

# Using Event Notification Servers to Support Awareness

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# Awareness and Collaboration

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- **In general, awareness means having information about other activities that affects a person's own work [DB92].**
- **Some types of awareness**
  - **Group awareness**
    - Who is around and what roughly are they doing?
    - e.g., images relayed in Portholes
  - **Project awareness**
    - What knowledge affects (e.g., decisions are made about) project content?
    - e.g., subscriptions in Knowledge Depot
  - **Application awareness**
    - What's going on in running software?
    - E.g., architectural gauge

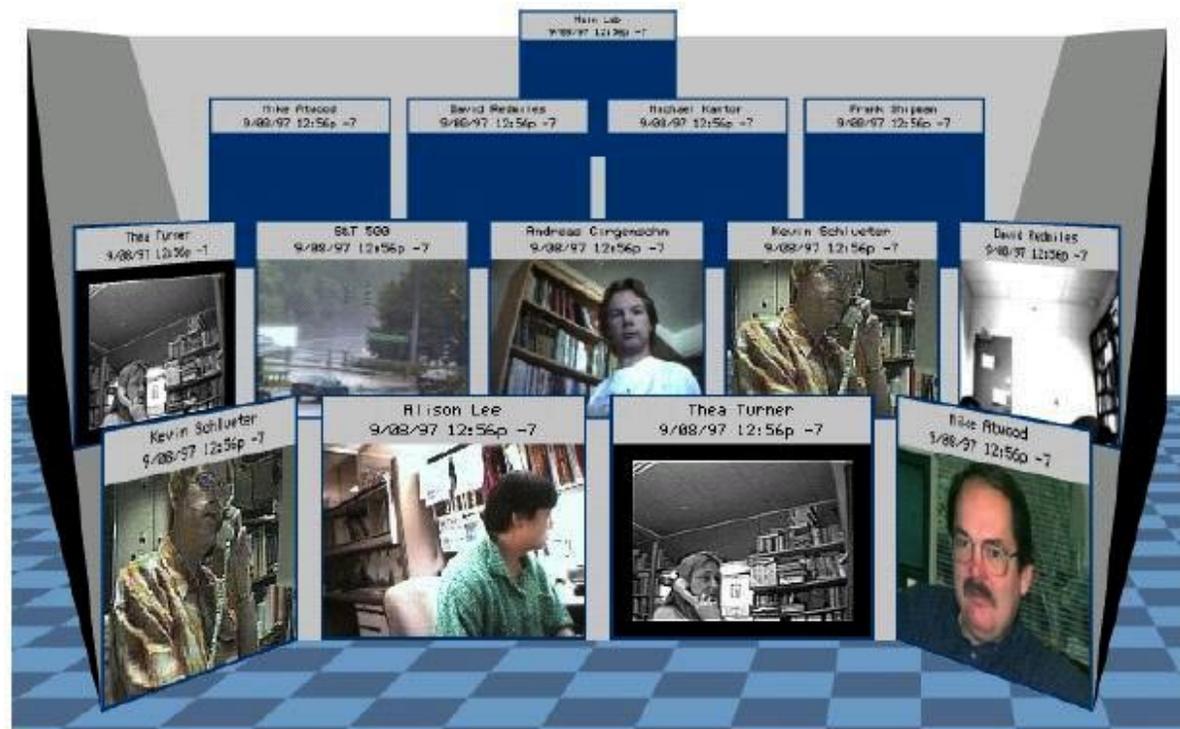
# Example: Group Awareness through a Portholes System[GLT99]

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- Shows presence of collaborators and relevant spaces
- Uses visual cues (such as this theater style) to condense view according to relevance.

Girgensohn / Lee / Turner 99

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# Explainer [Red93]

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- Early Hypermedia for human learning by example
- Extreme hyper-granularity
- Incremental [Minimal] Explanation
- Human Variability Reduced

