

Achieving Coordination Through Dynamic Construction of Open Workflows

**Louis Thomas, Justin Wilson,
Gruia-Catalin Roman, and Christopher Gill**

Mobilab

Department of Computer Science and Engineering

 Washington University in St. Louis

Workflows

- Workflows are an established technology
 - ❑ Coordination mechanism for integration of services
- A *workflow* is a graph of tasks that are executed to accomplish a goal
- Example: Printing a photo album on line
 - ❑ Upload – Print – Bind – Deliver
- Goal: Use workflows for coordination in mobile ad hoc communities
 - ❑ A more flexible approach is required

New Idea: Open Workflow

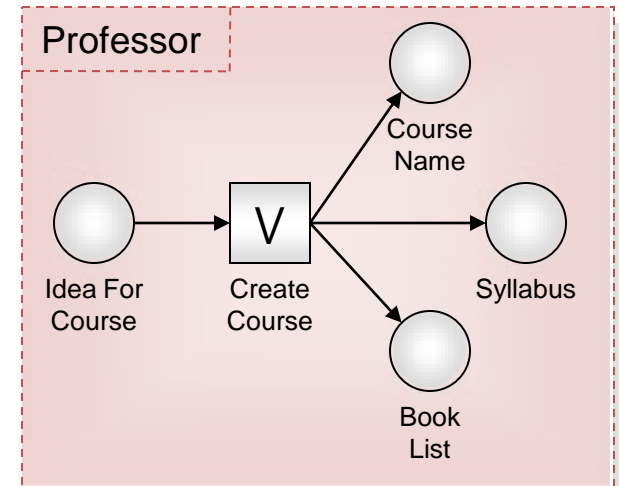
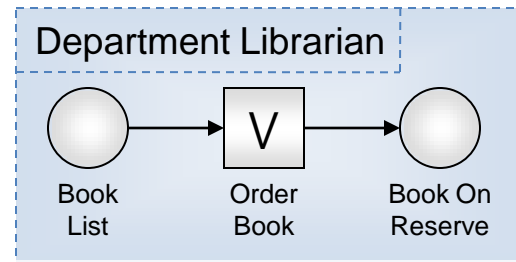
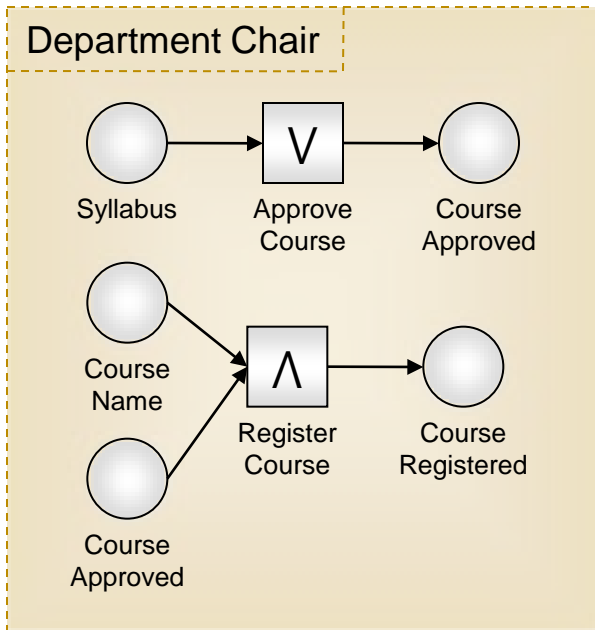
- Specify, construct, and execute a custom, context-specific workflow in response to expressed needs
- Respond to unpredictable and evolving circumstances
 - ❑ Evolving community of participants
 - ❑ Decouple task knowledge from service capability
 - ❑ Space and time constraints
 - ❑ Ad hoc wireless connectivity
- Goes beyond traditional workflow approaches

