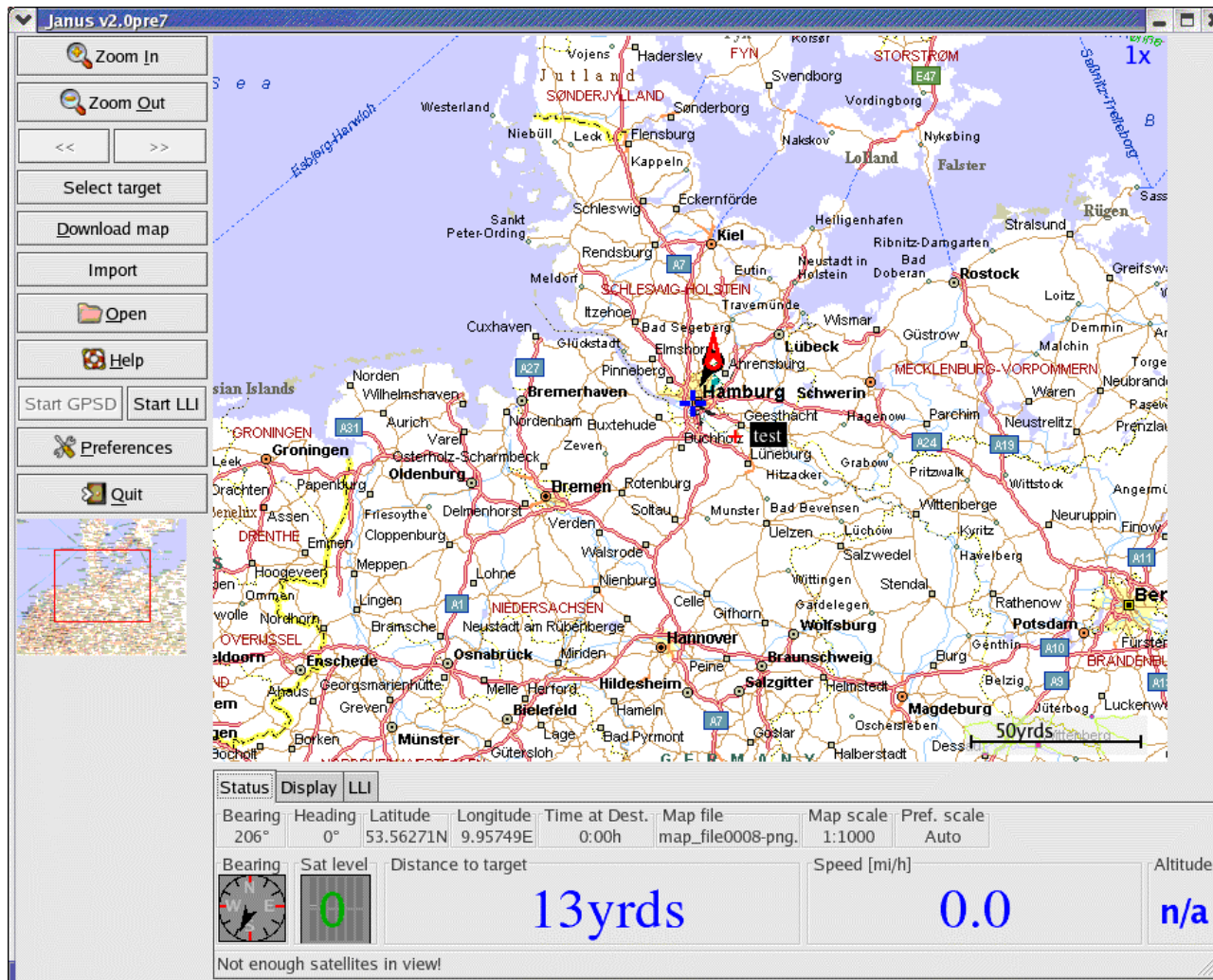


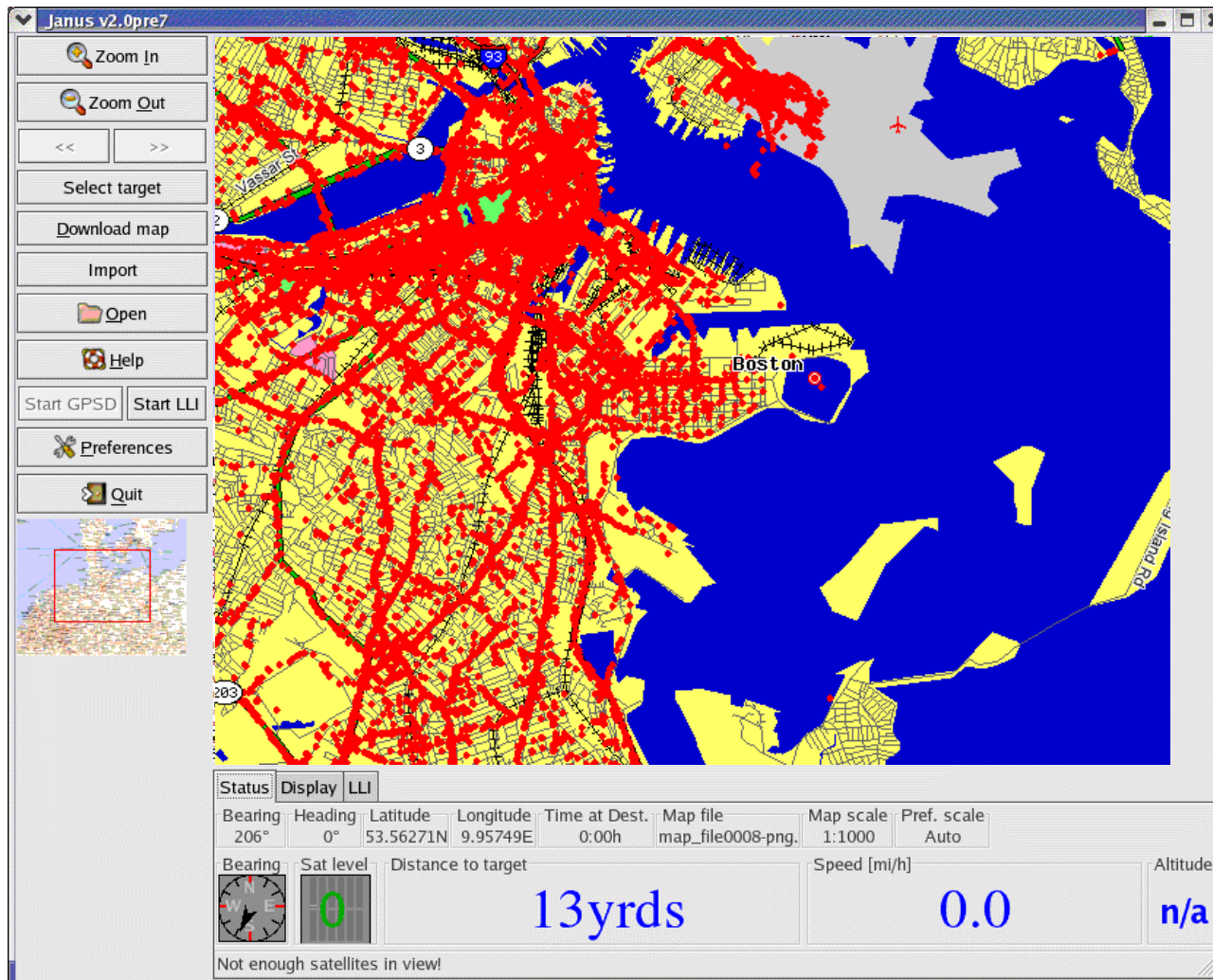
Matt Mankins.

Location Linked
Information.

