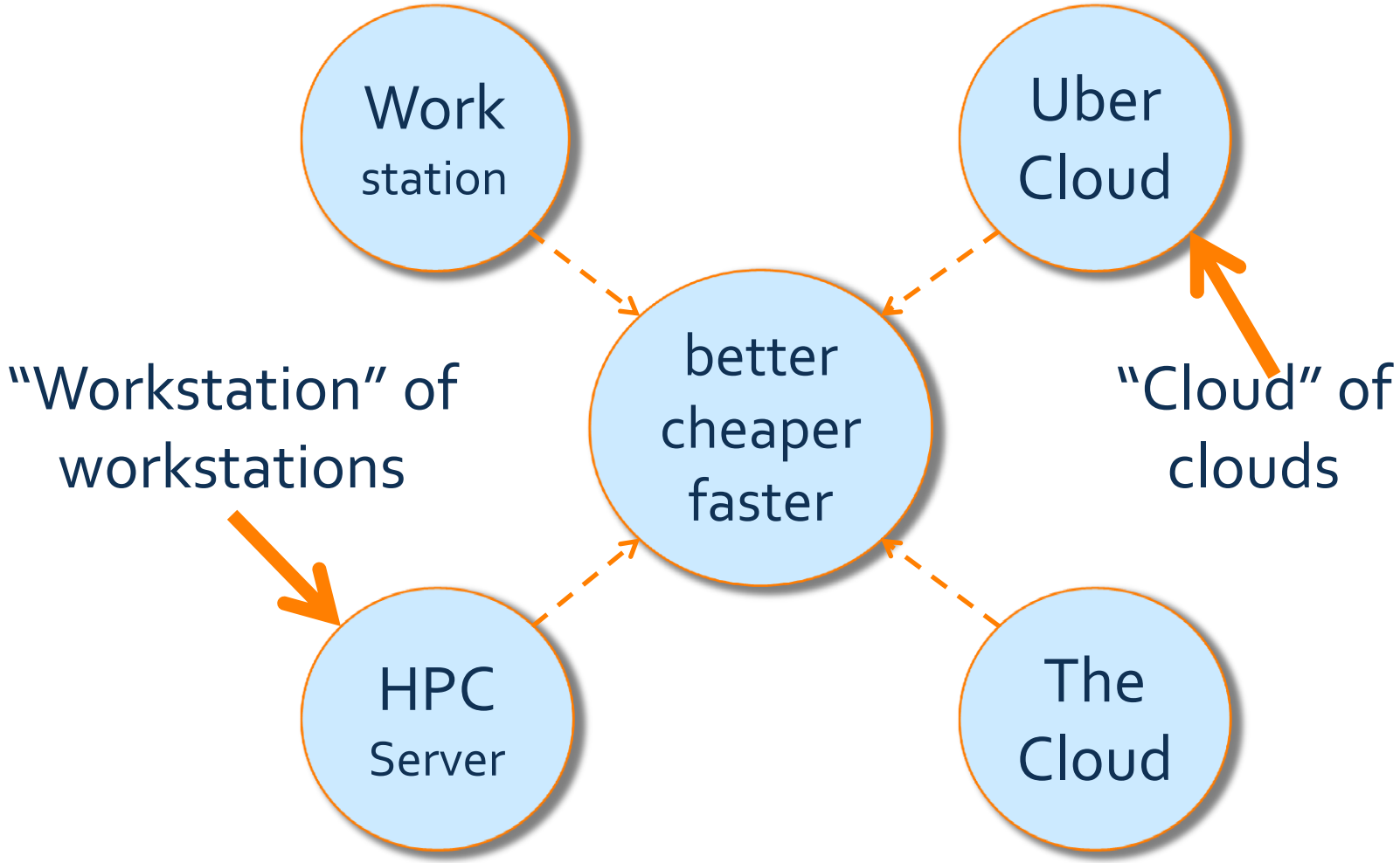




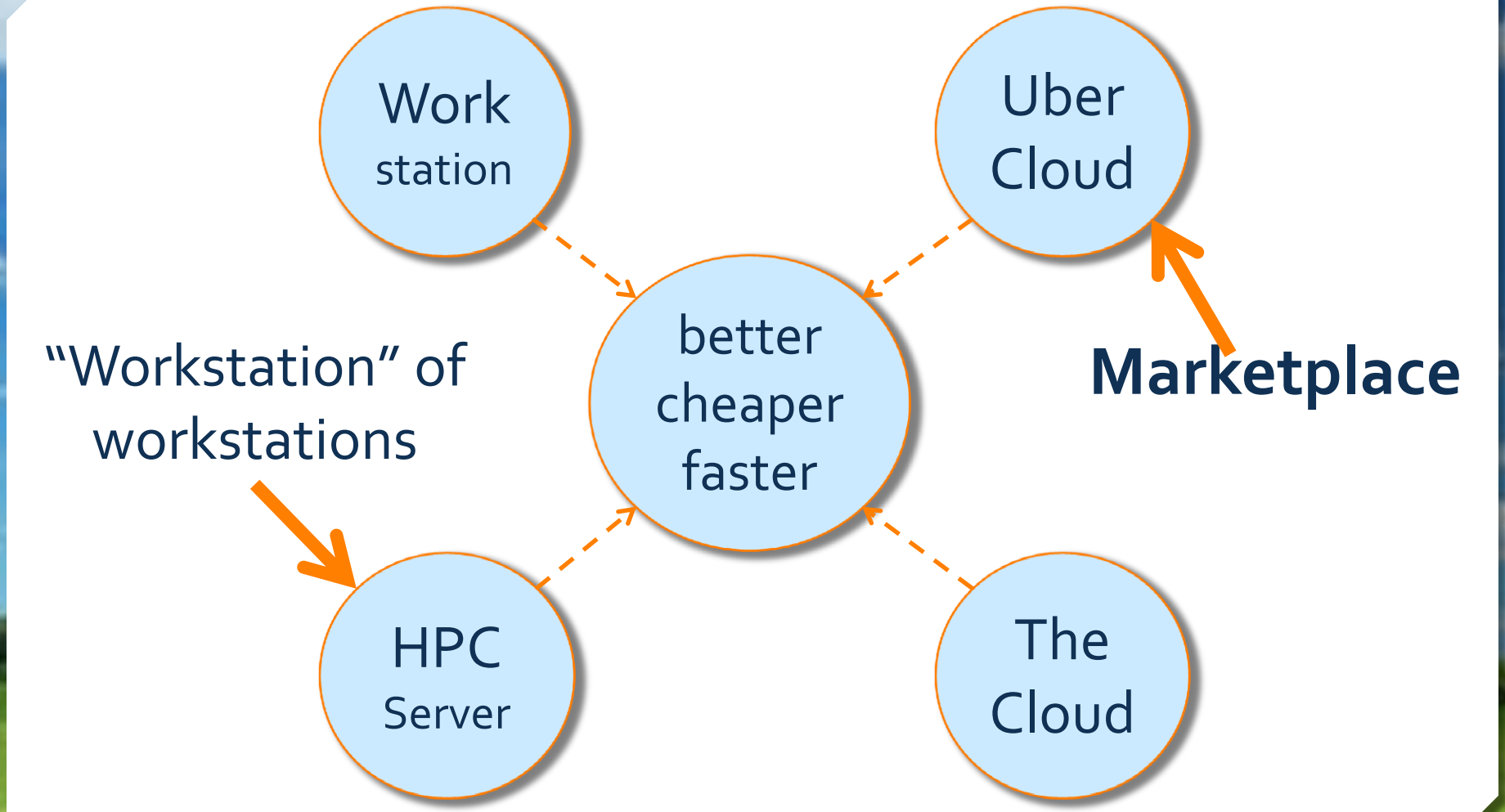




The four dimensions of HPC



The four dimensions of HPC



It all started July 2012 with the free voluntary UberCloud **Experiments**

HPC as a Service, on demand, in a team experiment

For **SMEs** and their engineering applications

to explore the end-to-end **process**

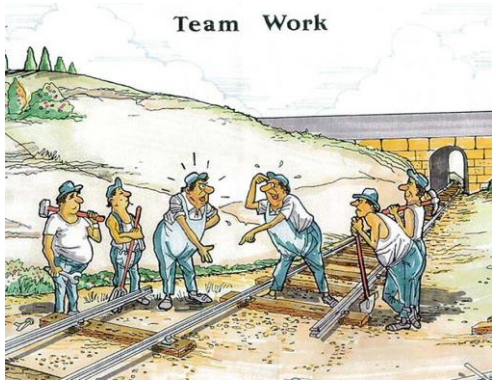
of using **remote** computing resources,

as a **service**, on demand, at your finger tip,

and learning how to resolve the roadblocks.

How does the Experiment work?

