Real-Time Cyber Physical Systems Application on MobilityFirst
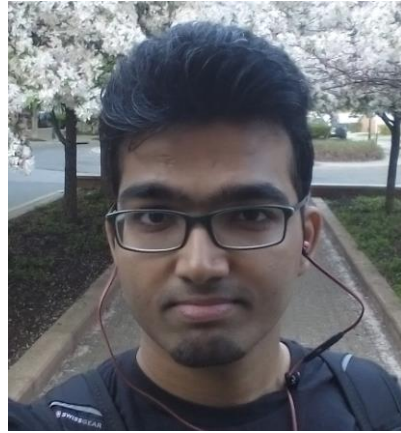
Winlab Summer Internship 2015

Karthikeyan Ganesan, Wuyang Zhang, Zihong Zheng

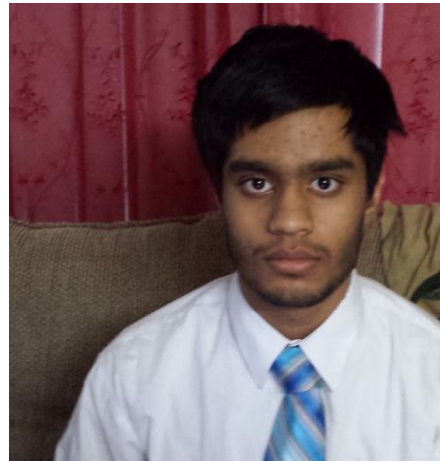Shantanu Ghosh, Avi Cooper

TEAM MEMBERS

Karthikeyan Ganesan

Wuyang Zhang

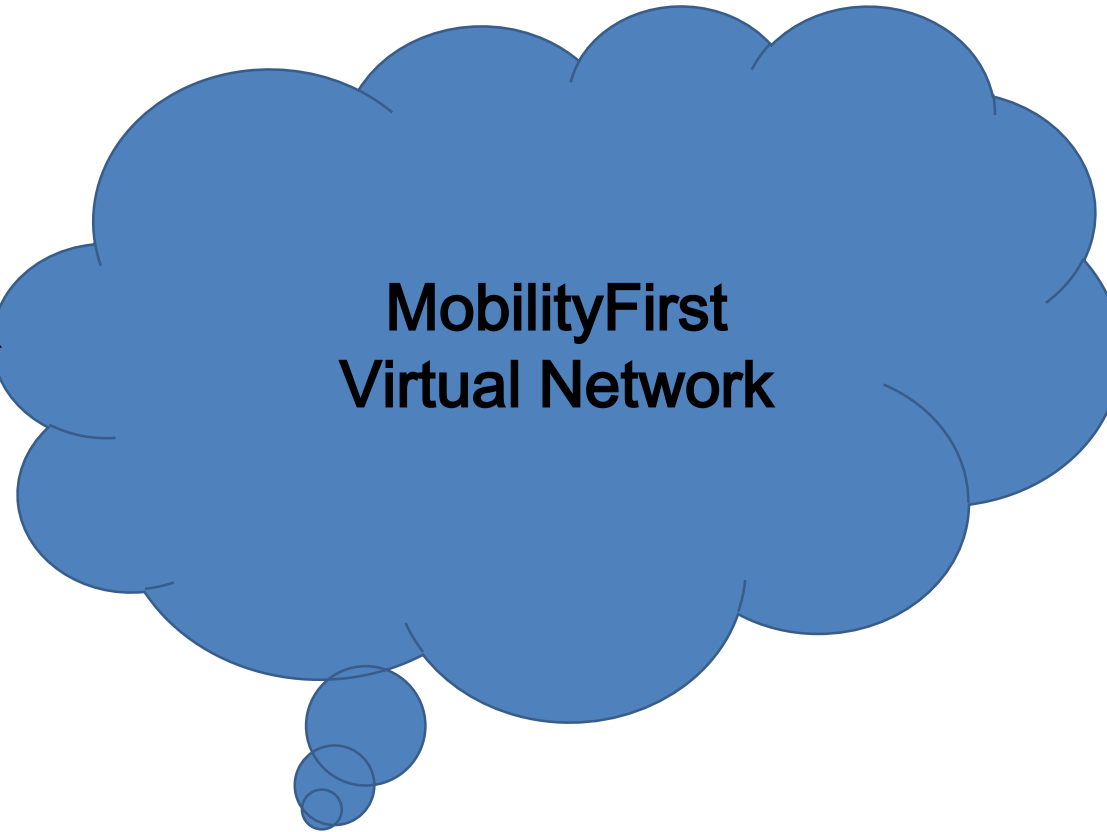**Zihong Zheng**

Shantanu Ghosh

Avi Cooper

BIG PICTURE OF OUR PROJECT

CPS Application based on MF

Server side:
Implement server application for object recognition;
Return the result

MobilityFirst Virtual Network

Client side:
Run an instance of camera system;
Transmits video in standard format;
