Independent LifeStyle Assistant™

Home-Care Technology for Independent Living

A NIST Advanced Technology Program

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Independent LifeStyle Assistant™

Agenda

ILSA Program

ILSA Vision

Program Progress

Evaluation Plans

ILSA in a Nutshell

Program Objective

Develop an intelligent home automation system with situation awareness and decision-making capability based on integration of diverse sensors, devices, and appliances to support caregivers and enable elderly users to live independently at home.

Programmatics:

- A NIST advanced Technology Program
  - High risk research program
  - 2.5 years (Nov 00 - Apr 03)
  - $5 million (HW 60%, NIST 40%)
- Led by Honeywell
  - University of MN School of Nursing
  - United Health Group EverCare

Benefits:

- Support elder independent living
- Provide peace-of-mind to caregivers
- Support efficient quality care for caregiving organizations
- Cost savings for government and industry
- Market growth for in-home product producers

ILSA Vision

What will ILSA look like?

- An invisible network of integrated sensors, devices, and "smart" appliances
  - Sensors - motion, contact, optical, acoustic, etc.
  - Devices - thermostat, speaker, telephone, medical, etc.
  - Smart Appliances - communicating refrigerators, stoves, etc.
- No computer workstation needed. Users interact with the system through familiar devices or simple dedicated devices like:
  - Telephones, Pagers, email, TV
  - Webpad, Digital picture frame, PDAs, speakers/microphones

