Rehabilitation Engineering Research Center on Technology for Successful Aging

University of Florida

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Brief Overview of Center

RERC / RERC RELATED AREAS

Home Monitoring
Communications
Smart - Technology

RERC / RERC RELATED AREAS

Home Monitoring
Communications

Telehealth

RERC / RERC RELATED AREAS

Home Monitoring
Communications

Smart Home

Telehealth

RERC / RERC RELATED AREAS

Home Monitoring Communications

Smart Home

Telehealth

Older Drivers

Partners: RERC-Tech Aging

University Partners

- University at Buffalo
- University of Wisconsin (Trace)
- University of California, Irvine (Ranchos)

Corporate Partners

- <u>Projects</u>
  - ◆ Honeywell
  - ◆ Motorola
  - ◆ General Electric
  - ◆ Hexamite
- <u>Advisory Board</u>
  - ◆ IBM
  - ◆ Phillips
  - ◆ Lifeline

Key Concepts of RERC-Tech-Aging

Defining Key Concepts in the Priorities:

Home Monitoring

- Home automation   - comfort, safety, security
- Remote monitoring of health
- Remote monitoring of behavior

Defining Key Concepts in the Priorities:

Communications Technologies- used as assistive devices / assistive environments

- Wired phones
- Wireless phones
- Internet
- Integration of wireless, web connectivity and PC capability into one device – Smart Phone
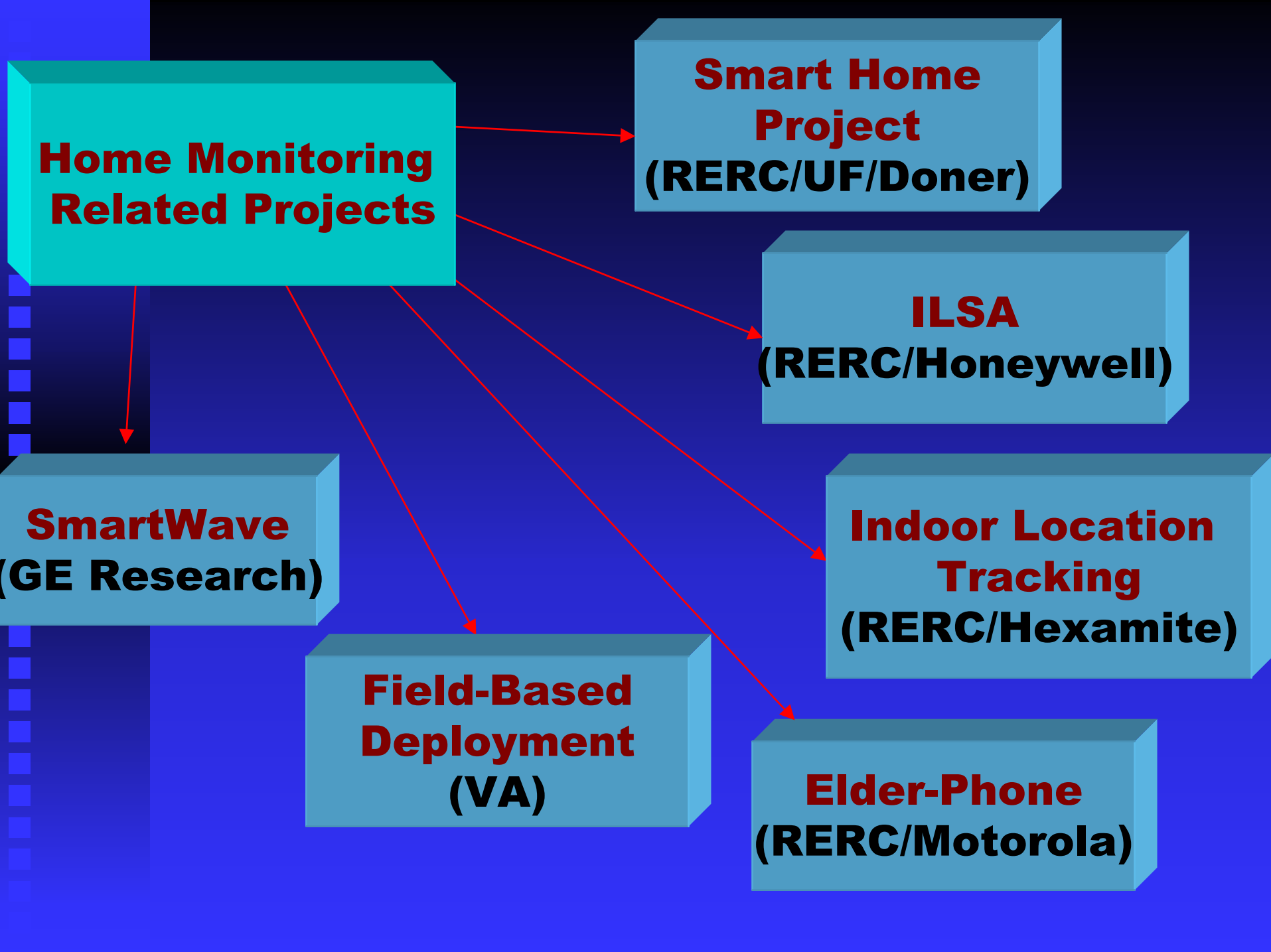
RERC-Tech-Aging Research Projects