Simple graphical interface to display results

CURRENT FRAME

Image Recognition:

Implemented the strategy to increase the accuracy and also cut down the mismatch issues.

Application:

Finished the combination of Glass-to-Phone and Phone-to-Node communication. The Google Glass is now able sending image to server and getting back the result.

Cloud Computing:

All configurations are done. The image recognition program could be run in a certain number orbit nodes side-by-side with STORM framework.

Some essential efficiency-related experiments are done.
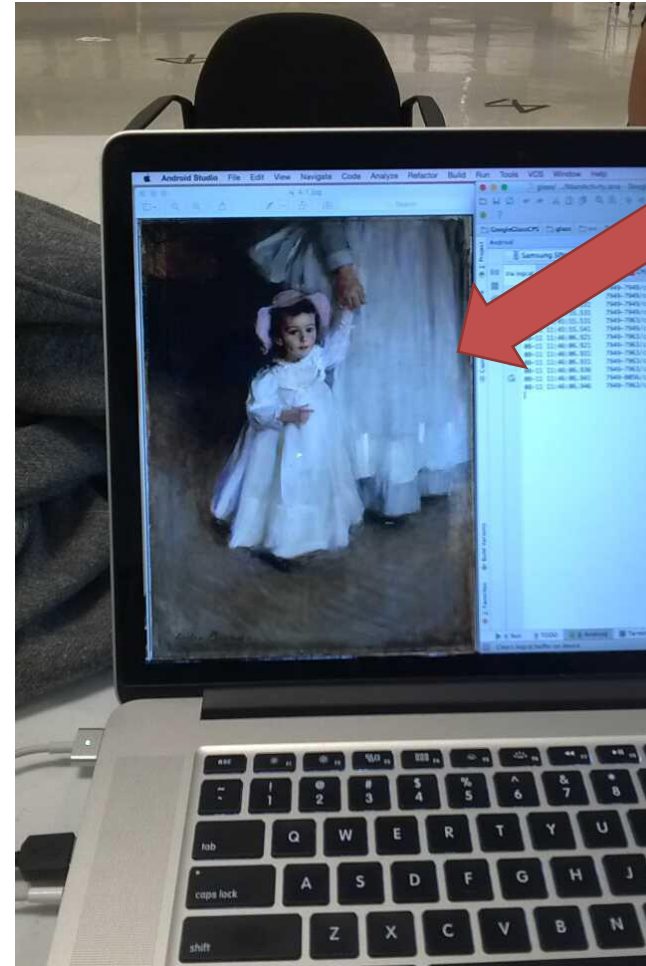
Some Images From The Google Glass
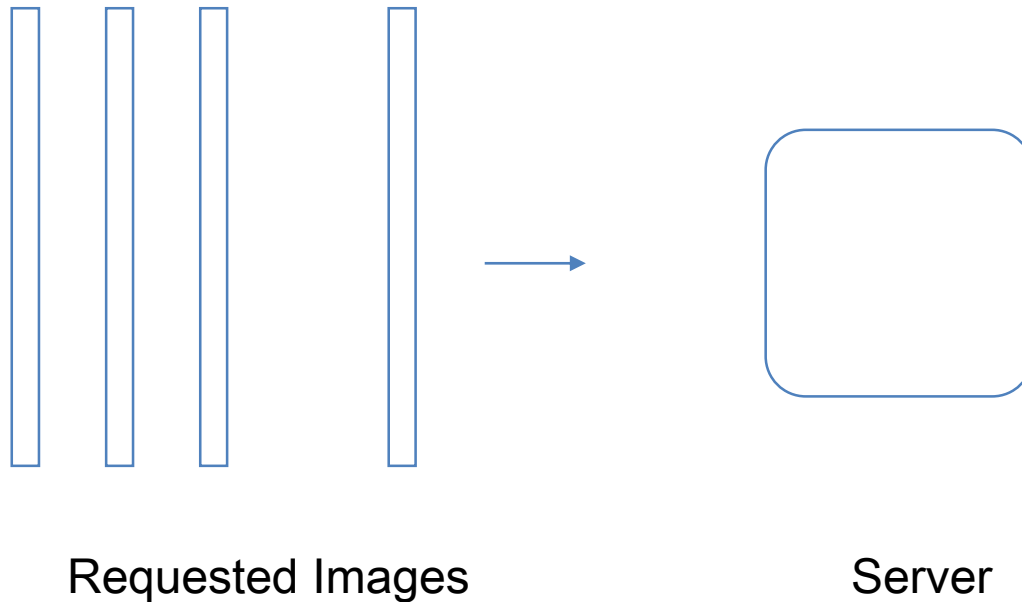
Index: 19