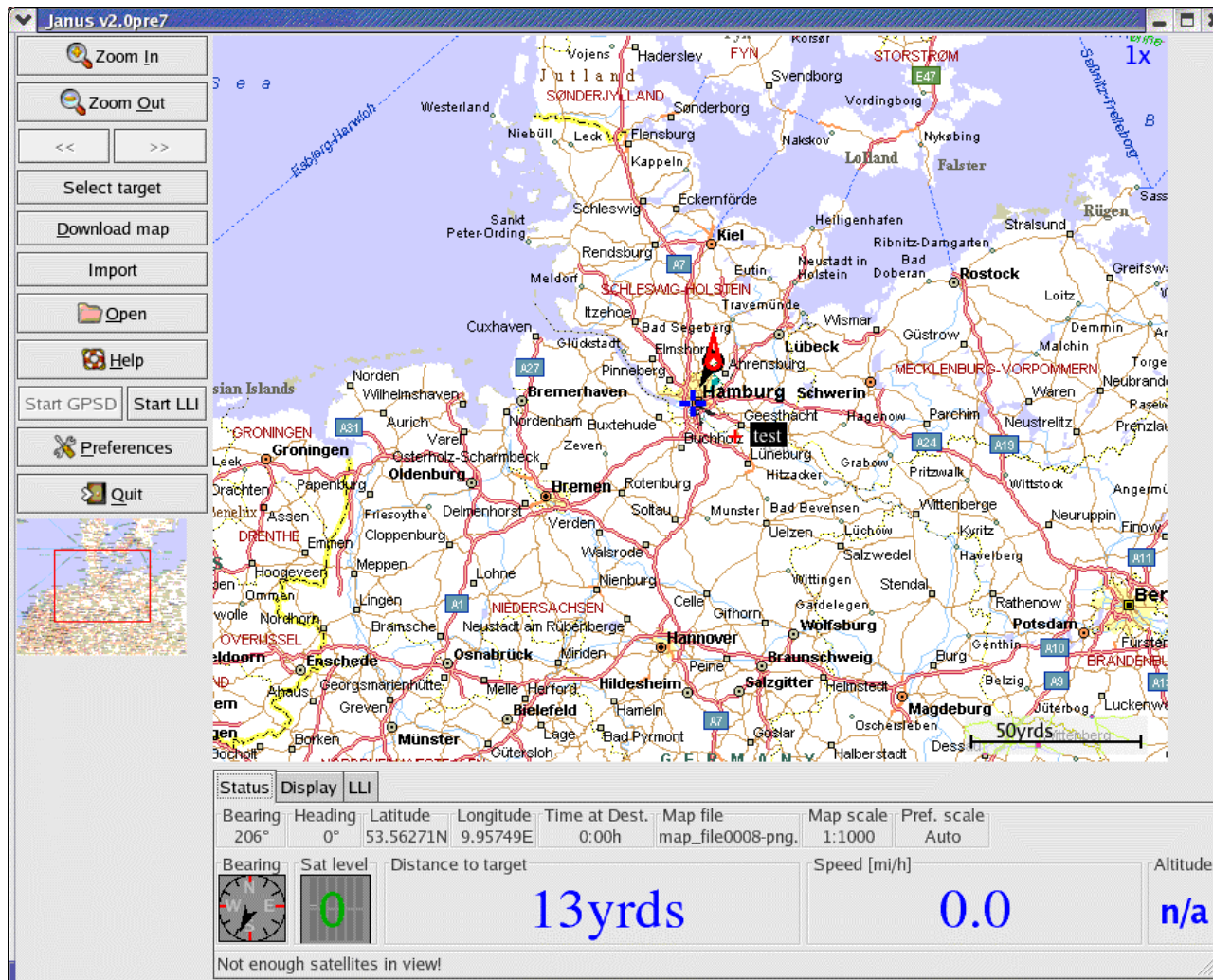
mankins@media.mit.edu - May 2003



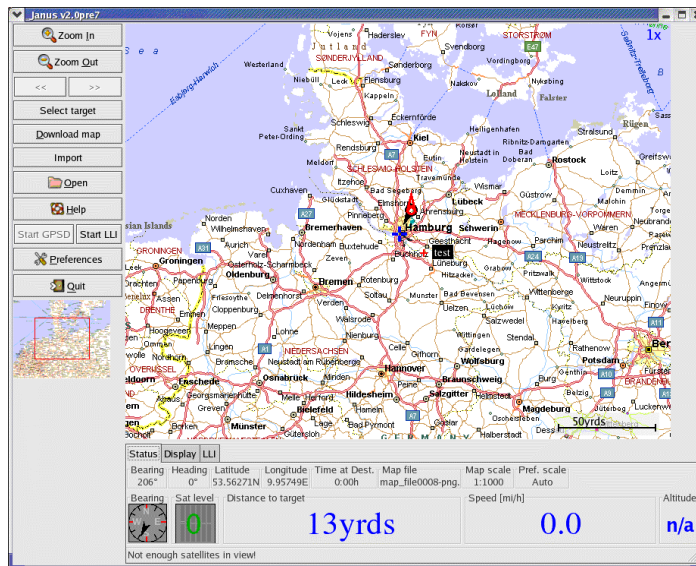
The Location Linked Information Viewer, aka Janus, in Traditional, "Top-down mode".



The Location Linked Information Viewer, aka Janus, in the new "bottom up map" mode.