Open Workflow Life Cycle



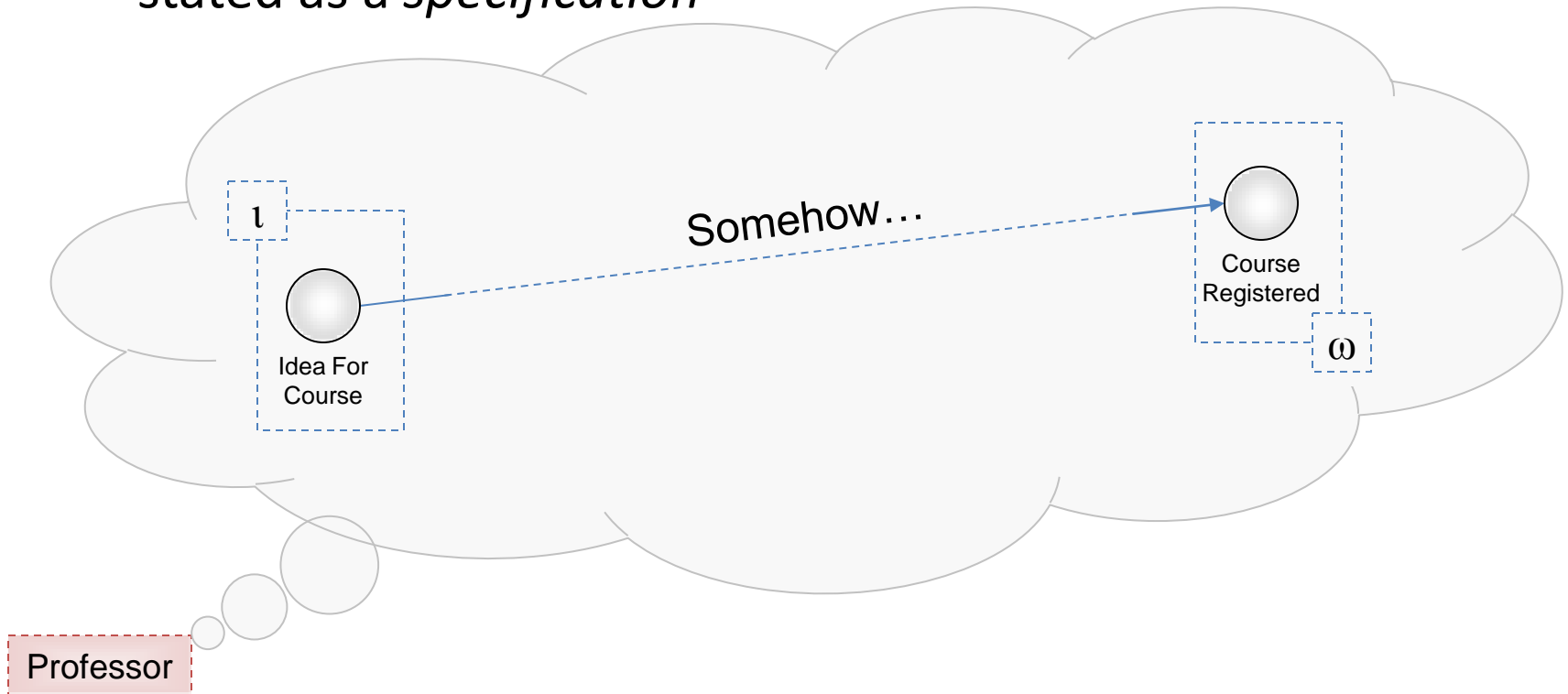
Open Workflow Example

- Knowhow within a Community of Participants



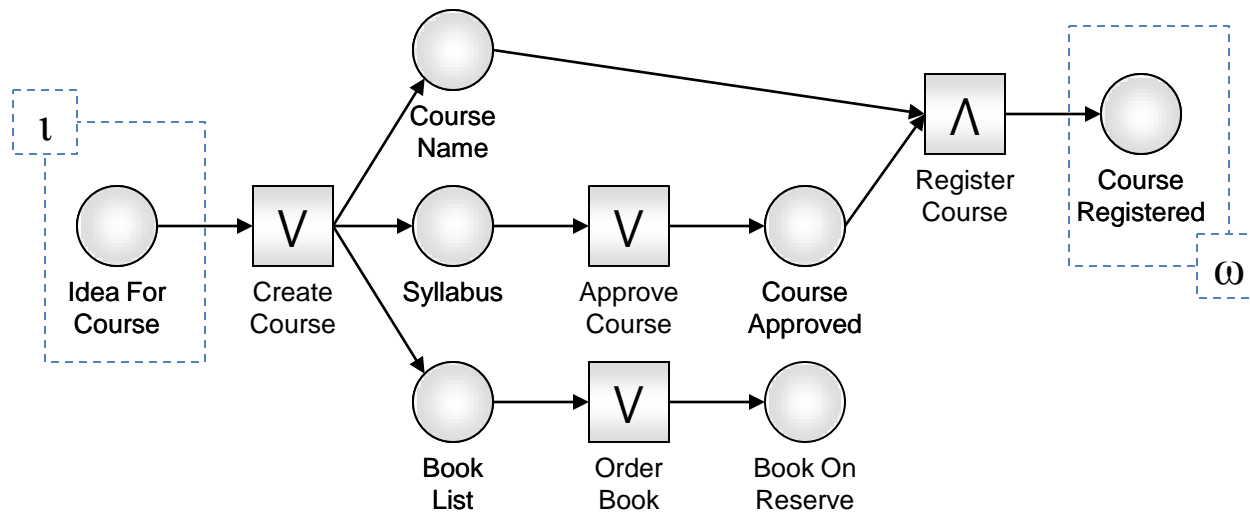
Open Workflow Example

- A workflow is constructed in response to expressed need, stated as a *specification*