Successfully Matched!
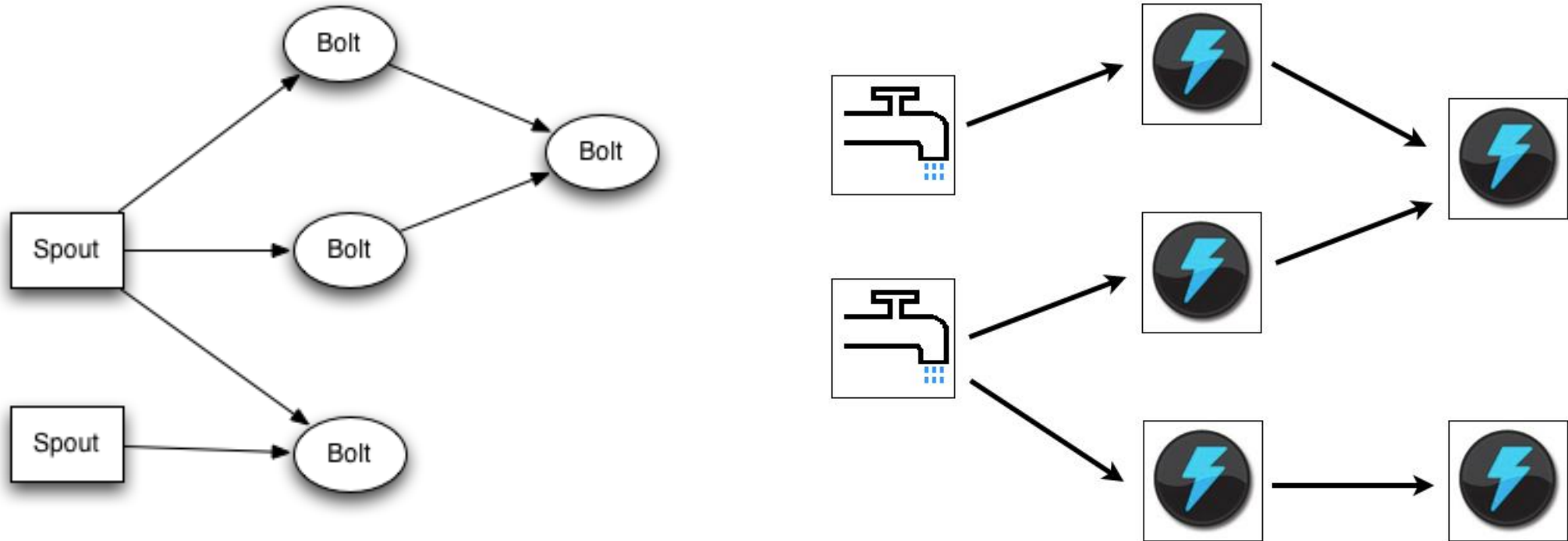
Index: 4

Successfully Matched!