+ **End-User** registers
+ **Software Vendor** joins
+ We select a **Team Expert**
+ Matching a **Resource Provider**



+ Assigning an UberCloud **mentor**
+ Now, the team is **ready to go**
+ Finally, writing the **Case Study**

152 UberCloud Experiments so far

42 case studies published in Compendium I & II

The UberCloud HPC Experiments

Started July 2012, 3000 participants, 72 countries

Example: Bull extreme factory in the UberCloud:

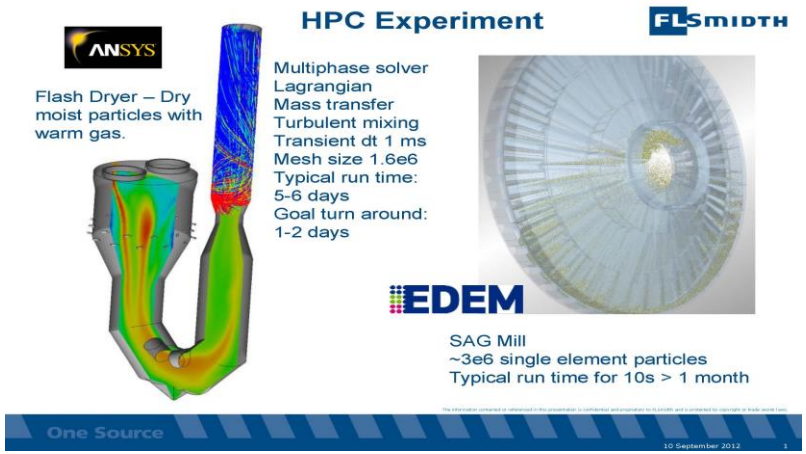
- Team 5: 2-phase Flow Simulation of a Separation Column
- Team 8: Flash Dryer with Hot Gas to Evaporate Water from a Solid
- Team 32: 2-phase flow simulation of a separation columns
- Team 52: Simulations of Blow-off in Combustion Systems
- Team 85: Combustion simulations of power plant equipment
- Team 89: Simulations of Enzyme-Substrate reactions
- Team 120: Simulation of water flow around self-propelled ship

