Simulation as a Service
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Kuava Ltd
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Outline

• Kuava Ltd.

• Modeling & Simulation as a Service (M&SaaS)
  – Cloud computing
  – Software as a Service (SaaS)
  – Waveller Cloud

• Research needs
Kuava Ltd.

- Founded 2007
- Spin-off from the University of Kuopio
- Computational technology services with Numerola Ltd.
- Services:
  - Modeling and simulation
  - Data analysis
  - Software development (simulators, high performance computing (HPC))
  - Consultation
DOGBERT KONSULTOI.

SUOSITTELEN, ETTÄ OSTATTE DOGBERTIN OMAN OHJELMISTON.

MAKSOINKO JUURI KONSULTILLE SUOSITTELEMAN TÄMÄN OMAN OHJELMISTOA?

OLEN TÄYSIN OBJEKTIIVINEN.

KUKA SEN ASENTAA JA TESTAA?

EHKÄPÄ KONSULTTI, JOKA TIE-TÄÄ TUOT-TEEN?
Application sectors and some customers

- Health care (Philips Medical Systems, PaloDEx Group)
- Mobile phones (Nokia)
- Paper & Pulp Industry (UPM-Kymmene, Metsä-Botnia)
- Environmental technology (Vaisala, Symo)
- Machine manufacturing industry (Burckhardt Compression, Metso, Wärtsilä)
- Electronics and measurement systems (Mega Ltd, Numcore)
Cloud computing

Cloud Computing Types

- Hybrid
- Private/Internal
- Public/External
- The Cloud
- On Premises/Internal
- Off Premises/Third Party

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Why Cloud Computing?

- Dynamic computation capacity and licensing: major share of total cost of ownership (TCO) is something else than hardware & software

Typical Three-Year Server TCO

- Staffing (60.0%)
- Downtime - user productivity (15.0%)
- IT staff training (8.0%)
- Server hardware (7.0%)
- Software (7.0%)
- Outsourced costs (3.0%)

Note: The figure is based on over 300 interviews conducted across numerous platforms, presented in composite form.

Source: IDC, 2007
Modeling & Simulations as a Service (M&SaaS)

- **Key benefits:**
  - On-demand allocation of computation resources
  - Global availability
  - Short deployment time
  - Minimal / no software or hardware maintenance
  - On-demand allocation of resources to increase simulation performance
  - A shorter path from research to users??
Kuava Acoustics SaaS beta

User interface

Acoustic simulation
data management

Client

Computation server

Kuava Acoustics SaaS beta
Waveller Cloud for Acoustics

- Desktop / Cloud
- A fast multipole BEM algorithm
  - Robust method insensitive to simulation tuning parameters
  - Fast simulation turnaround times
  - Used by Nokia
- On-demand computation capacity
  - Multi-core servers with large memory capacity
  - Multi-server parallelization of frequency sweep simulations
Waveller Desktop

Waveller Desktop
WAVELLER CLOUD

CUSTOM EVALUATION POINT SET

- Status: Running

Log:

- CompaRHM launcher: 5.0
- 64-bit Version
- COMPA_HOME : /usr/local/compa-5.0/
- c = 331.50000 m/s
- Beta parameter choosen by the program
- f = 100.00000 Hz
- Wavenumber = 1.8953801831612629e+00 + i*0.0000000000000000e+00
- Wavelength = 3.915000 m
- Reading from file Mesh.dat
- status = 1
- node = 43694
- ele = 87384
- Elements in the mesh 87384
- Nodes in the mesh 43694
- 393.49 elements per wavelength
- beta = 0.0000000000000000e+00 0.0000000000000000e+00

---

COMPA SOLVER v. 5.0

Assembling right hand side in parallel ... done
Filling degree = 0.183
Assembly of the first part of the system matrix took 25.10112 seconds

---

ILUT preconditioner:

1 / 43694
1001 / 43694
2001 / 43694
3001 / 43694
4001 / 43694

Frequency result (zip)

Simulation result (zip)

Simulation & intermediate result (zip)

New simulation initialisation file
Waveller Cloud Manual Simulation file spec documentation

Account Activity
Waveller-Cloud

<table>
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<th>CUSTOM EVALUATION POINT SET</th>
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- Distributed computing (e.g. Amazon EC2)
- Simple post processing
- Log
- Interactive graphics soon (using WebGL)
M&SaaS Summary

Simulation lifecycle management
- Provides acoustic simulation data storage and easy retrieval
- Global availability enables global collaboration
- Integration to complete simulation process via server/client side data conversion

Topics to focus on M&SaaS applicability
- Capacity requirements
- Simulation process integration requirements
- Service level requirements
Research needs

- **Virtual design of an entire product is still a new concept**
  - Pilot studies that combine all submodels and optimize the workflow (different models, measurements, virtual/real prototypes, design sensitivities,...)
  - Can M&SaaS offer new approaches for virtual design?

- **Cloud computing and new services (e.g. Noise maps):**
  - Maps, 3d city models, etc are in the cloud
  - Do we still need desktop software for noise maps?
  - What is the business model?