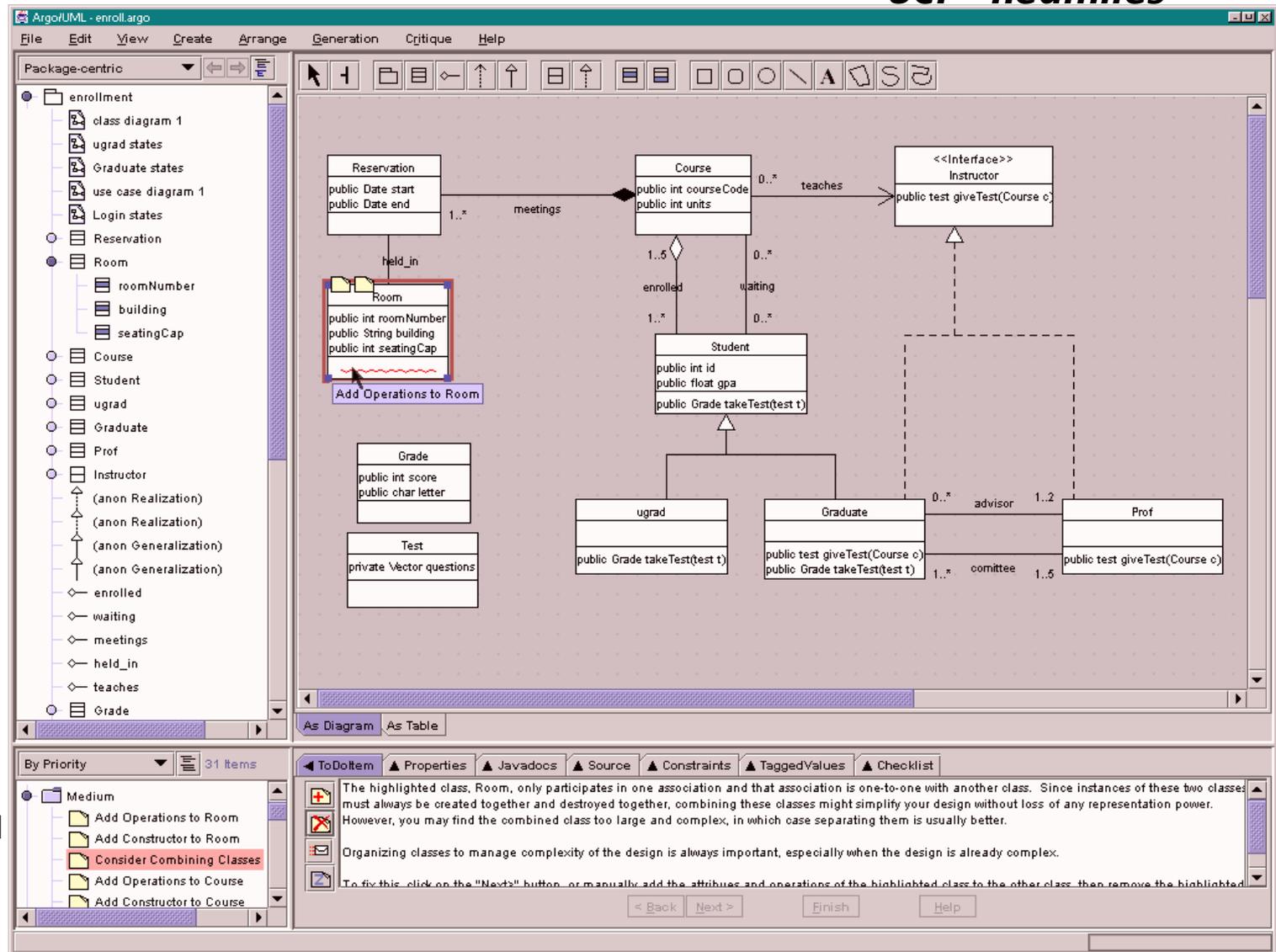
The screenshot shows the Explainer software interface with four main panels:

- Code:** Contains Lisp code for plotting a circle and drawing a string. Some lines are highlighted in black, such as `(setq x (* (+ radius 5) (cos (- theta pi/2))))` and `(graphics:draw-string label`.
- Diagram:** A hierarchical tree diagram showing relationships between concepts like 'plot stories', 'coordinate space', 'circle', 'labels stories', 'x ticks', 'number labels', 'position story', and 'number'. Some nodes are highlighted in black.
- Example Output:** A circular plot with several points marked on its circumference. The points are labeled with numbers: 98, 99, 0, 1, 2. The origin is labeled '0 = 0'.
- Explanation Dialog:** Contains text explaining the plot as a visualization of addition modulo 100. It includes three perspectives:
  - Story - (Tell-Story) - Cyclic-Operations Perspective:** This plot is a good way to visualize operations in a cyclic group. ... (more)
  - Position - (Tell-Story) - Program-Features Perspective:** The coordinates for labeling are thought about in terms of radians. Values in radians are converted to rectangular coordinates for the plotting functions. The conversions and computations use the constants  $2\pi$  ( 360 degrees ), and  $\pi/2$  ( 90 degrees ).  $\pi$  ( 180 degrees ) is a system constant. ... (less)
  - Position - (Tell-How) - Lisp Concept Perspective:** The position consists of a value assignment. The value assignment consists of a special form name, a variable name, a function call, a variable name, and a function call. ... (less)
- TypeIn Commands:** A list of commands including 'Command: Stop Recording', 'Command:', and 'Command:'.

