Lecture and Presentation Topics (tentative)
CS 7301: Recent Advances in Cloud Computing

- Cloud storage systems
  - The rise of “big data” on cloud computing: Review and open research issues
  - Consistency models
    - Conventional models, current cloud practices
    - Do we need new models?
  - Erasure coding
    - Fundamentals, from RAID to Reed Solomon
    - Practical erasure coding in the cloud
    - Performance of erasure coding schemes
  - Access to erasure codes: Yongtao Huang (2/6)

- SaaS technologies and SaaS security
  - SaaS technologies: A short overview
  - Access control models for SaaS
    - Existing access control models
    - What is the difference in SaaS and what are the access control models that are suitable for SaaS
  - Information flow control and data provenance for SaaS
    - Fundamental concepts in information flow control and why they are not sufficient for SaaS
    - New models and research
  - Taint analysis: Timothy Hoffman (2/27)
  - Semantic based service composition in the SaaS cloud: Wei Zhu
  - SaaS development technologies (with MDA): Nidhi Solanki and Uzma Azim
    - Last three topics will be presented during 3/5-12

- Virtualization, resource management, and security in the cloud
  - Summary of virtualization basics
    - CPU virtualization: Technologies evolution
    - Memory virtualization: Shadow page and ballooning
  - IaaS cloud resource management
    - VM workload prediction
    - VM placement
  - Trusted processors and its role in cloud computing
    - Most research on cloud security focuses on intrusion detection (IDS)
    - What if intruder successfully compromises the system
    - Data protection even if the system is hacked
  - Secret sharing and homomorphic encryption for cloud data protection
    - Cloud provider is malicious, or having insider attacks
    - Ultimate protection to customer data
    - Allow computation being performed on encrypted data
  - VM security: Shuai Zhang (roughly 3/26 or 4/2)

- IoT Cloud and big data
  - Cloud computing for Internet of Things & sensing based applications
  - The Internet of things: A survey from the data-centric perspective
- An IoT-oriented data storage framework in cloud computing platform
- An efficient index for massive IOT data in cloud environment
  ♦ IoT cloud and security: Hessam Moeini (roughly 4/2 or 4/9)
  ♦ IoT data management in the cloud: Anthony Opara
  ♦ Building an ad hoc communication infrastructure for IoT cloud: Guang Zhou (roughly 4/2 or 4/9)
- Back to Cloud storage systems
  ♦ Better erasure codes: Yongtao Huang (roughly 4/9 or 4/16)
- More efficient computation in the cloud
  ♦ MapReduce and other data parallel computation models
  ♦ Computer vision basics and using cloud for computer vision: Jinwei Yuan (roughly in the 4/16 or 4/23)
- Project demo and presentation in the last two weeks
Papers for the presentation topics (incomplete)

Cloud Storage

- Access to erasure codes: Yongtao Huang
  - Secure, dependable, and high performance cloud storage

- Better erasure codes: Yongtao Huang
  - Rethinking erasure codes for cloud file systems: Minimizing I/O for recovery and degraded reads
  - Simple regenerating codes: Network coding for cloud storage
  - Tree-structured data regeneration with network coding in distributed storage systems

- Cloud load balancing: N/A
  - A comparative study into distributed load balancing algorithms for cloud computing
  - Ananta: Cloud scale load balancing
  - Stochastic Models of load balancing and scheduling in cloud computing clusters
  - Efficient, proximity-aware load balancing for DHT-based P2P systems
  - Locality-aware and churn-resilient load-balancing algorithms in structured peer-to-peer networks
  - The server reassignment problem for load balancing in structured P2P systems

SaaS

- Information Flow Control and Taint analysis: Timothy Hoffman
  - A sound type system for secure flow analysis
  - Dynamic vs. Static flow-sensitive security analysis
  - TaintDroid: An information-flow tracking system for realtime privacy monitoring on smart phones
  - Towards fully automatic placement of security sanitizers and declassifiers

- SaaS development technologies: Nidhi Solanki and Uzma Azim
  - Model driven architecture: Principles and practice
♦ Automatic code generation by model transformation from sequence diagram of system’s internal behavior
♦ A survey of model driven engineering tools for user interface design
♦ From UML diagrams to behavioral source code
♦ A MDA-based environment for web applications development: From conceptual models to code
♦ EasySaaS: A SaaS development framework
♦ Comparing PaaS offerings in light of SaaS development
♦ Cloud SaaS and model driven architecture
♦ Software customization based on model-driven architecture over SaaS platforms
♦ A template-based model transformation approach for deriving multi-tenant SaaS applications
♦ Enhancing cloud SaaS development with model driven architecture

➤ Semantic based service composition in the SaaS cloud: Wei Zhu

➤ Software development by crowdsourcing: N/A
♦ Two's company, three's a crowd: a case study of crowdsourcing software development
♦ Creative software crowdsourcing: from components and algorithm development to project concept formations
♦ Collaborative software development platforms for crowdsourcing

Virtualization
➤ Security issues in virtualization technologies: Shuai Zhang

➤ Security for IoT cloud: Hessam Moeini
♦ Enforcing security mechanisms in the IP-based Internet of things: An algorithmic overview
♦ A capability-based security approach to manage access control in the Internet of Things
♦ Identity establishment and capability based access control (IECAC) scheme for Internet of Things
♦ Securing the IP-based Internet of Things with HIP and DTLS
♦ Key management systems for sensor networks in the context of the Internet of Things
♦ Sensor network security: A survey
Wireless sensor network security: A survey

IoT data management

- The Internet of Things: A survey from the data-centric perspective
- Supporting streaming updates in an active data warehouse
- Semantics for the Internet of Things: Early progress and back to the future
- An extensible and active semantic model of information organizing for the Internet of Things
- Massive heterogeneous sensor data management in the Internet of Things
- Sensor search techniques for sensing as a service architecture for the Internet of Things
- Towards a quality-centric big data architecture for federated sensor services
- Ubiquitous data accessing method in IoT-based information system for emergency medical services
- An information framework for creating a smart city through Internet of Things

Building ad hoc communication infrastructure in IoT cloud: Guang Zhou

Container technologies and security: N/A

- Container-based operating system virtualization: a scalable, high-performance alternative to hypervisors
- Containers and cloud: From lxc to Docker to Kubernetes
- Performance evaluation of container-based virtualization for high performance computing environments
- Virtualization: A survey on concepts, taxonomy and associated security issues
- Analysis of Docker security
- Provisioning software-defined IoT cloud systems

Computation in the Cloud

- Computer vision basics and using cloud for computer vision: Jinwei Yuan