

Achieving Coordination Through Dynamic Construction of Open Workflows

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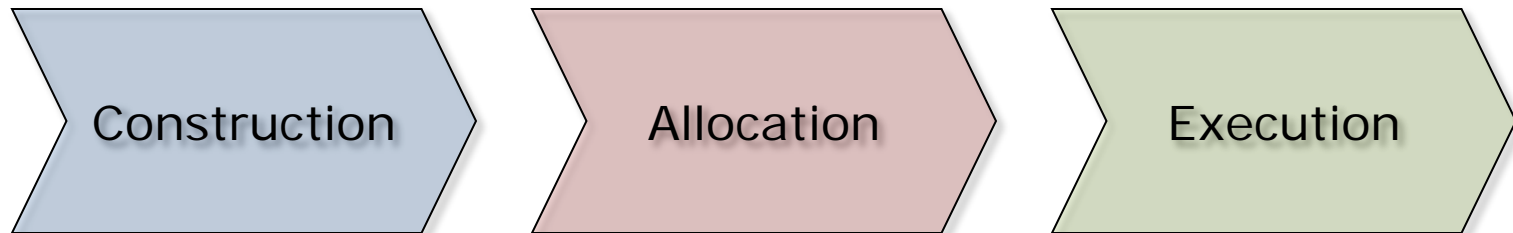
Workflows

- 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

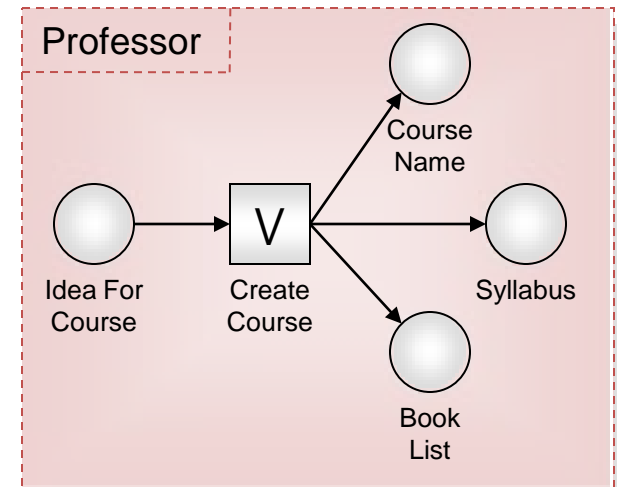
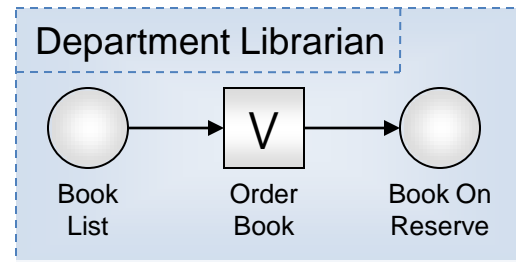
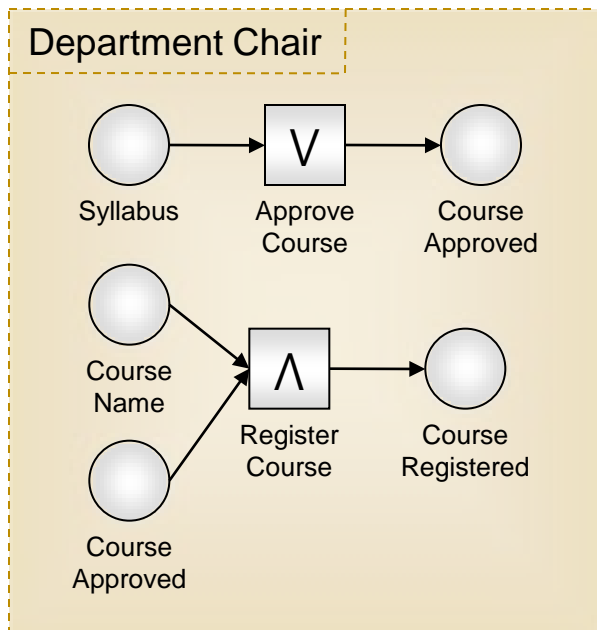
- Specify, construct, and execute a custom, context-specific workflow in response to expressed needs
- Respond to unpredictable and evolving circumstances
 - ❑ Evolving community of participants
 - ❑ Decouple task knowledge from service capability
 - ❑ Space and time constraints
 - ❑ Ad hoc wireless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

