



# OKGems: GENI-Federated Multimodal Cyber-Physical System

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**<http://okgems.cs.okstate.edu/>**





# Current Status

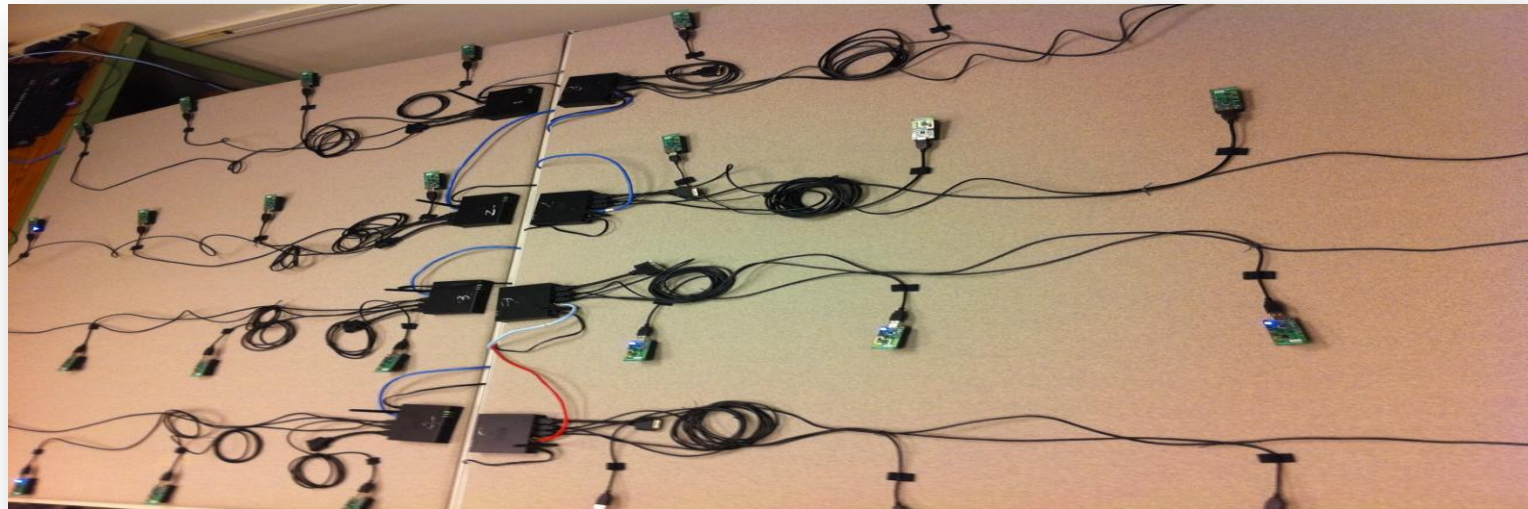
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- Hardware

- 100+ nodes in lab testbed
  - TelosB/Micaz motes, FitPC2 as gateways
  - 32 nodes available for demo
- 10 nodes + 1 gateway with modem in field
  - Collaborate with Biosystems and Agriculture Engineering Department at OSU
- About 20 robots in lab
  - iGems: a standalone Robotics Virtual Lab



# Current Status (cont.)





# Current Status (cont.)

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- Software
  - Installed and configured ORCA (version 2.0) in local environment
  - Built and ran OKGems system
    - Web Portal for user configuration
    - Web Service for integration with control framework \*
    - Messaging for managing substrates
    - Integrated with ORCA via plug-in \*
  - Robotics Virtual Lab (iGems)
    - Standalone robotic experiment system based on Microsoft.NET



\* We acknowledge the original design and kind support from the [KanseiGenie](#) group.

# Current Status (cont.)

OKGems - field-sensor-status

http://okgems.cs.okstate.edu/secure/field-sensor-status.php

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Field sensors status

Date	Time	Payload	Node	Group	Packet	ADC-0	ADC-1	ADC-2	ADC-3	Temperature
April 29, 2010	09:00:24	7	8	66	20	4552	4687	4634	0	22.3
April 29, 2010	09:00:23	7	8	66	21	4583	4684	4634	0	22.2
April 29, 2010	07:00:24	7	8	66	19	4583	4667	4637	0	22.2
April 29, 2010	06:00:23	7	8	66	18	4549	4670	4643	0	22.3
April 29, 2010	05:00:24	7	8	66	17	4546	4701	4631	0	22.1
April 29, 2010	04:00:23	7	8	66	16	4542	4681	4632	0	22
April 29, 2010	03:00:23	7	8	66	15	4577	4691	4633	0	22.2
April 29, 2010	02:00:21	7	8	66	14	4537	4699	4628	0	22.2
April 29, 2010	01:00:21	7	8	66	13	4557	4702	4633	0	22.4
April 29, 2010	00:00:23	7	8	66	12	4535	4698	4649	0	22
April 28, 2010	23:00:23	7	8	66	11	4537	4695	4647	0	22.1

**OKGems Web Portal**

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**iGEMs**  
VIRTUAL LAB FOR ROBOTICS

ABOUT THIS PROJECT | HOW TO START | OUR ROBOTS

Log In

User Name:

Password:

Remember me next time.