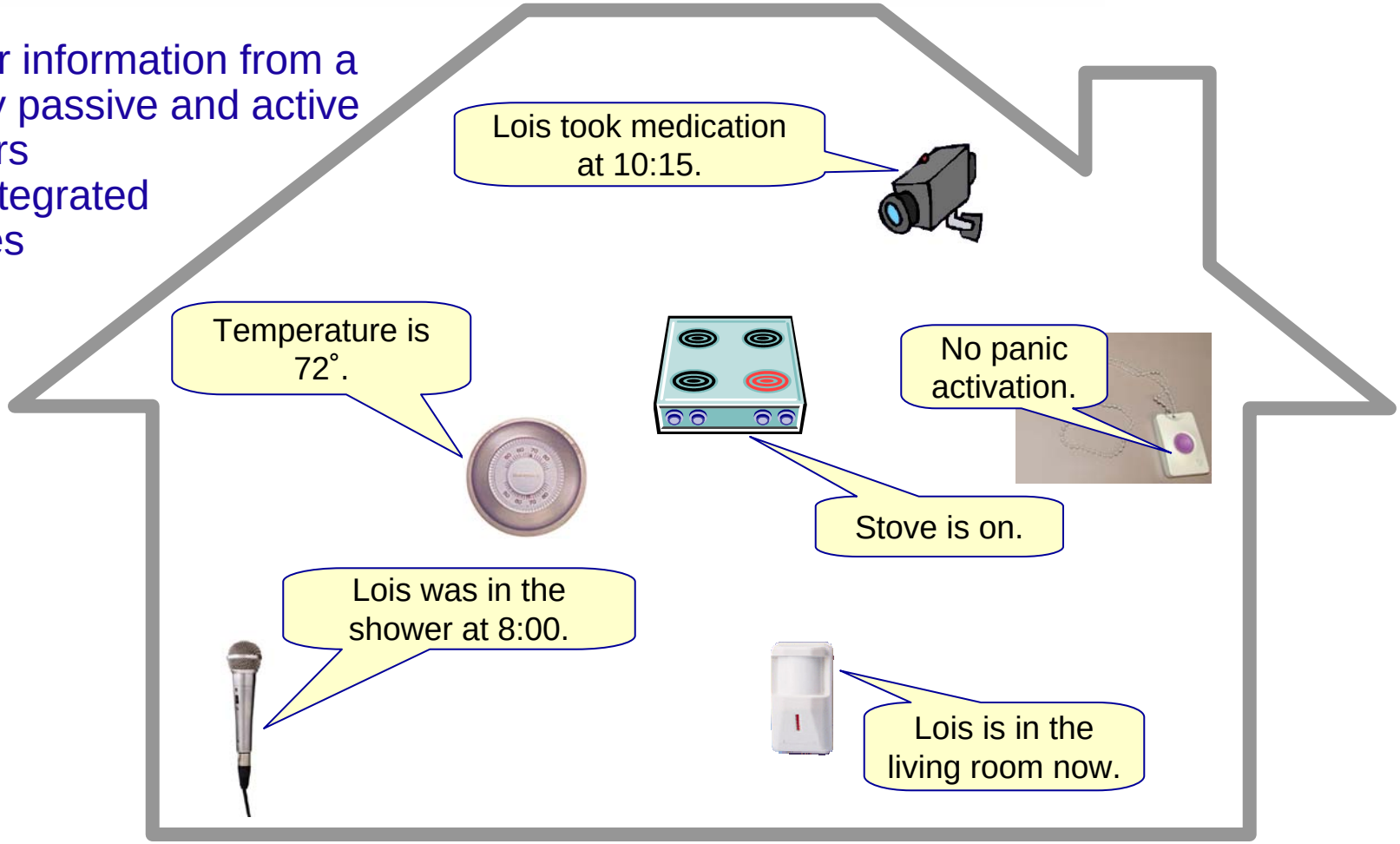
ILSA Vision

What will ILSA do?

- Gather information about elder, activity, and home status by listening to the home and communicating with devices
- Assess the need for assistance based on the system's understanding the elder's condition and what activities are going on inside the home
- Respond to a given situation by providing assistance to the elder and getting help when necessary
- Share health and status information with authorized caregivers to help improve the quality and timely delivery of care

