REVEAL: Software Documentation and Platform Migration

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Embry-Riddle Aeronautical University
USRP Interns – Summer 2008
Outline

- Background
- Internship Objectives
- Project Foundation
- Platform Migration
- Field Test
- Next Steps
- Project Status
• Research Environment for Vehicle-Embedded Analysis on Linux

• Implemented on MontaVista Linux

• “Data acquisition and distribution system”

• Primarily used in aircraft
Suborbital Telepresence

- Hardware platform for REVEAL
- PC/104 Form Factor
- Configurable acquisition, processing, recording

![Diagram of hardware platform]

- Network
- Digital I/O
- Analog I/O
- External Sensors
- Internal Sensors
- Configurable Components
- Satellite Links
Internship Objectives

• Grow REVEAL’s support for multiple developers
  • modern version control system
  • modern software documentation

• Verify implementation flexibility
  • implement on different CPUs
  • demonstrate end-to-end functionality
Project Foundation: Subversion

• Version Control Software
• Motivation
  – Multiple people working with same files

Revision 80: /
- DailyReports/
- FRAU_REVEAL_XML/
- FinalDraftVoibell.txt
- FinalOutline.txt
- NTPD_Setup
- REVEAL_MAKENOTES
- Reveal_Setup
- ToDo.txt
- USRP_Report.odt
- WeeklyReports/
- doxygen_checklist
- doxygen_manual_1.5.6.pdf
- mod_authz_svn_notes.txt
- piccolo_comms.pdf
- piccolo_notes
- svn-book.pdf
- svn_authentication_notes.txt
- xmlperl/
- xmltracor/

Powered by Subversion version 1.4.6 (r28521).
## ViewVC

Browser based repository

### Index of /

Files shown: 14
Directory revision: 77 (of 77)
Sticky Revision: [Set]

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<th>Age</th>
<th>Author</th>
<th>Last log entry</th>
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<td>$REVEAL = /Users/mjm/Reveal$</td>
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<td>$LDADS = $(REVEAL)/Revealv1.1a$</td>
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| 13 | $LD_LIBRARY_PATH=$(LDADS/BIN:$LDADS/LIB:/usr/lib$ | 13 | $LD_LIBRARY_PATH=$(LDADS/BIN:$LDADS/LIB:/usr/lib$ #
Doxygen

- Visual Interactive Code Documentation
- Motivation
  - Easy to find and interpret code
  - Parses files, functions, variables, definitions
  - Useful comment structure
int checkParity(int chan, uint32_t word)
/** @return TRUE if it checks valid, otherwise false */
/** @param chan the channel index */
/** @param word the 32-bit ARINC-429 parameter word, via the Condor API */
{
    int okay = FALSE;    // return code
    uint32_t ptest;      // parity test value

    switch(chan)
    {
        case ARINC_CHAN0: ptest = ARINC_CHAN0_PARITY; break;
        case ARINC_CHAN1: ptest = ARINC_CHAN1_PARITY; break;
        case ARINC_CHAN2: ptest = ARINC_CHAN2_PARITY; break;
        case ARINC_CHAN3: ptest = ARINC_CHAN3_PARITY; break;
        default: jobMsg(LOG_BYE,"checkParity: unknown channel: %i\n",chan);
    }

    if (working) switch(ptest)
    {
        case AR_ODD: if (!(word & ARINC_PARITY_BIT)) okay = TRUE; break;
        case AR_EVEN: if (word & ARINC_PARITY_BIT) okay = TRUE; break;
        case AR_RAW: okay = TRUE; break;
        default: jobMsg(LOG_BYE,"checkParity: internal error: %i\n",ptest);
    }

    return(okay);
}
Doxygen - GraphViz

- File dependency graphs
- Clickable links
• Functional dependency graphs
• Flow visualization
• Easy code debugging
Platform Migration

- Three considered platforms:
  - VersaLogic EPM-5 “Puma”
  - Lippert “Cool FrontRunner”
  - eBox-2300 (“NorhTec MicroClient”)
- Puma and Lippert suspended due to time constraints
eBox-2300

• Motivations for choice
  – Built-in Compact Flash interface
  – Passive Cooling
  – Low Power Consumption (15W)
  – Self Contained
  – Two Serial Ports
eBox-2300 (cont.)

- Finally: small size
eBox Modification

- Added 2nd Compact Flash interface
  - Usability: separates system and data
  - Makes one complete package
Testing REVEAL

• Data Source: Piccolo II Autopilot
  • Generates useful, verifiable data
  • Communicates over serial
  • Existing data acquisition software
Testing REVEAL (cont.)

- Network Link: Iridium 9505A Satellite Phone
  - Globally accessible
  - Allows data transmission
  - Serial accessory
Field Test

• Proof of Concept

Truck Setup

Terminal
Physical Network Architecture

Iridium

Ground Station

Internet

9505A

Piccolo II

REVEAL

Vehicle

California Team

New Hampshire Team

NASA

EMBRY-RIDDLE AERONAUTICAL UNIVERSITY
Field Test (cont.)
Next Steps

• Further documentation
  • XML configuration files
  • Data flow
  • Accessibility to a broader audience
• Further miniaturization of REVEAL hardware
  • Current size is restrictive
• Expanded applications of REVEAL software
Project Status

• Implemented multi-developer capability for REVEAL
  • Created interactive REVEAL documentation.

• Became first users

• Migrated REVEAL to low-cost hardware (eBox-2300)
  • Field tested system
  • Verified end-to-end operation
Acknowledgments

• Larry Freudinger
• Brent Bieber
• Sky Yarbrough
• Jim Murray
• Shari Olson
• Miriam Rodon-Naveira
• Matt Miller & John Wilson
• Professor Gary Gear
Questions?