Code Mobility

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Outline

Motivation

- Design code mobility system on ESE Board
- Hardware drivers & mobile agents & communication
- Master project management skills

Code mobility overview
Concept of code mobility

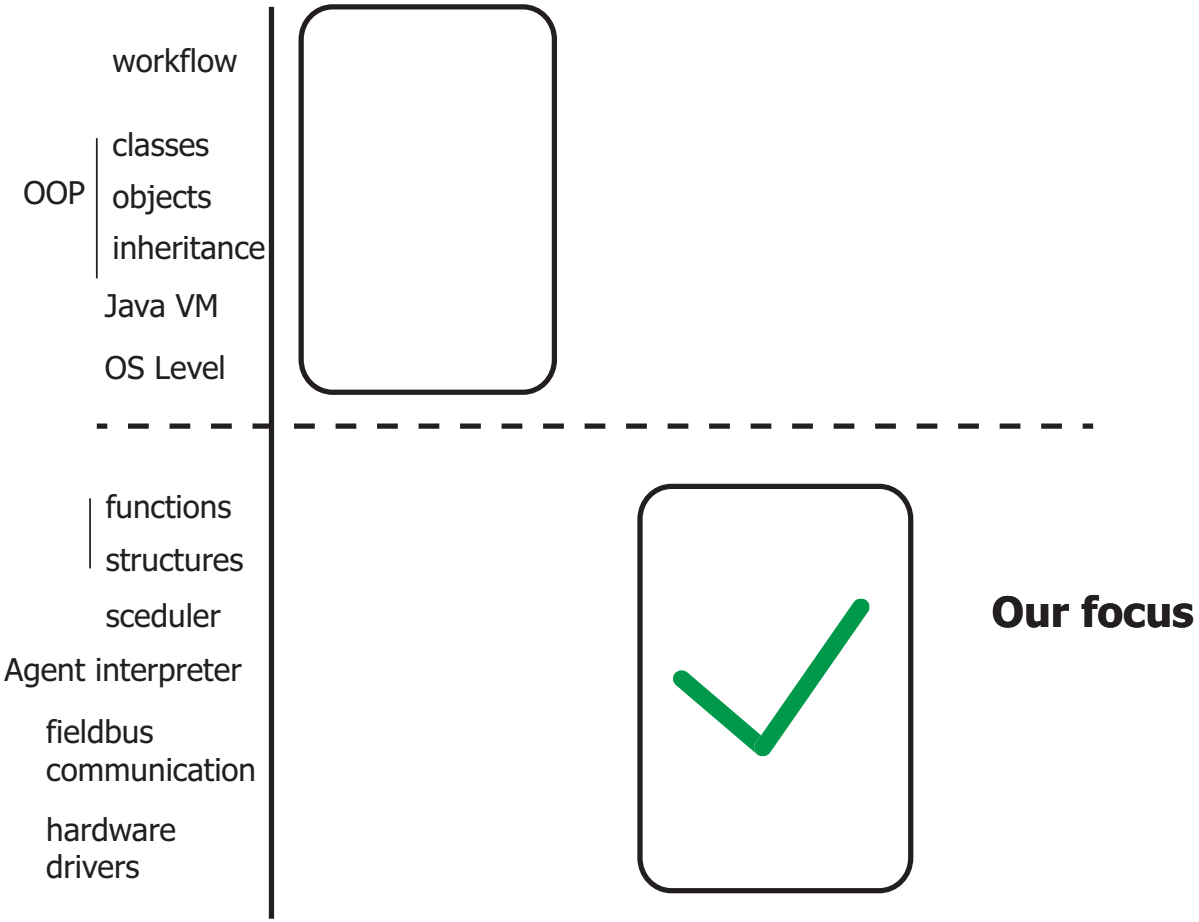
Concept of code mobility

- Mobile agent
- *Strong* and *weak* code mobility
- Layered architecture

Advantages of code mobility

- Move code close to resources
- Enable client customization of remote resources
- Performance gains