Open Workflow Construction Algorithm

- Create a *supergraph*



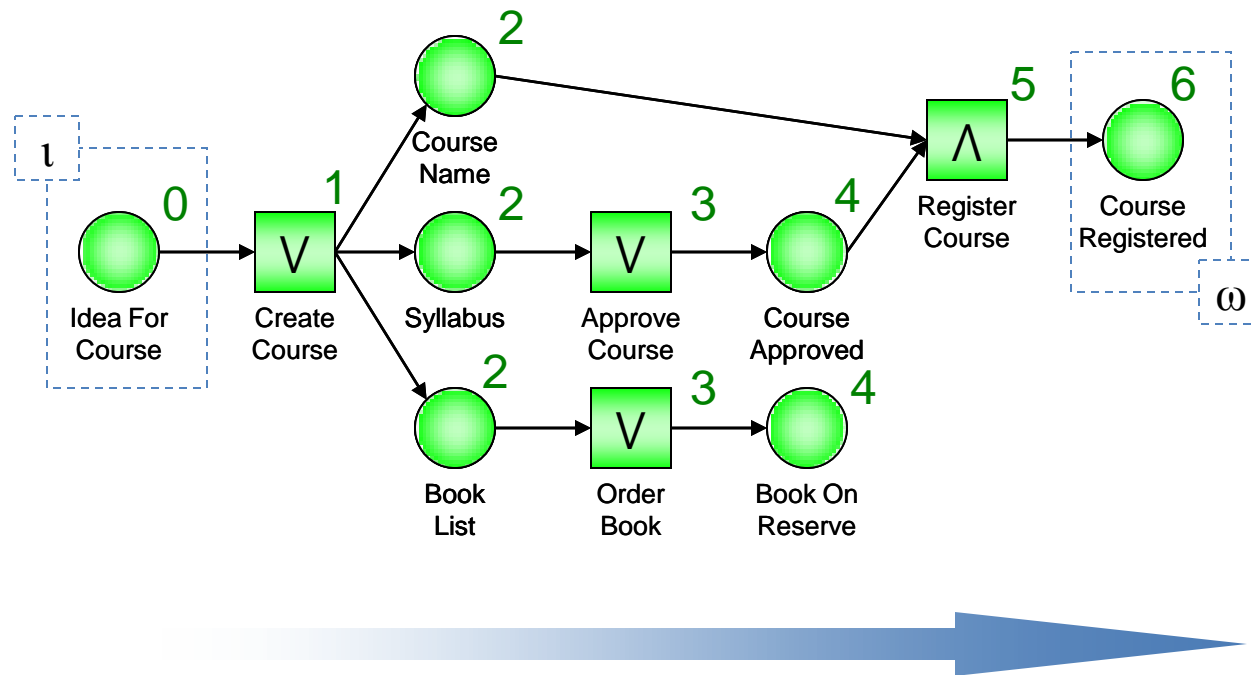
Professor

Dept. Librarian

Department Chair

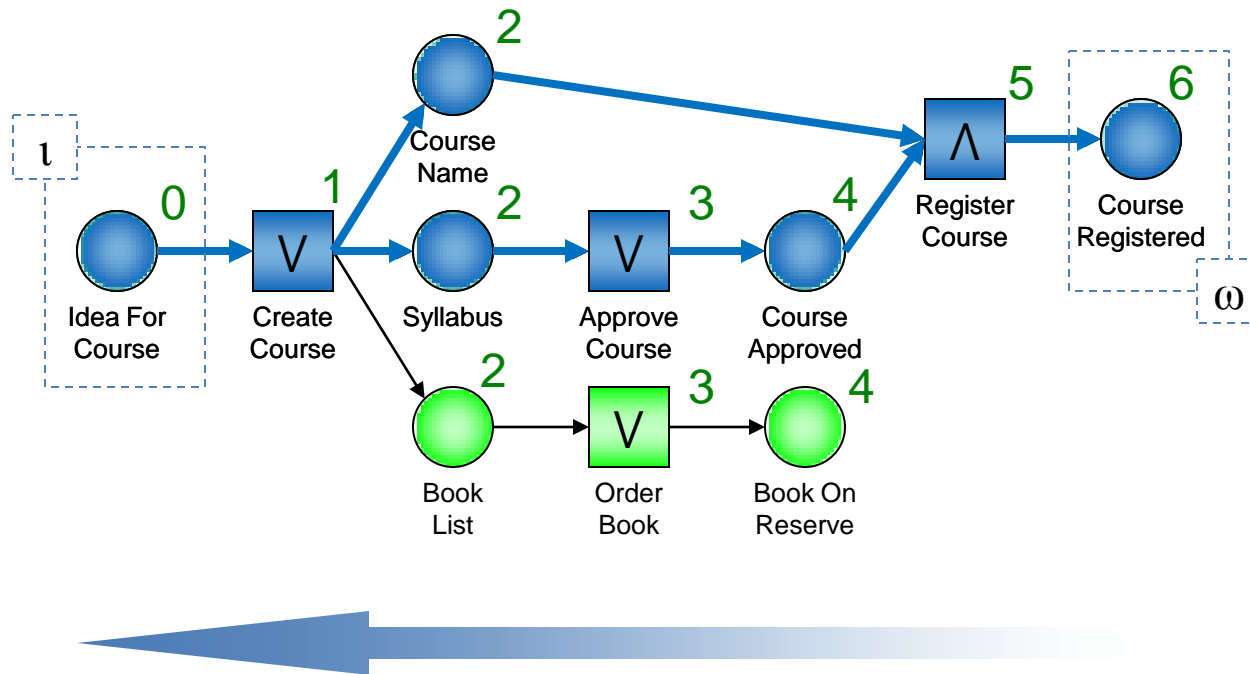
Open Workflow Construction Algorithm

- Identify reachable nodes



Open Workflow Construction Algorithm