STORM

Background:

As a server processing a large amount of real time requests, requested images will be set into a queue waiting for be processed.. They have to keep waiting before the server completes their previous requests, which delays unnecessary requested time.

Requested Images   Server

STORM

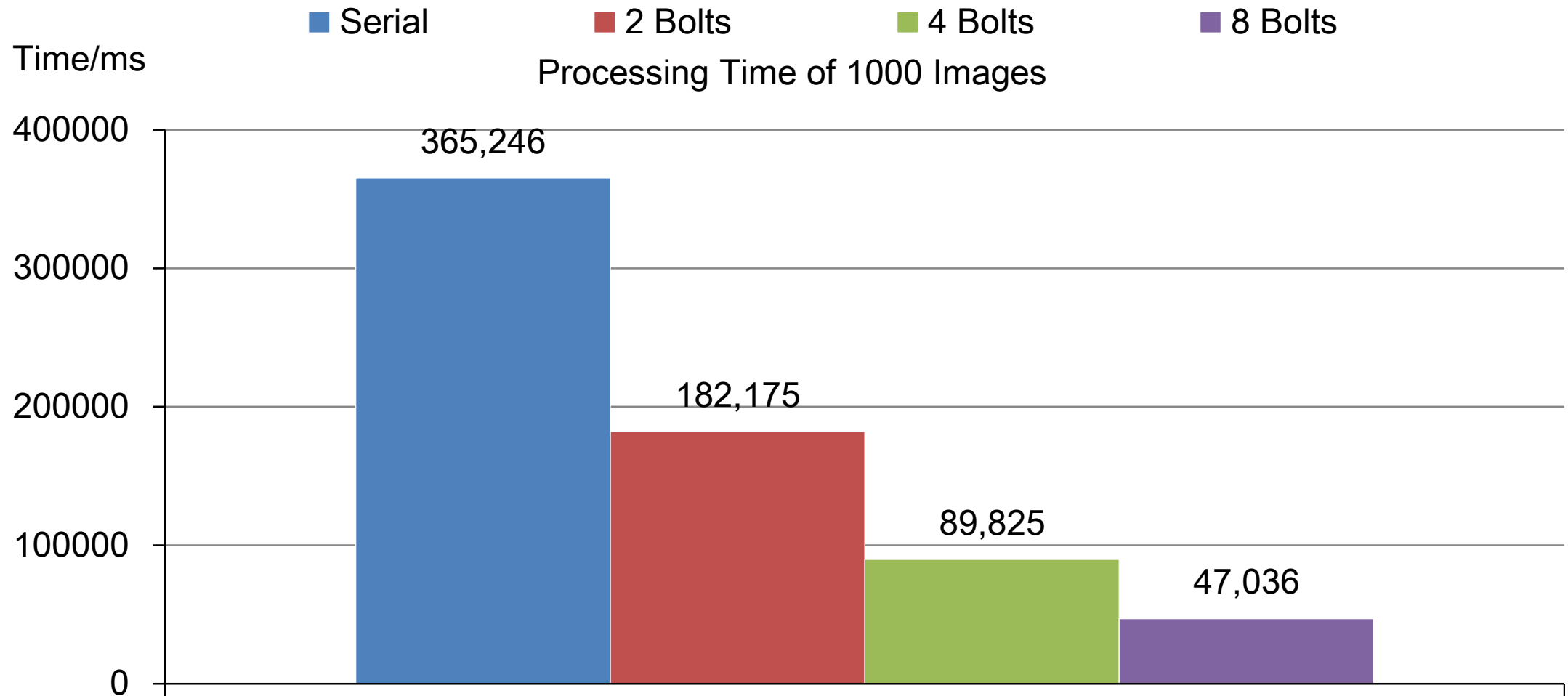http://blog.gigaspaces.com/wp-content/uploads/image/topology.png

Spout: Water Source (tweets, images, news….)