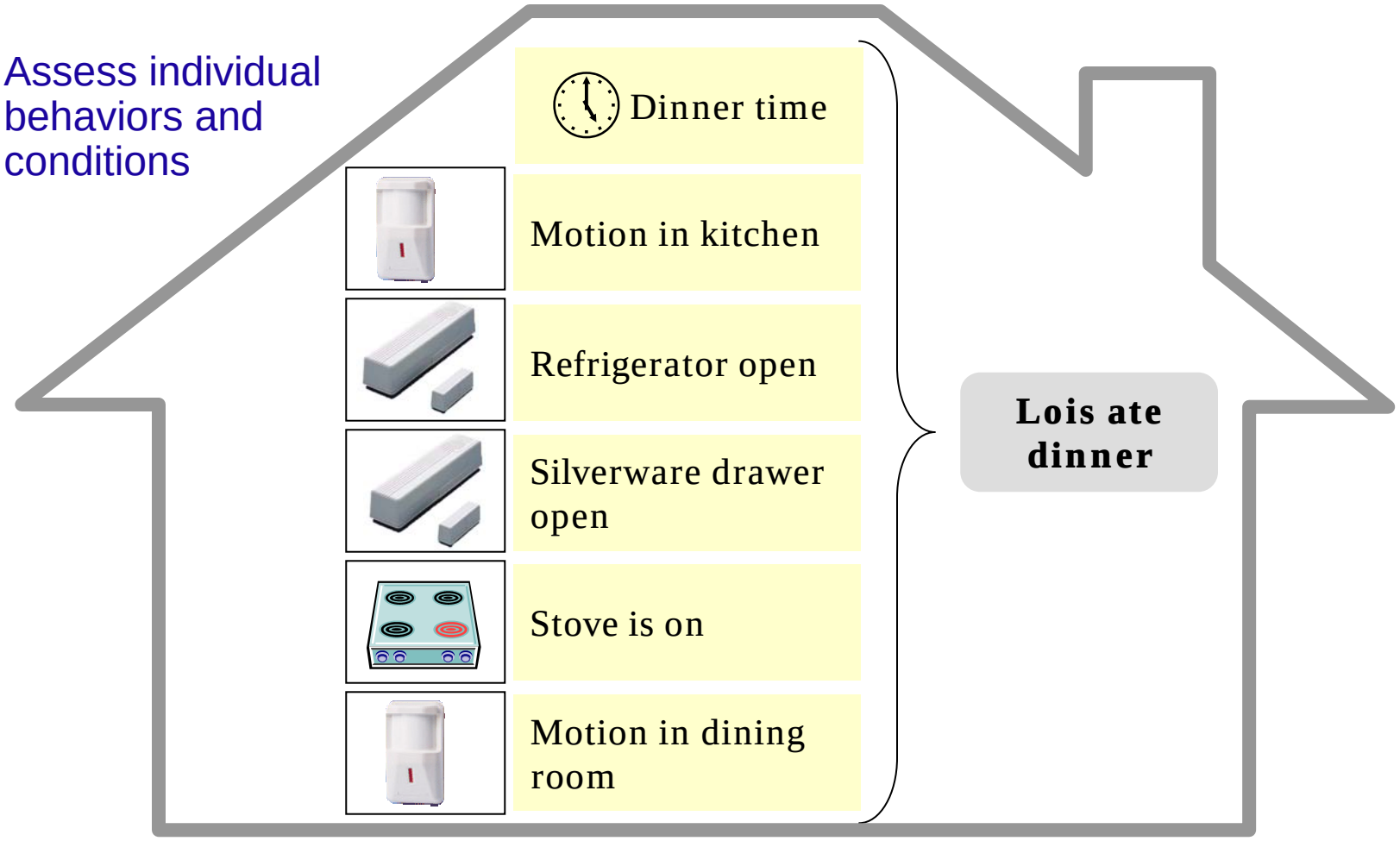
ILSA Vision
Gather Information

Gather information from a variety passive and active sensors
and integrated devices



ILSA Vision
Assess Information

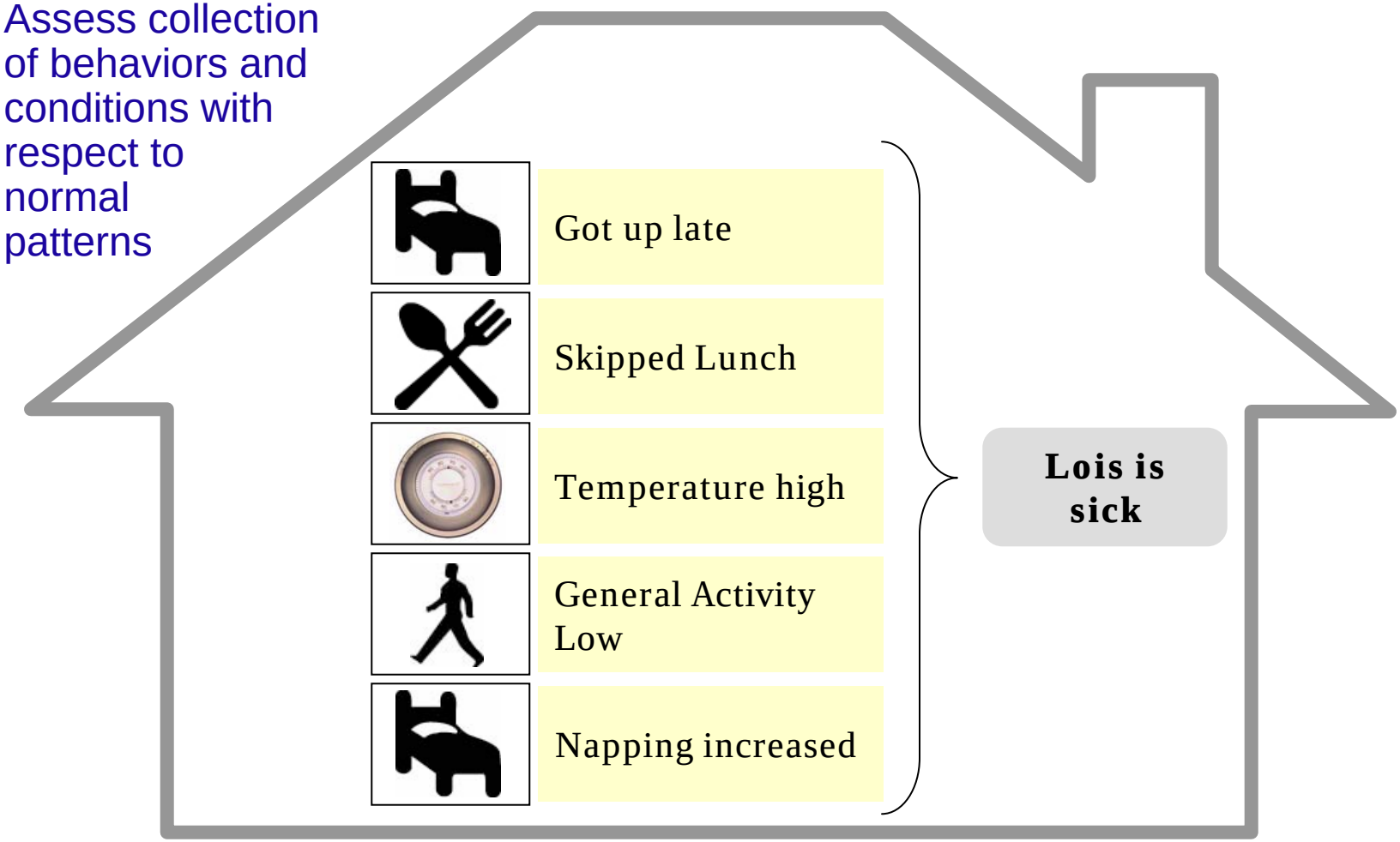
Assess individual behaviors and conditions