- Needs and Barriers to Home Monitoring/Communications Technology
- Effectiveness of home monitoring – today's technology
- Effectiveness of home health monitoring with rural-living elders
- Effectiveness of home monitoring for people aging with disability

Development Projects

- **D1: Cognitive Assistance**
- **D2: Smart Phone – Carry Anywhere Assistance**
- **D3: Partnerships with Industry:**
  - ◆ **Honeywell's Independent LifeStyle Assistant Program**
  - ◆ **Motorola's iDEN Smart Phones**
  - ◆ **GE Smartwave**

Expanding on the base: RERC Related Projects

Home Monitoring Related Projects

Smart Home Project (RERC/UF/Doner)

ILSA (RERC/Honeywell)

SmartWave (GE Research)

Field-Based Deployment (VA)

Indoor Location Tracking (RERC/Hexamite)

Elder-Phone (RERC/Motorola)

Facilities

Indoor Infrastructure
Multiple wireless/wire-line networks, Smart Phones, Sensors, devices, A/D wireless & Universal Interfaces.
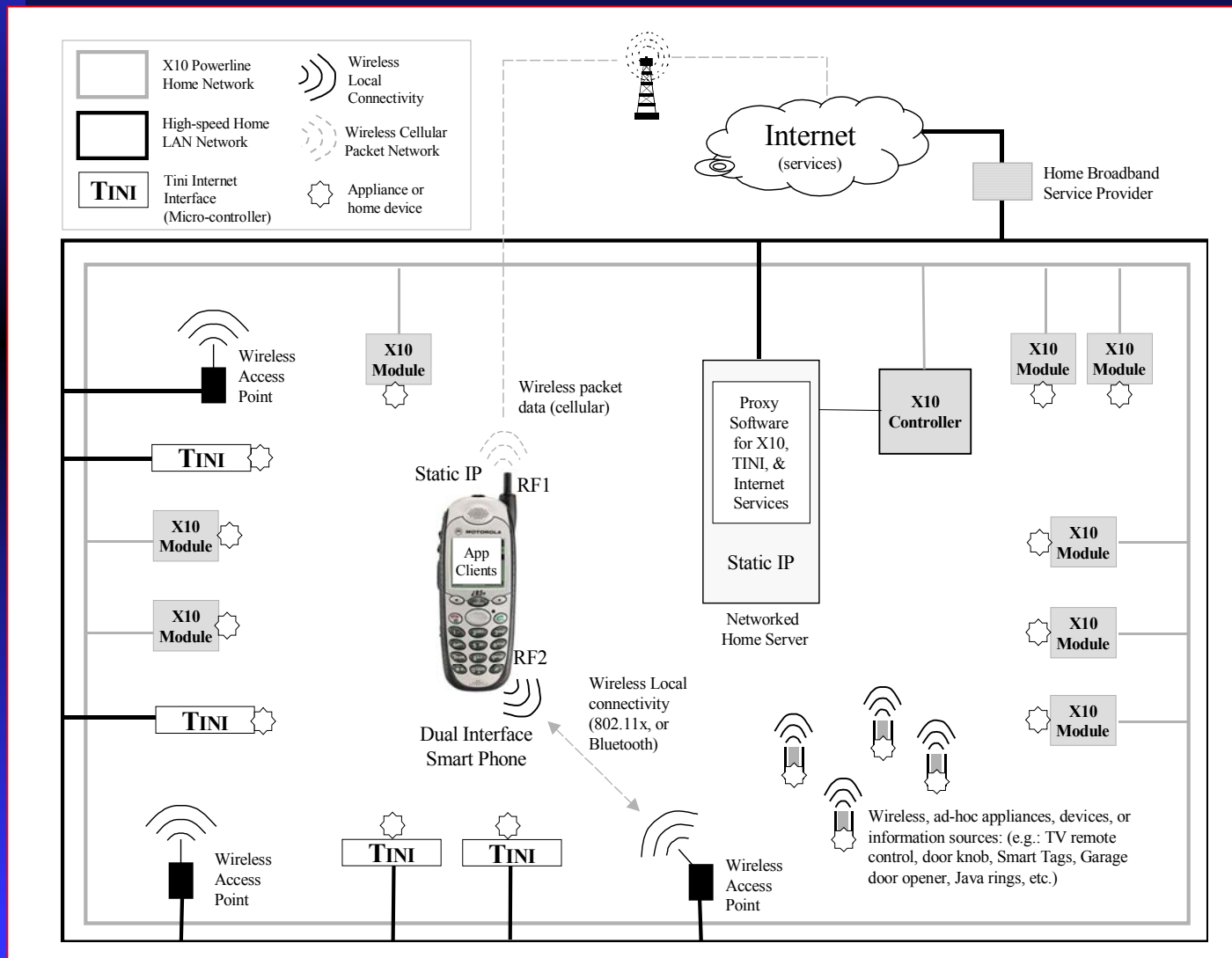
Gator-Tech Smart House February, 2004

www.corbis.com

Part 1

Management Processes

Procedures

- Choice of investigators

- Monthly meetings (teleconference)