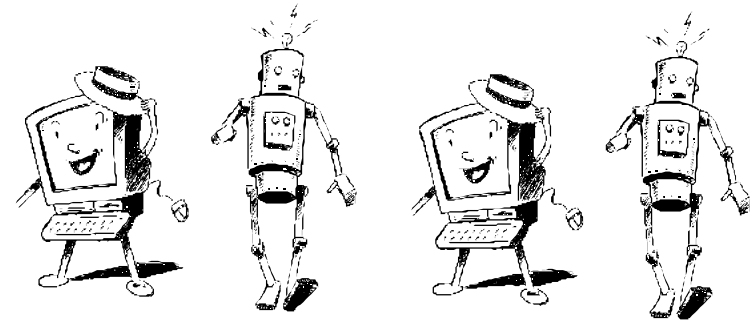


People use a digital map to discover/leave information about their surroundings. This device is called "Janus".



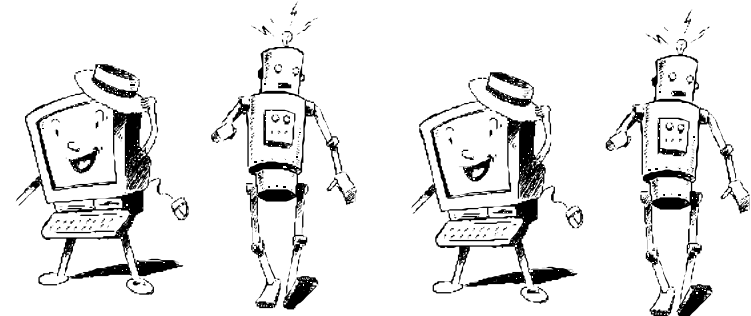
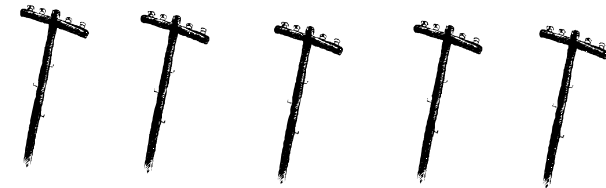
Virtual World <=> Physical World

People use a digital map to discover/leave information about their surroundings. This device is called "Janus".

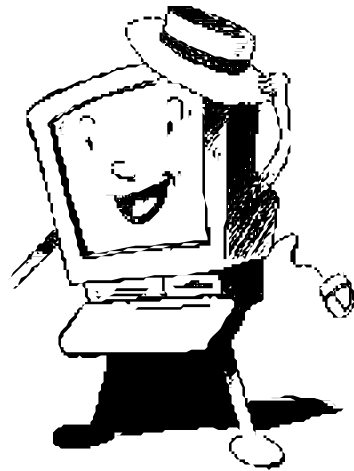




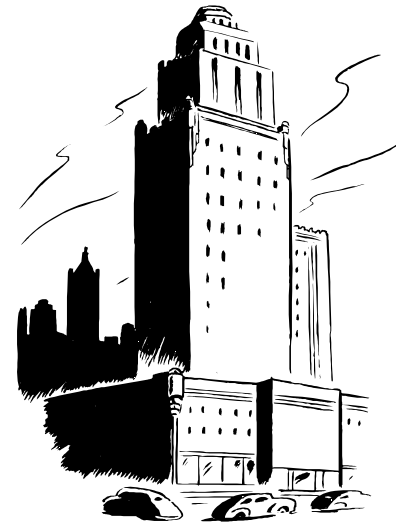
I'm interested in
digitally
influenced **urban**
interactions. =>



I wonder: how do we bring the benefits of the “Net Effect” to the urban experience?



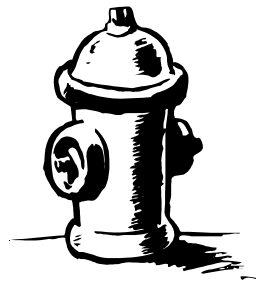
+



a la

Urban Annotations

MM: TAKE ELM STREET TO
AVOID THE SLOW TRAFFIC LIGHT
ON WINDSOR...



EP: THANK YOU
VERY MUCH FOR
VISITING MY GRAVE.



HOW?

MM: TAKE ELM STREET TO
AVOID THE SLOW TRAFFIC LIGHT
ON WINDSOR...



EP: THANK YOU
VERY MUCH FOR
VISITING MY GRAVE.

We have the technology.

- * Global Positioning
- * Ubiquitous Internet
- * Portable Computation

We have the

technology.

Where's the

Interface?

