REVEAL: Software Documentation and Platform Migration

Mike Wilson
Victoir Veibell

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

- Network
- Digital I/O
- Analog I/O
- Satellite Links
- Internal Sensors
- External Sensors
- Configurable Components
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
# ViewVC

## Browser based repository

### Index of /

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*Site Admin*

Powered by ViewVC 1.0.5
## ViewVC

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<td>CC = gcc</td>
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<td>CFLAGS = -I$(IXML) -I$(INOVAS) -I$(IARINC) -I$(IDSCUD) -D$(OS)</td>
<td>CFLAGS = -I$(IXML) -I$(INOVAS) -I$(IARINC) -I$(IDSCUD) -D$(OS)</td>
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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>8</td>
<td>OBJ = $(LDADS)/LIB</td>
<td>BIN = $(REVEAL)/bin</td>
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<td>BIN = $(LDADS)/BIN</td>
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<td>LD_LIBRARY_PATH=$LDADS/BIN:$LDADS/LIB:/usr/lib</td>
<td># LD_LIBRARY_PATH=$LDADS/BIN:$LDADS/LIB:/usr/lib</td>
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• 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_ERR,"checkParity: unknown channel: %s",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_ERR,"checkParity: internal error: %s",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
• Finally: small size
eBox Modification

• Added 2\(^{nd}\) 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
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?