- Research Core

- Statistics Core (through Brooks Center)

- Monthly / quarterly reports

- Annual reports

- Consumer Advisory Board feedback

- National Advisory Board feedback

Part 2

Outcomes, Activities, Output Targets

Research

Development

Education / Capacity Building

Dissemination

Research Outcomes:

- Long term: Wide use of home monitoring and computing/communication technologies
- Intermediate: Demonstrate effectiveness of today's technologies (RCT's)
- Short-term: Identify barriers to using home monitoring and communications technologies; Short term studies, weaker designs that suggest effectiveness of technologies.

Research Program of Activities

- Initial study of needs and barriers

- Two RCT's

- Matched pairs study of VA tele-homecare demonstrations

- Additional related research with funds beyond RERC

Research Problems and Actions

- Some target numbers for studies not yet achieved.
  - ◆ Increasing recruitment of subjects
- Some start-up time with setting up RERC at UF (first RERC at UF) – projects did not initiate work on Oct 1, 2001
  - ◆ Worked to "catch-up"

Research Progress

- Very good progress
- Have secured funds for additional studies to build on RERC research

Development

Overview

- Push the Envelop of the emerging "Assistive Environments" Technology by utilizing recent advances in Pervasive Computing

- Create an anytime, anywhere elder digital assistant by utilizing recent advances in Mobile Computing.

- Enable key applications in the Assistive Environment and using the elder digital assistant

- Technology streamlining through open framework development

Assistive Environments

Smart Homes

Multiple wireless/wire-line networks, Smart Phones, Sensors, devices, A/D wireless & Universal Interfaces.
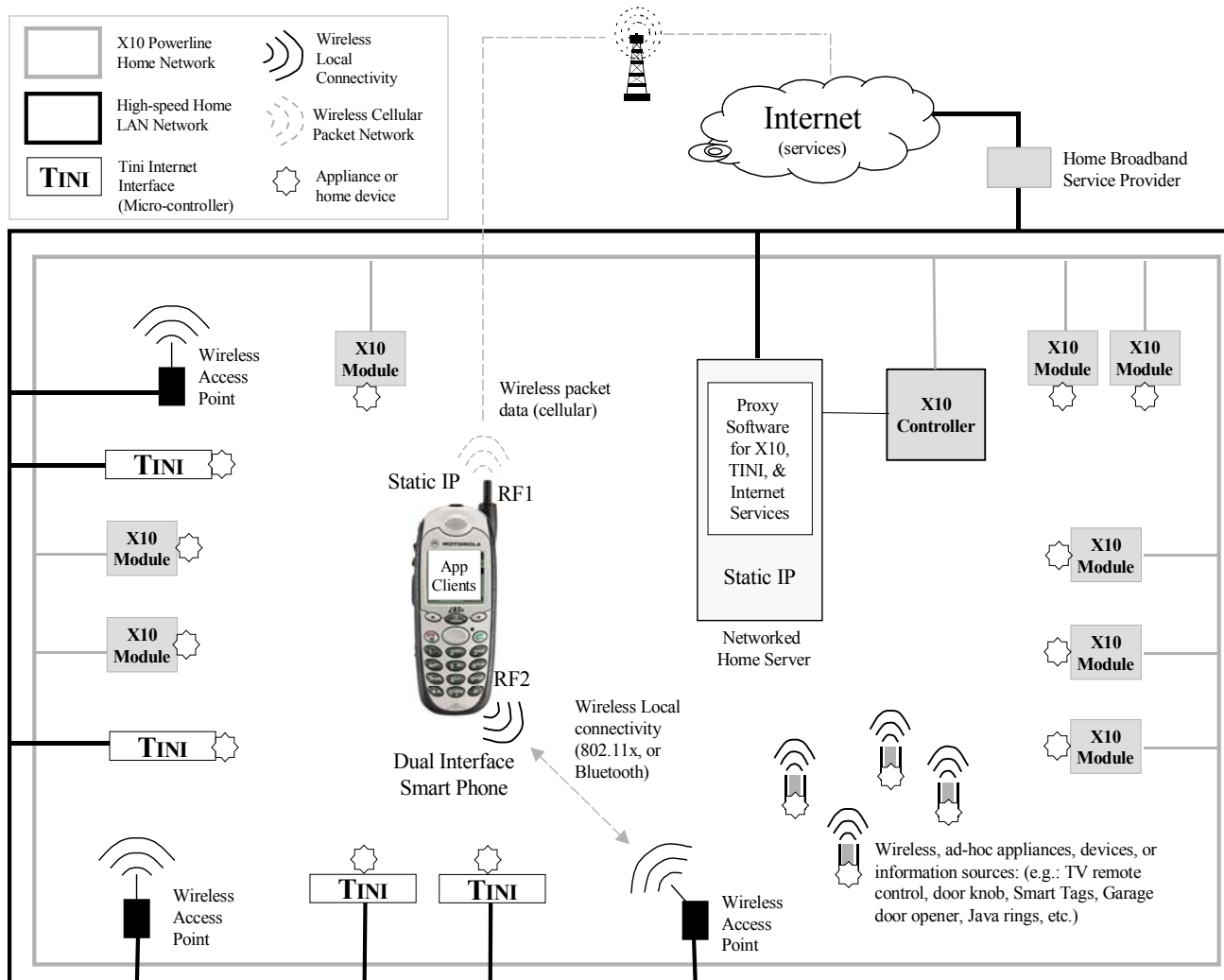
Ultrasonic Positioning System

