Messages with Implicit Destinations as Mobile Agents

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Joint work with:

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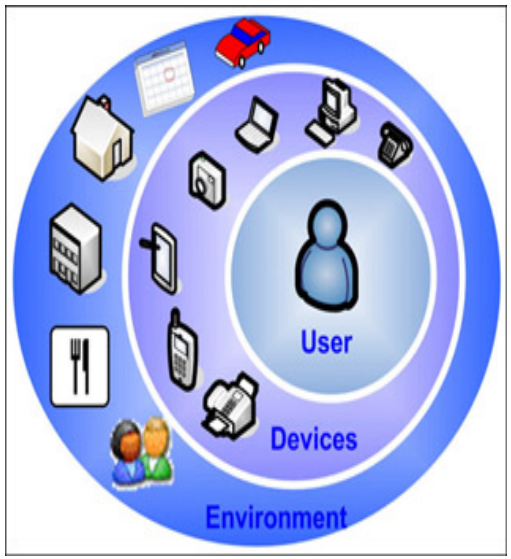
AGERE'12, Tucson, Arisona, USA

Context

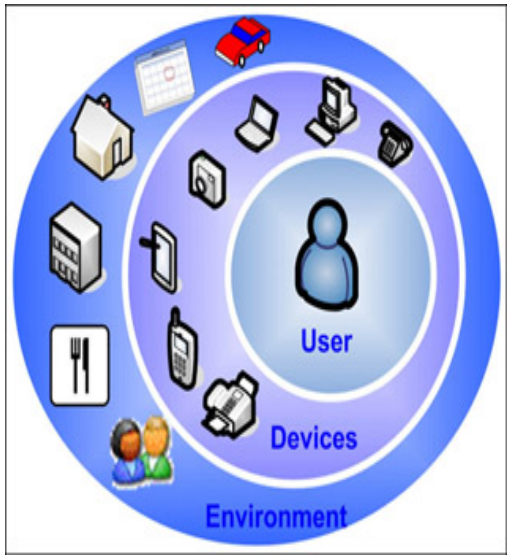
- Ubiquitous environment
  - heterogeneous devices
  - data intensive applications
- Complex network infrastructure
  - dynamic of some networks
  - various types of failures



Requirements

Such applications require distributed algorithms

- are difficult to program
- require skilled programmers
- offer limited warrantee on their behavior



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- messages with **explicit** destination

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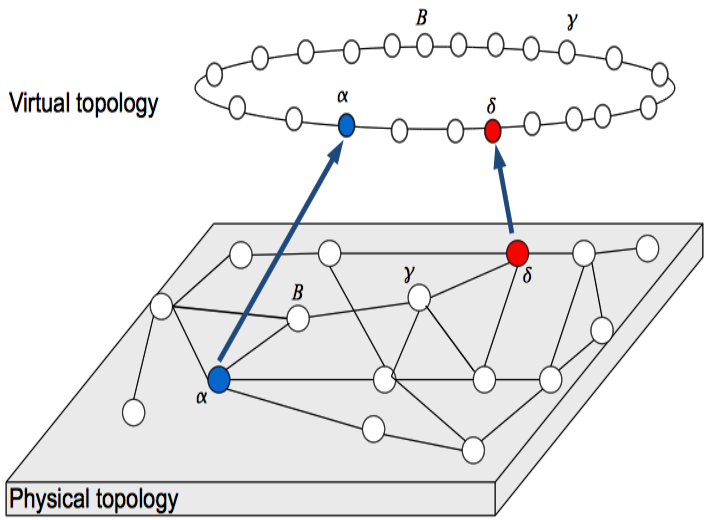

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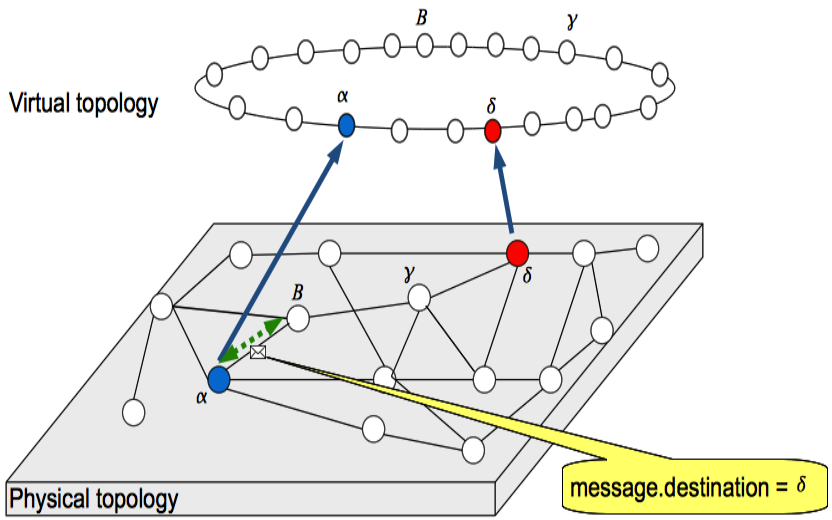