Level of abstraction



Design challenges for the project

Processing gap

Performance

Memory management

Communication design

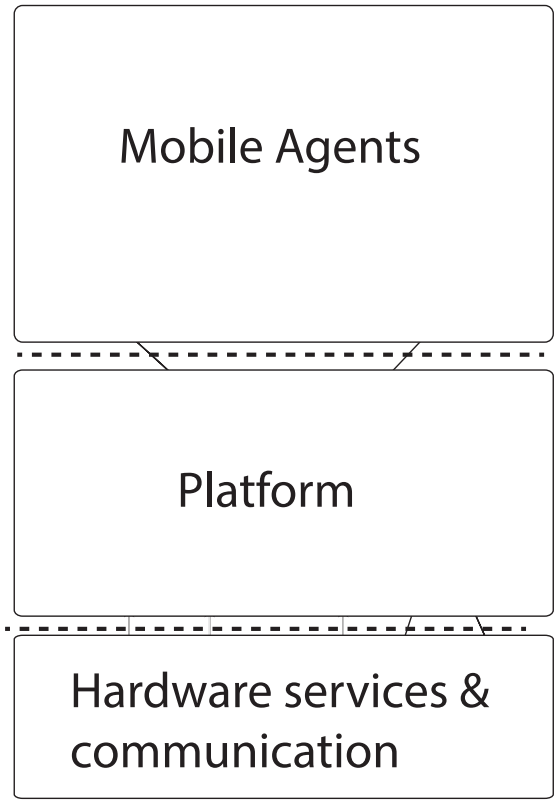
Requirements

- Agents:
  - simple language
  - support mobility and message exchange
- Platform:
  - execute agents concurrently
  - provide hardware services to agents
- Communication:
  - transfer agents & state *strong mobility*
  - transfer messages between platforms
  - cross board communication via Zigbee

General overview

3 layered architecture:

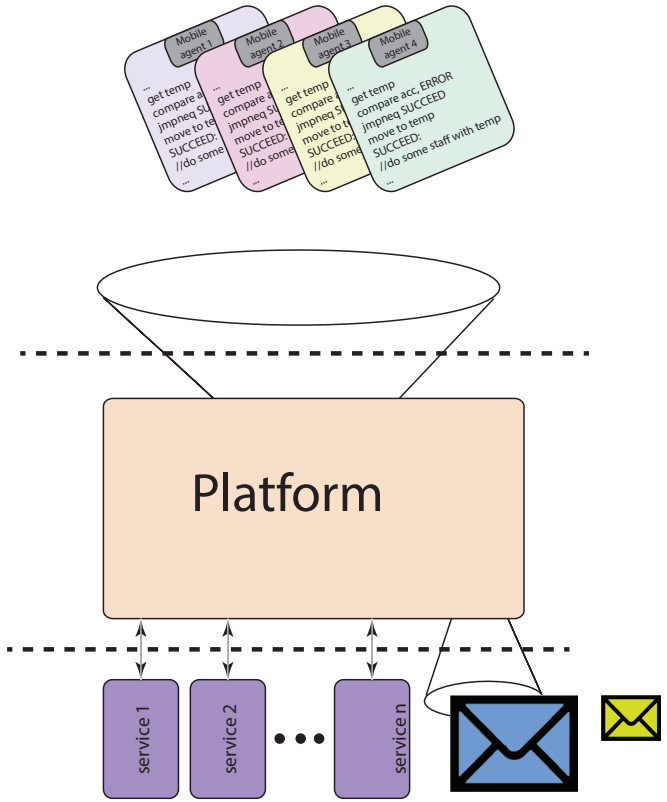
- Agent level
- Platform level
- communication & drivers



General overview

3 layered architecture:

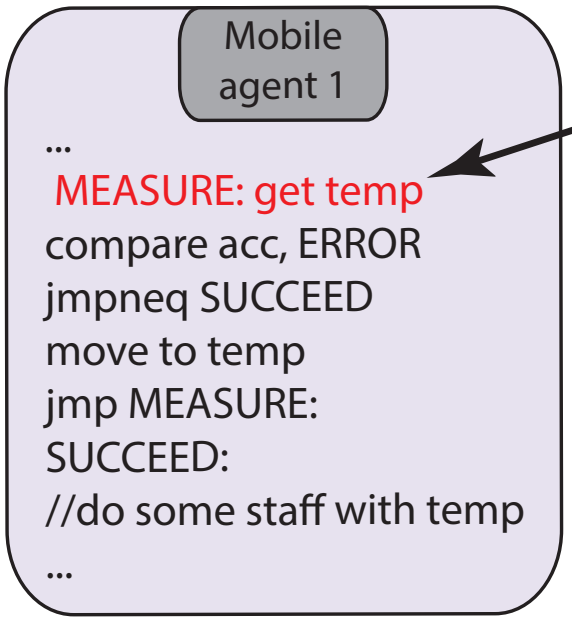
- Agent level
- Platform level
- communication & drivers



Agent language that support:

- Arithmetical operations, branching and looping
- Message exchange
- Replication and code mobility

Agents



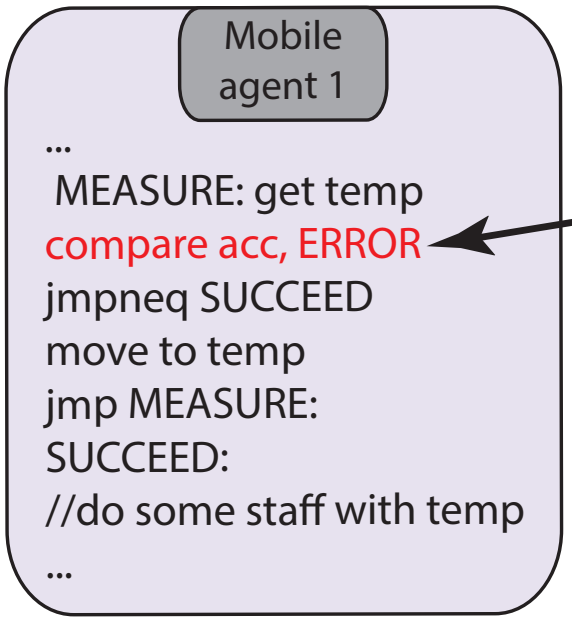
Get temperature value

Platform can provide this service?