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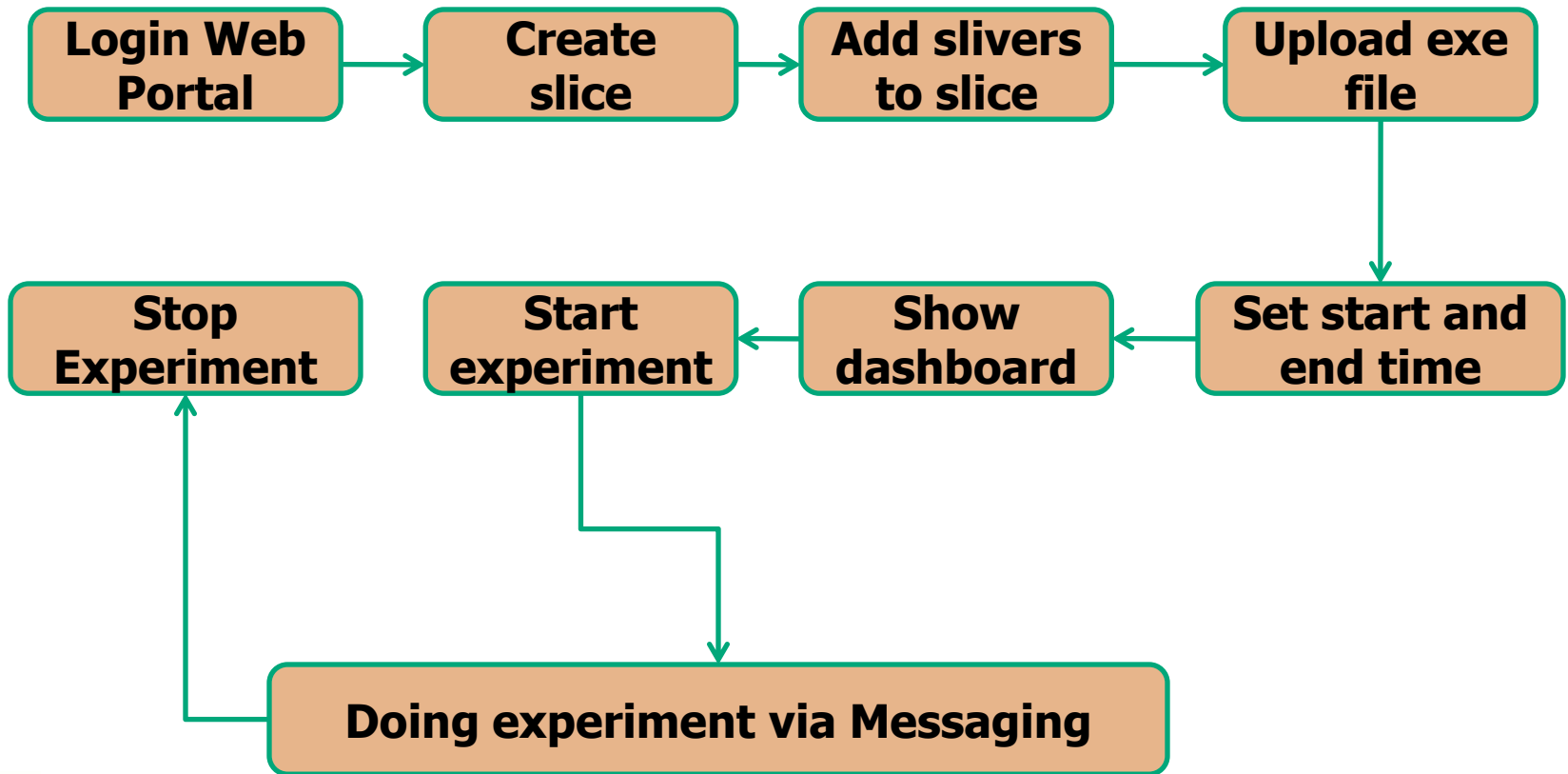
Forgot your password?