# Argo/UML [RHR98] [RR00]

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While designers work, design critics analyze the design and provide helpful advice. The “to do” list (lower left) presents and organizes advice about pending design changes.



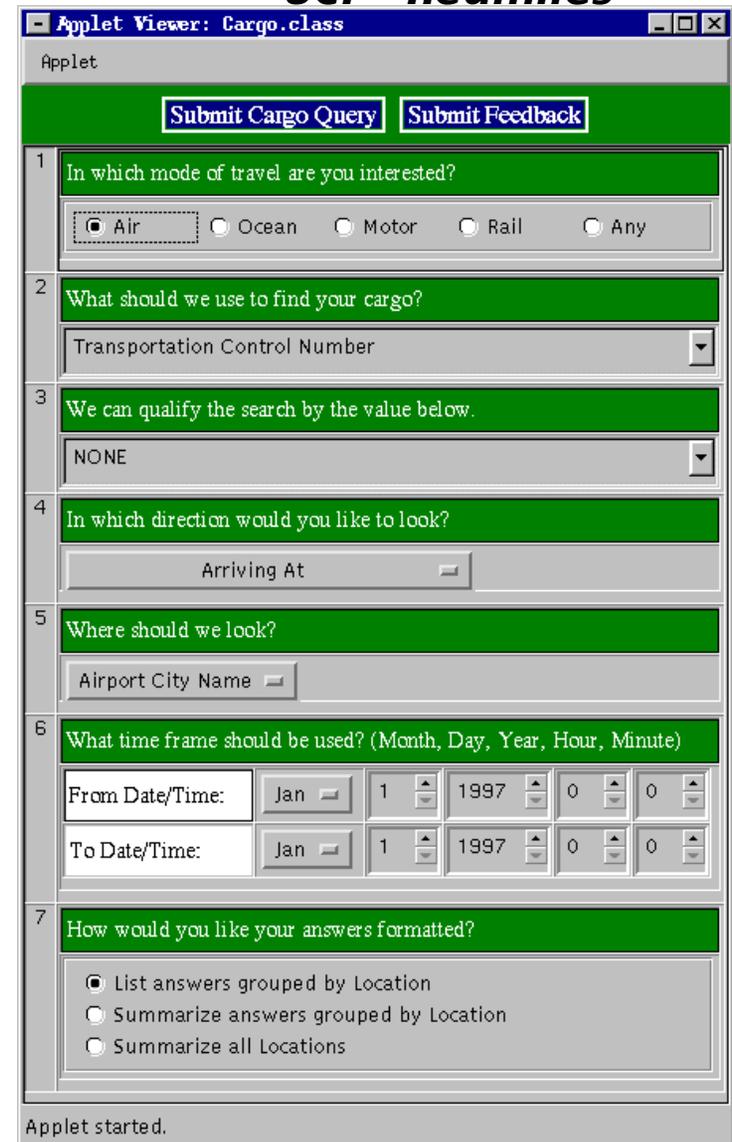
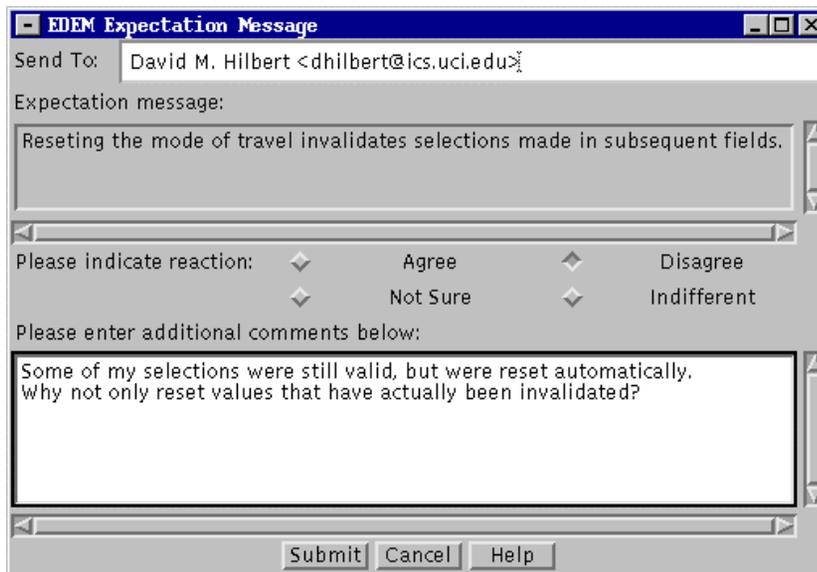
# EDEM - Expectation-Driven Event Monitoring [HR98]

UCI - Redmiles

Agents monitor application events



And optionally facilitate feedback.