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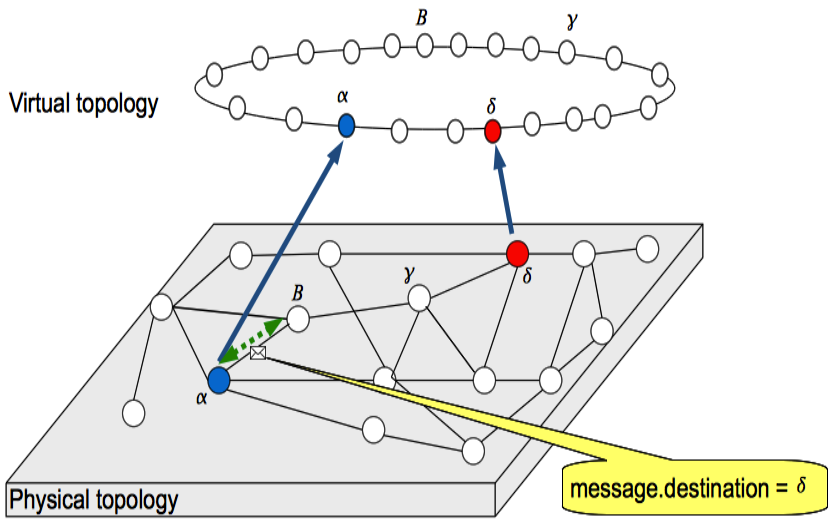

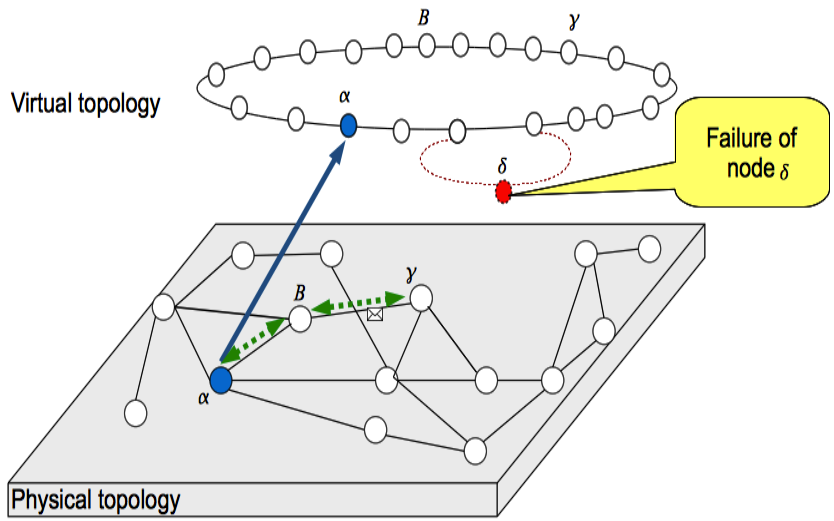

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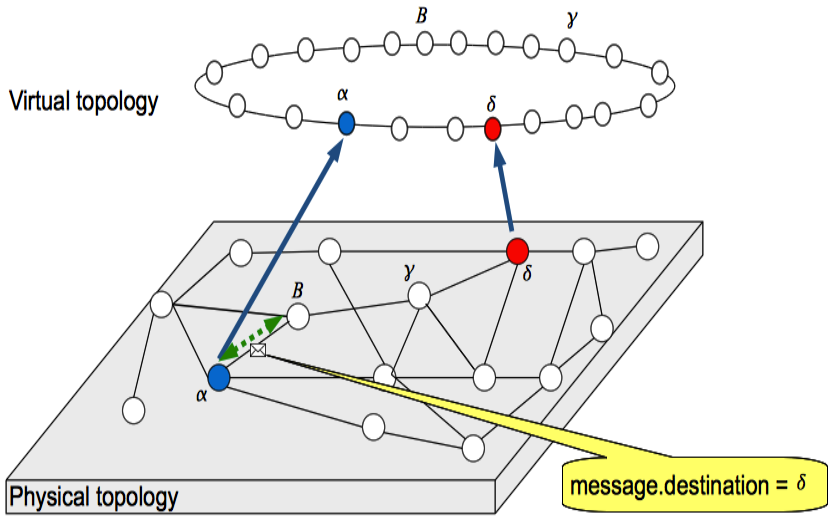