Bolt: Water Processing Machine (popular tweets ranking, image matching, news follower counting)
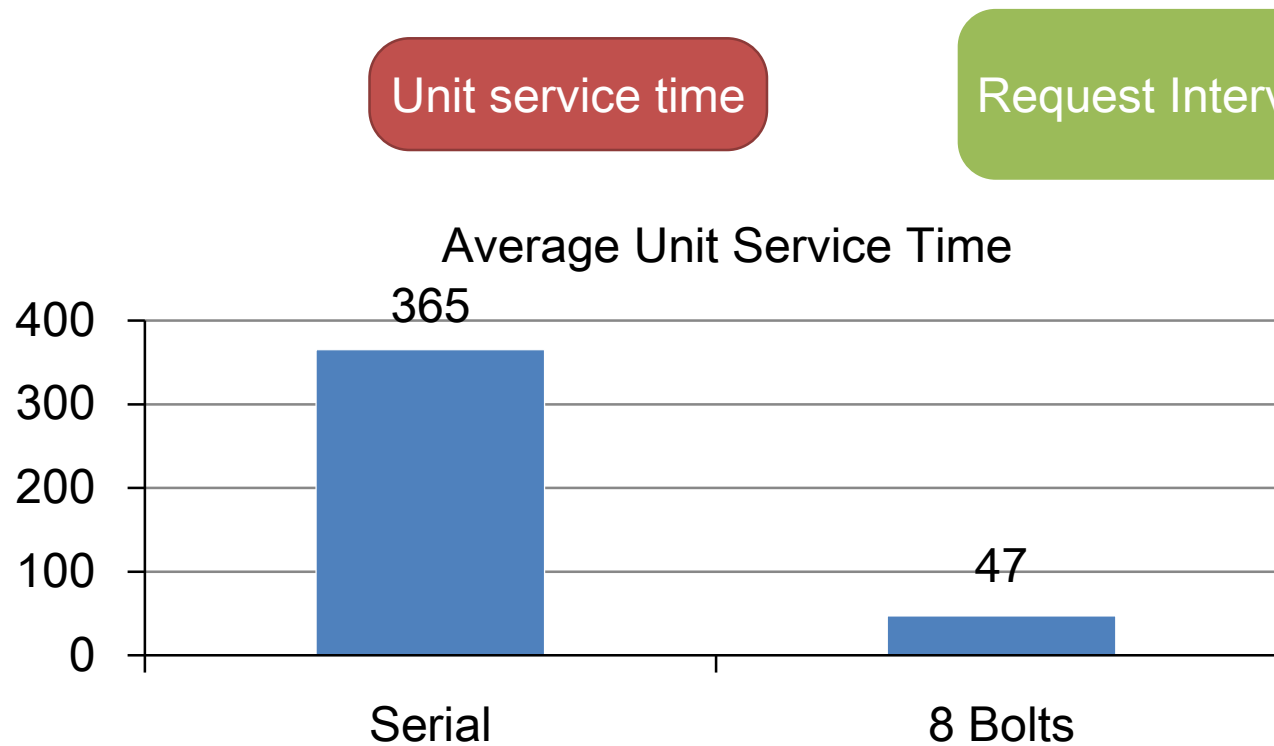
STORM Application

■ Serial   ■ 2 Bolts   ■ 4 Bolts   ■ 8 Bolts

Time/ms

Processing Time of 1000 Images

Result Analysis

Curve tendency ?