Architect of an Open World

Team 8: Flash dryer with hot gas to evaporate water from a solid

Ingo Seipp and Team

science + computing
A Bull Group Company



End-User

FLSmidth

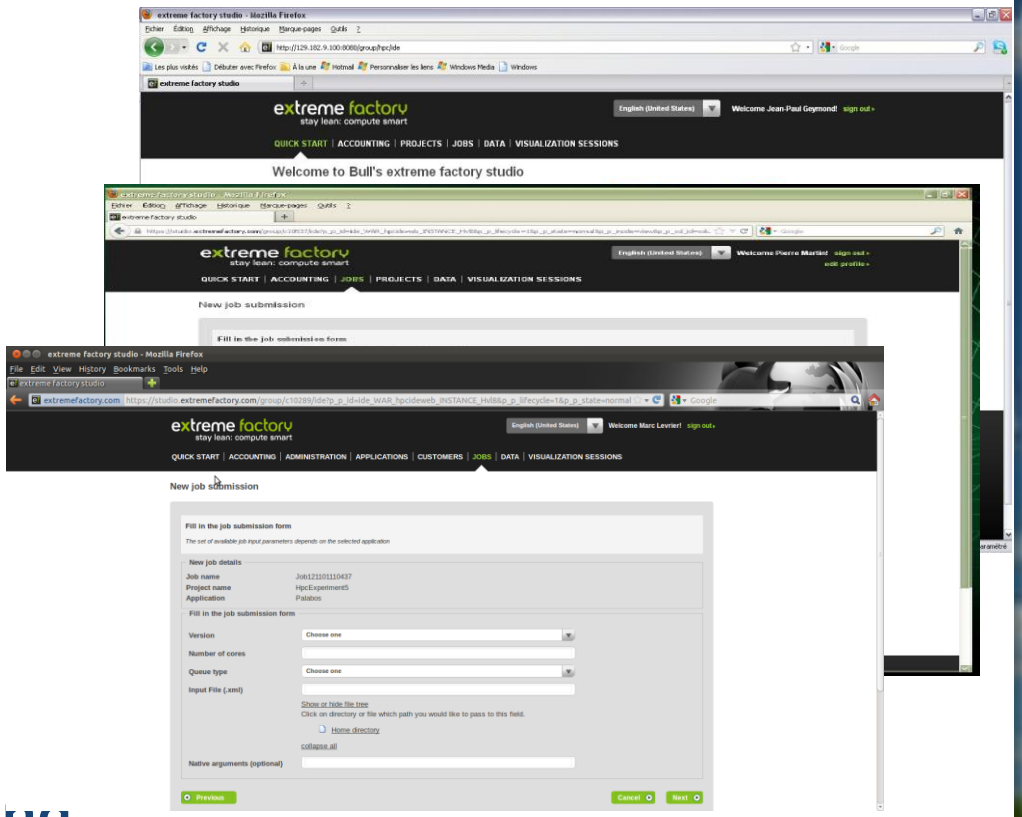
ANSYS

CFX

extreme factory
stay lean: compute smart

Team 8:
End-to-end workflow in a web browser

- Input data upload
- Software license check / update
- Job submission
- Job control
- Job & solver log check
- 3D remote post-processing



Palabos job submission form

Team 8:
Positive results, no major roadblock

"Primary goal running the job **in 1-2 days** was met."

"Due to the size of output data and transfer speed limits, a **remote visualization** solution is required."

"HPC applications in the cloud require experience and a team to deploy and tune apps and support users. This is one reason HPC Software as a Service is **not 100% ready yet** for total cloud automation."

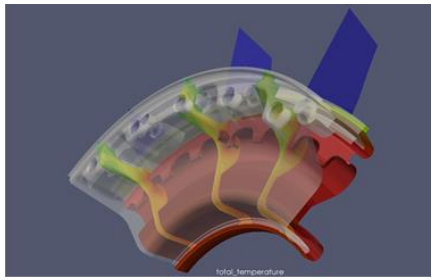
This was in 2012. Now in 2014, this has changed!

TEAM 118: Coupling in-house FE code with ANSYS Fluent CFD in the Cloud

- **End user** - Marius Swoboda, Hubert Dengg, Rolls-Royce Deutschland
- **Software Provider:** Wim Slagter, René Kapa, ANSYS
- **Cloud Provider:** Matthias Reyer, CPU 24/7
- **Team Expert:** Alexander Heine, CPU 24/7

Team 118: Temperature predictions for jet engine components

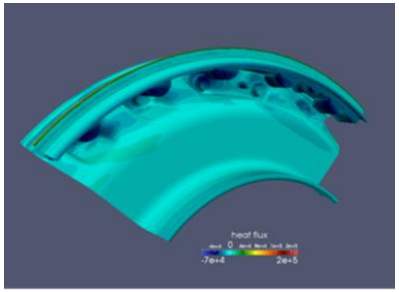
- Jet engine high pressure turbine assembly
- Transient **aero-thermal analysis**
- **FEA/CFD coupling** achieved through iterative loop with exchange of information between the FEA and CFD at each time step,
- Ensuring consistency of temperature & heat flux on the coupled interfaces **between metal and fluid domains**



Temperature contours for a Jet Engine Component

Team 118:
The aim of this experiment

- **Coupling** ANSYS Fluent with in-house FE code.
- Done by extracting **heat flux profiles** from Fluent model and applying FE model. FE model provides metal temperatures in the solid domain.
- Conjugate heat transfer needs al lot of computing, especially when 3D-CFD-models with more than 10 mio cells are required.
- Using **cloud resources is beneficial** regarding computing time.



Contours of heat flux

Challenges with the experiments

- **HPC is complex**; at times it requires multiple experts
- Reaching out to industry **end-users**
- **No standards:** access and usage of hw & sw providers are different, some are complex
- **Time delays:** vacation, conferences, and everybody has a day job (busy!)
- **Barriers:** Complexity, data transfer, security, IP, software licenses, performance, interoperability…

AND: we learned a lot . . . .

Problem: today's crowded and ineffective cloud 'market'

