Remote Vehicle Interface (RVI)

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Project Goals

Interface with vehicle using phone or WWW

- Start / Kill engine
- Lock / Unlock doors
- Pop trunk

Must provide reasonable security

Mimic satellite-based implementation

- Top-down LOS channel model
Overall Design

RVI Server (TX)
  • Stores user database
  • Provides user interfaces
  • Authenticates users
  • Transmits RF commands

Vehicle Control Unit (RX)
  • Accepts RF commands
  • Interfaces with vehicle systems
PC Server

- MS Access for user database
- VTapi ActiveX control for Dial-in
  - Custom message prompts (.wav)
  - Tone detection
  - Thread-safe
- Microsoft IIS for Web UI hosting
  - Dynamic content with ASP.NET
  - Connection to database via ADO.NET
TX - AC4490 Transceiver

- Frequency: 902 - 928 MHz
  - License-free band
- Power: 5 - 1000 mW (variable)
- Range: ~20 miles (LOS)
  - at 500 mW
  - with 3 dB omni antenna
- Modulation: FHSS FSK
- RF Data Rate: 76.8 kbps
- Supply Voltage: 3.3 Vdc
Vehicle Control Unit

AC4490

RF
HCS08-GB60 MCU

- 8-bit microprocessor
- Operates down to 1.8 V
- Real-time debugging
  - No additional hardware
  - Uses one SCI port
- CodeWarrior IDE included
  - with C compiler !!
RX - AC4490 Transceiver

• Same specs as RVI-server TX
Specific Parts

Aerocomm AC4490 TX/RX

- $70 ea. in bulk
- Negotiating samples with "Western Region Sales Manager"
- Cirronet makes a similar product

HCS08-GB60 MCU

- $80 ea.
- CodeWarrior IDE

Multiple places to buy from:
- Arrow Electronics
- Future Electronics
- Both had it in-stock last night
Specific Parts 2

PC Server

- PIII-500 CPU
- Abit motherboard
- 256 MB PC100 RAM
- 3Com 3c905b NIC
- Diamond SupraExpress 56i voice modem

- a.k.a. “Travis’s old desktop”
Security Overview

Security

• Each user has a unique seed and an offset for a random # algorithm
  • MCU and DB retain these numbers
• MCU checks the authorization # received against the next 128 possibles in the series (using last successful offset)
  • Why so many?
• If successful, it resynchronizes
Vehicle installation

- Will get Best Buy, Circuit City, etc. to “donate” a tutorial over the summer

Signal strength

- Range is everything
- Panel antennas *(example)*
  - Modest gain
  - Can be mounted discretely on exterior
  - Prevents losses caused by metal exterior
**Issues 2**

**Serial Port Communication**

- Never written code that uses serial port to transmit data
- Obviously, both UI’s need a way to do this
- Shouldn’t be too hard
  - Famous last words…
## Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
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<tbody>
<tr>
<td>User DB</td>
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Milestones

1. Access database built
   - User ID#
   - Password
   - Seed for random number generator

2. Working Dial-in UI
   - Accept calls
   - Authenticate users
   - All menus functional
   - Packets getting to serial port
Milestones 2

1. Working Web UI
   - Users can log in
   - All menus functional
   - Packets getting to serial port

2. Server and TX integrated
   - TX receiving packets on serial port
   - Packets being transmitted correctly
Milestones 3

1. MCU Programmed
   - Receiving packets on SCI port
   - Checking authorization #
   - Setting GPIO pins properly

2. RX and MCU integrated
   - RX receiving RF packets
   - Forwarding to serial port
   - MCU still receiving
Milestones 4

1. MCU and Vehicle integrated
   - Able to start/kill engine
   - Able to lock/unlock doors
   - Able to pop trunk
   - All work at LONG range
     - Say 1 mile for starters
That’s it...

Questions?

Suggestions...