The relation curve between the number of bolts and processing time is roughly a linear method.
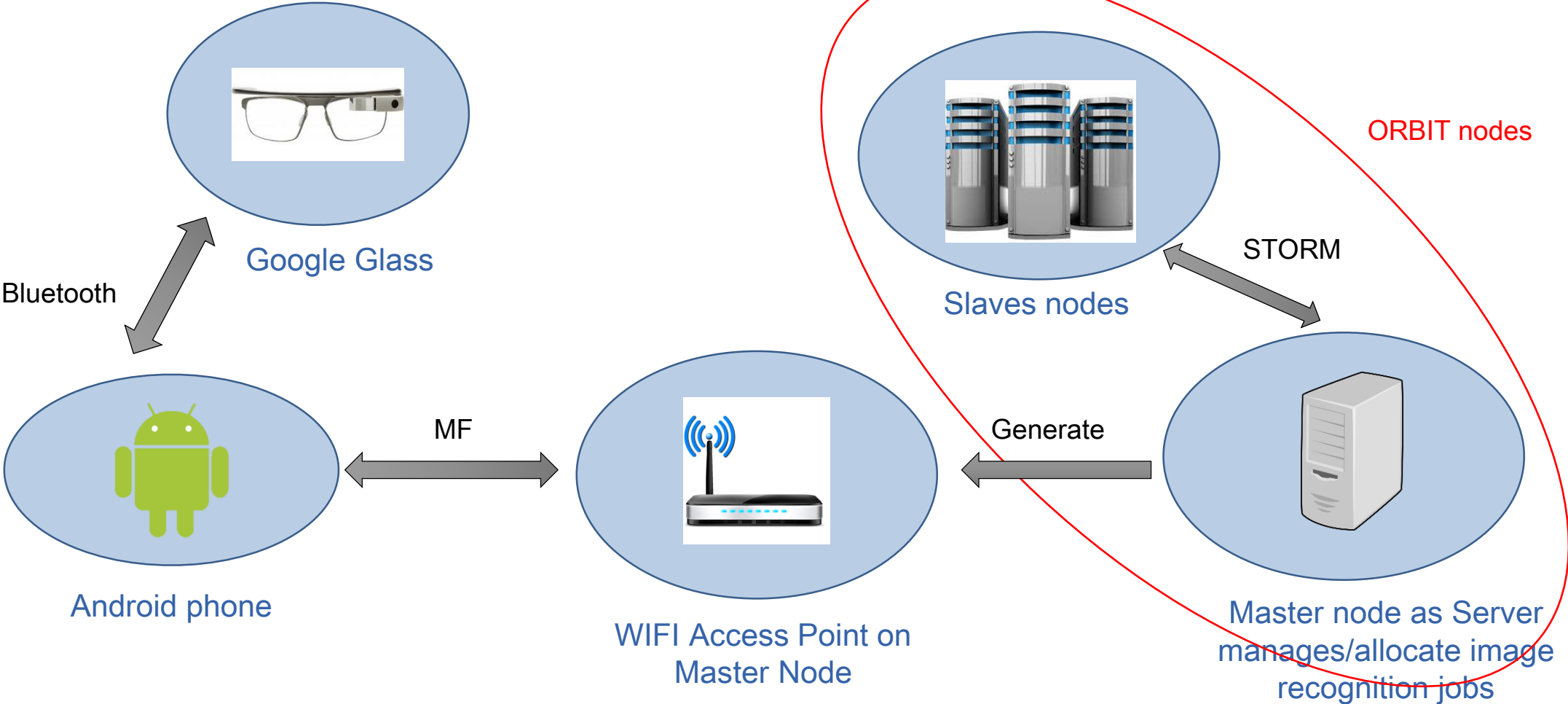
Request interval and unit service time?

When the request interval is larger than the unit service time, the actual total service time equals to that of the unit service time but without any waiting time in a queue.

