Composable Ad-hoc Location-based Services

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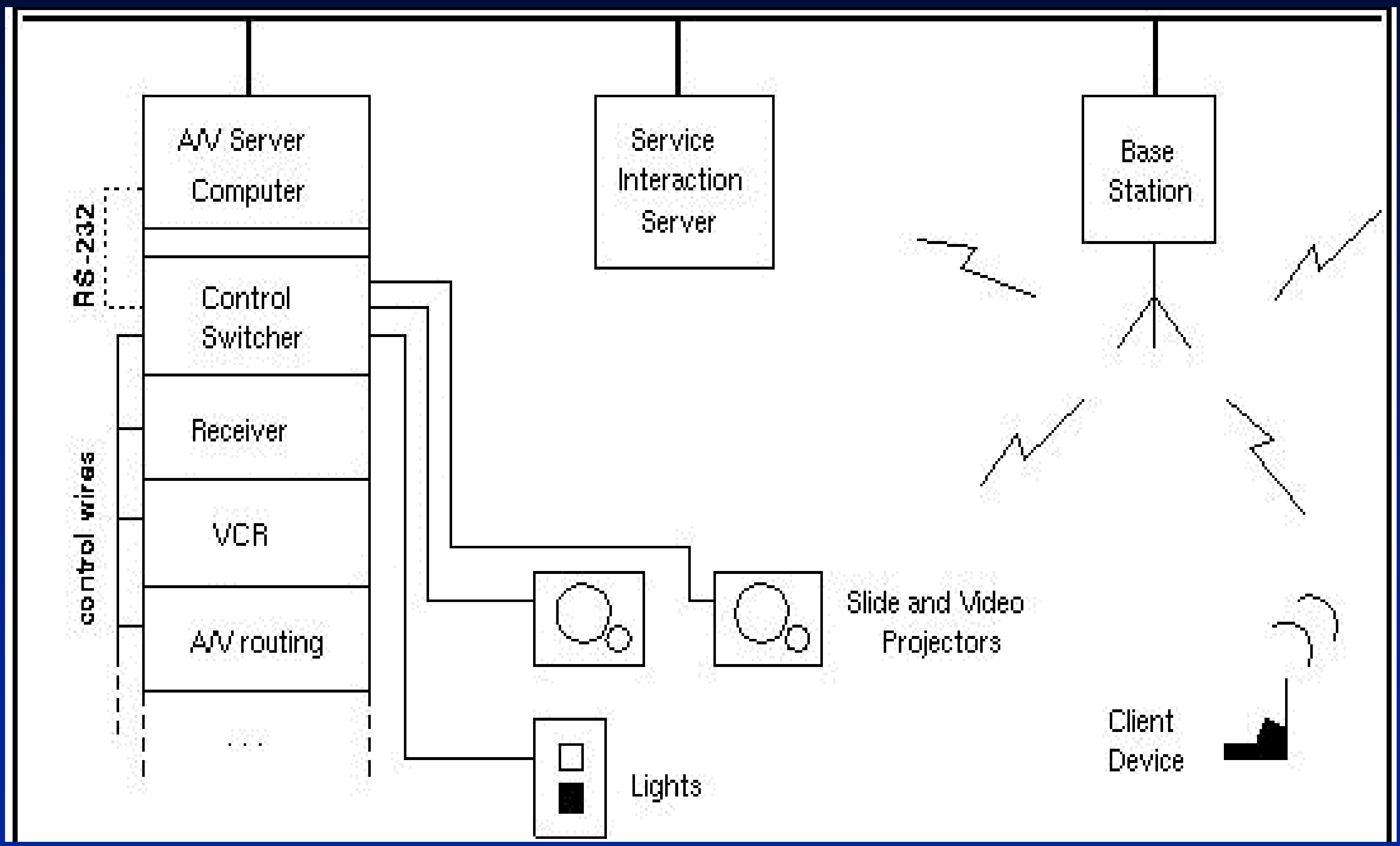
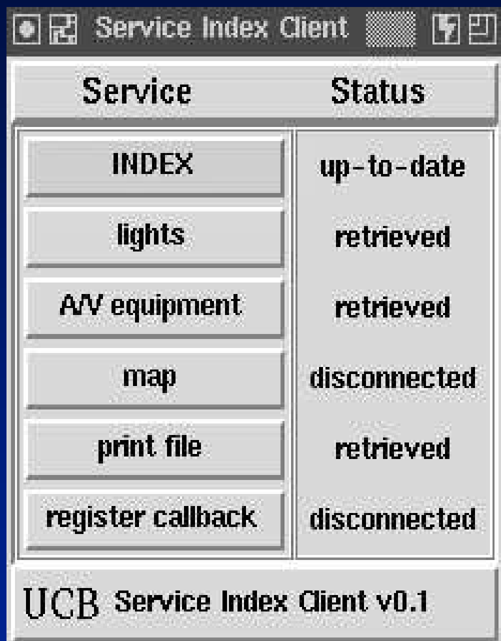
Related Work