# Knowledge Depot [KRZ97]

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Kantor, Redmiles, Zimmermann 97  
— UCI - Redmiles —

The screenshot displays the Knowledge Depot [KRZ97] interface with several windows and their descriptions:

- eden Category Browser:** A hierarchical list of topics. The selected topic is "Quarterly Report, QR, Report Meeting, Agenda".
- Edit Subscriptions:** A dialog box for managing subscriptions. It shows the email address "mkantor@ics.uci.edu" and a frequency of "7" days.
- Topic Browser:** A window for browsing through a hierarchical list of topics to find information. Messages can be cross-referenced by multiple topics.
- View Message:** A window displaying a message with the subject "4th EDCS Quarterly Report and Annual Report" and the date "Tue Dec 30 12:54:29 PST 1997". The message content includes: "Hi Everyone. It's that time again. I'd like to get an early start on the next quarterly report as I will also need to get out an annual report in the same time frame. Please provide the following information ASAP. Please be as complete as possible and submit your information in the format listed below. Also, try to write up each section in a form that can be included in the report without significant..."
- eden Archive Messages List:** A list of messages with columns for date, sender, and subject. The selected message is from "kari@etoile.ics" dated "2/30/97" with the subject "4th EDCS Quarterly Report and Annual Report up through Jan 1, 1998!".
- Message List:** A description of the message list window: "Selecting a topic from the topic browser opens a list of messages related to the topic. Some messages have additional comments added to them to help identify them in a list of messages."

# Gauges for Application Awareness [SBR02]

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The screenshot displays the Netscape CASS Monitor application window. The title bar reads "Netscape: CASS Monitor". The address bar shows the URL "http://kdepot.ics.uci.edu/users/kdepot/SOS/viewer\_BIG.html". The interface includes a menu bar (File, Edit, View, Go, Communicator, Help) and a toolbar with buttons for "Subscriptions", "ResetTime", "Run/stop simulator", "Step", "Top", and "Up".

The main content area is titled "Legacy STEP: 7.5" and is divided into three primary sections:

- Legacy Units:** Contains sub-sections for CAU1, CAU2, BMU1, BMU2, MMU1, MMU2, and MMU3. AOCPCAU1 and AOCPCAU2 are also listed.
- OSU Area:** Contains sub-sections for AMC1, AMC2, SDS1, SDS2, STC1, and STC2. Each sub-section lists various components like SMAMC, DSAMC, STC, and RDMX.
- RDMX Area:** Contains sub-sections for RDMX1 and RDMX2, listing components like MHRDMX, SHRDMX, MTT3RDMX, AGRDMX, MAPRDMX, SCSIRDMX, DSRDMX, and MAINRDMX.

At the bottom of the window, a message log table is visible:

Source	Destination	Message
MAINRDMX1	TMRRDMX1	MAINRDMX1 Timer Event Ack

The status bar at the bottom shows the URL "66:Request: Operation=Poll&Interface=Simulator%20Full&Username=testuser".

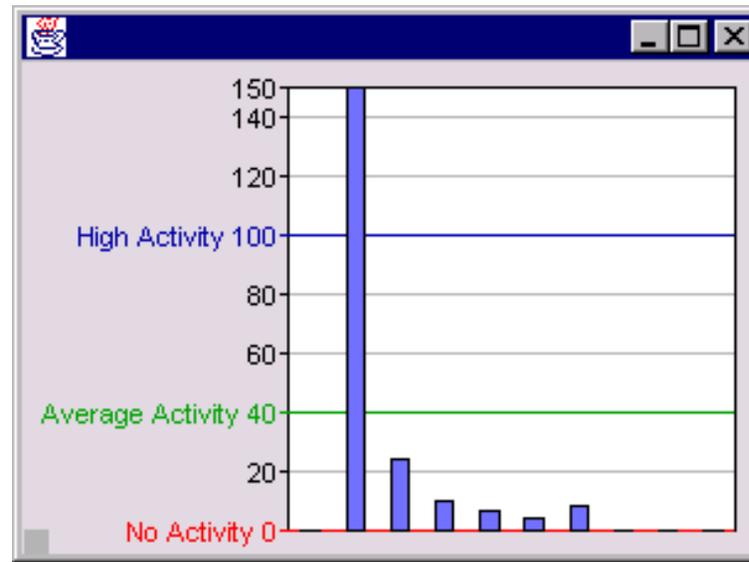
## Architectural Message Passing Monitor

