Recitation 01/22: Course Projects

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About me

- 5th year PhD student in CS (https://www.cs.cornell.edu/~sagarjha/)
- Working with Prof. Ken Birman on Distributed Systems
- Interested in building efficient reliable systems, specially on RDMA networks
- TAed the course in 2018
- Office Hours – Tuesdays 2pm – 3 pm, Thursdays 12pm – 1pm in Rhodes 405
- Meeting by appointment for project discussion

Recitations plan

- I will go over the lectures in more detail, at a slower pace
- I will answer questions about the course material, projects and logistics
- I will discuss solutions for homework/quizzes
- We will have guest lectures from time to time
- Next recitation will be Prof. Julio Giordano talking about dairy projects

Project Organization (tentative)

- Group Formation and Project Idea (February 7th)
- Project Plan (February 21st)
- Intermediate Report (March 27th)
- Peer Reviews (April 10th)
- Final Report (May 1st)
- Presentation/Poster/Demo (May 4th-May 7th)
  - Exception might be made, since your presence is required.

Project Grading

- Project + homework accounts for ~50% of your total grade.
  - 10% -> Intermediate report
  - 10% -> Peer Reviews
  - 20% -> Final Report
  - 20% -> Poster
  - 20% -> Presentation
  - 20% -> Demo
  - +10% -> Presentation in BOOM (April 29th).
- MEng Project
  - MEng project grade same as the course grade

Group Formation & Project Idea

- List of group Members
  - Name, Net ID
- If this is an M.Eng. project mention who is taking the M.Eng. credits.
- Two paragraphs about the project idea.
  - What are you trying to achieve?
  - Why is it useful?
  - Briefly mention how you are going to do it (input data, analysis, etc.) in one paragraph.

Intermediate & Final Report

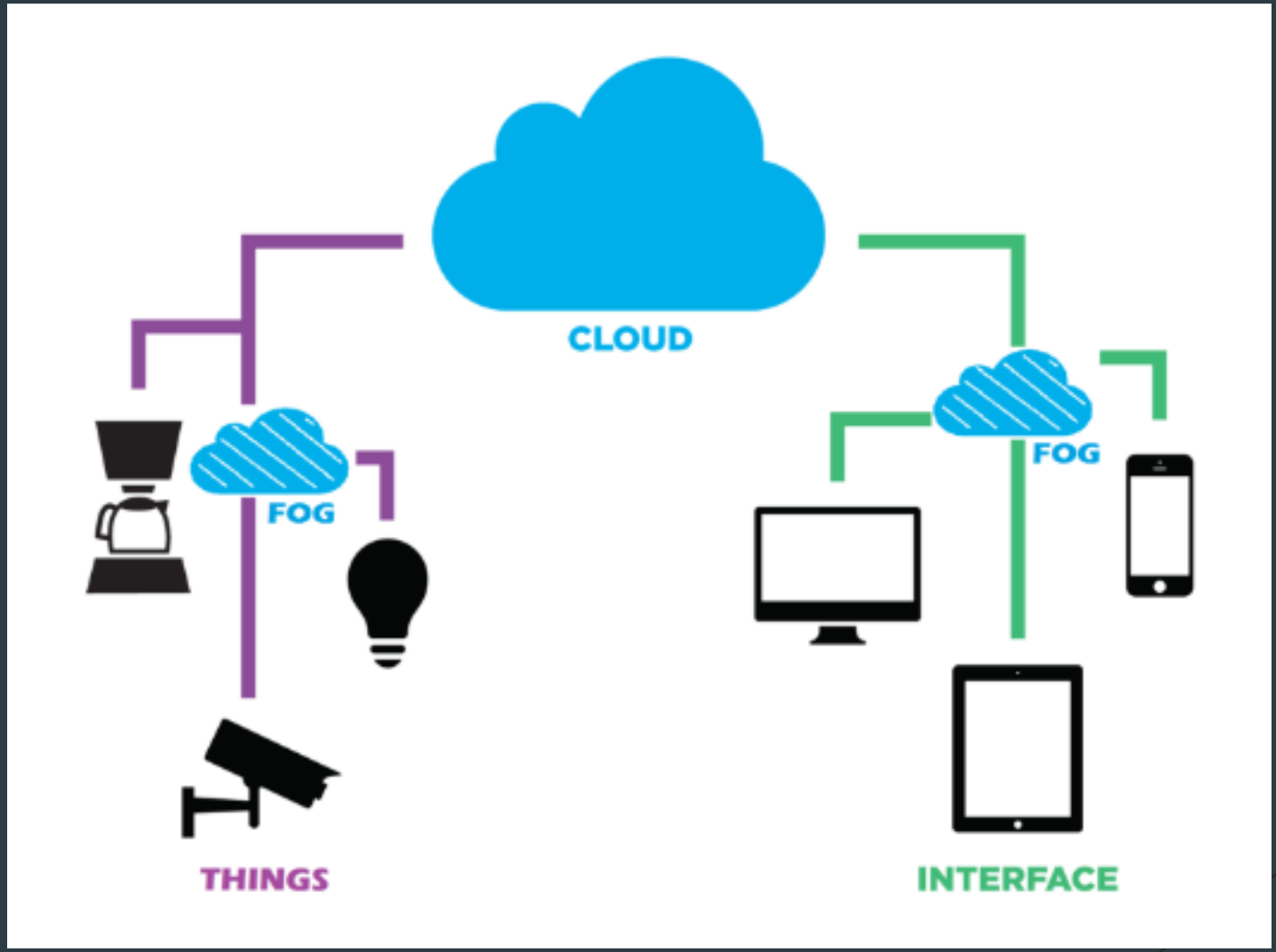
Should consist of the following sections:

1. Motivation (idea, why it is useful, etc.)
2. Background (what is the current state?)
3. Design + Implementation
4. Evaluation
5. Conclusions

Project – IoT application

- Input
  - Sensor Data
- Data Analysis
  - Machine Learning/Optimization
- Output
  - Visualization of Data
  - Control Actions
  - Recommendations
  - Alarms

IoT application –Architecture



IoT application – Technical Challenges

1. Data Collection
   - Integrate data from possibly multiple sources
   - Integrate data from third-party sources (Weather)
2. Data Analysis
   - Utilize ML/Optimization tools to analyze data.
3. Scalability
   - Scale up to million/thousands devices
4. Hardware on Site*
   - Tune devices on site to work accordingly
5. Cost-Effective Solutions

Digital agriculture projects

- Pair up with project groups from the dairy management course
- Some ideas include cow tracking, cow pregnancy analysis etc.
- Other projects: Analyze data from greenhouses
- Inter-disciplinary work: Interact with students from other departments
- Impactful projects

Project - Traditional cloud application

- Examples – New key/value store, Storage system, Banking application etc.
- Guarantee availability and consistency across failures
- Manage application membership (sharding/replication/leaves/joins)
- Optimize for performance – High throughput and low end-user latency
- Scalability – Scale with number of user, request rates, internal resources
- Recommended for
  - Students interested in pursuing MS/PhD or a career in Systems

Azure Accounts

- Once you form groups, you will receive some Azure credits for your project.
- We will have examples using Azure technologies later in the course.
- Other Cloud vendors might be used. We will not provide funding or assistance for them.

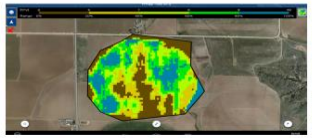
Examples of projects

My internship project with FarmBeats

A Case Study in Smart Agriculture

Connected Farms

Data collection with sensor deployments, drone flights, and farm equipment



AI-based Advisory

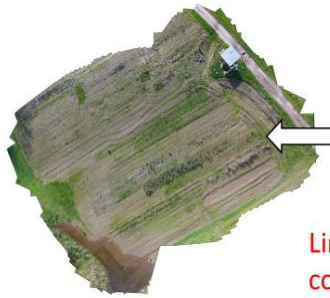
Real-time, actionable insights based on the ground conditions combined with remote sensing and weather patterns