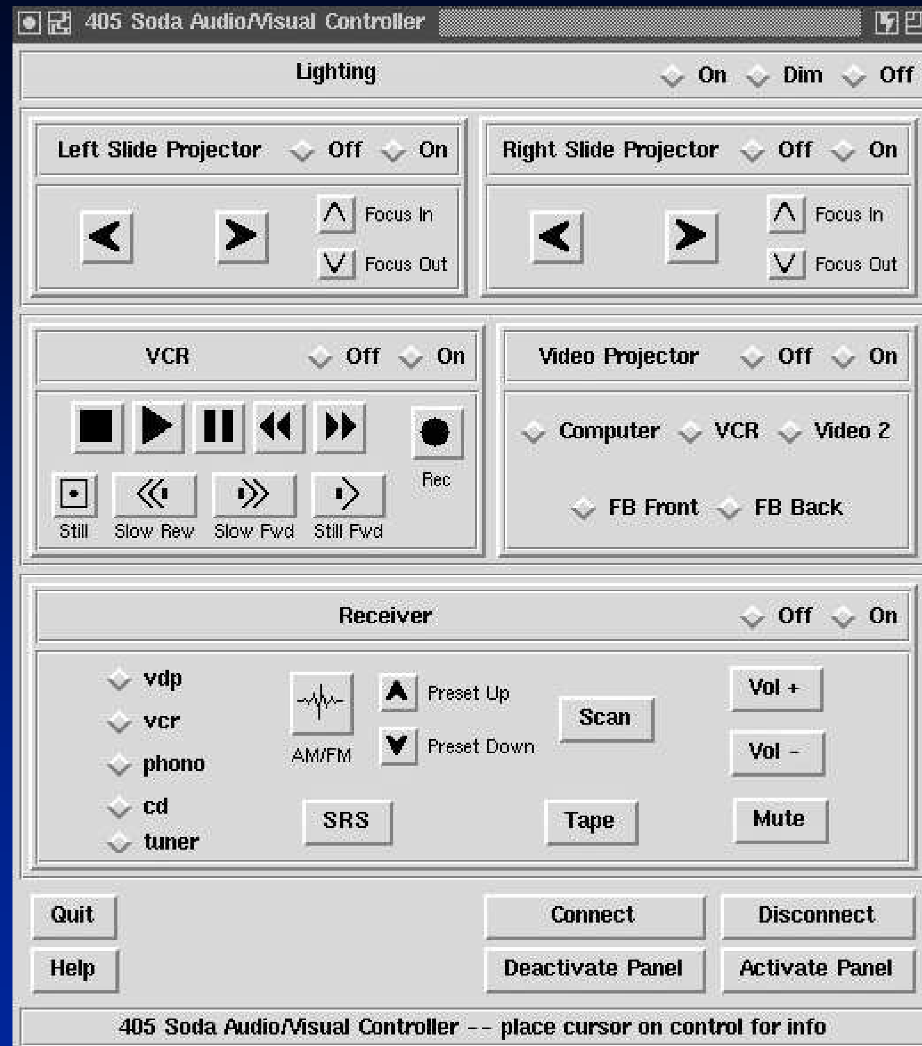
- Overlay Networking, Mobile IP
- PARCTab, Active Badges
- Application Partitioning
- Proxies, Gateways, Transcoders
- Service Location Protocol
- . . .