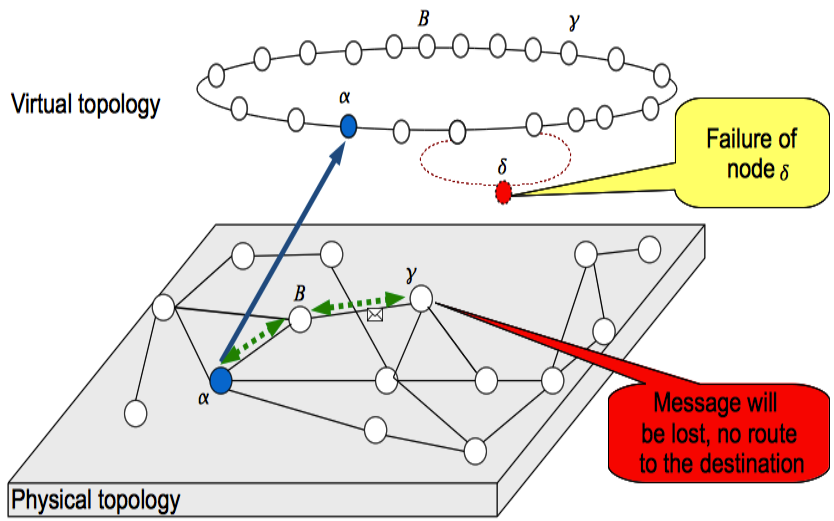

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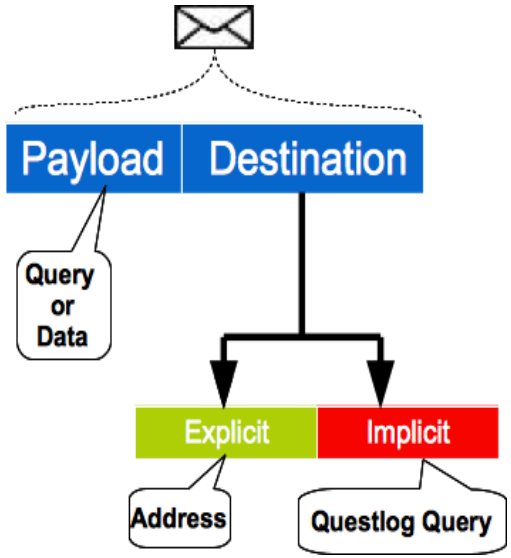
- A framework that allows:

  - messages as mobile agents with **explicit/implicit** destinations

- A rule-based language **Questlog**

  - implicit destination is specified by a **Questlog** query



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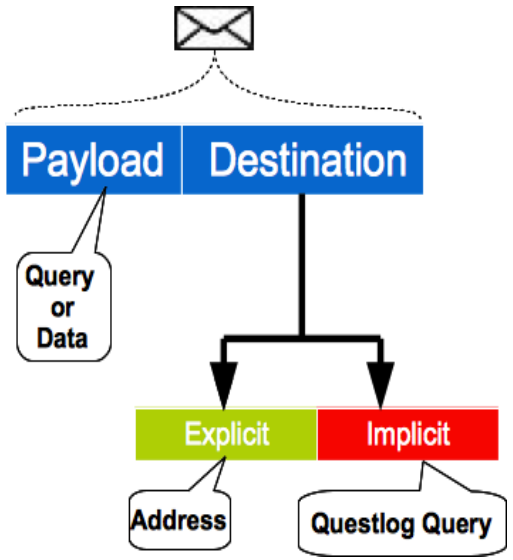

→ Messages are solved while traveling in the network

Outline

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Questlog query

- Query in Questlog
  - Based on relational data model
  - Predicate prepended by: ?
  - $?R(x_1, ..., x_\ell)$
    - R is a relation symbol
    - $x_1, \cdots, x_\ell$ are variables or constants

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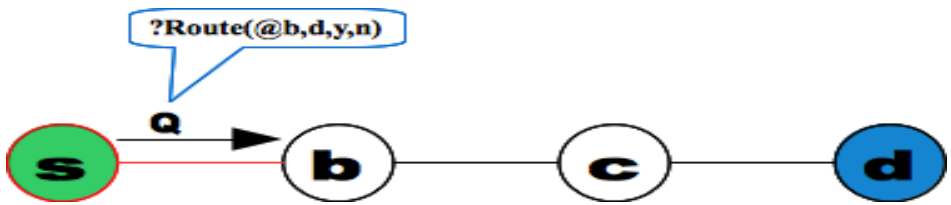

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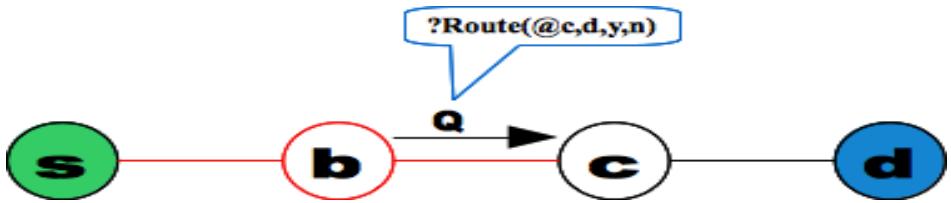

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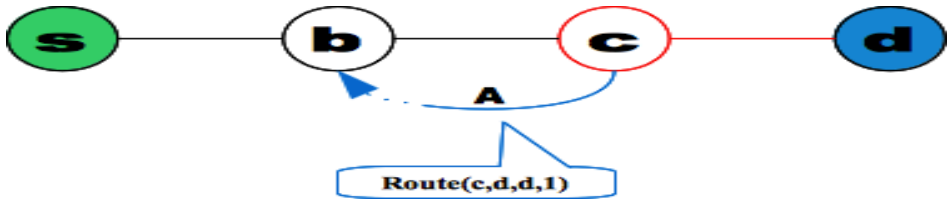

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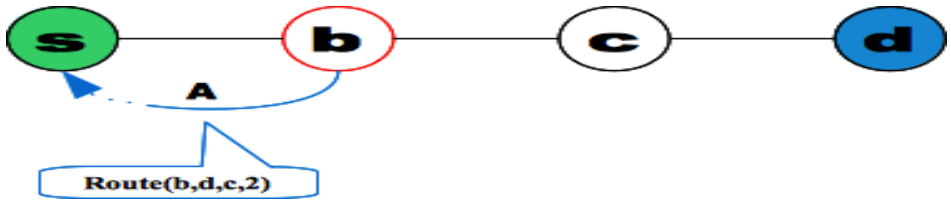