Precision Farming

Irrigation, Fertilizing, Weeding and Spraying applications

Traceability

Use of blockchain to track usage & compliance



Edge

Weak & Intermittent

Microsoft Azure

Limited storage & compute capabilities

My internship project with FarmBeats

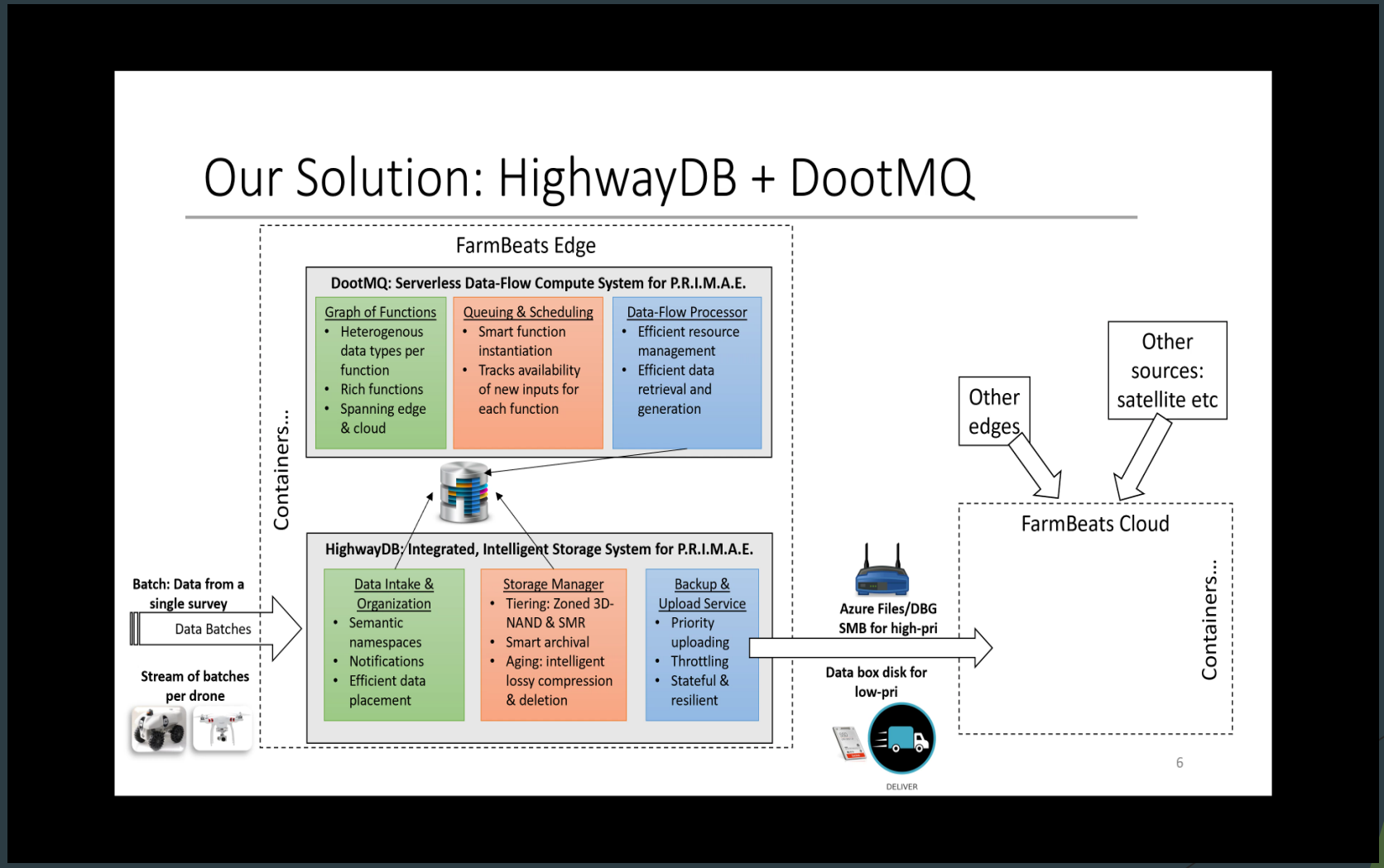
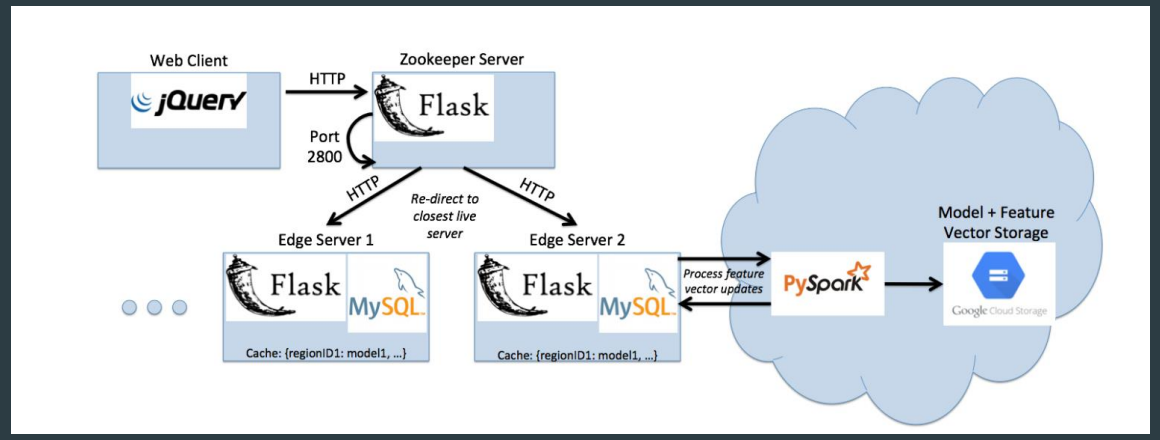
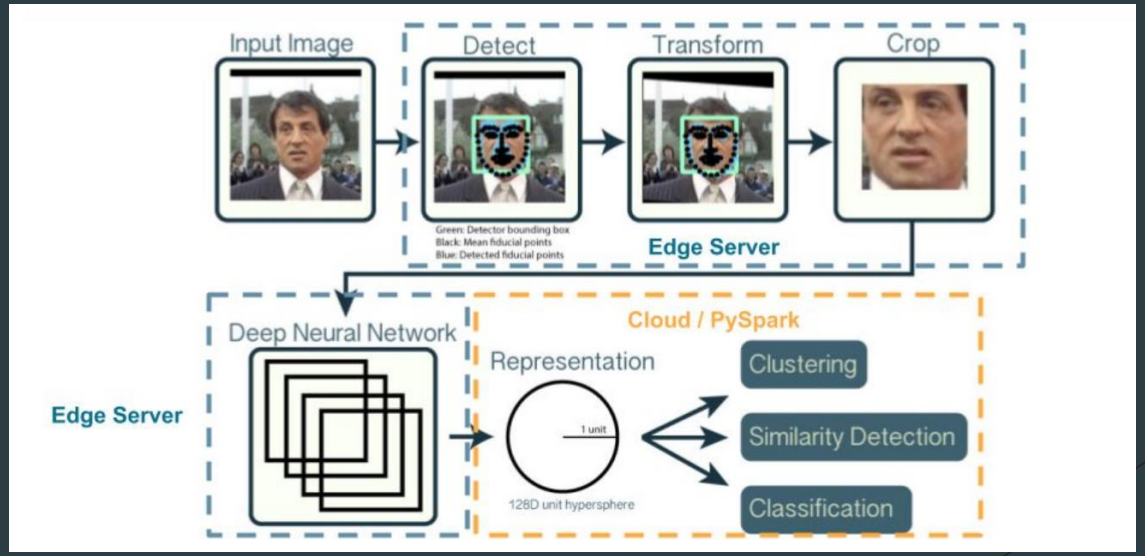