Unit service time

Request Interval
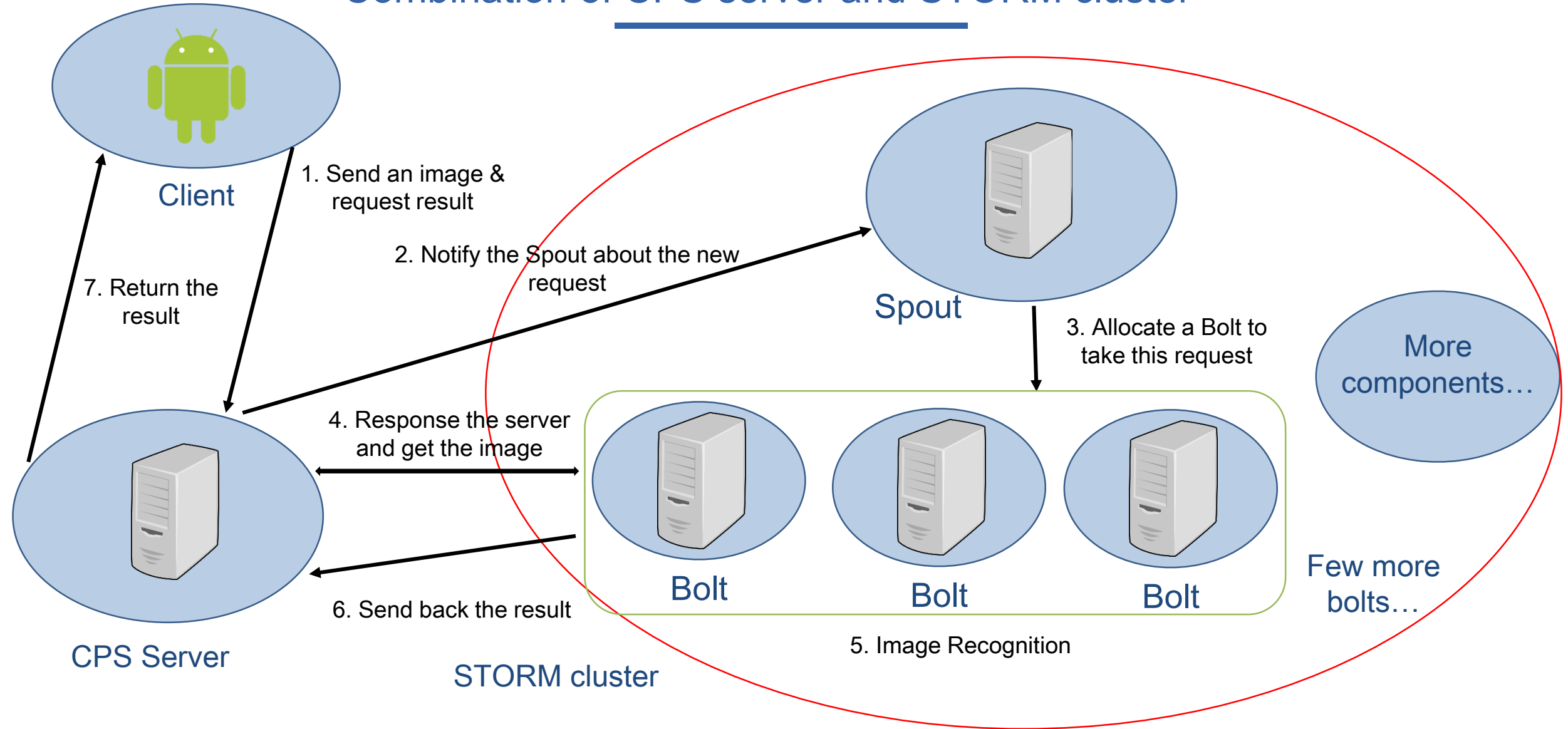
Unit service time

Average Unit Service Time

To achieve the service time will not involve the queue waiting time, the serial method allows the minimal request interval is 365ms, but only 47 ms for 8 bolts!!
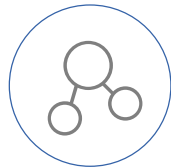
THE WHOLE CONNECTION

Google Glass

Bluetooth

ORBIT nodes

Slaves nodes

STORM

Android phone

MF

WIFI Access Point on Master Node

Generate

Master node as Server manages/allocate image recognition jobs

Combination of CPS server and STORM cluster

Client

1. Send an image & request result

2. Notify the Spout about the new request

Spout

3. Allocate a Bolt to take this request

7. Return the result

More components…

4. Response the server and get the image

Bolt   Bolt   Bolt

6. Send back the result

Few more bolts…

5. Image Recognition

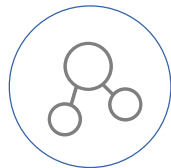CPS Server

STORM cluster

Next Week Plan

Try to improve the stability of both the Google Class and Android phone programs.

Do the combination of our CPS server and the Image Recognition program based on STORM.

And of course the Poster!

Questions?