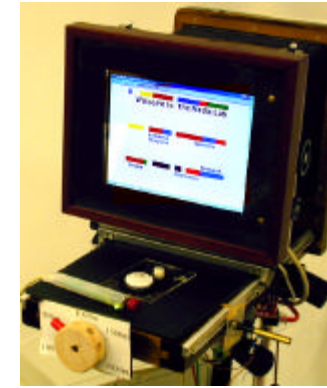
* Global Positioning

* Ubiquitous Internet

* Portable Computation

Some **past work**:

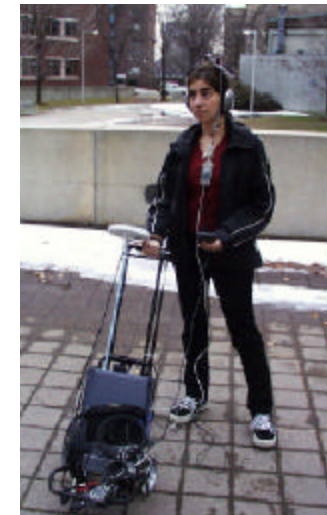
Wherehoo/Periscope



HearThere

Augurscope

CoolTown



GIS/Home grown location services...

Some past work:

Wherehoop/Perisc

HearThere

Augu'scope

CoolTown

GIS/Home grown location services...

“TOP DOWN,” APPROACHES



Location Linked Information:

geo-bound virtual
handles for retrieving and
storing distributed info
nuggets.

Location Linked

Information:

“BOTTOM UP”

geo-bound virtual

handles for retrieving and

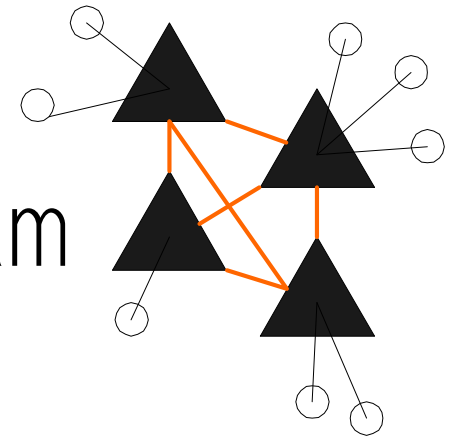
storing distributed info

nuggets.

DESIGN

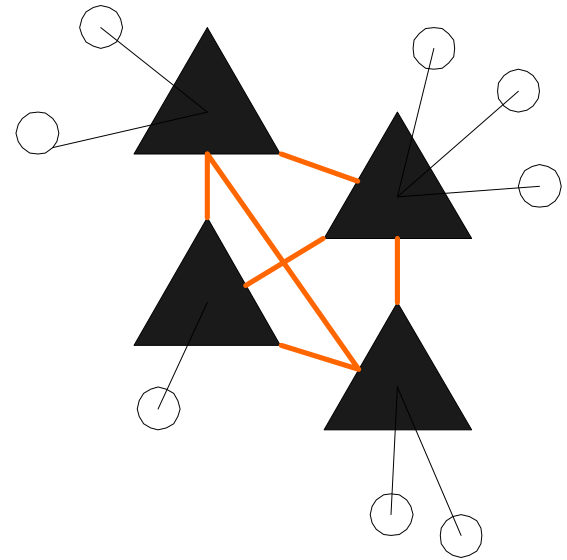
How is LLI implemented?

- * hybrid client/server & P2P
- * **Jabber** (XMPP) application stream
- * async **XML messages**
- * as **stored/searchable references to data** whose “primary key” is Lat/Lon (position)