Image-based authentication for banking

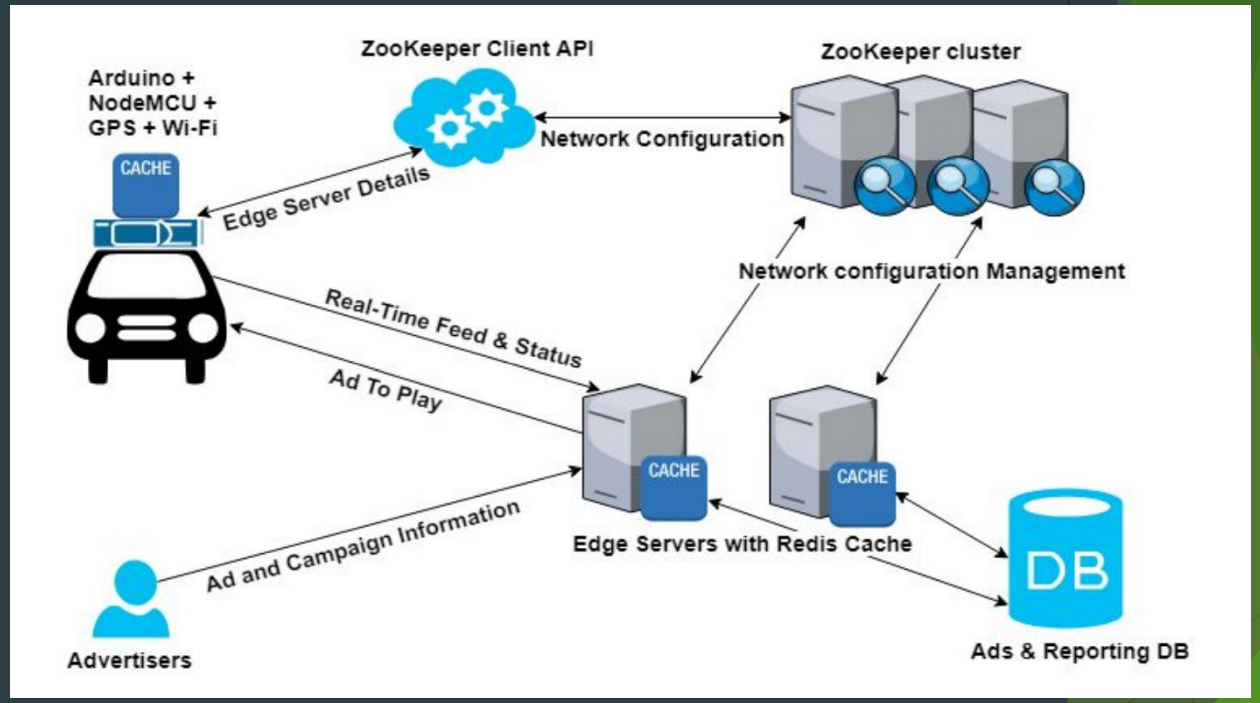
Yu Gu, Gloria Xiao, George Li





Admomo

Saksham Papreja, Vidhant Maini



Smart Highway Simulation

Cameron Love