ILSA Vision

Assess Information

Assess collection of behaviors and conditions with respect to normal patterns



ILSA Vision
Respond to Situations

Prioritize conditions and formulate an appropriate response plan

ILSA Vision

Respond to Situations

Control situation so Lois' immediate needs are met

The Stove's been left on for 46.3 minutes!

ILSA Stove - turn yourself off.

I've fallen, and I can't get up!

Lois, are you all right? ILSA

Linda's calling.

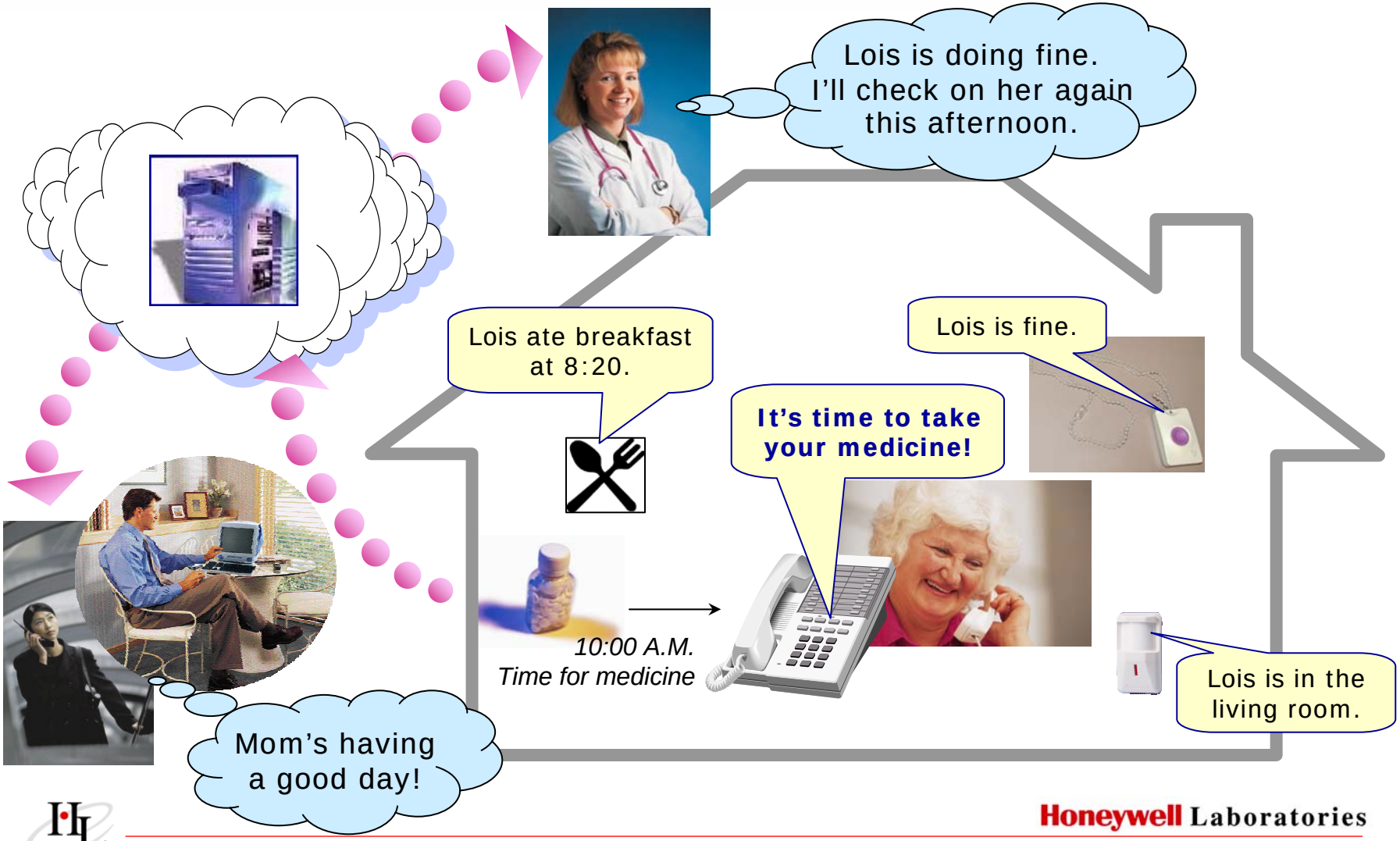
It's time to take your medicine!