yes: do staff

no: move agent to another platform

Agents



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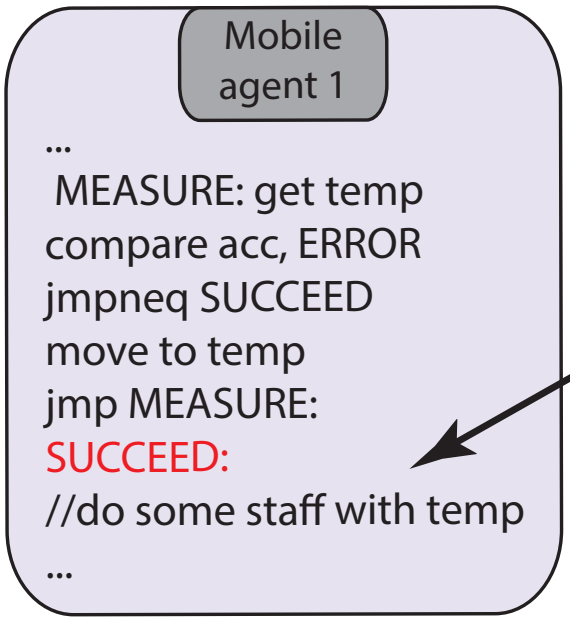

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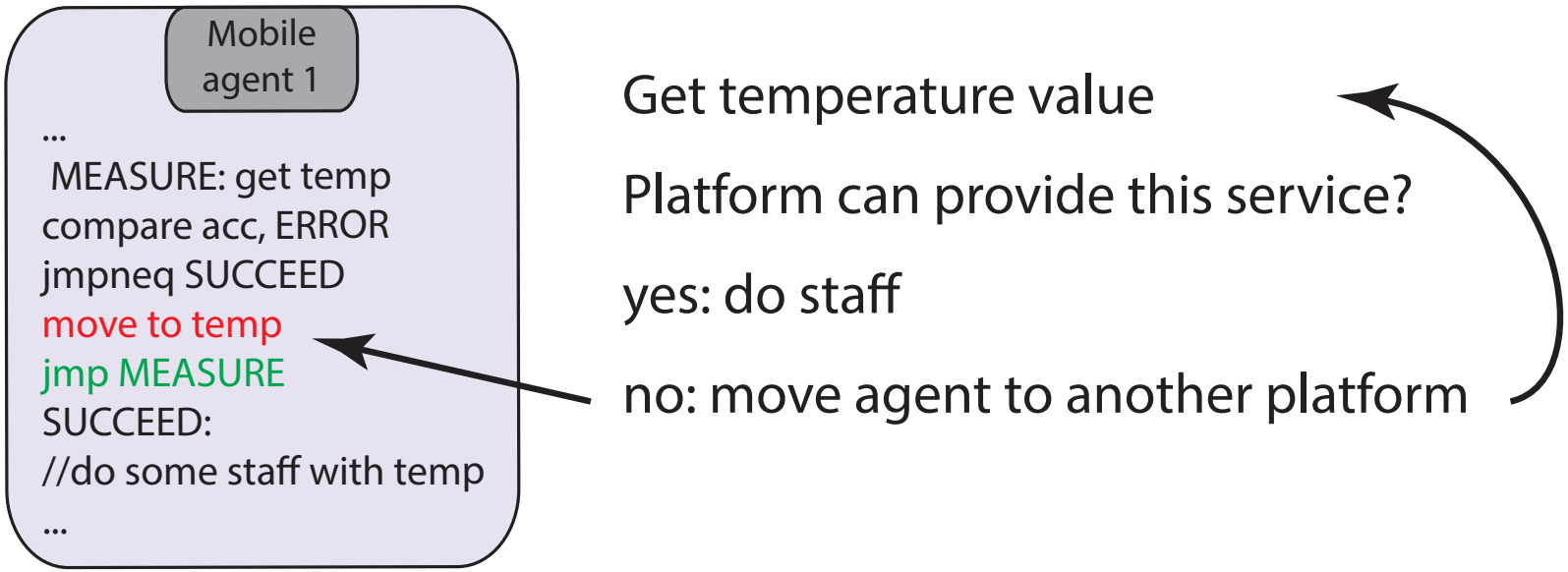
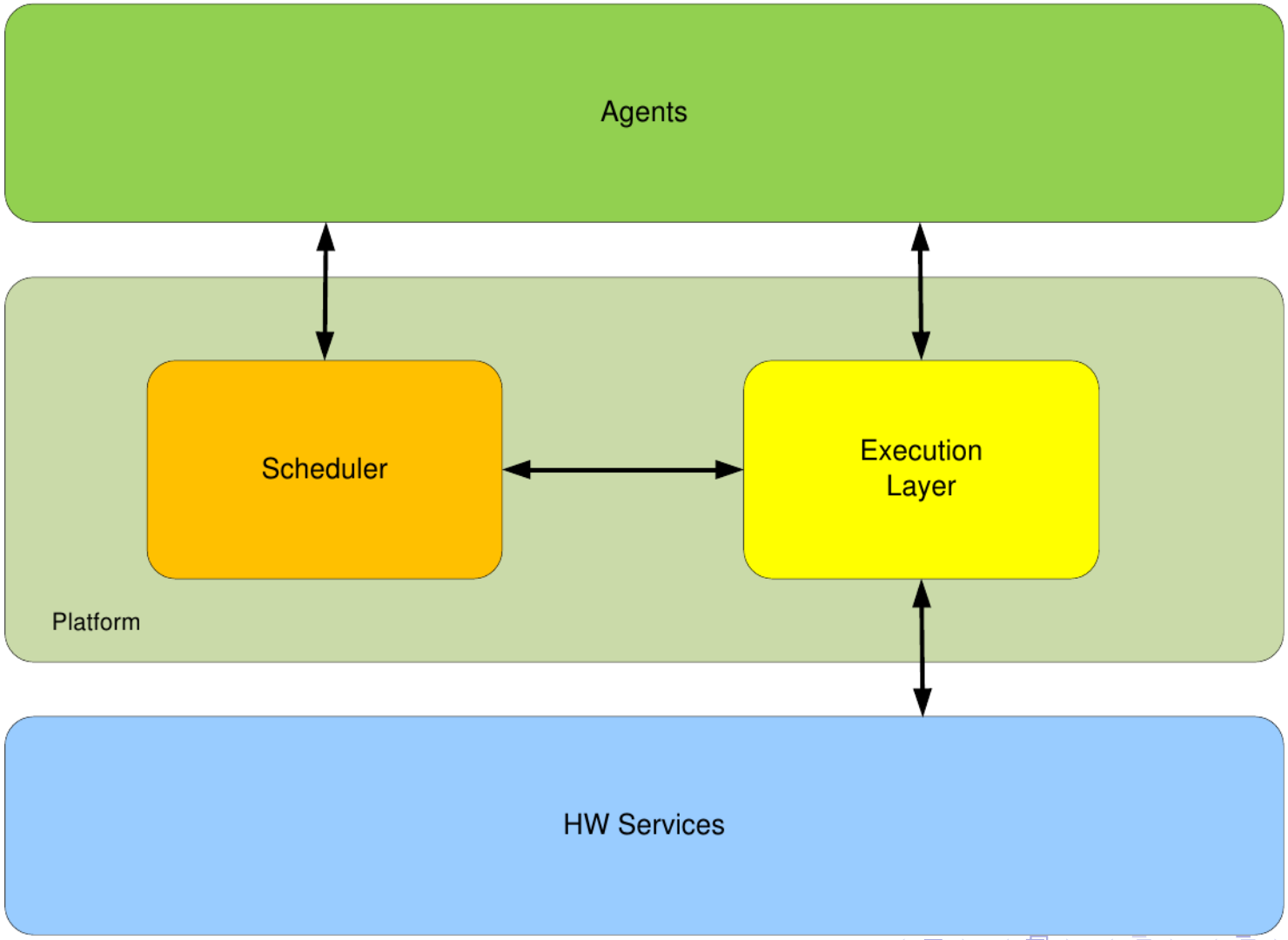
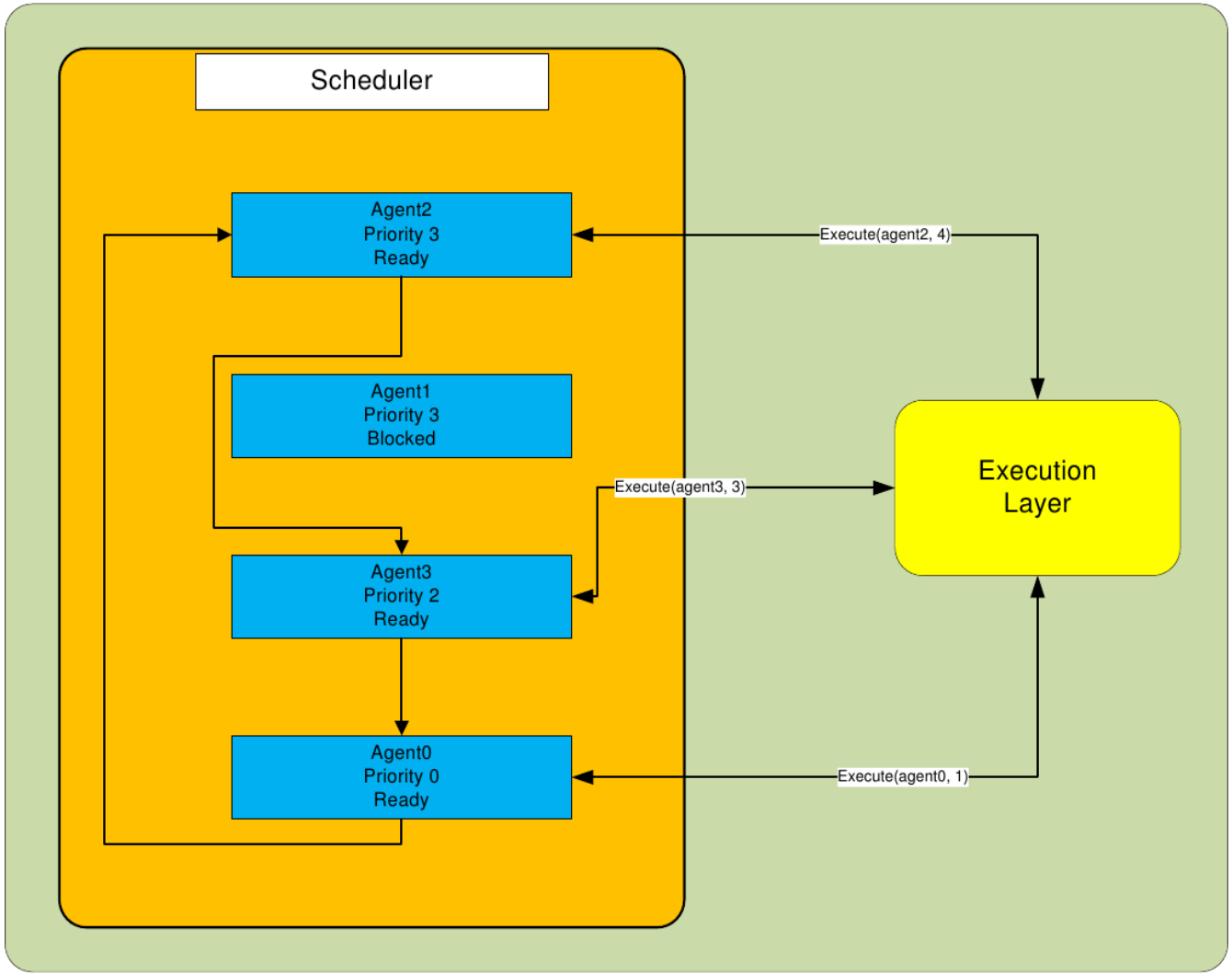