# Some More Gauges [SBR02]

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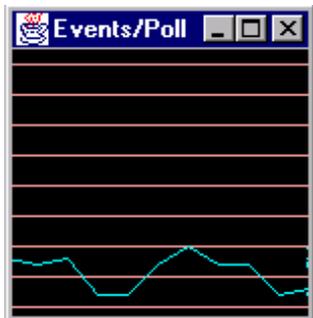
a) Progress Bar



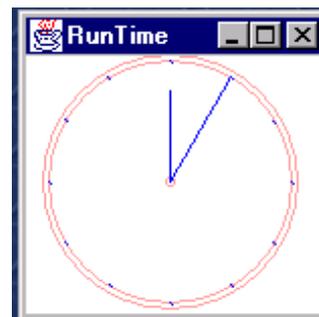
b) Bar Chart



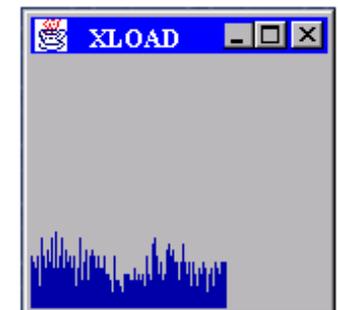
f) Signal



c) Line Graph



d) Clock



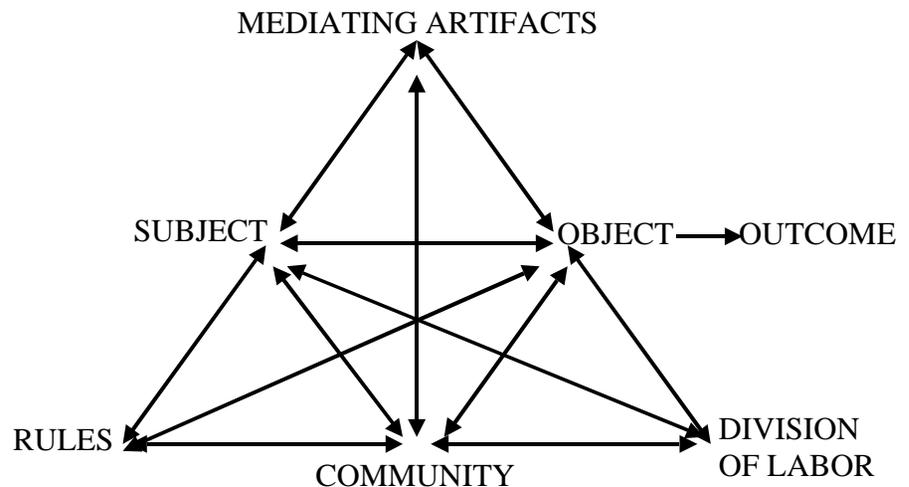
e) Load

# Activity Theory and Design [Red02a]

## [CSR02]

UCI - Redmiles

- Identify the stakeholders in the process.
- Help ensure that technology is designed to the users, other stakeholders, and the organization.
- Work toward alignment between users' rewards and business' needs.
- Work toward alignment between the rewards of the designers of the device and both the end users' and business' needs.



Engeström [Eng90] Activity System Model

# Theme – Awareness Information

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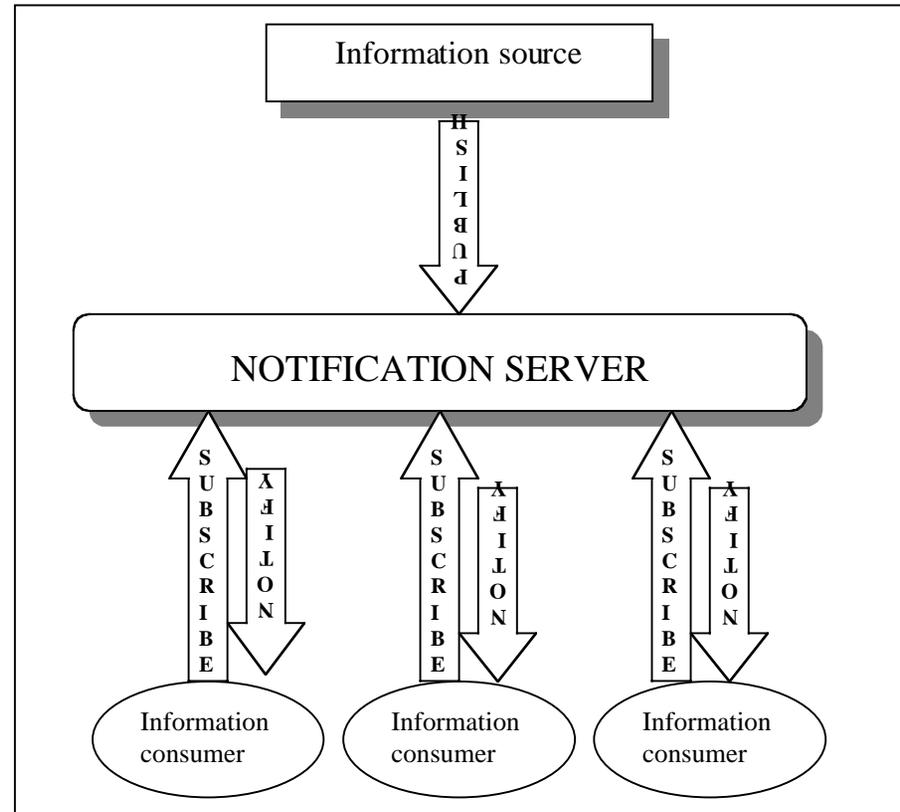
*UCI – Redmiles*

