Electronic ID for Inventory

Status Report as of Dec 6, 2012

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Overview

I Introduction:
  - Project
  - Client

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Introduction to Project

Our objective is to provide a turn-key solution to:

- Complete a weekly count of occupied cages at client's location,
- Discover any cages that are mis-located,
- Track cage history and account information,
- Generate billing summary.
Lab Animal Resources

- **Contact:** Dr. Lon Kendall, Interim Director
- **Lab Animal Resources (LAR)**
  - House and care for 10,000 animals (approx 3500 cages)
  - Two facilities (Main & Foothills campuses)
- **Needs:**
  - Complete regular census of cages
  - Promptly discover mis-located cages
  - Track resident care history & generate statements
  - Continuous database function; minimal interruption
Project Requirements

- Functional Requirements
  - 17 Functional Requirements
  - Example: Link RFID to database, min read range 12 in., editable.

- Physical Requirements
  - 5 Physical Requirements
  - Example: Mobile, hand-held unit, tags disposable or autoclavable.

- Proof of Concept:
  - $5000 Budget
  - Demonstrate RFID Census & Tracking of 1 room,
  - Up to 300 RFID tags per room,
  - Demonstrate alerts for mis-located cages,
  - Demonstrate check out station.
System Map

New Protocol

User

Response

Handle Alerts

Notification

HW/SW I/O

Account Info

Create Card

Census Request

Run Census

Check Out Request

Delete Card

RFID to be Removed

RFID

Tags Found

Get Tag ID

Handle Errors

Tag Assignments

Database

Excitation Response

Reader Module

Excitation

Get Tag ID

Handle Errors

HTTP

Tags Found

Account Info

Create Card

Census Request

Run Census

Check Out Request

Delete Card

RFID to be Removed

Software Intensive

Hardware Intensive

Hybrid

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Project Introduction
Client Requirements
System Map
RFID Challenges
Software
Recommended Configuration
Project Time-Frame
Challenges of RFID System

- **Operational Environment**
  - Read Distance (typ. 10x mm), polarization, power, etc.

- **Quantity of Data**
  - Requires more memory on reader, higher frequency

- **Ethics: Safety & Welfare of Animal Residents**
  - Hearing range up to 125 kHz; Antenna radiation

- **Public WiFi Range is 2.4 GHz**

- **Ghost Reads and Error Correction**

- **Generational Differences among RFID tags**
System Trade-Offs

Optimization
- LOW Census Time
- LOW Cost
- LONG Read Distance
- HI Reliability
- HI Data Quantity

Constraints
- Room Dimensions
- Facility Layout
- Construction
- Population
- Welfare of Animals
- Room ID
- Metal Shelves

Legend
- ← Vary Indirectly
- •• Vary Directly

Where is the right balance?
Software Modules

- **Control Read Session**
  - Includes error handling algorithms
- **Perform Comparison & Generate Alerts**
  - Includes user I/O at the reader
- **Track Account History**
  - User ID & Cage History
- **Facilitate 'Admin' & 'User' Functionality**
  - Admin: Full Access
  - User: Limited Access
General Recommendations

- 900 MHz – 1 GHz (above hearing range, below WiFi)
- Generation 2 tags
- Write Distance = Minimum Read Distance
- Circular Polarization
- Interface written in C++
- WiFi Capabilities on Reader
- Backup Feature to Address RFIDs without Internet
Specific Configuration

- Motorola 9090Z; C++ Interface, Gen2 Disposable Tags, 802.11b/g
  - ✓ 900 MHz – 1 GHz
  - ✓ Generation 2 Tags Compatible
  - ✗ Circular Polarization
  - ✓ Min Write Distance 12”
  - ✓ Interface written in C++
  - ✓ WiFi Capabilities on Reader
  - ✓ Backup Feature to Address RFIDs without Internet
Project Time-Frame

- **Dec 10, 2012 to Jan 3, 2013**
  - Test: Cage Card Scan Function
  - Develop preliminary I/O software
- **Jan 3, 2013 to Feb 1, 2013**
  - Test: Comparison to Database, Multiple Cards
  - Develop Software Package (will be ongoing)
  - Demo: census capture  [01/31/2013]
- **Mar 1, 2013 to May 1, 2013**
  - Integration
  - Proof of Concept Delivery  [05/01/2013]
Questions?