Mobile agent 1
...
MEASURE: get temp
compare acc, ERROR
jmpneq SUCCEED
move to temp
jmp MEASURE
SUCCEED:
//do some staff with temp
...
Get temperature value
Platform can provide this service?
yes: do staff
no: move agent to another platform

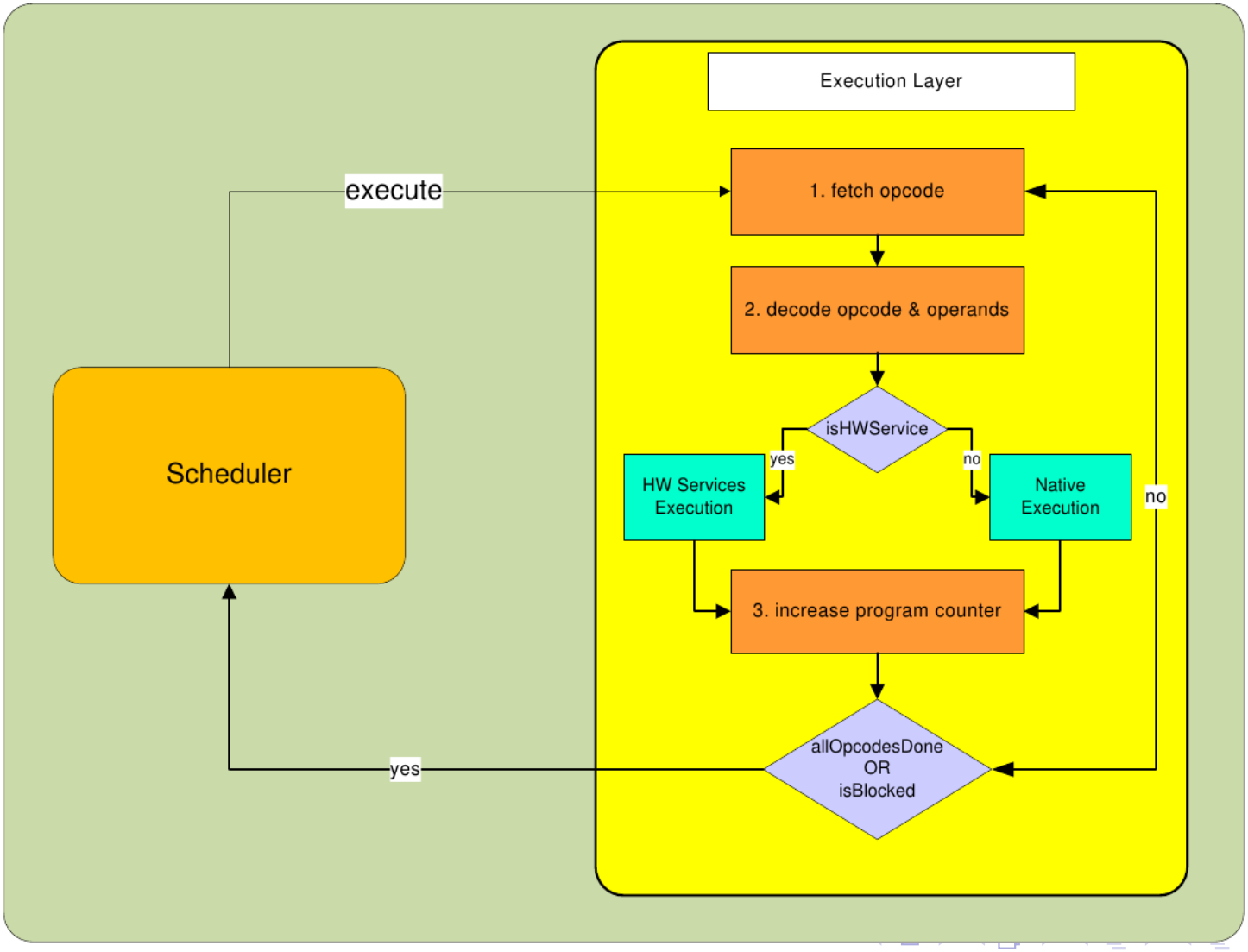
Platform



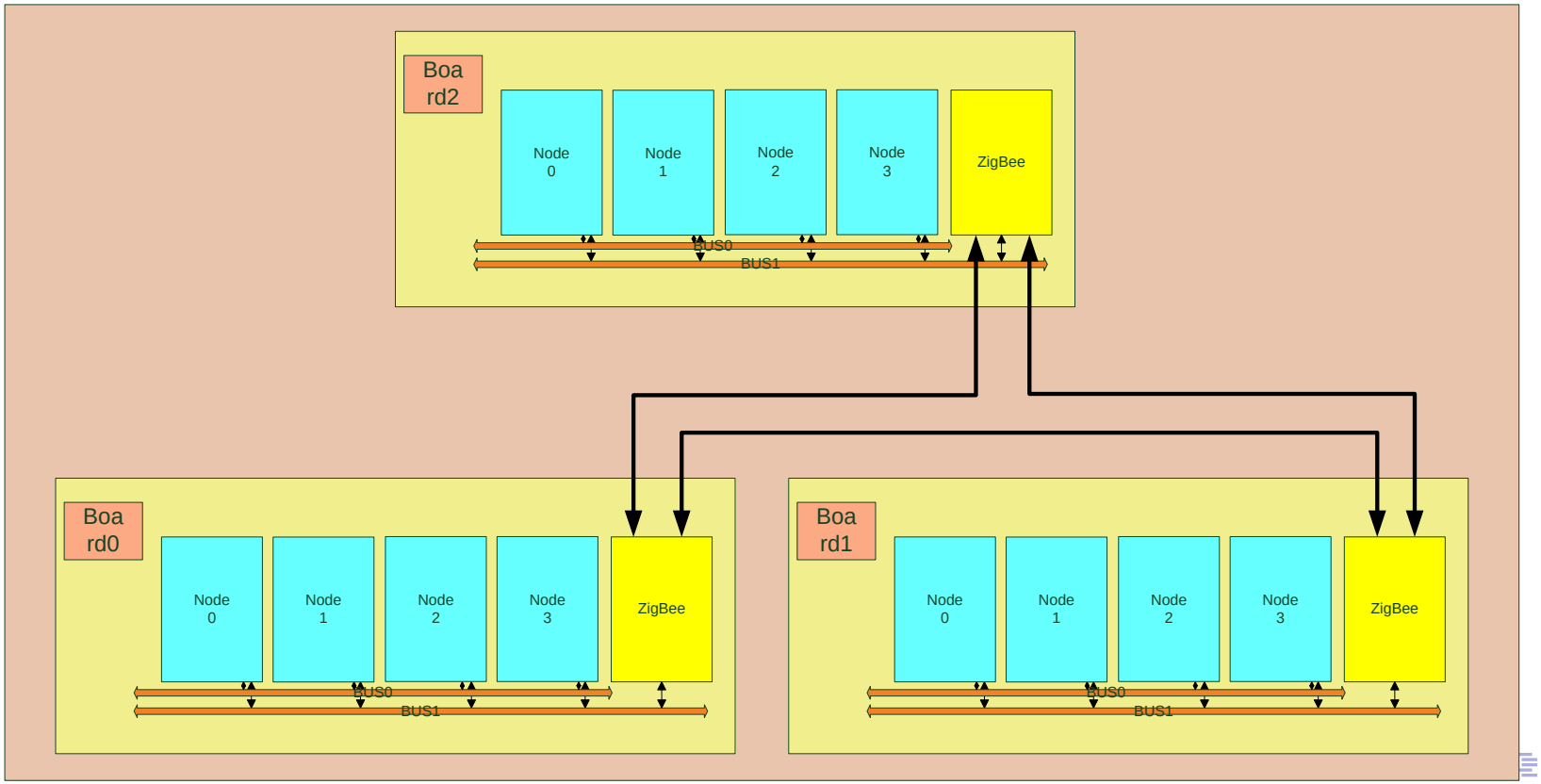
Scheduler


Scheduler
Agent2
Priority 3
Ready
Agent1
Priority 3
Blocked
Agent3
Priority 2
Ready
Agent0
Priority 0
Ready
Execute(agent2, 4)
Execute(agent3, 3)
Execute(agent0, 1)
Execution
Layer

Execution Layer



Communication Protocol
Communication Participants



Protocol Design

Requirements

- Local *on-board* communication
- Remote communication
- Sending agent code
- Sending application data

Principles

- Layered design
- *Fairness* in network access
- Composability with *Zigbee*
- Acknowledgement and retry

Transmission Layers

Byte	MSB	LSB
0	*destination node*	*payload length*
1	*data*	
|	...	
14	*data*	
15	*crc*	

Figure: Low Level Datagram

Byte	MSB	LSB
0	*destination node*	*payload length*
1	*source node*	*destination board*
2	*source board*	*packet type*
3	*frame id*	
4	*packet id high*	
5	*packet id low*	
6	*empty*	
7	*data*	
|	...	
14	*data*	
15	*crc*	