- Identify valid workflow



Open Workflow Allocation and Execution

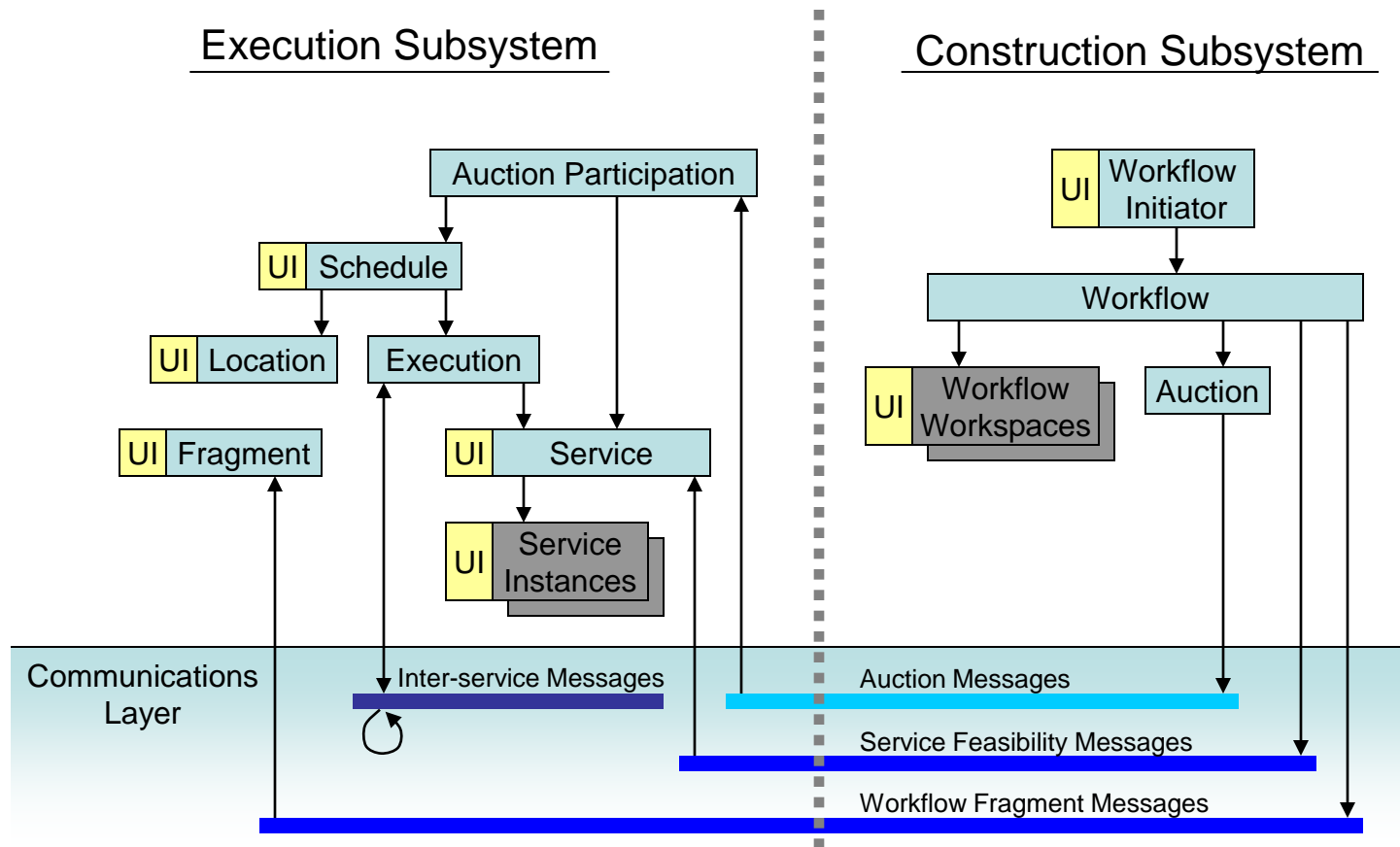
➤ Allocation

- ❑ Participants bid to execute tasks, making firm commitments
 - Must be have corresponding service
 - Must have time in schedule to travel as necessary

➤ Execution

- ❑ Wait for location, time, required inputs
- ❑ Execute service
- ❑ Communicate service outputs
 - Move freely (so long as commitments are met!)

Open Workflow Middleware Architecture



Open Workflow Application in Action

The 'Professor' window shows a workflow interface with the following sections:

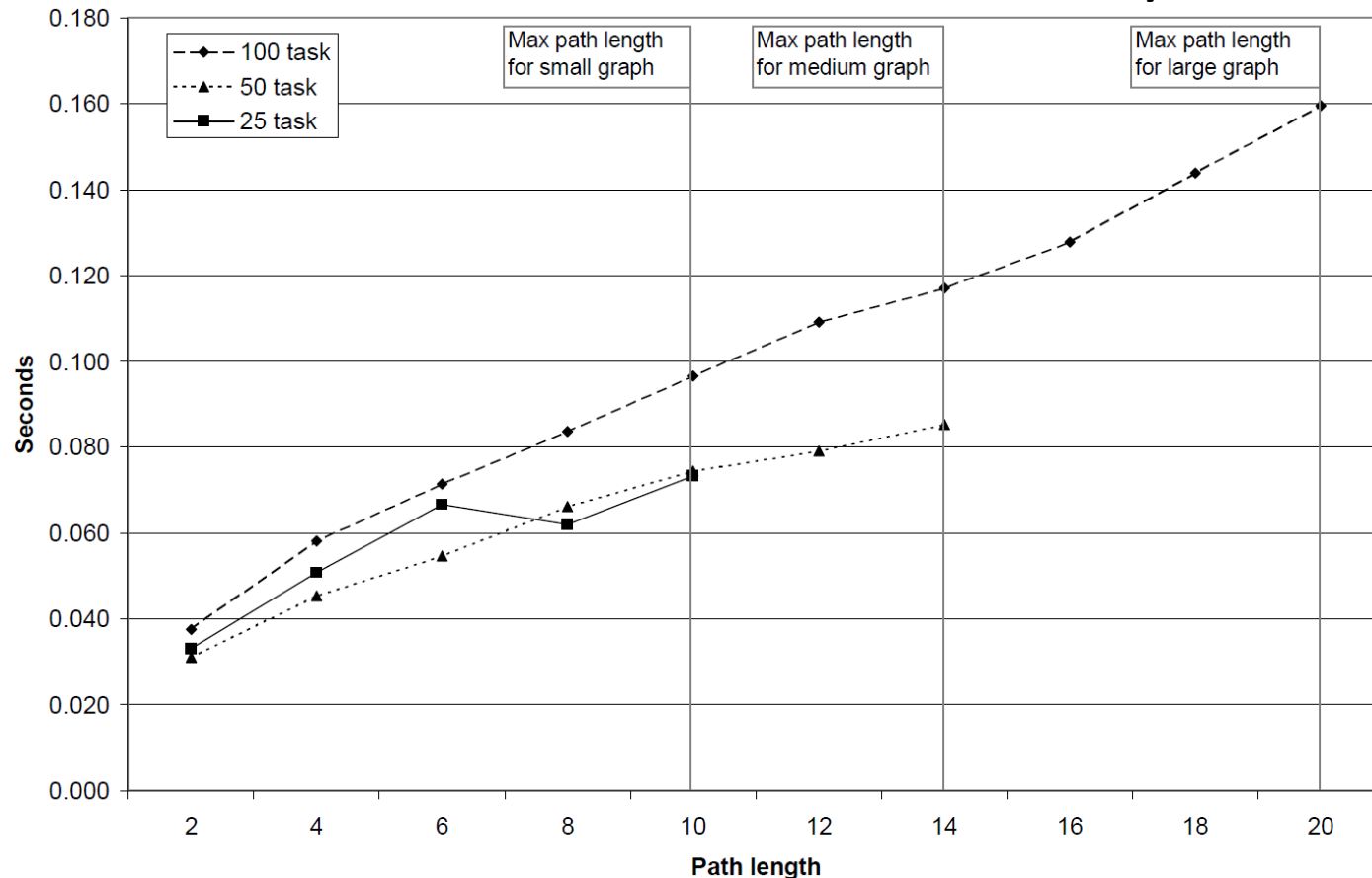
- Header:** 'Professor' title, 'Current Location: Saint Louis', and timestamp '2009-03-01 08:40 AM'.
- Buttons:** 'Add Problem' at the top and bottom.
- Schedule:** 'Triggering Conditions' with a text area containing 'Idea For Class'.
- Gazetteer:** 'Available Conditions' with up/down arrows.
- Services:** A list containing 'Book List', 'Book On Reserve', 'Class Approved', and 'Class Name'.
- Fragments:** 'Goal Conditions' with a text area containing 'Class Registered'.

The 'Department Chair' window shows a workflow interface with the following sections:

- Header:** 'Department Chair' title, 'Current Location: Saint Louis', and timestamp '2009-03-01 08:55 AM'.
- Buttons:** 'Add Problem' and 'Travel Alert' at the top.
- Viewers:** 'View one' with 'Month', 'Week', and 'Day' options, and the date '2009-03-01'.
- Schedule:** A timeline view with slots for 8 AM, 9 AM, and 10 AM. A commitment 'Travel from Saint Louis to Denver' is highlighted in the 9 AM slot, with a sub-commitment 'Register Class' and 'Location: Denver' shown below it.
- Instructions:** A text box at the bottom stating: 'Click a commitment to view details. Drag out a period within the timeline to create a new commitment.'

Open Workflow System Performance

Time taken to construct different sized workflows in a community of four wireless devices



Work in Progress

- Expressiveness
- Dynamics
- Knowledge Management

Conclusions

- Mobile devices demand new approaches for collaboration
- We proposed the **Open Workflow** paradigm
- We presented a construction algorithm and an application built on the open workflow paradigm
- Our source code is available online

<http://mobilab.cse.wustl.edu/projects/openworkflow/>