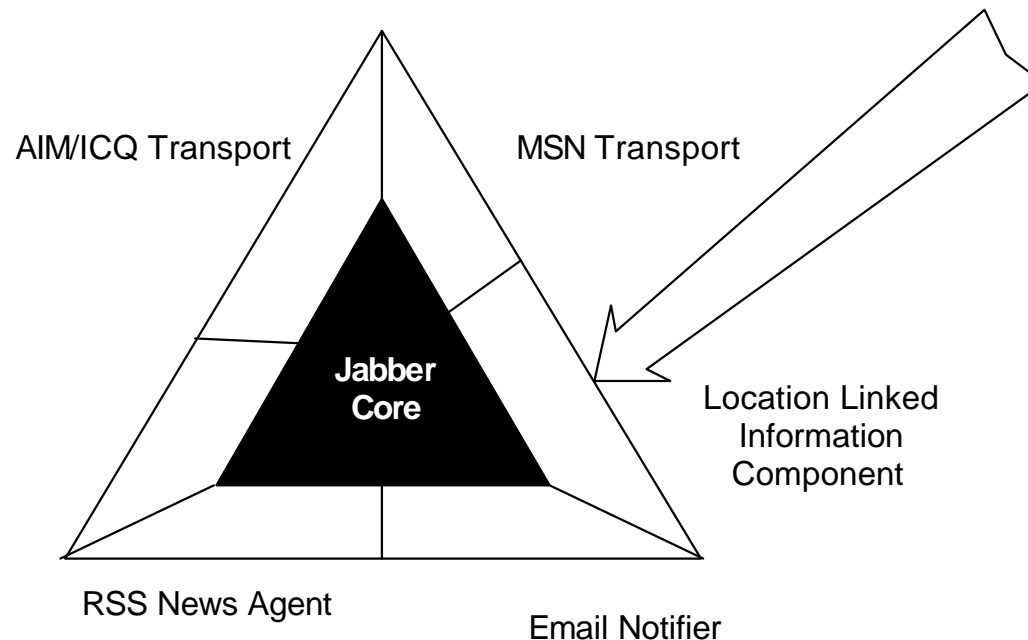
Built on top of Jabber Server.

- * Authentication/SSL
- * Presence
- * Message Routing, Nodes
- * XML Streams
- * Publish/Subscribe (pubsub) model



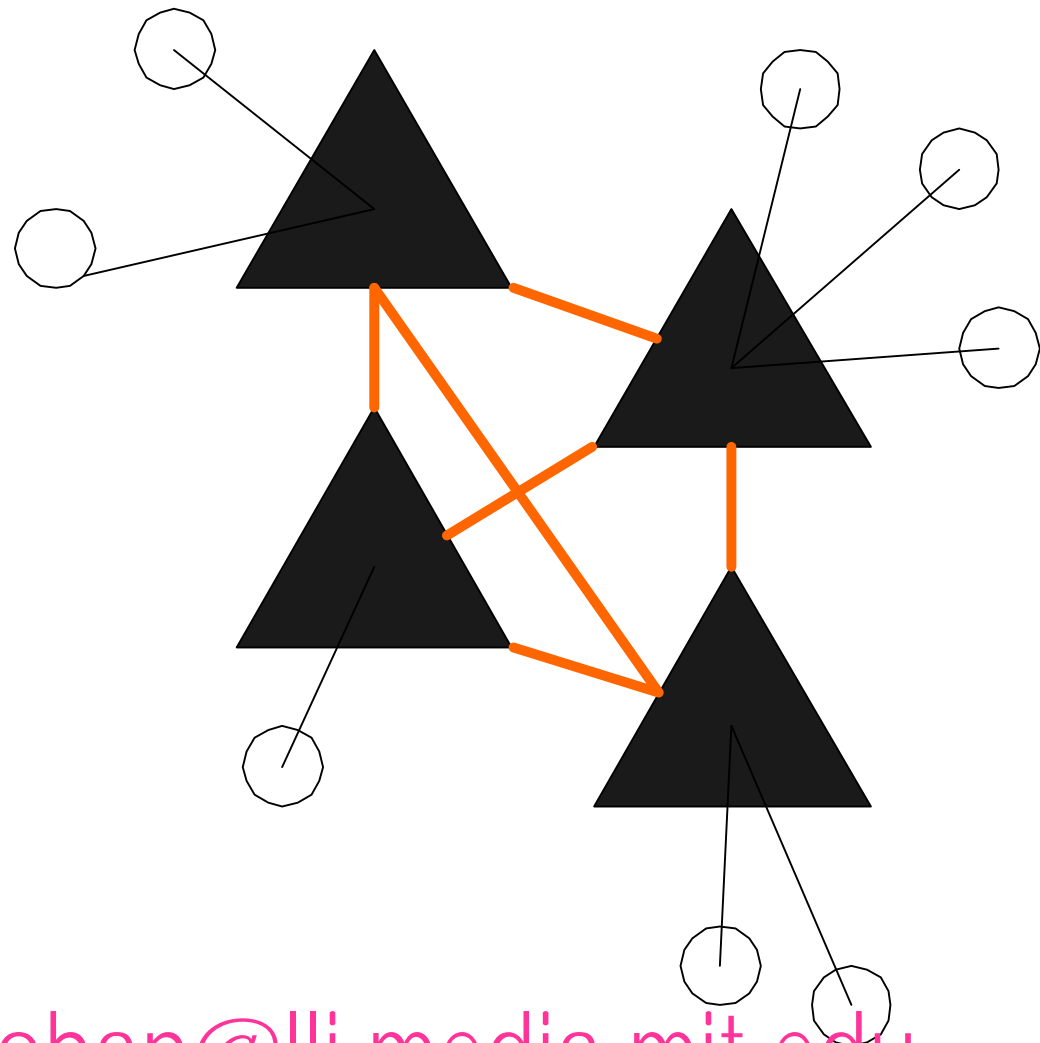
LLI is a component of a Jabber Server.