Figure: High Level Datagram

Network Configuration

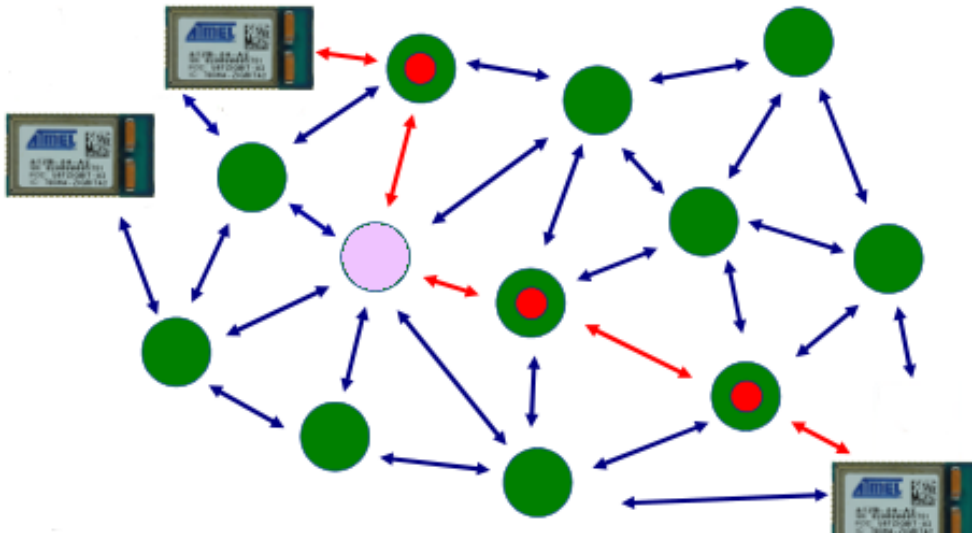


Figure: Zigbee Mesh Network

Zigbee Network Configuration

Rerouting Example

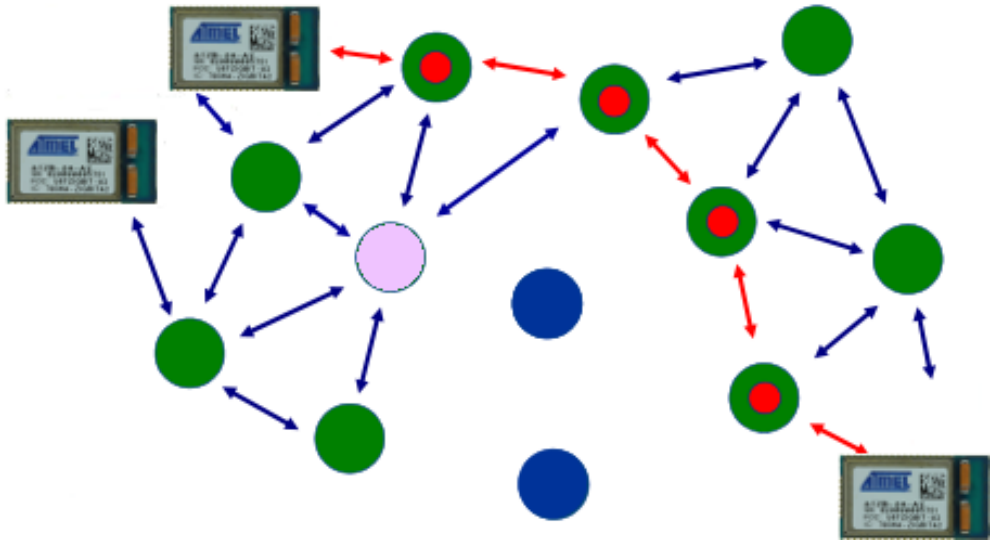


Figure: Network after rerouting

- Network Coordinator
- Failed Node
- Network Router
- Message Route

Milestones

Phase 1. Product outline and information gathering

