Mobile and Cloud Computing Seminar

MTAT.03.280

Spring 2014

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Course Purpose

• To have a platform to discuss the research developments of Mobile Cloud Lab
• Introduce students to newest concepts and advances in the respective research fields
• To give students a feel of theses topics available from Mobile Cloud Lab
• Preliminary platform for the students to understand their prospective Master/Bachelor theses better
• Help students in preparing proper technical reports
• Help students in making proper presentations
To pass the course

• Write a report on a chosen topic
  – At least 6 pages of ACM double column format
• Peer review the work of your colleagues
• Give an oral presentation on the topic
• Demonstrate their work
• Participate actively in all the seminars
Course schedule

• Monday 14.15 - 16.00, J. Liivi 2- 511

• Schedule of the sessions
  https://courses.cs.ut.ee/2014/mcsem/spring
Related Courses

• **MTAT.08.027** Basics of Cloud Computing (3 ECTS)
  – Tue. 14:15 – 16:00, J. Liivi 2 - 404

• **MTAT.08.036** Large-scale Data Processing on the Cloud (3 ECTS)
  – Fall 2014

• **MTAT.03.266** Mobile Application Development Projects (3 ECTS)
  – Fri. 10.15 - 12.00, J. Liivi 2 – 512

• **MTAT.03.262** Mobile Application Development (3 ECTS)
  – Fall 2014
RESEARCH AT MOBILE CLOUD LAB
Cloud Computing

• Computing as a utility
  – Utility services e.g. water, electricity, gas etc
  – Consumers pay based on their usage

• Cloud Computing characteristics
  – Illusion of infinite resources
  – No up-front cost
  – Fine-grained billing (e.g. hourly)

• Gartner: “Cloud computing is a style of computing where massively scalable IT-related capabilities are provided ‘as a service’ across the Internet to multiple external customers”
Scientific Computing on the Cloud (SciCloud)

- Research the utilization of cloud computing platforms for HPC
- Compare different Cloud computing frameworks for algorithms used in scientific computing
  - MapReduce
    - Replicate data and computation
  - MapReduce implementations
    - Hadoop
    - Twister
    - Spark
  - Bulk Synchronous Parallel (BSP)
    - Fault-tolerance
CloudML

- Deployment description of cloud based applications
  - Developed to tame cloud heterogeneity
- DSL based on Java-based metamodel
  - Nodes, artefacts and bindings can be defined
- Different means to manipulate CloudML models
  - Programmatically via Java API
  - Declaratively, via serialized model (JSON)
- Models@Runtime
  - Dynamic deployment of CloudML based models
Migrating Enterprise Applications to Cloud

• Refactoring enterprise applications for the cloud

• To enable migrated applications to exploit cloud advantages, such as:
  – Elasticity
  – On-demand and in real-time resource provisioning

• Introducing automatic load based scaling to the migrated application deployment model
  – Avoid vendor lock-in to any single cloud provider

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Mobile Application development

- Mobile is the 7th mass media
  - 6.8 bn subscriptions / Global population of 7.2 bn
- Some popular application domains
  - Location-based services (LBS), mobile social networking, mobile commerce, etc.
- Multiple languages and platforms to choose from
  - Android, Apple iOS, Windows Phone 7 etc.
- Real time system development
  - Mobile Apps using sensors
  - Mobiles in biometry
The devices we use

Mobile Cloud Lab
http://mc.cs.ut.ee

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Mobile Cloud

• Delegate resource-intensive processing to the cloud
  – To enrich the functionality of mobile applications

• Mobile Cloud Middleware
  – Cloud interoperability
  – Hiding the complexity of cloud from mobiles

• Applications
  – CroudSTag
  – Zompopo

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Mobile Cloud - continued

• Code offloading
• Decision making
  – When it is ideal to offload a task from mobile to cloud
  – Fuzzy logic
  – Linear Programming
• We also think the decision making should be a continuous learning process
  – Machine learning
Sensors and Internet of Things

• Effective utilization of sensors in designing mobile applications
  – Arduino sensor kits
• Energy-aware models
• Smart homes
Mobile Web Services

• Provisioning of services from the smart phones
• Invocation of web services from smart phones
• Mobile web service discovery
• Addressing mobiles in 3G/4G networks
• Push notification mechanisms

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Data Analytics on the Cloud

• Cloud scale data storage solutions
• Cloud scale data analytics
  – Pig & Hive
• NoSQL
• Implementing graph algorithms on graph databases
Cloud Computing with Network Data: Theory, Methods, and Applications

- How to analyze, predict, discover, create knowledge, and manage data in the huge linked information spaces using cloud computing?

Figure: “Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. http://lod-cloud.net/”

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WE ALWAYS WELCOME NEW IDEAS!
Seminar topics

• Listed at
  https://courses.cs.ut.ee/2014/mcsem/spring/Main/Topics/

• Session 2 (24.02)
  – Second meeting to finalize the topics

• Selection of topics should finish by Mon., 3rd March 2014
  – Email srirama@ut.ee, jakovits@ut.ee, your supervisor