Figure 1- Pilot

Ultrasonic waves are passed between stationary pilots (Figure 1) and mobile beacons (Figure 2).

- The time of arrival (TOA) of the waves between the devices is used to calculate position (Trilateration)
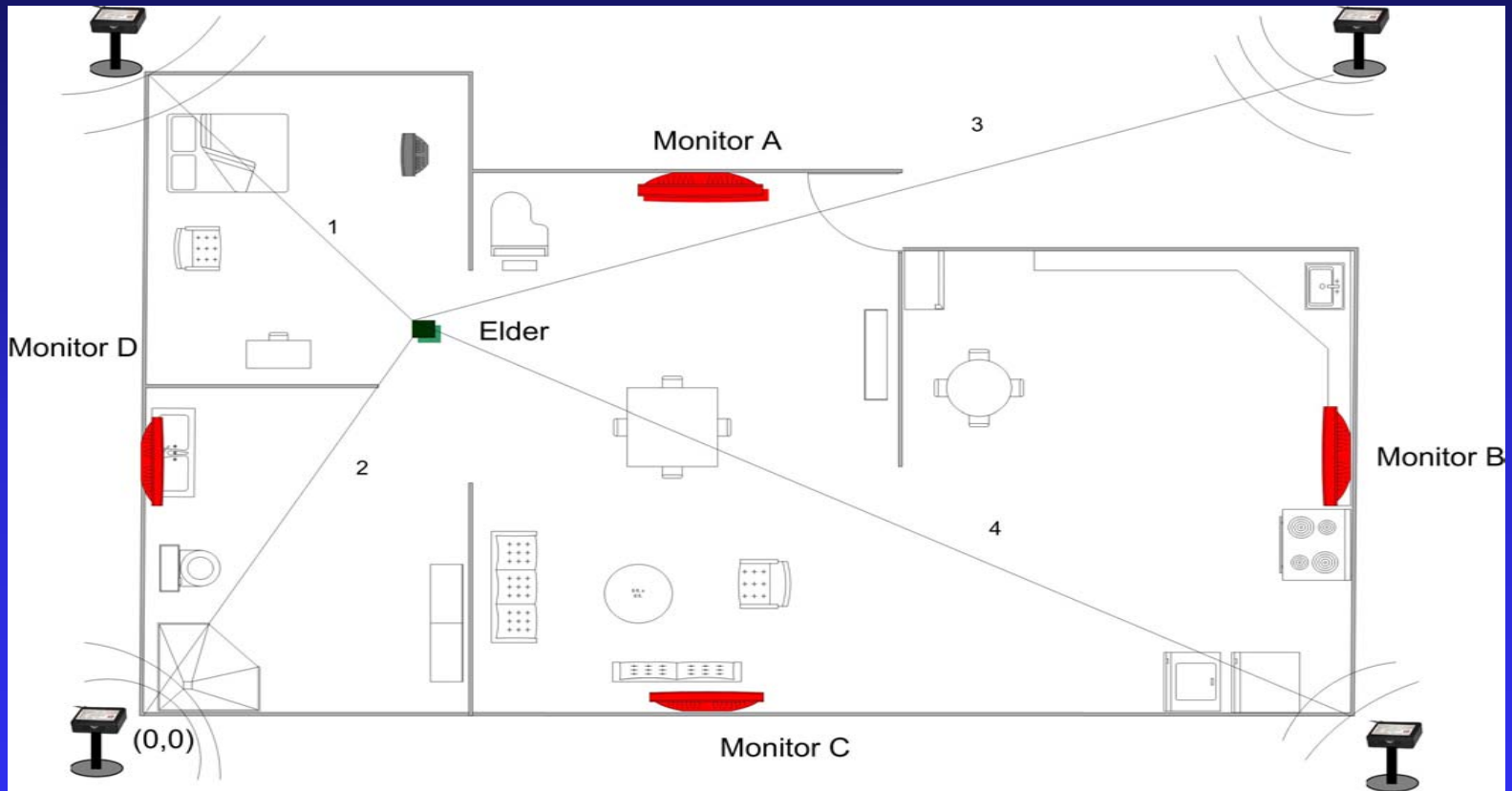
- Accuracy:
  - We have achieved 3cm accuracy.