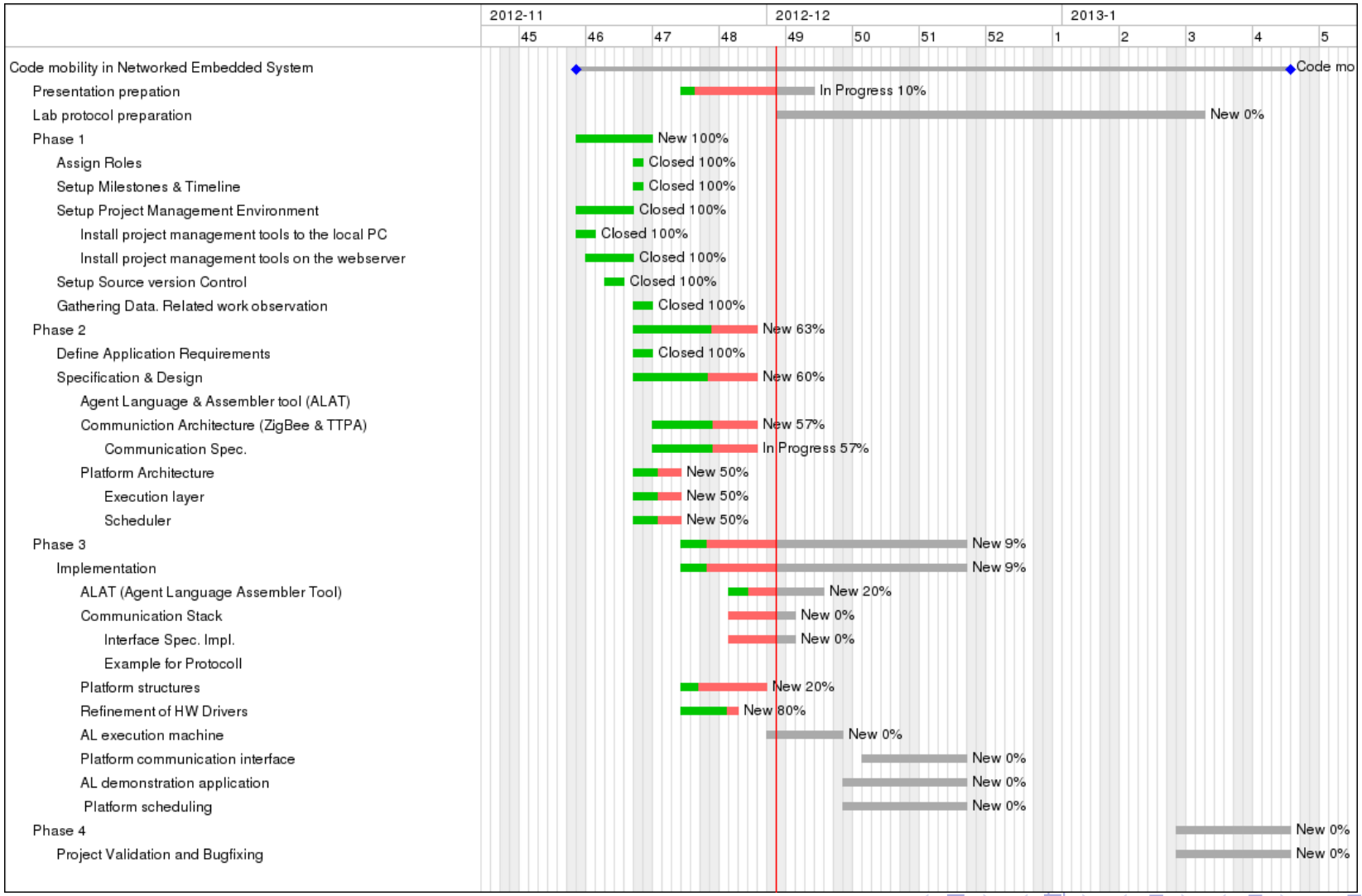
Phase 2. Application requirements and specification

Phase 3. Implementation

Phase 4. Validation and analysis

Workpackages

Gantt diagram



Tools

Version control	git
Documentation & code repository	github
File sharing	amazon s3
Project management	redmine

http://nes2012group4.herokuapp.com/

Code generation	SCADE
Editors	Emacs
	gedit