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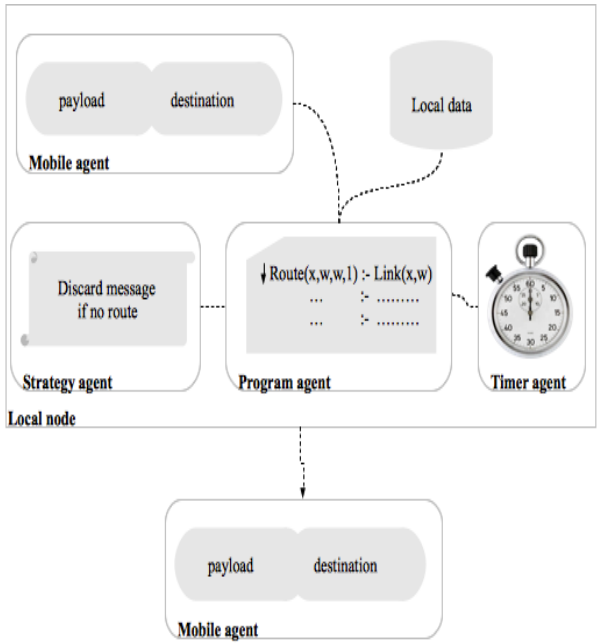
$$\begin{aligned} \uparrow WarnPos(v, x, y) :- & \; Pos(v, x, y), Tmp(v, t), t > T, \\ & \forall w \; Link(v, w), ?HighTmp(@w). \\ \uparrow HighTmp(v) :- & \; Tmp(v, t), t > T. \end{aligned}$$

Outline

Questlog programs

- The Questlog programs are agents
  - installed on each node
  - run concurrently
  - interact to solve tasks
- The computation is distributed
  - nodes exchange asynchronously messages of the form:



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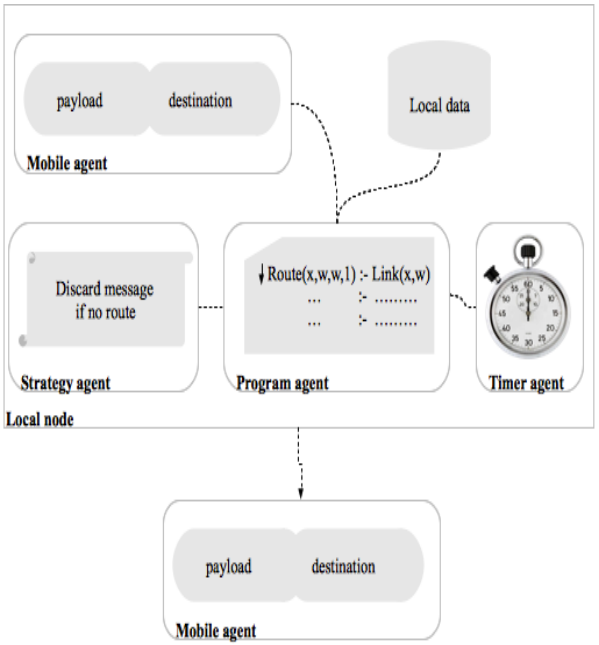
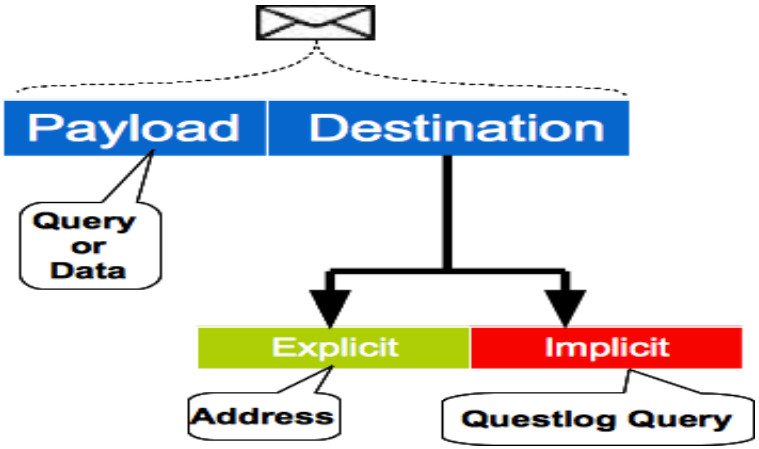
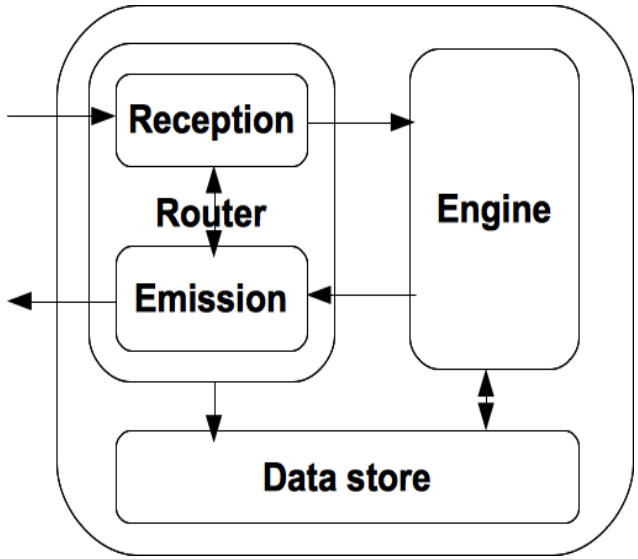