- * Addressable as a **component**:
lli.media.mit.edu



* Clients connect and authenticate to a home server.

* Clients have globally unique Ids:



yohan@lli.media.mit.edu

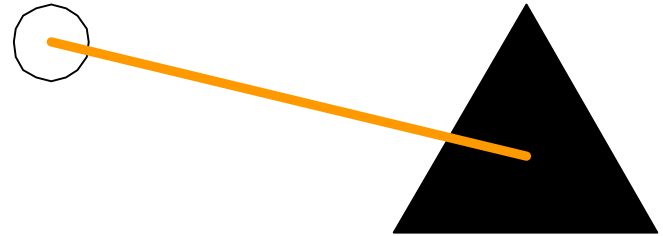
Clients Send:

- * Presence

(lat, lon, altitude, availability)

- * Searches

(I'm looking for stuff around me)



Clients Send:



* Presence

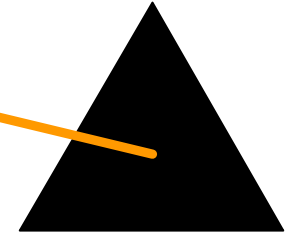
(lat,

```
<presence
from='yohan@lli.media.mit.edu/pda'
to='lli.media.mit.edu'
type='available' />
```

* S

(I'm looking for stuff around me)

Clients Send:



* Presence

(lat,

```
<iq to="lli.media.mit.edu"
from="yohan@lli.media.mit.edu/pda"
type="set" id="B8AJFP">
```

```
<query xmlns="jabber:iq:search"><x
xmlns="jabber:x:data"
type="submit"><field
var="lat"><value>73</value>
</field><field var="lon">
<value>44</value></field><field
var="expiration"><value>10</value>
</field></x></query></iq>
```

* S

(I'm looking for stuff around me)

LLI Servers:

- * Propagate Searches

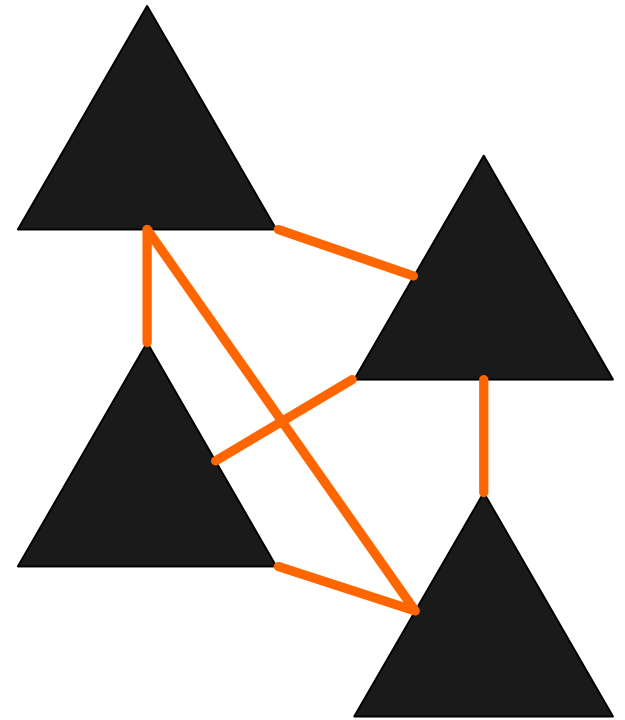
(async discovery, peer table)

- * Maintain Node Cache

(I know about stuff. I want to know more!)

- * Gatekeep subscription requests

(prez@whitehouse.gov wants a presence sub?)



LLI Servers:

- * Store NO DATA— just references via URLs!
- * Send search “answers” aka information nuggets.