- **Argo/UML**
  - Critics notify end users of design problems
- **EDEM**
  - Agents monitor application usage and report data to designers
- **Knowledge Depot**
  - End users subscribe to email categories / topics
- **Gauges**
  - “Probes” (instrumentation) should collect specific information about distributed applications’ behavior and performance and supply this information to narrow-purposed “Gauges” (visualizations)
- **Activity Theory**
  - Many people and things affect the achievement of an objective.

# Event Notification Service

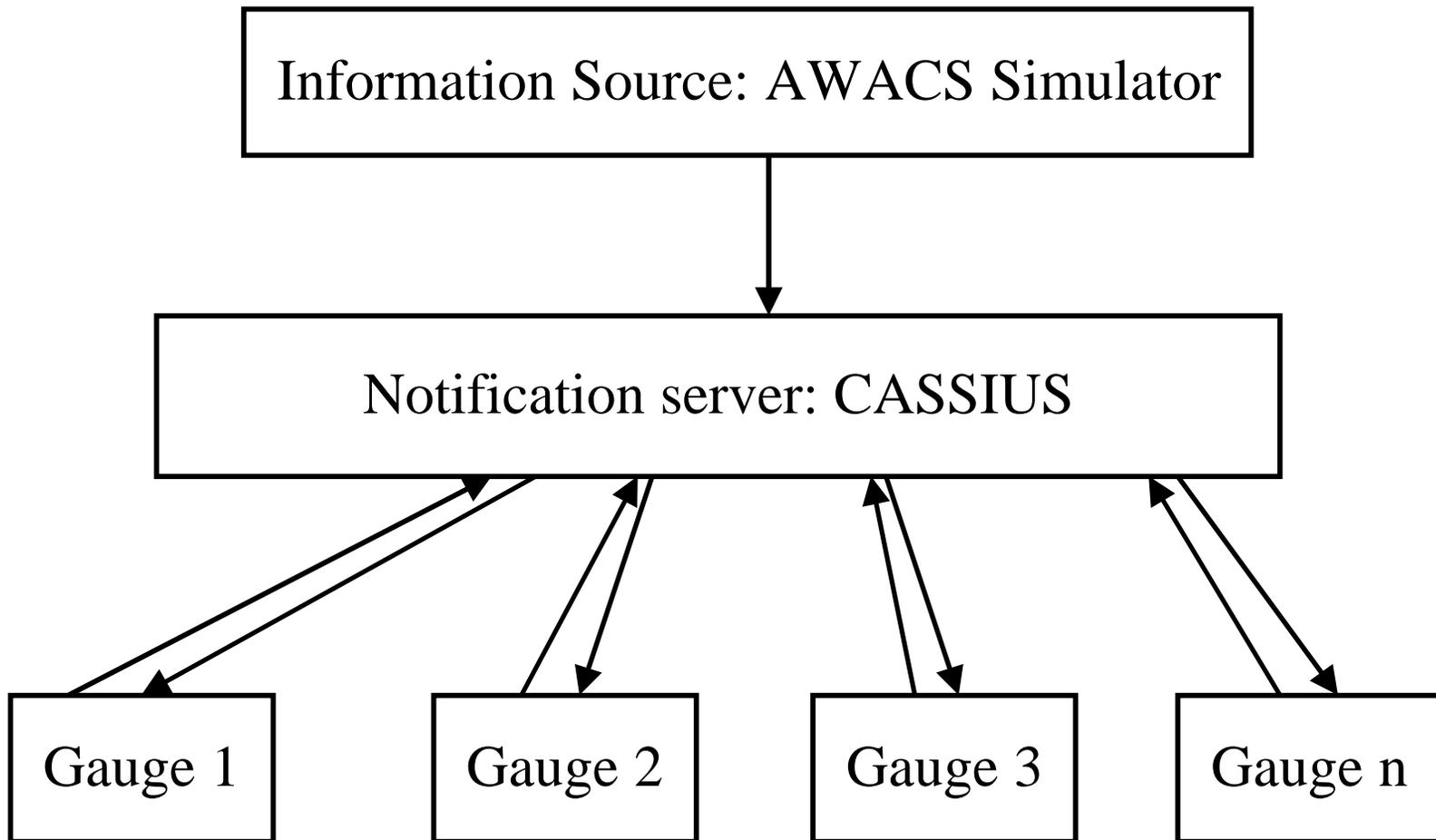
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- Information Sources
- Information Consumers (Gauges)
- Event Notification Servers
- Event Services
  - Publish (Post)
  - Notify (Receive)
  - Subscribe