Nowadays, robots for educational purposes are not so expensive anymore but for big robotic experiments such as swarms or related, the costs are always over the budgets of many institutions. Borrow robots from others or travel to else places to perform experiments sometimes worth so much, is inconvenient and is impractical in

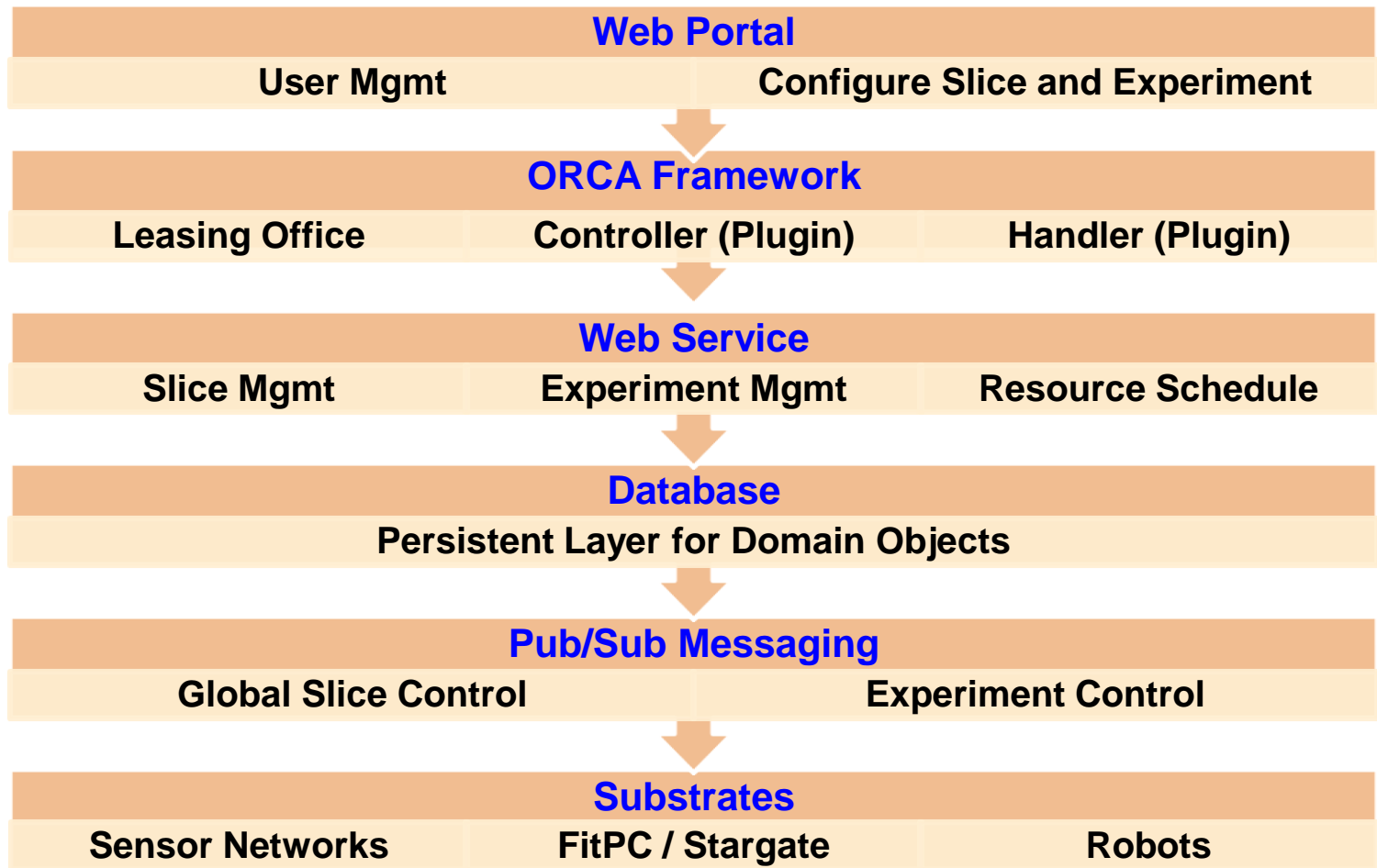
**iGems Robotics Virtual Lab Portal**



# Experiment Workflow



# Conceptual Architecture





# Year Two Plan

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- To integrate sensor networks
  - Lab sensors testbed
  - Remote programmable field sensors
- To integrate various robots
  - Case Study 1: Robotic Arms picking up patterns based on pattern recognition algorithms (camera and RFID)
  - Case Study 2: Mobile Sensor Network Platform on iGems
- To integrate resources across sites
  - Oklahoma State University
  - University of Florida







# Year Three Plan

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- To refactor the abstraction models of robots and sensor networks
- To federate all devices into GENI
- To enable experiments across multiple sites for users via ORCA broker