Prototype Implementation



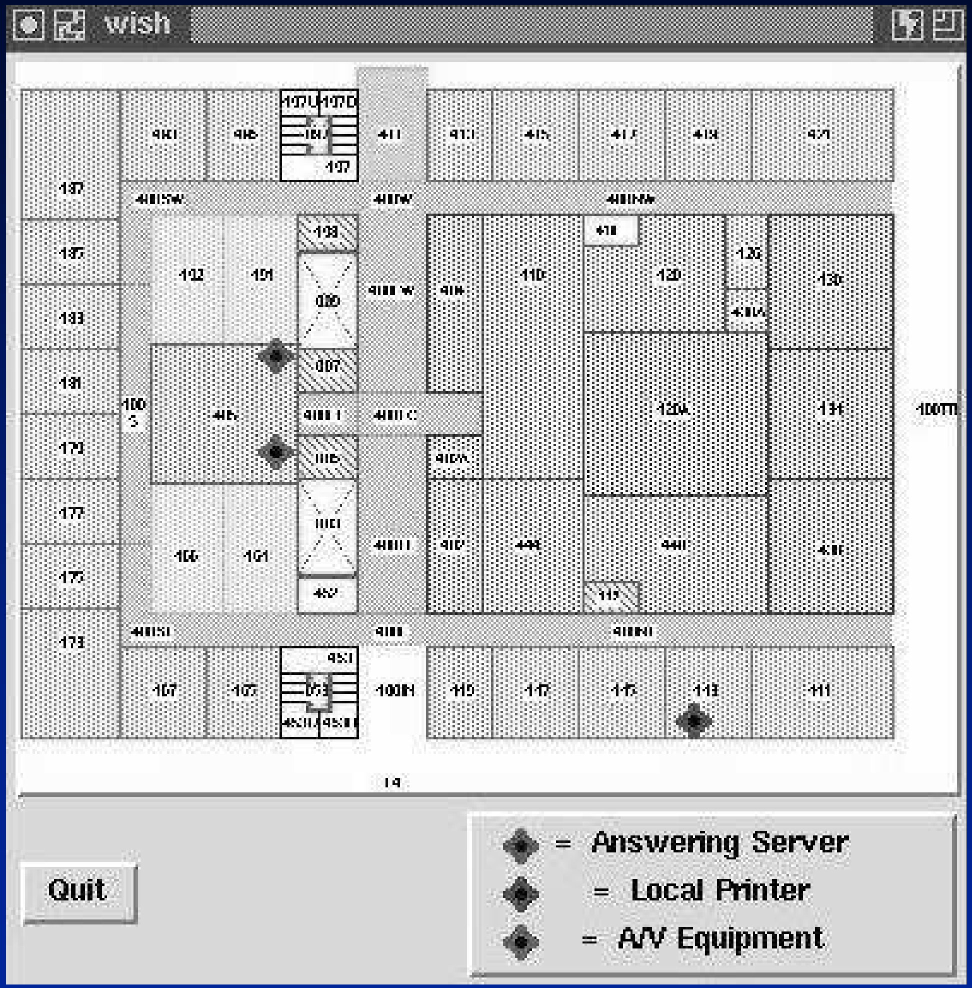


Service Interaction Client Screenshot



Monolithic A/V controller

Generated (generic)
UI for Lights



Map with Exported Object Locations

Example Location-based Services

- Discovery and interaction with, reconfiguring to use *local:*
  - servers (DNS, SMTP, NTP, WWW, …)
  - proxies (HTTP, RTP)
  - custom SW: maps with object locations, message boards
  - HW: printers, lights, audio/video equip, HVAC, …
- Location Tracking
- Composing these to create "behaviors:" (music that follows, security)
- Transparent remapping of elements