# Using the CASS Strategy

UCI - Redmiles



# Information Sources

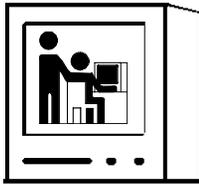
## Physical Environments

(Portholes, Active Badges)



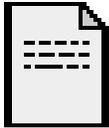
## Virtual Environments

(MUDs, chat rooms)



## Shared Artifacts

(Papers, spreadsheets, databases)



## Mobile Workers

(Customer Rep, Support Staff)



# Awareness Tools

## Complex tools: Portholes



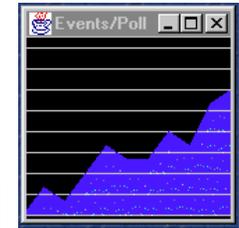
Writer

Developer

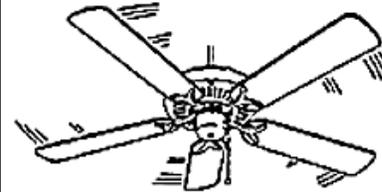
Document

Printer

## Simple desktop widgets



## Ambient Fixtures [ishii]



## Mobile Awareness



Notification Server

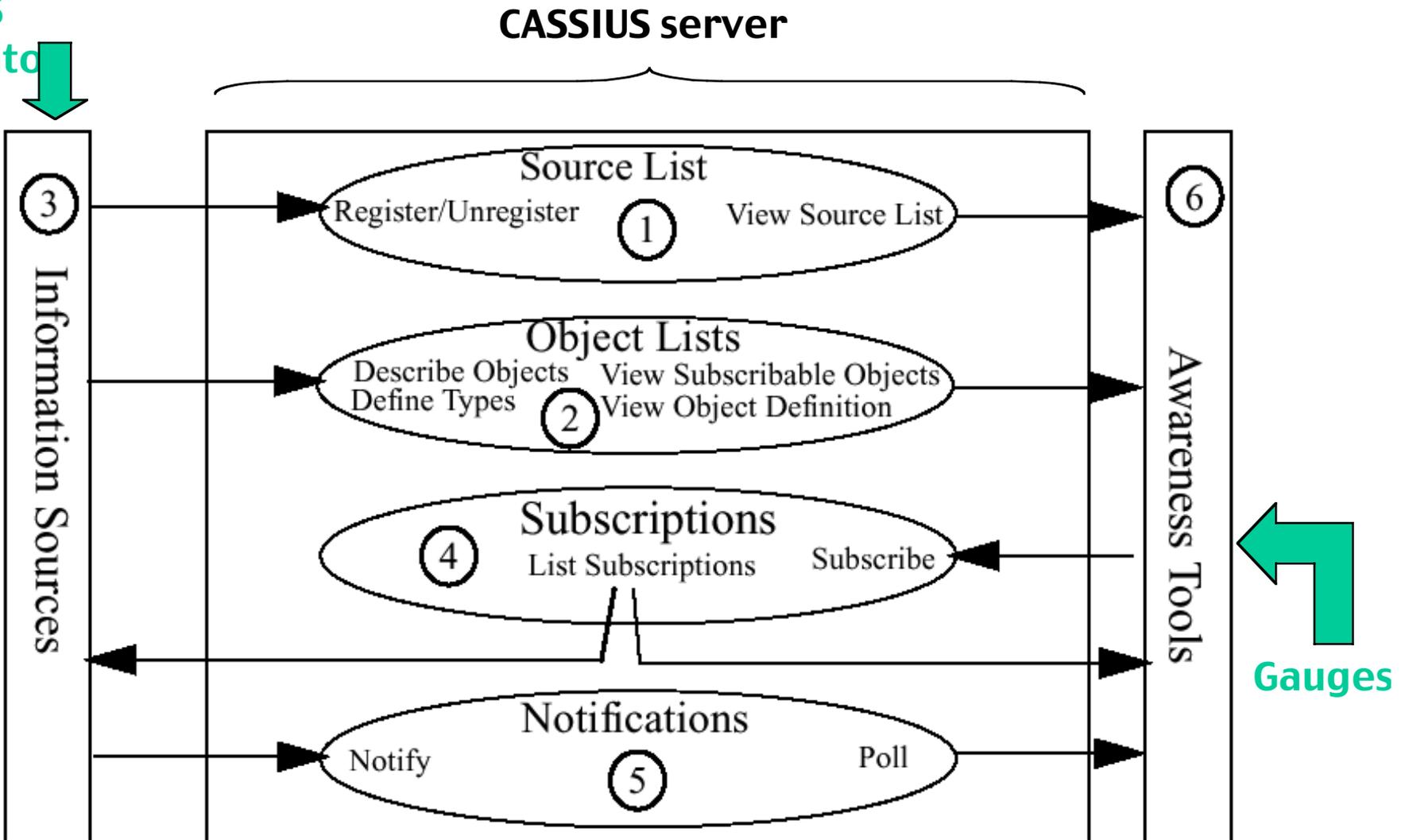
# CASSIUS [INPUT]