Execution

Each node is equipped with an embedded machine:

- **router**: to handle the communication with the network
- **engine**: to evaluate the Questlog queries
- **local datastore**: to manage the information (data and programs) local to the node



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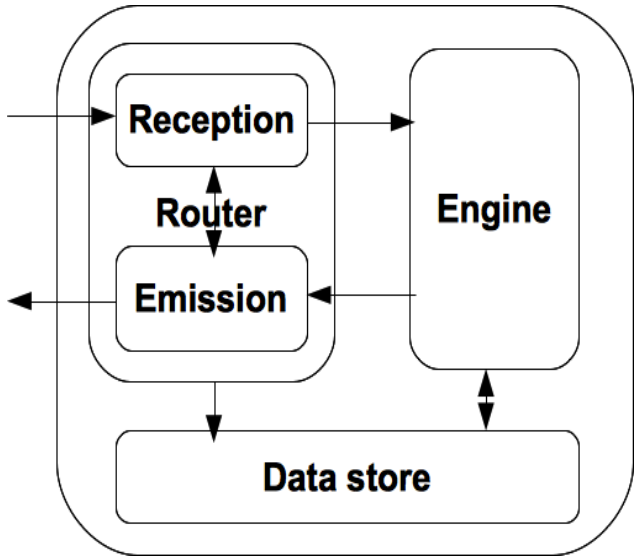

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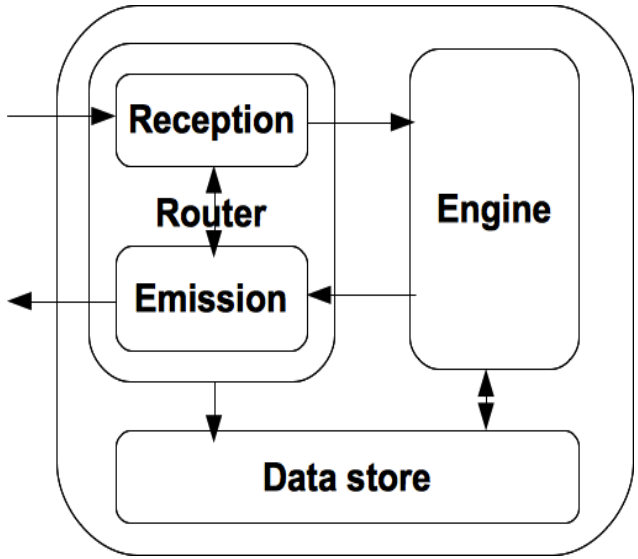

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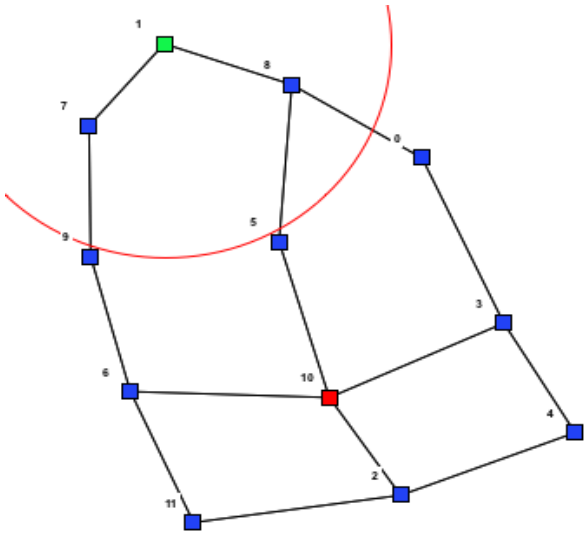
→ Extend it with an API to send Questlog queries at run time

Simulation results



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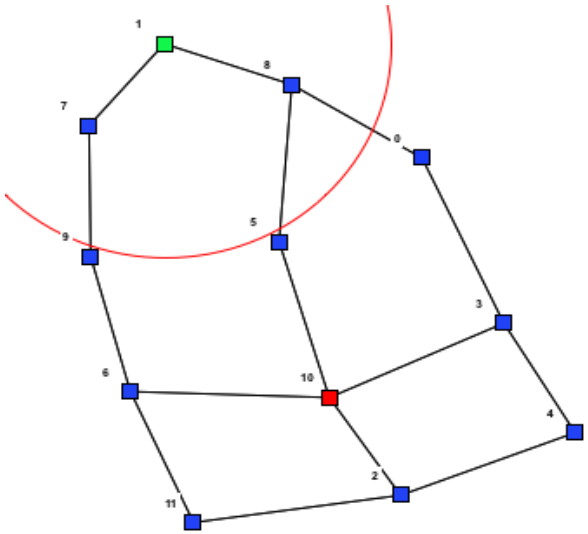

