Pattern-Driven Software Problem Solving

Introduction

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Memory Dump Analysis Services
Prerequisites

Experience in software troubleshooting and/or debugging
Agenda (Summary)

- A Short History
- Basic Definitions
- Pattern Categories
- Future Research Directions
DumpAnalysis.org*

5 Years!

* Now Includes: TraceAnalysis.org, www.ForensicAnalysis.org, and Victimware.org
Agenda (Basic Definitions)

- Software Problems
- Software Patterns
- DA+TA
- Pattern Hybridization
Software Problems

- Construction: Requirements, Architecture, Design, and Implementation
- Post-Construction: Maintenance and Support

Post-construction problem: any observed deviations in structure and behavior between modeling expectations and the actual built system.*

* What is a Software Defect?
Software Patterns

- Construction: Requirements, Architecture, Design, and Implementation
- Post-Construction: Maintenance and Support

**Pattern**: a common recurrent identifiable problem together with a set of recommendations and possible solutions to apply in a specific context
DA+TA

- **DA**: Dump Artifact / Dump Analysis
  Memory snapshots: process, kernel, physical memory dumps

- **TA**: Trace Artifact / Trace Analysis
  Software traces: Event Tracing for Windows, logs
Pattern Hybridization

A bit of Chemistry: Carbon $SP^3$ orbital hybridization

Software Patterns$^3$
- Structural
- Behavioral
- Debugware
- Debugging
Agenda (Pattern Categories)

- Software Behavior
- Debugware Tools
- Problem Workaround
- Unified Debugging
Software Behavior

- Memory dump and software trace
- Examples: Spiking Thread, Discontinuity
- +200 patterns (DA+TA)
- DumpAnalysis.org
DA: Software Behavior

- Memory dump: a memory snapshot
- Definition, partial classification and historical list
- Pattern identification case studies
Imagine you got a software trace from hundreds of modules you haven’t written or haven’t seen source code of...

- Software trace: a sequence of memory fragments ordered in time
- Definition, and historical list
- Pattern identification case studies
Debugware Tools

- Troubleshooting and Debugging
- Example: Troubleshooting Unit of Work
- 13 patterns, case study
- DumpAnalysis.org
Problem Workaround

- Troubleshooting when debugging is not an option
- Example: Frozen Process
- Patterns
- DumpAnalysis.org
Unified Debugging

- Systematic Pattern Language
- Example:

  Analysis Patterns
  Architectural Patterns
  Design Patterns
  Implementation Patterns
  Usage Patterns

  *Shared Buffer Overwrite*
  Debug Event Subscription / Notification
  Punctuated Execution
  Breakpoint (software and hardware)
  Kernel vs. user space breakpoints
Agenda (Future Directions)

- Structural Memory Patterns
- Unified Debugging Pattern Language
- Domain Pattern Hierarchy
- Periodic Table of Software Defects
Structural Memory Patterns

- Examples: Memory Region and Region Boundary
- DumpAnalysis.org
Domain Pattern Hierarchy

Repeated patterns through the layers of software
Resources

- DumpAnalysis.org
- Pattern-Driven Memory Dump Analysis
- Memory Dump and Trace Analysis: A Unified Pattern Approach
- Advanced Software Debugging Reference:

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Q&A

Please send your feedback using the contact form on DumpAnalysis.com