Figure 2- Beacon

Ultrasonic Location Positioning/Tracking System

Digital Downtown/Campus
UF Wireless Campus
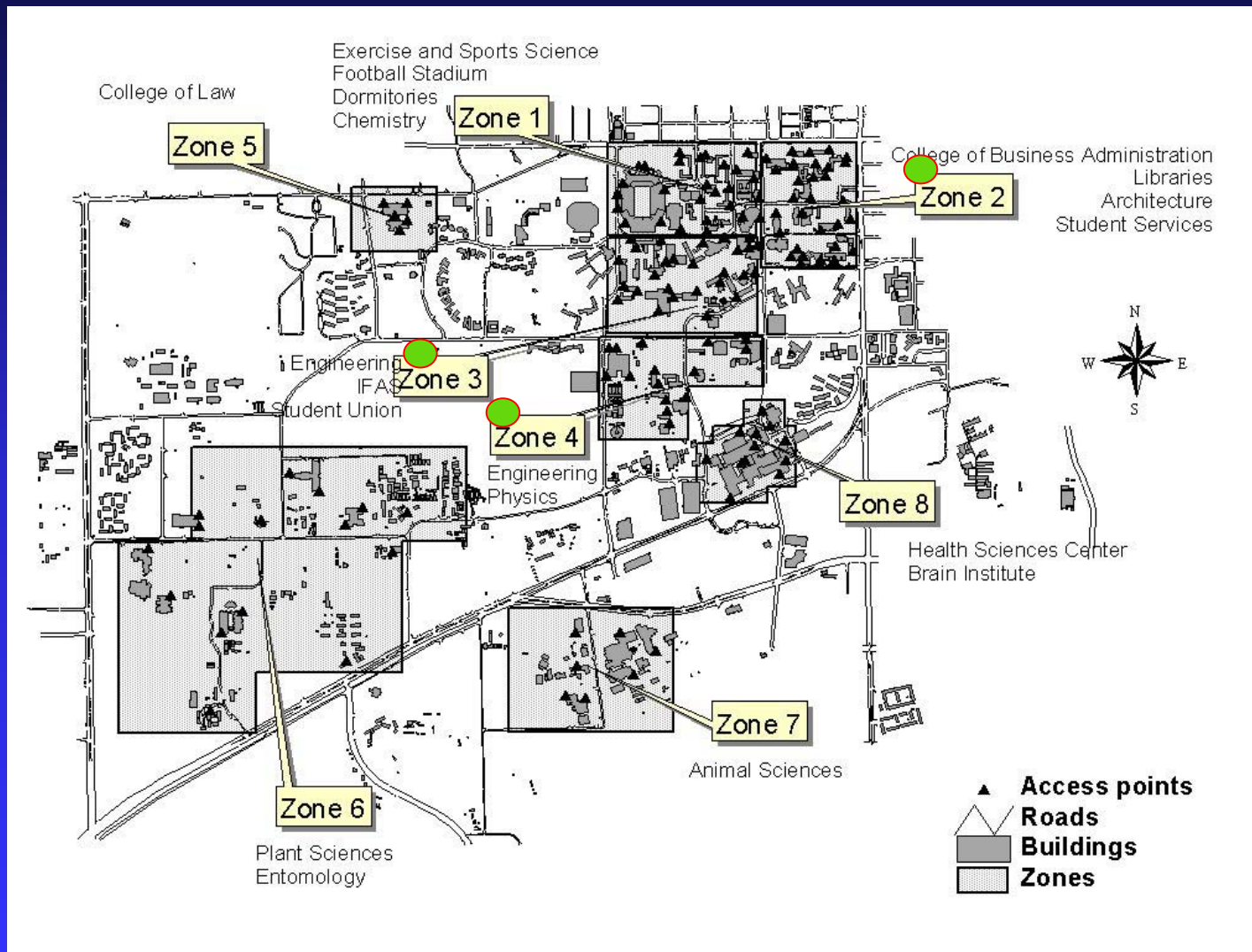
Anytime, Anywhere Elder Digital Assistant

Automatically refill prescription

Sense and see visitors/strangers at front door

Check if laundry is done

Turn on/off lights (and visually inspect) other rooms.