ILSA Reminders - be quiet for now.

Phone - disconnect Linda and call caregiver. I'll talk when you connect. ILSA

ILSA Vision

Share Information



ILSA Vision

Example Assistance Scenarios

- Safety
  - Panic button is activated
    - » Query elder about status and need for assistance
    - » Notify caregivers
- Functional Assessment
  - ADL/IADL monitoring - task completion, duration, and consistency
    - » Provide cognitive support for elder by offering reminders or task instructions
    - » Notify caregivers of changes in performance over time
- Health Monitoring
  - Track vitals and ADL/IADL activity to detect and prevent health crises
    - » Query elders about how they are feeling daily
    - » Communicate with 3rd-party medical devices
    - » Share health data with caregivers to improve diagnosis and treatment

Program Progress

2001 Accomplishments

- Study users to understand what leads to institutionalization
- Identify the most important assistance needs and opportunities for technology
- Develop infrastructure to support hardware-software communications
- Develop system architecture, situation assessment capabilities, and begin learning capabilities
- Build and test prototype systems in home settings

2002 Activities

- Expand system functionality
- Refine and enhance machine learning capabilities
- Expand system's ability to communicate with various types of sensors and devices
- Build user interfaces
- Evaluate user interface and interaction designs
- Evaluate overall system in field settings over extended period of time
- Address configuration and set-up issues

Field Test Plans

Initial Functionality

Monitoring Functions

- Mobility (general activity level)
- Verify medication taken
- Panic button activation

Response Functions

- Alarms
- Alerts
- Notifications
- Activity Reports

Service Features

- Reminders
- Internet & phone access to elder activity information

Usability Features

- Password-free elder interactions
- Operational modes (on/off)

User Interfaces

- Elder - Phone, Webpad, eFrame
- Caregiver - Web, Phone, eMail

Field Test Plans

Evaluation Scope

- **Interface & Interaction design**
  - Ease of use, access to information, intuitiveness, match with expectations
- **Attitudes and perceptions**
  - Trust, levels of monitoring, privacy
- **Patterns of behavior**
  - Accuracy of identification, inferences, and learning
- **System operation**
  - Quality of data from devices, appropriateness of behavior
- **Affect of system on…**
  - Caregiver effectiveness and burden, quality of care, elder sense of independence

Evaluation Methods

- **Usability evaluations**
- **Interviews & Surveys**
- **User & System Logs**
- **Focus Groups**

Evaluation Sites

- **Two locations**
  - 20 homes in Minnesota & Florida
- **Elder Criteria**
  - Needs assistance with IADLs
  - Takes 1 or more medications
  - Has family or formal caregiver who provides regular assistance
  - Caregiver willing to participate in study
- **6-10 month duration**

ILSA Vision

Technology Innovations

Technical challenges require innovations in:

- Home automation - Ability to centralize, automate, and/or integrate control of home functions like security, comfort, lighting, entertainment, etc.
- Situation Assessment - Ability to identify and infer specific behaviors and patterns of activity
- Machine Learning - Ability to recognize changes in patterns of behavior over time
- Adaptive Interaction Design - Ability to dynamically format content and presentation style for different devices, users, tasks, etc.
- Human-Centered Systems Design - Ability to design automated systems that match elder abilities & expectations