REVEAL: Software Documentation and Platform Migration

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USRP Interns – Summer 2008
Outline

• Background
• Internship Objectives
• Project Foundation
• Platform Migration
• Field Test
• Next Steps
• Project Status
REVEAL

- 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
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
• Version Control Software
• Motivation
  – Multiple people working with same files
## Index of /

Files shown: **14**  
Directory revision: **77 (of 77)**  
Sticky Revision:  

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*Site Admin*

Powered by ViewVC 1.0.5
**ViewVC**

Highlighted differences

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<td>REVEAL = /Users/mjm/Reveal</td>
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<td>LDADS = $(REVEAL)/Revealv1.1a</td>
<td>OBJ = $(REVEAL)/lib</td>
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<td>OBJ = $(LDADS)/LIB</td>
<td>BIN = $(REVEAL)/bin</td>
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Doxygen

• Visual Interactive Code Documentation
• Motivation
  – Easy to find and interpret code
  – Parses files, functions, variables, definitions
  – Useful comment structure
Validates ARINC-429 parity

@section func_sec FUNCTIONAL DESCRIPTION:
The Condor card has already checked parity and set a bit in the 32-bit parameter word to let us know, we just look at the bit.

@section revhist_sec REVISION HISTORY:
* Date     By       Description
* 11/24/04 Carl Sorensen  Created
* 01/31/08 Carl Sorensen  From 2 to 4 channels

@section notes_sec NOTES:
* If the channel is in “raw mode” parity is not checked by card or us.

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 2\textsuperscript{nd} 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

9505A

REVEAL

Piccolo II

Vehicle

Ground Station

Internet

California Team

New Hampshire Team
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?