Check locks on doors and windows

Monitor of kitchen; oven and stove on/off; temp.
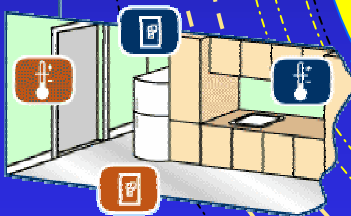
Call in for help and Assistance

Order groceries with dietary restrictions

Call in a nurse

Smart Phones

Code reader (Smart ID, RFID,…)

Wider Screen

Back-lit & Contrasting colors

Full-day Back Battery

Wider Vertical Key Spacing

Larger fonts Back-lit Audio-feedback

Wider Phone Keypad

Wider Horizontal Key Spacing

Voice Input/Output
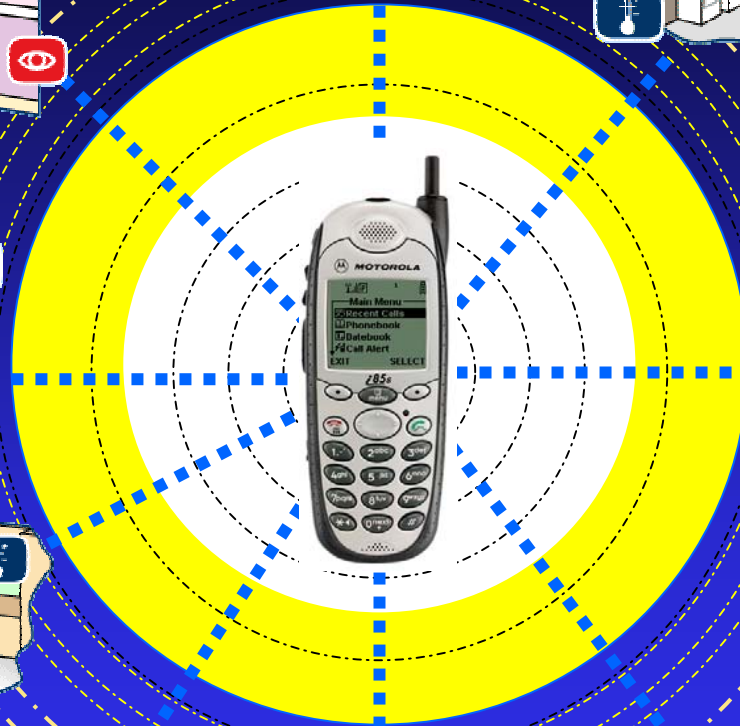
Smart Phones for the Elders –
Special Ergonomics + Mobile Sensor Network Platform

Code Reader

Electronic Nose (Chem. Sensor)

GPS

Ultrasonic Receiver

Wireless Local/Body connectivity

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Enabling Key Applications

Applications

- Locating elders & objects (e.g. Car in parking garage, TV remote)
- Home appliances and device control (e.g. switching functions & A/C control)
- Smart Microwave Ovens, Talking Food, etc
- Alerts and alarms (e.g., medicine reminders & postal mail notification)
- Grocery shopping assistant
- Weather Awareness

Applications

- Integrated indoor/outdoor location tracking
- Map maker and navigation
- Security Alerts (doors, windows, water leaks)
- Access Control (lock/unlock doors, windows)
- Next generation Lifeline
- Home Entertainment for the elders
- Push to Eat (and other automated services)
- Dictation
- Others…

Framework

Framework

- Smart Phone/Smart Space Integration
- Open service Gateway Initiative (e.g. OSGi) & other universal interfaces
- Zero Configuration (Service Discovery)
- Wireless Sensors
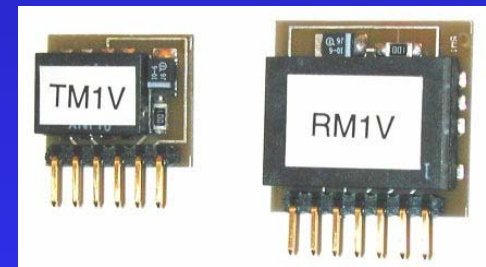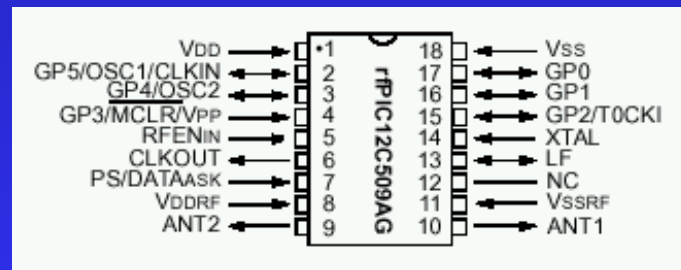
- 3D Ultrasonic indoor location services
- Applications as service composition