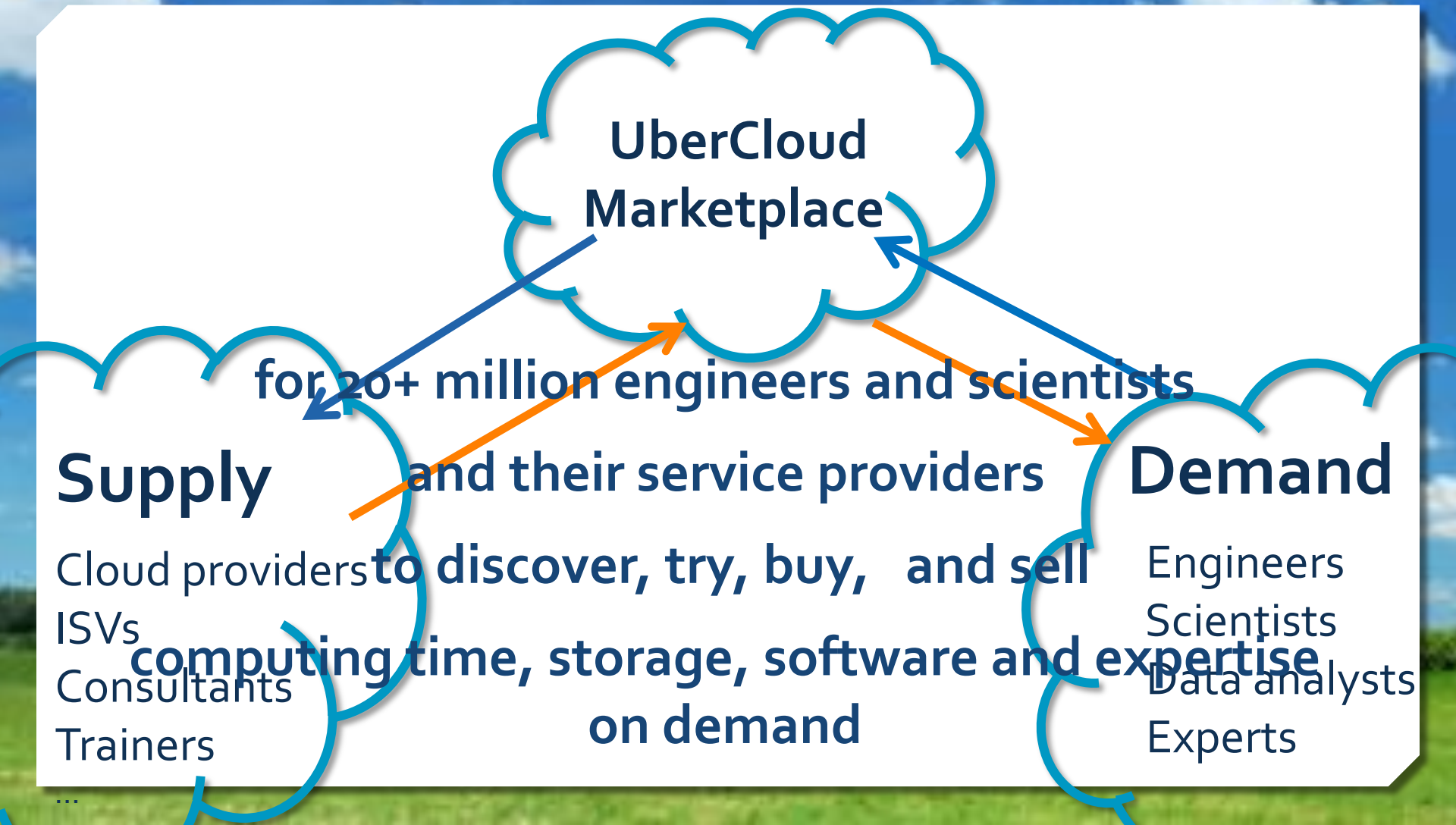
Supply

Cloud providers
ISVs
Consultants
Trainers

Demand

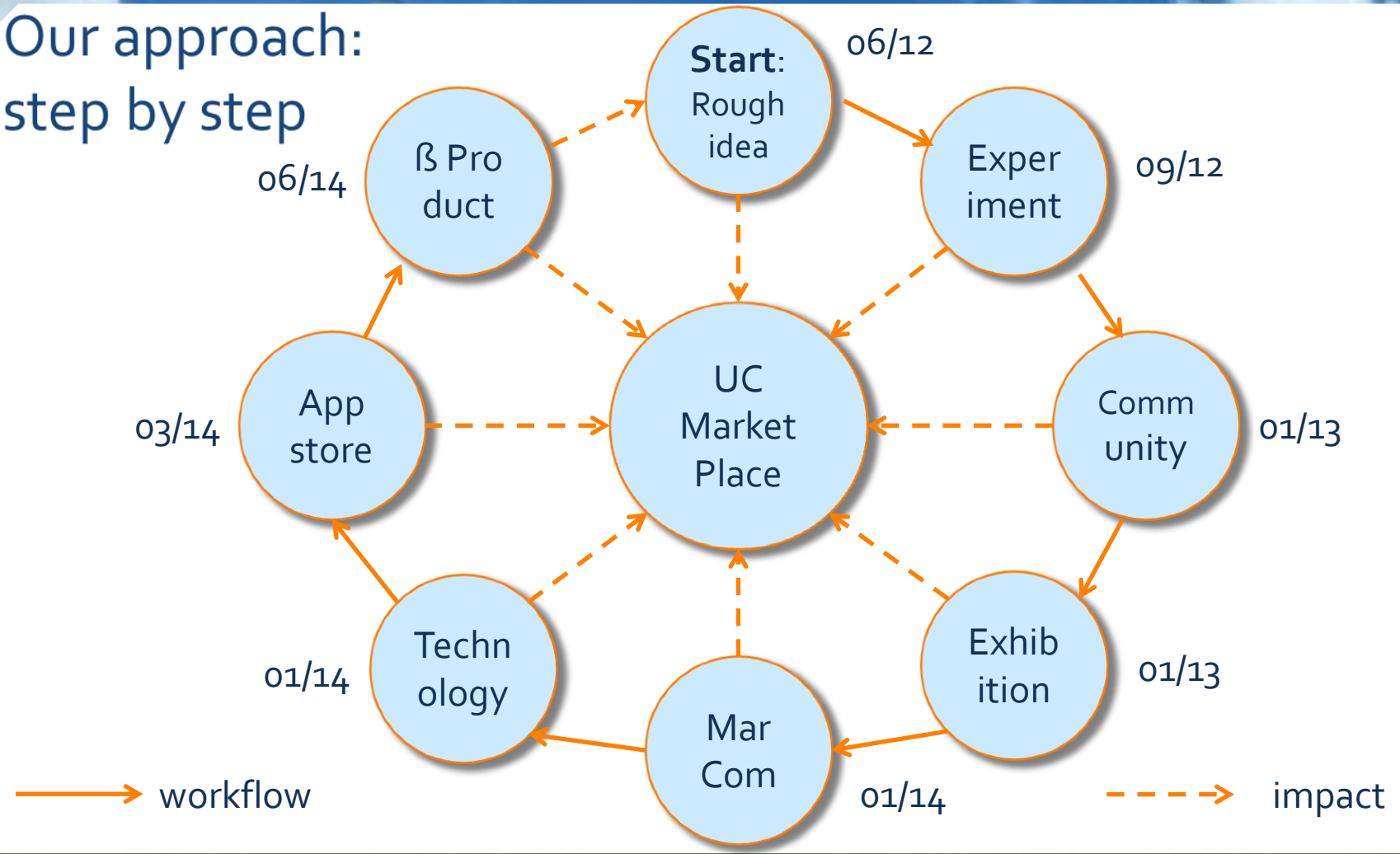
Engineers
Scientists
Data analysts
Experts

Solution:
The UberCloud Marketplace



Building a marketplace demands building an ecosystem

Our approach: step by step



Announcement at Ter@tec

UberCloud Marketplace

HOME | LOGOUT BURAK YENIER | MY PROFILE | HELP 1

OpenFoam on AWS (starter)

OpenFOAM on 16 virtual CPU cores at Amazon AWS for 24 hours. Starter size, ideal for test runs.

Price: $99.00

Add To Cart »

CST Studio Suite on Nimbix (medium)

CST Studio Suite 2014 on 32 CPU cores for 7 days at Nimbix. Medium size, ideal for shorter production runs.

Price: $999.00

Add To Cart »

**Sim 360 subscription
(starter)**

Monthly subscription to Autodesk Sim 360 Cloud Service and advanced support. Excellent way to try Sim 360.

Price: $115.00

Buy Now »

Custom quotes from UberCloud providers

Tell UberCloud about your requirements and receive competing quotes from multiple providers.

Price: $0.00

Buy Now »

Next Steps:
Reducing / Removing Cloud Challenges

Challenge *)	Addressed today	With UberCloud **)
Portability	low	high
Security	medium	high
Software Licenses	low	medium
Data Transfer	low	medium
Compliance	low	medium
Standardization	low	high
Cost & ROI Transparency	low	high
Resource Availability	medium	high
Transparency of Market	low	high
Cloud Computing Expertise	low	medium

*) Cloud challenges are addressed low, or medium, or high

**) When UberCloud is fully developed two years from now

It's your turn now ☺

- Download 2013 Compendium of case studies from HPCwire
- Download 2014 Compendium of case studies
- Register at TheUberCloud.com
- Try the UberCloud Marketplace and you get
- NOW

NOW

The UberCloud Community and Marketplace

Thank You !