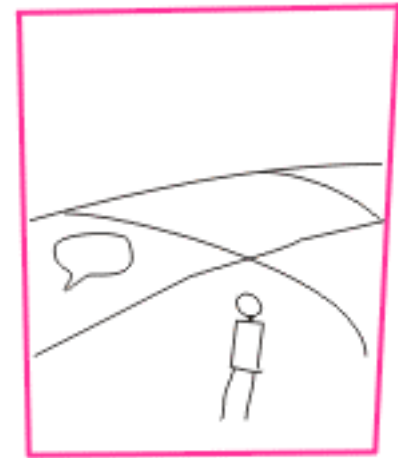
Nodes, Cells, Presence

* World segmented into cells, named

30n50e.3n0e.2n1e.2n7e =

33 degrees, 2 min, 2 sec North

50 degrees, 1 min, 7 sec East



* **Nuggets stored within cells**, as exact decimal seconds. -> Nuggets are more precise.

Nodes, Cells, Presence

* 1 second x 1 second cell ~ 30 m²

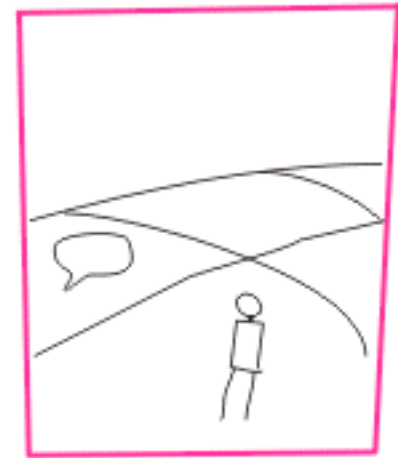
* Cells are arranged hierarchically

10decN10dece .

1decN1decE .

minutesNminutesE .

secondsNsecondsE

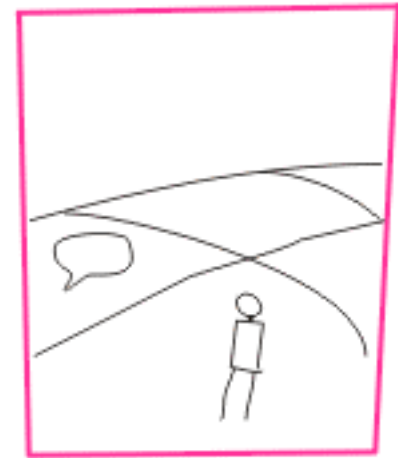


Nodes, Cells, Presence

* Presence type nodes:

p:yohan@jabber.media.mit.edu

p:JID

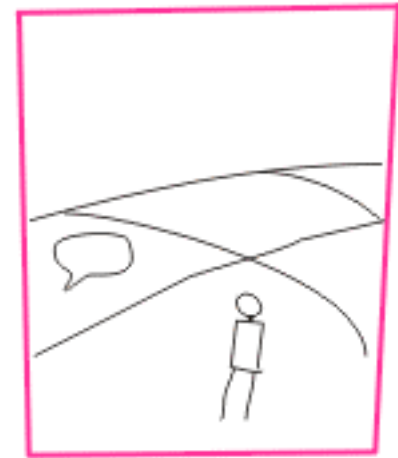


* **Strict subscription required** for nugget propagation.

* Used to have others know about sensitive items' location.

RDF & Nugget Ontology

- Nuggets use RDF to describe type of information.



```
<rdf:RDF xmlns:dc="http://purl.org/dc/elements/1.1/"
xmlns:foaf="http://xmlns.com/foaf/0.1/"
xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
<rdf:Description rdf:about="http://www.cs.cmu.edu/~sprite/index.html">
<dc:title>Bridget Spitznagel</dc:title>

<foaf:topic rdf:parseType="Resource"> <geo:lat>40.442673</lat>
<geo:long>-79.945815</long> </foaf:topic> </rdf:Description>
</rdf:RDF>
```

Design Challenges:

- * Location data is valuable and **privacy cannot be an afterthought.**
- * Current interfaces challenge users to get at information (**large devices, cacophony**).
- * To be implemented, **scalability** and **economics** need to be considered.

Building with LLI

- * Client implementations light weight.
- * Quick to prototype location-based apps.
- * “Built in” integration with instant messaging.
- * Extensible Namespace for future additions.
- * Fixed link between virtual, “real” worlds.

First Application: Animal Watcher

- * Integrates multiple animal tracks into one display.
- * Annotations through virtual anchors.
- * Perl/Tk application.

I am Mankins.

That was my story.