Outcomes

Framework, Standards,
Prototypes,
Products, communities

Research publications,
Prototypes
Demos

Technology Research,
Concepts,
Demos,

Short-term

Medium-term

Long-term
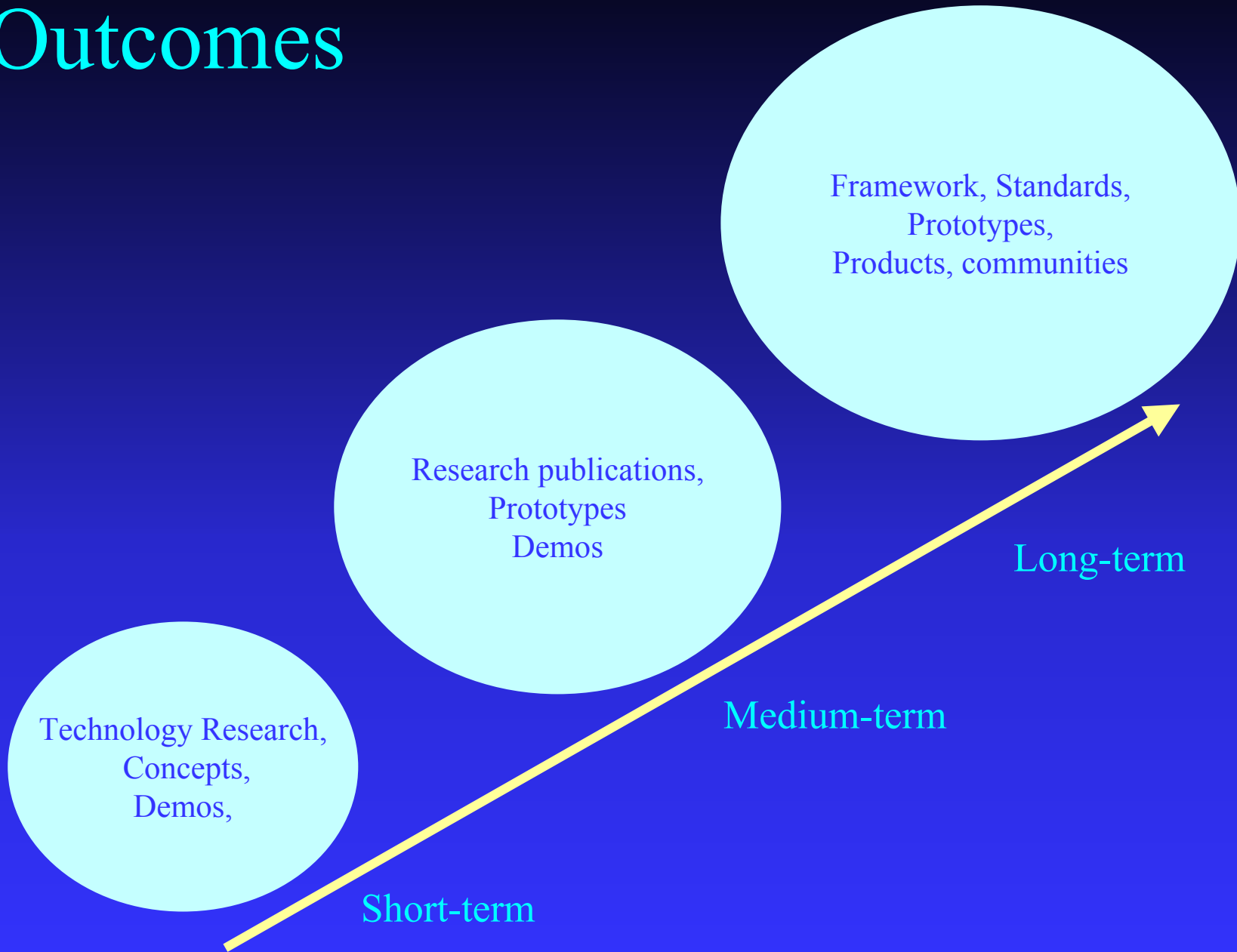
Engineering Team

- Faculty
  - Sumi Helal, Computer Science & Engineering
  - Joachim Hammer, Computer Science & Engineering
  - John Harris, Electrical Engineering
  - Mark Schmaltz, CISE
  - James Oliverio, Digital Arts Institute
- Postdoctoral Associates:
  - Choonhwa Lee, Ph.D. Computer Engineering
- Research Scientists:
  - Steven Moore, MS. Computer Engineering

Engineering Team

- Ph.D. Students
  - Youssef Kaddourah – Location positioning
  - Carlos Giralso – Elder Phones
  - Hicham Zabdani – Remote Monitoring Infrastructure & Elder Entertainment
  - Andi Sukojo: Devices and wireless interfacing
- Research Assistants:
  - Wenzheng Gu: Remote Monitoring Infrastructure
  - Choonhwa Lee: Networking and Service Discovery
- Masters Thesis Students
  - Satish Kumar: robotics (Matilda)
  - Pinkesh Desai: Sensor Networks

Engineering Activities

- Industry and Government Interactions
  - Demo Visits by NSF, Toyota, General Electric, Motorola, Intel, others
- Community Interactions – demos
- Participation in major engineering, computer science, and aging conferences
- Organizing conferences & Workshops
- Related Research Proposals