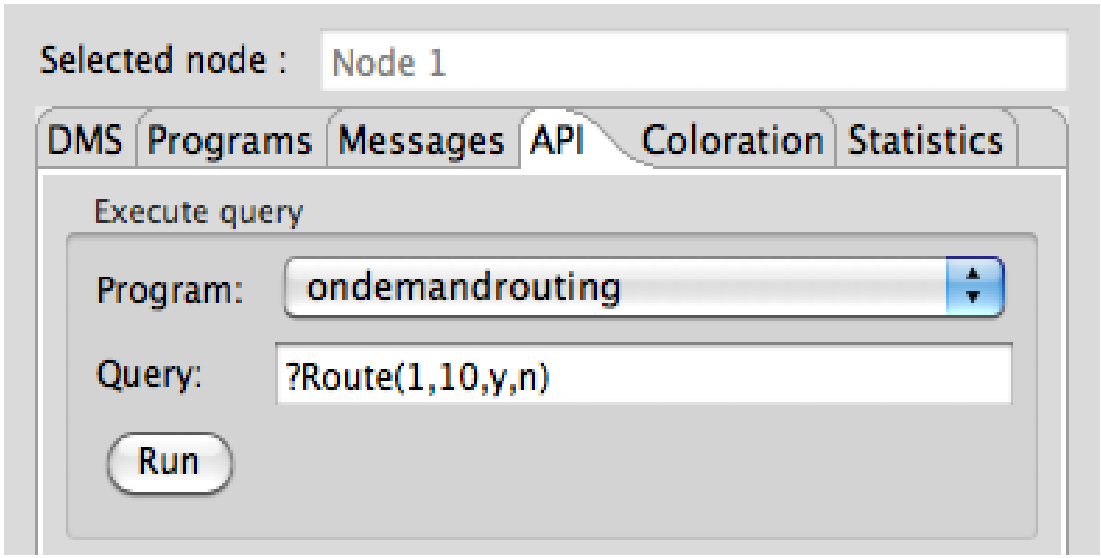

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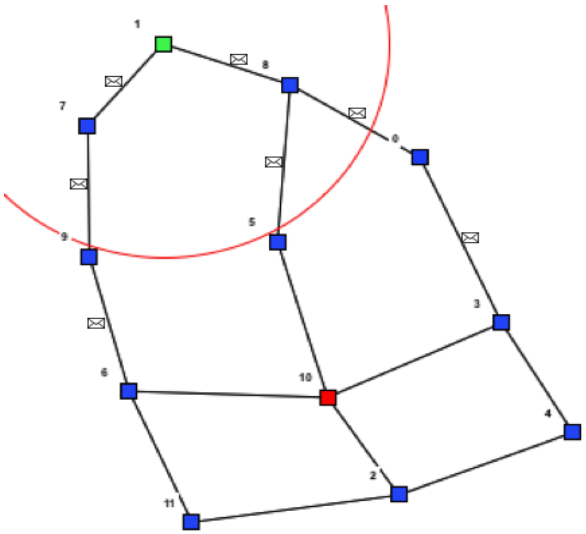

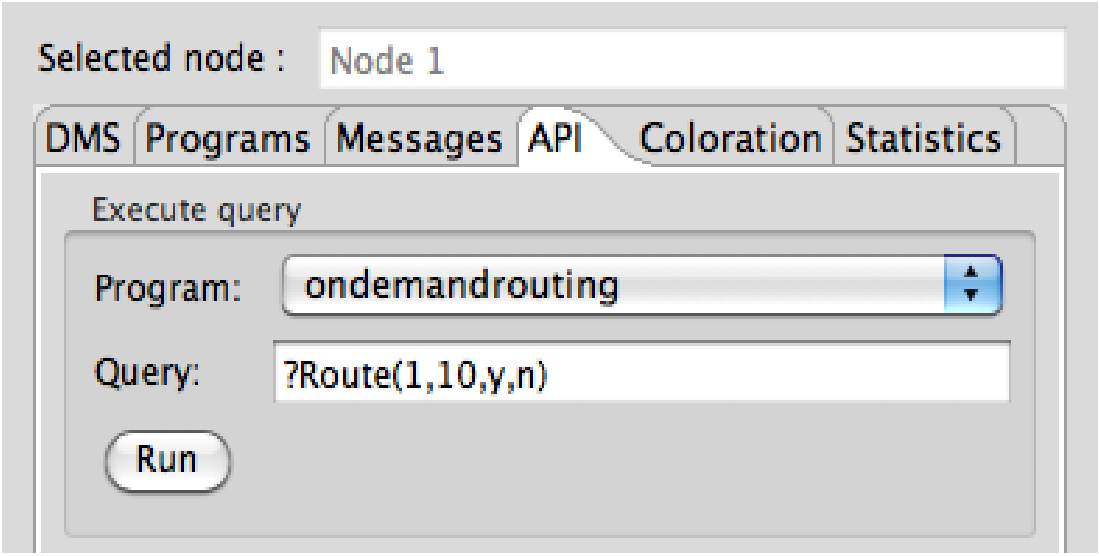

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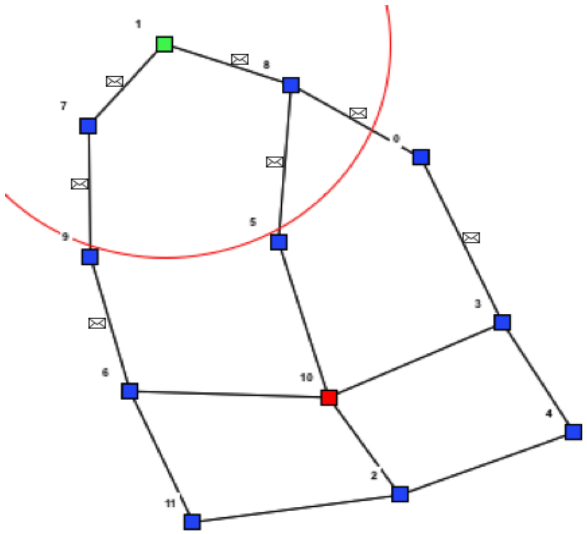