## Interchangeability and the Detail-Variety

### Tradeoff

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AWACS  
Simulator



**How easy is it to  
provide integrated  
awareness?**

# Issues

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- **How gauges are notified about the events or The Issue of Push vs. Pull Architectures between the notification server and the gauges?**
- **How powerful is the subscription service for each notification server? What are the types of matching supported?**
- **Which objects can send events to the notification server, or Issues about event and object registration?**
- **Which meta-information is associated to the events sent to the notification server or How powerful are the events?**
- **What are the interfaces implemented by the notification servers, or how easy to change from a notification server to another?**

# Conclusions

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- **The available software (e.g., notification servers) for building systems incorporating awareness information is very low-level and prone to design and programming errors.**
- **Support for complex, heterogeneous systems (e.g., multiple different, servers, information sources, and consumers) varies, currently designers must expend extra effort to design for change and flexibility.**
- **The goal is usability—we seek to provide a set of usable and useful services and strategy to provide usable and useful awareness capabilities for applications.**

# In other words ...

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- **A greater variety of awareness *devices* ...**

- Critics
- Usability expectations
- Email notifications
- Application gauges
- *Security and privacy gauges?*
- *Portholes?*

**... integrated through an event notification infrastructure**

# References

# References

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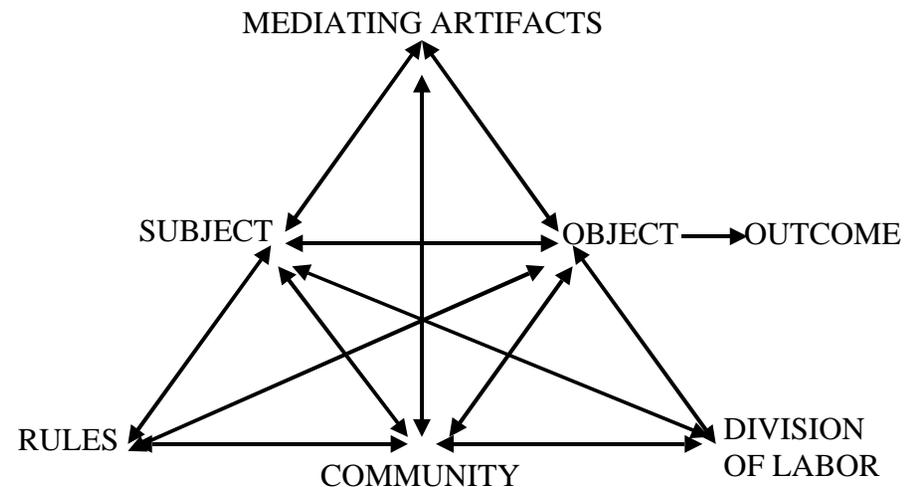
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# **Extra Slides**

# Ethnography + SE: Activity Theory

UCI – Redmiles

- **Subjects are people within a community that work with objects to obtain an outcome.**
- **Rules determine the behavior of subjects and their interaction with objects.**
- **Division of labor determines who performs what actions.**
- **Mediating artifacts help subjects manipulate objects and obtain outcomes.**
- **Mediating artifacts have a history with respect to a community.**



Engeström Activity System Model