Dissemination

- Publications
- Conferences & Workshops
  - Int'l Conf. on Aging, Disability & Independence (ICAD) – DC, Dec 03
  - Preparatory Workshop for the ICAD High Technology Track – London, June 03
  - Possibility – ICAD follow-up meeting in conjunction with IEEE/IPSJ SAINT Conference – Tokyo, Jan 04
- Web Site
- Application Flash Demos
- Patenting and Technology Transfer

Leverage

- Pervasive Computing Laboratory
  - 950 sq. ft – UF College of Engineering
  - $36K renovation grant – UF CoE
- Full Scale Elder Home
  - Located on edge of UF campus at a Continuous Care Retirement Community
  - Will serve as a living lab
  - $350,000 project
- Motorola funded research to prototype smart phones for the elders
  - $85K, Motorola iDEN Gourp

Education / Capacity Building Outcomes:

- Long term: More investigators working in the area of aging and technology

- Intermediate: 6 dissertations by end of current RERC funding cycle; 12 more beyond 2006 – on applications of technology for successful aging

- Short-term: Enroll 15 Ph.D. and 3 post-docs during current cycle

Education / Capacity Building Program of Activities

- Research assistantships in Engineering and Rehabilitation Science

- Post-docs – NIDRR and VA

- Junior faculty mentoring

- Senior faculty collaborations

- Internships, work with corporate partners, and international exchanges

Education / Capacity Building Problems and Actions

- Internships have not yet proven to be a practical option for graduate students
  - Students work with corporate partners, but not at their facilities

Education / Capacity Building Progress

- Excellent progress, excepting internships
- Have secured additional funds to support more graduate students in engineering and rehabilitation science, and more post docs.

Dissemination Outcomes:

- Long term: Wide use of home monitoring and communications technologies

- Intermediate: More informed consumers

- Short-term: Dissemination products: video, web-site, Project Link, conferences, popular press and peer reviewed articles

Dissemination Program of Activities

- 12 areas of focus for dissemination
- More web-based delivery
- Partnerships with consumer and professional organizations
- Additional funds secured for wider dissemination

Dissemination Problems and Actions

- Initially under direction of UF Institute on Aging, which underwent administrative change
  - Moved dissemination directly under RERC Director (Mann), hired person with disability to implement dissemination plan

Dissemination Progress

- Good progress
- Conferences are very strong

A Conference Integrating Research, Practice, Business & Consumer Perspectives

The conference is financially supported by the National Institute on Disability and Rehabilitation Research, Veterans Health Administration, National Science Foundation, European Commission, private foundations and corporate sponsors. The conference program has been developed in cooperation with the European Commission.

Conference Partners

American Association of Homes and Services for the Aging [AAHSA] • American Medical Association Program on Aging and Community Health [AMA] • American Occupational Therapy Association [AOTA] • American Physical Therapy Association: Section on Geriatrics [APTA] • American Public Health Association [APHA] • American Speech-Language-Hearing Association [ASHA] • Association of Rehabilitation Nurses [ASN] • Case Management Society of America [CMSA] • Center for IDEA, SUNY at Buffalo [IDEA] • Center for International Rehabilitation Research Information and Exchange [CIRRIE] • Easter Seals • International Association of Homes and Services for the Aging [IAHSA] • Lighthouse International [LI] • National Asian Pacific Center on Aging [NAPCA] • National Association for Hispanic Elderly [NAHE] • National Association of Home Builders Research Center [NAHBRC] • National Association of State Units on Aging [NASUA] • National Chronic Care Consortium [NCCC] • National Council on Aging [NCOA] • National Gerontological Nursing Association [NGNA] • National PACE Association [NPA] • National Rehabilitation Association [NRA] • National Resource Center on Supportive Housing and Home Modification • USC Andrus Gerontology Center • Rebuilding Together • RERC on Mobile Wireless Technologies Persons with Disabilities • RERC on Universal Design and The Built Environment [RERC-UD] • RERC on Universal Telecommunications Access [RERC-UTA] • Rehabilitation Engineering Society of North America [RESNA] • Rehabilitation Research and Training Center Aging with Disability, Rancho Los Amigos Medical Center [RRTC] • Society of Certified Senior Advisors [CSA] • Trace Research and Development Center, University of Wisconsin [TRACE] • Visiting Nurse Associations of America [VNAA] • World Congress on Disability [WCD]

Conference Location:
Hyatt Regency Crystal City
Arlington, VA
Tel: (703) 418-1234

Conference Fees:
(Includes reception & luncheon)

Early Registration: $325 US
After Oct. 1, 2003: $350 US

Also possible to participate through the WWW.

Conference Sponsors

University of Florida,
Rehabilitation Engineering
Research Center on Technology
for Successful Aging
www.rerc.ufl.edu

American Society on Aging
www.asaging.org

European Commission (EU)
http://europa.eu.int

2003

The European Year of
People with Disabilities

An EU-US Sponsored

International Conference on Aging, Disability and Independence

*Advancing Technology &
Services to Promote
Quality of Life*

December 4-6, 2003
Washington, D.C., USA

www.asaging.org/icadi