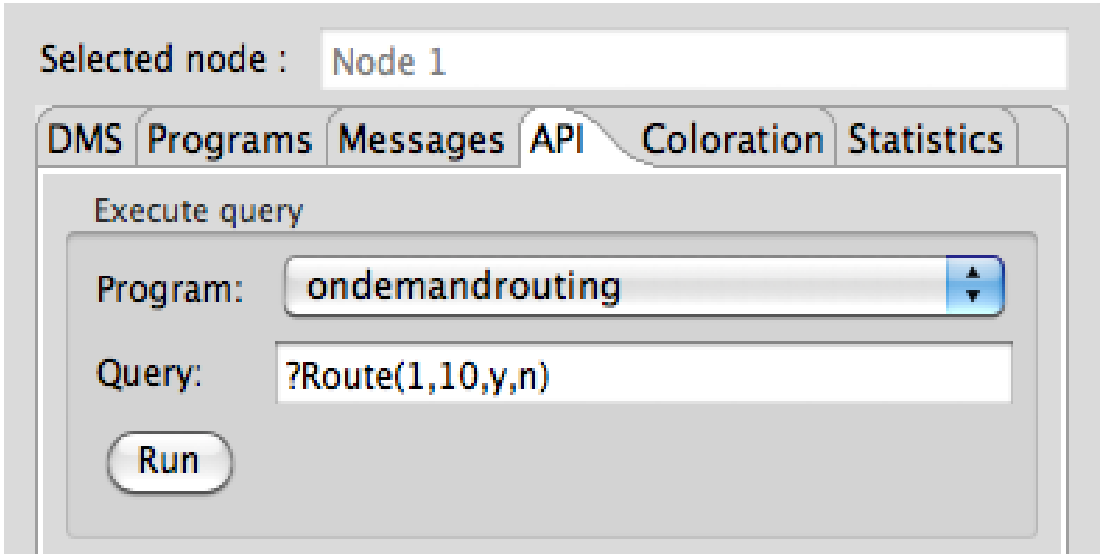

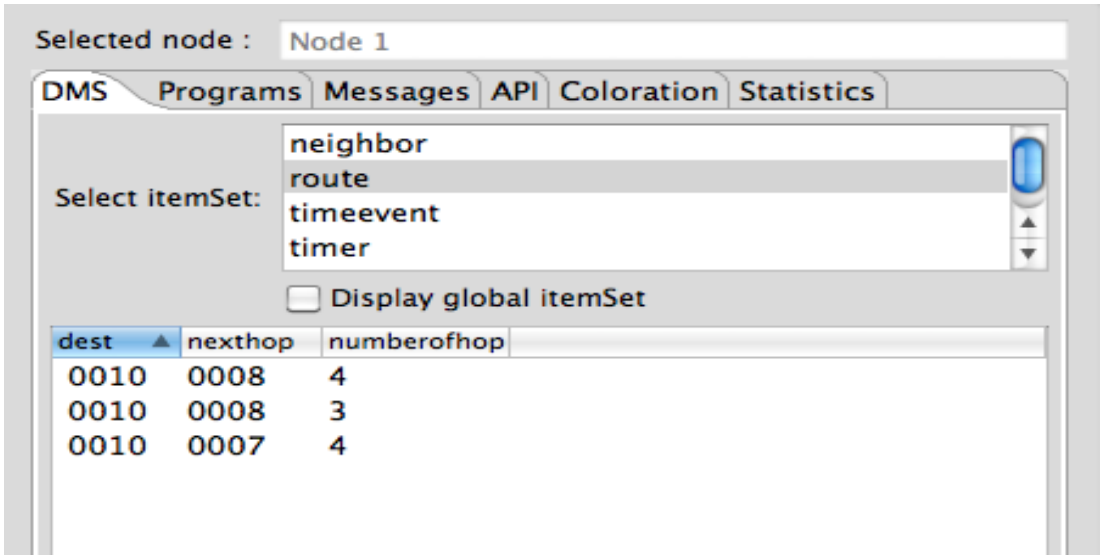

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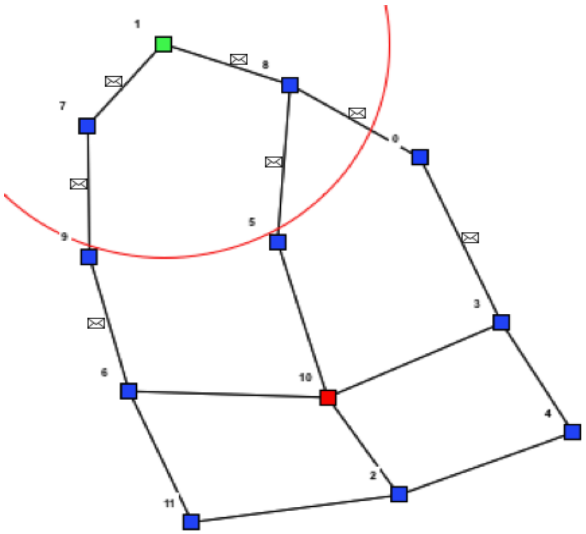