Open Workflow Life Cycle



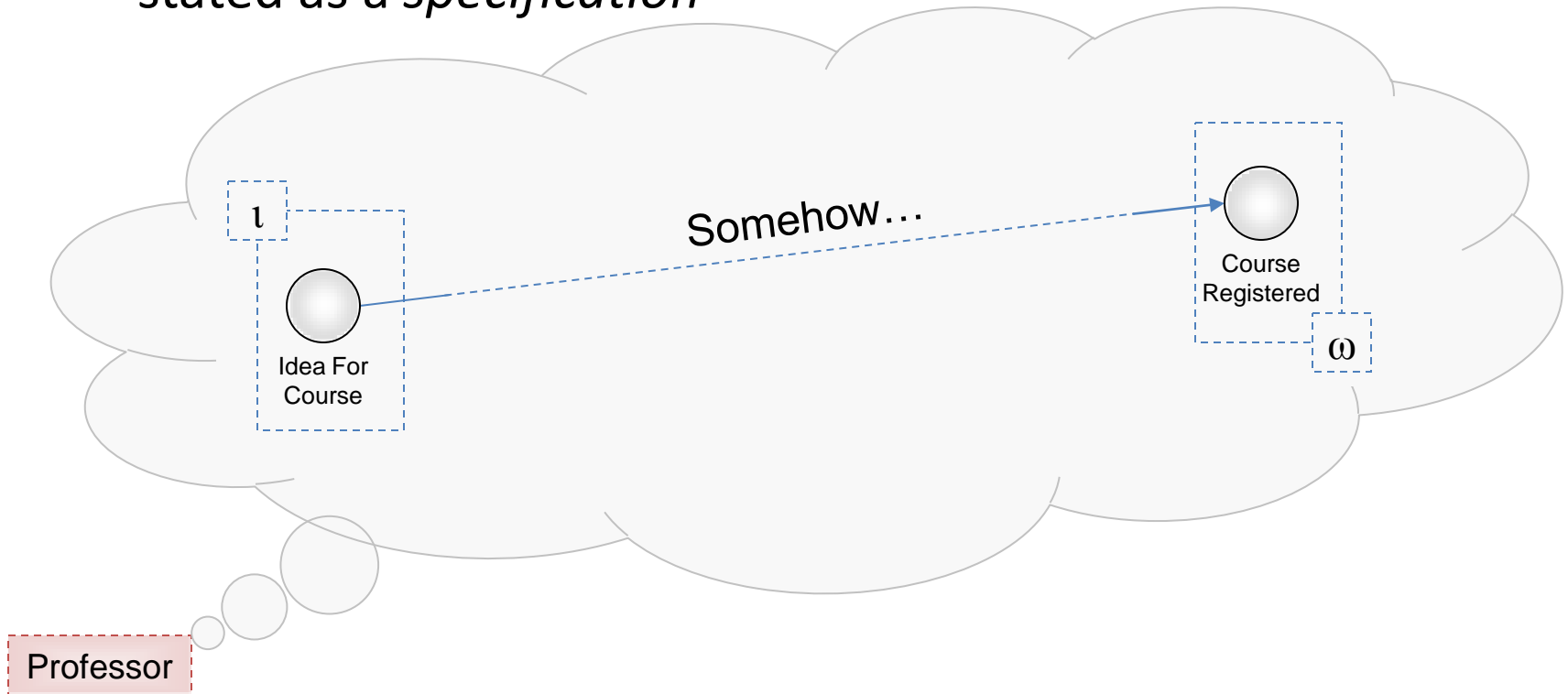
Open Workflow Example

- Knowhow within a Community of Participants



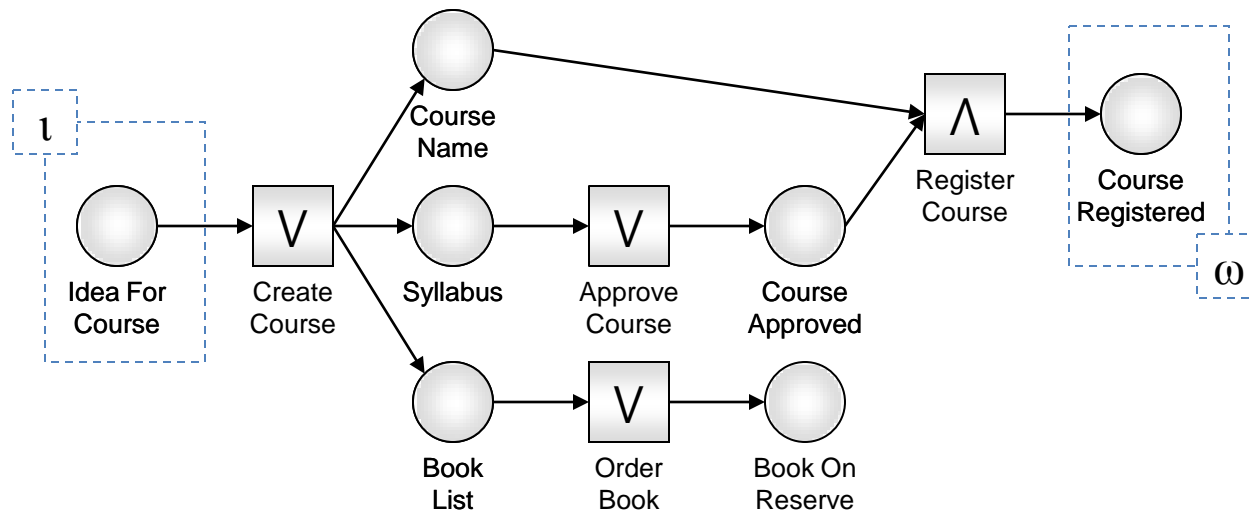
Open Workflow Example

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



Open Workflow Construction Algorithm

- Create a *supergraph*



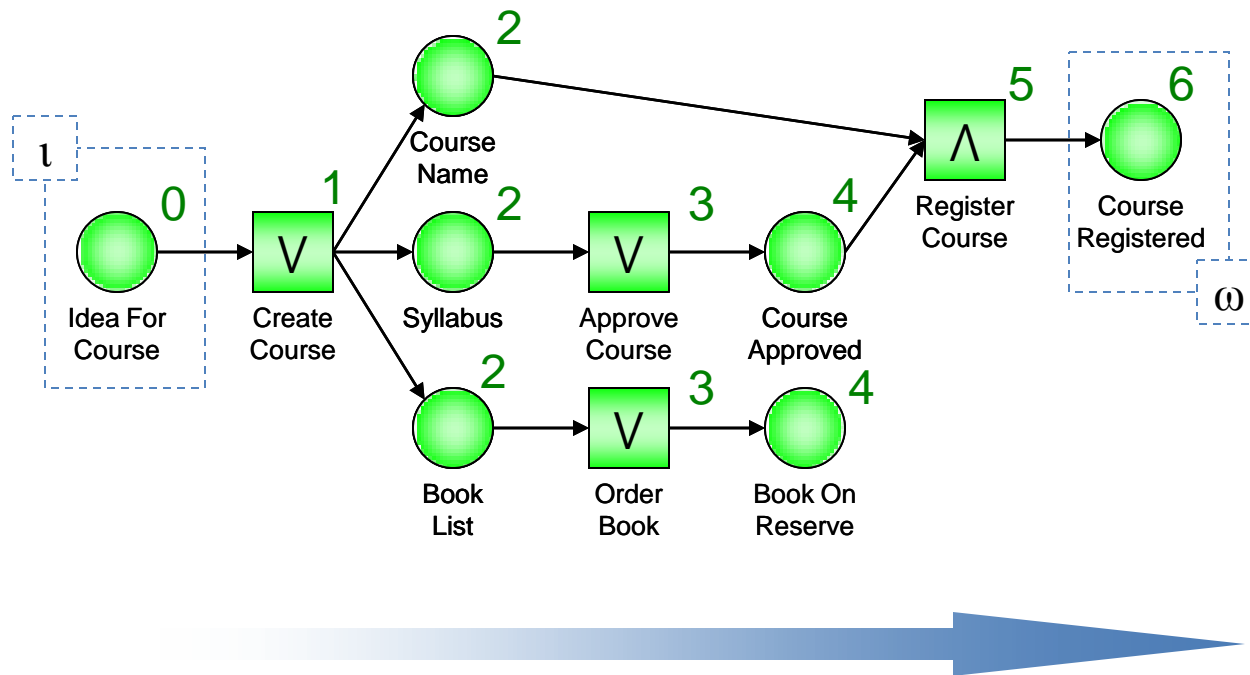
Professor

Dept. Librarian

Department Chair