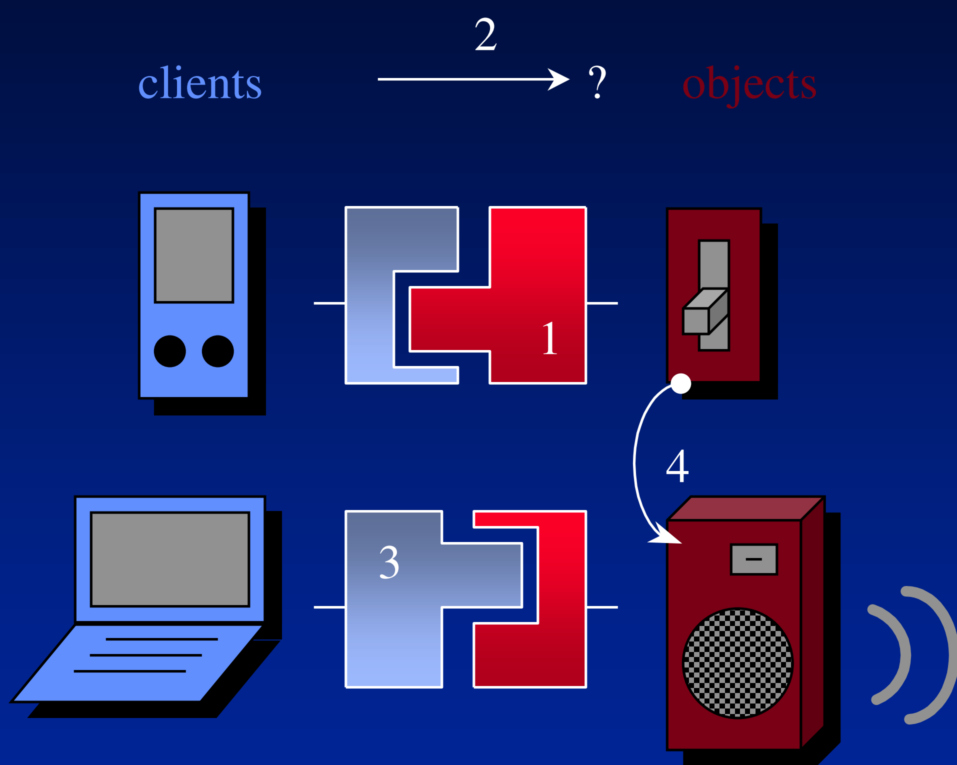
Research Issues

1) Augmented Objects

2) Service Discovery

3) Mapping between object interface and client interface ("transduction")

4) Building complex behaviors from the underlying objects



Current Design

DESIGN ISSUE	REQUIREMENT	OUR APPROACH
Mobility; remote environments	standard bootstrap	Mobile IP + Overlay networking
new services in new domain	discovery protocols	leverage, augment SLP
heterogeneous devices and objects	interoperability	interface transducers
opaque protocols	backward compatibility	GUI movement
enforced service locality	augment access control with scope	embed nonce in beacons
continuous accessibility	fault-tolerant service advertisements	dynamically vary advertisement scopes

Generalization

- Need for bootstrap above network/transport layer
  - "IP Dial Tone Ain't Good Enough"
  - Push vs. pull + hybrids
    - Service Advertisements: Extend SLP, SDAP
- Transduction Protocols
  - Minimize need for *a priori* interfaces
  - Discover RPC parameters, move GUIs
- Various location metrics (GPS, triangulation, ...)
- Security, privacy
- Manageability, Extensibility, Deployment as metrics

Future Work

- Further beacon augmentation
- Extend discovery beyond local-area
  - hierarchy, scoping, union/intersection
- MASH collaboration laboratory (colab, 326 Soda)
  - Conference control elements
  - video and audio as sensors
- Pilot + Metricom interface implementation
- User Interfaces (with J. Landay, M. Newman)
  - Presentation of controls
  - Behavior specification
  - Reconciliation of conflicting behaviors