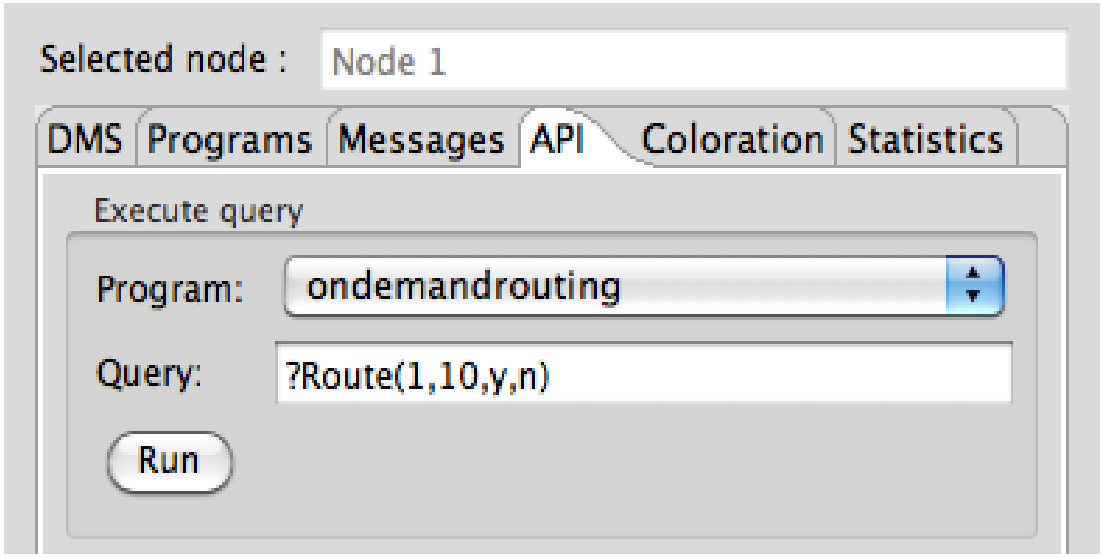

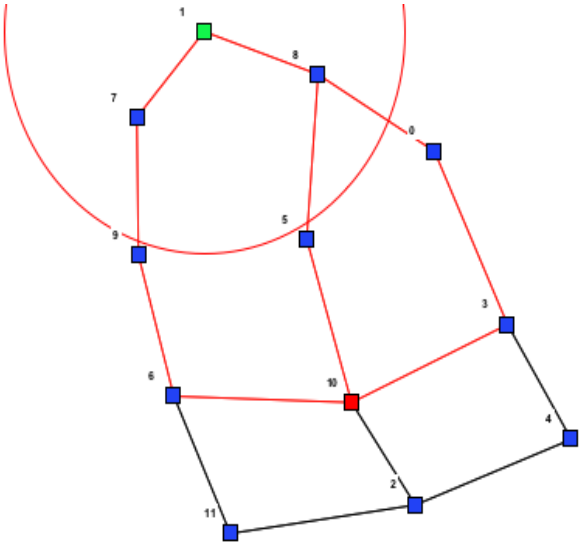

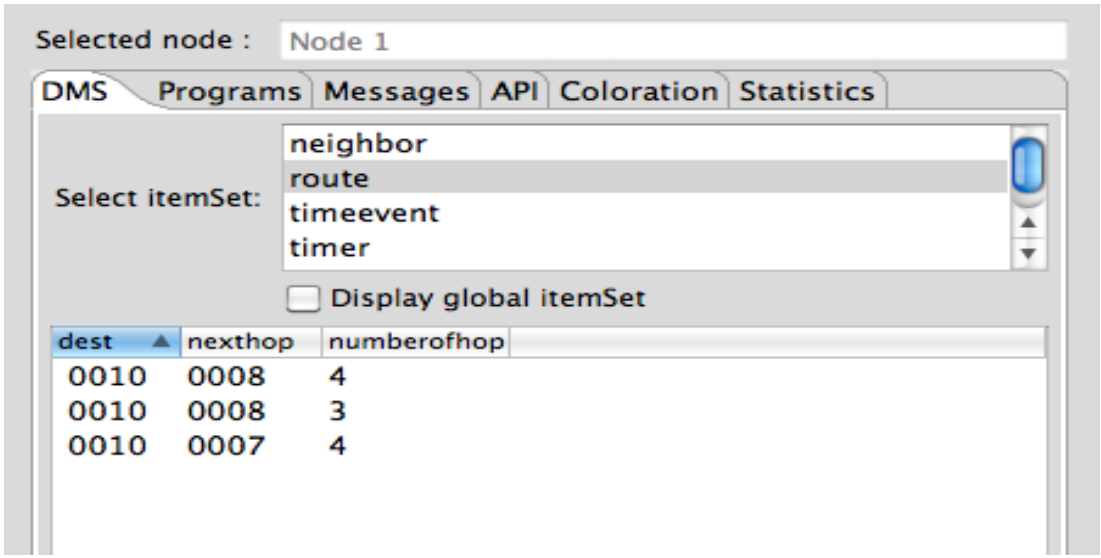

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Future work

- address social network applications using this framework