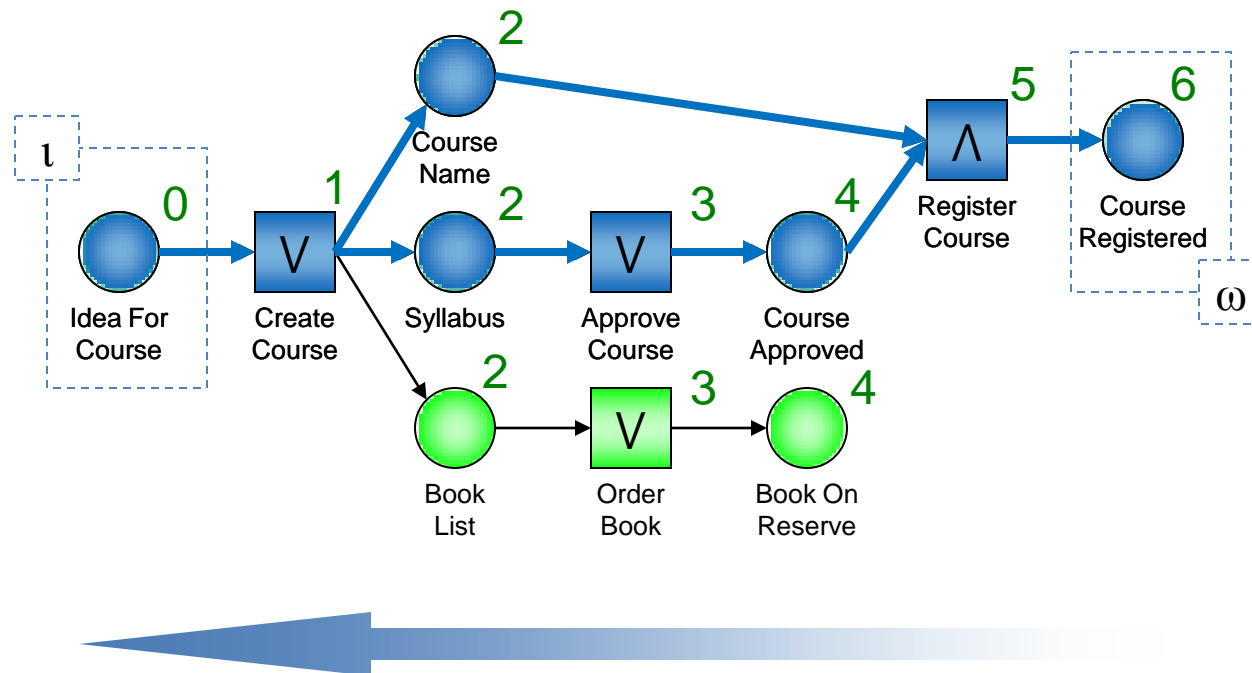
Open Workflow Construction Algorithm

- Identify reachable nodes



Open Workflow Construction Algorithm

- Identify valid workflow



Open Workflow Allocation and Execution

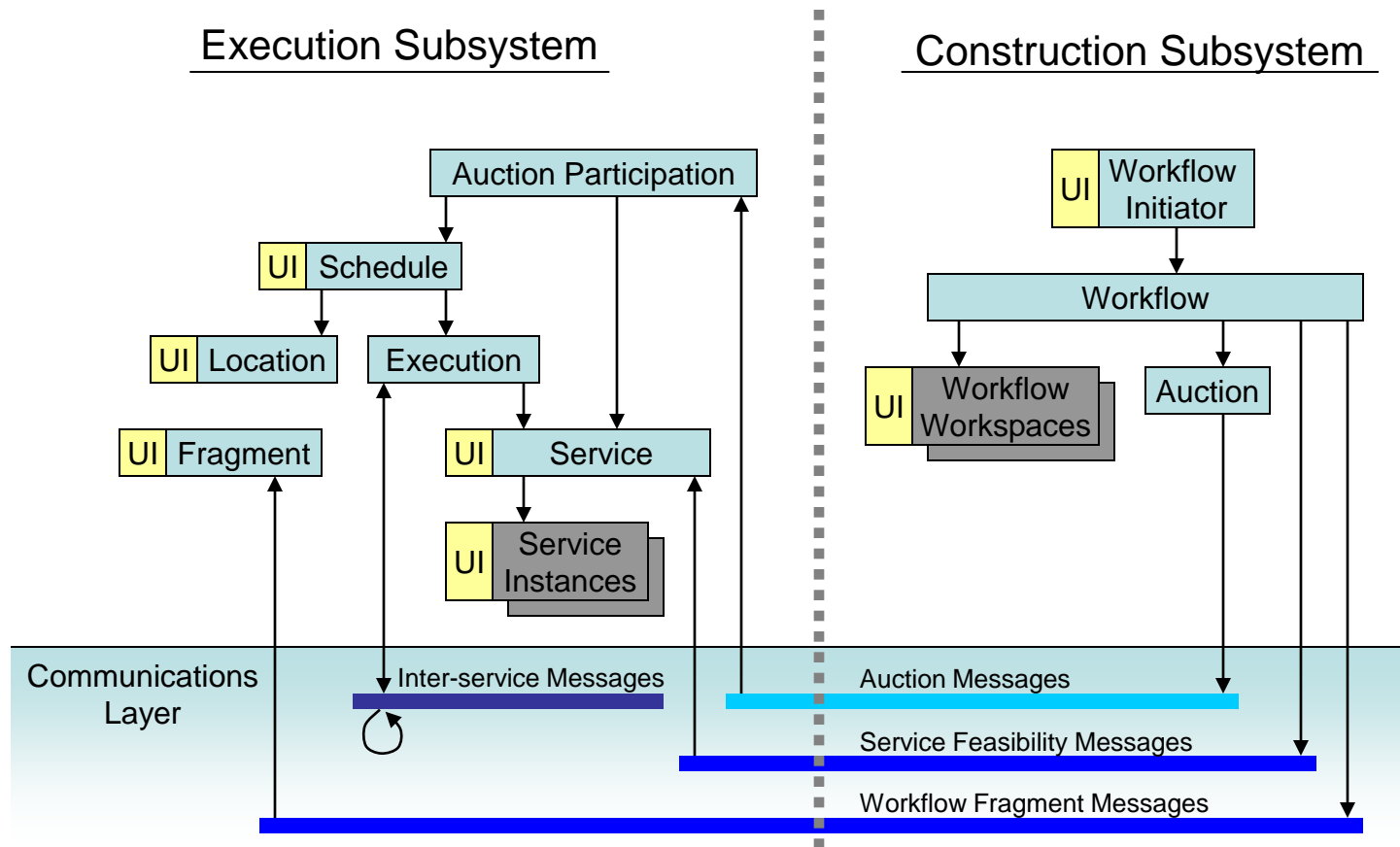
➤ Allocation

- ❑ 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



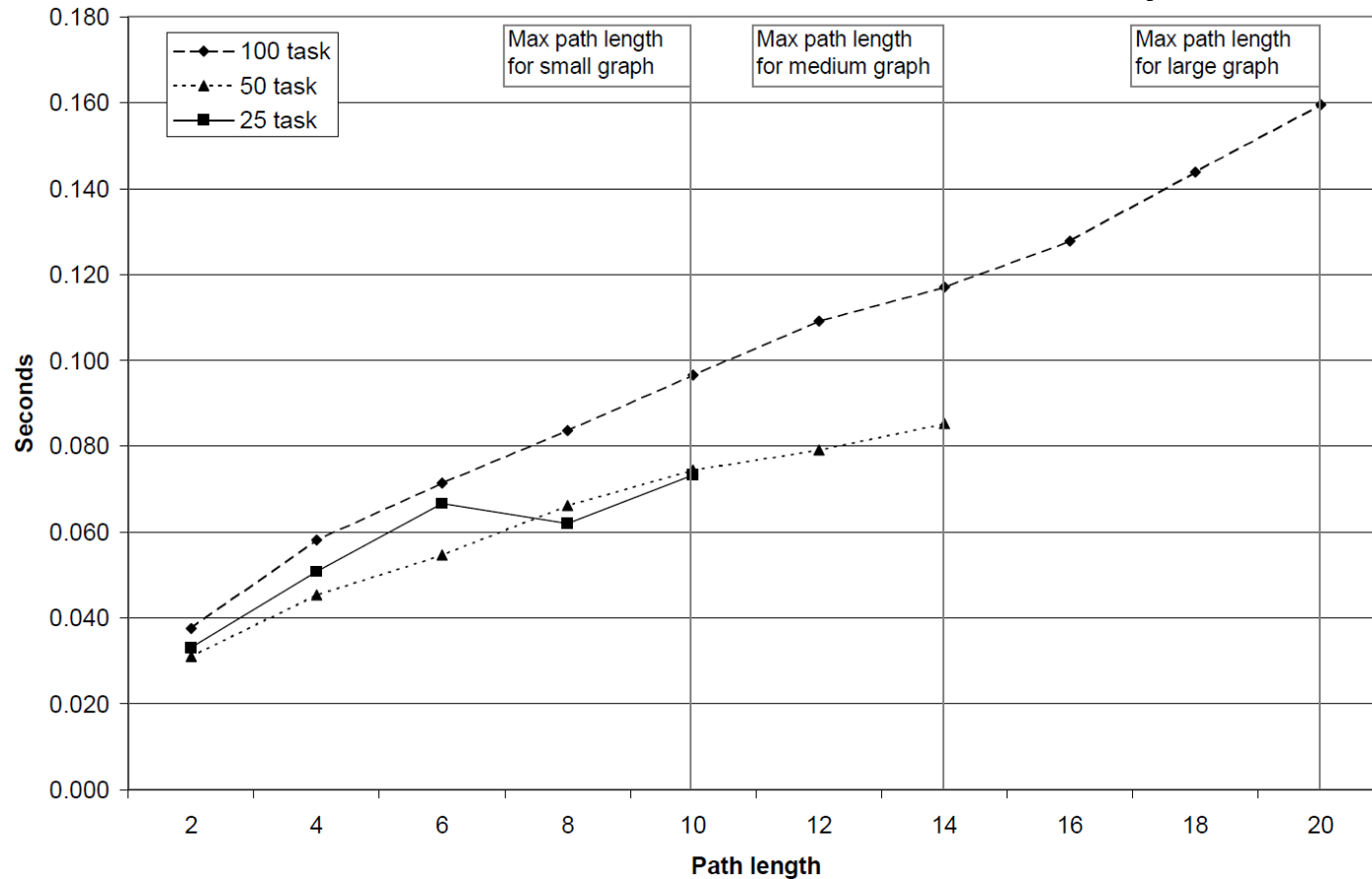
Open Workflow Application in Action

The screenshot shows the 'Professor' workflow application window. At the top, it displays 'Current Location: Saint Louis' and the date '2009-03-01 08:40 AM'. The interface is divided into four main sections: 'Schedule', 'Gazetteer', 'Services', and 'Fragments'. The 'Schedule' section contains a text area for 'Idea For Class'. The 'Gazetteer' section has two arrow buttons. The 'Services' section lists 'Book List', 'Book On Reserve', 'Class Approved', and 'Class Name'. The 'Fragments' section contains a text area for 'Class Registered'. An 'Add Problem' button is located at the bottom of the window.

The screenshot shows the 'Department Chair' workflow application window. At the top, it displays 'Current Location: Saint Louis' and the date '2009-03-01 08:55 AM'. The interface has tabs for 'Add Problem' and 'Travel Alert'. Below the tabs, there are view options for 'Month', 'Week', and 'Day', and a date selector for '2009-03-01'. The main area is a timeline with time slots: '8 AM', '9 AM', and '10 AM'. A commitment is shown for the 9 AM slot: 'Travel from Saint Louis to Denver'. Below this, a tooltip displays 'Register Class' and 'Location: Denver'. At the bottom, a text box provides instructions: '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/>