

# Military

EMBEDDED SYSTEMS

INCLUDING  
**MIL/COTS**  
**DIGEST**  
 ▶ PDF

Developing an Embedded  
 System / Device?

**VDC**  
 research

CLICK HERE

ARTICLES & TOPICS

NEWS & PRODUCTS

WHITE PAPERS

VENDORS

E-CAST SCHEDULE

Keyword Search > GO

## Visualization

### Legacy Software Migration

September 2009

# Architectural visualization key to code reuse

By



**Gwyn Fisher**  
 KLOCWORK

**What can developers of military and avionics software systems do to take advantage of software reuse while ensuring that software is as bug-free and secure as possible?**

In all industries, software is becoming increasingly ubiquitous. Take Boeing jets as an example. At 6.5 million lines of code, Boeing's 787 aircraft flight control system has three times more code than the 777[1]. Given this growth trend, it is both unrealistic and impractical to rewrite an entire system from scratch for each new project.

## COLUMNS

### Crosshairs Editorial

by Chris A. Ciuffo



### Industry Analysis

### In the System

### Field Intelligence

### Daily Briefing

### Legacy Software Migration

### [Analyze Embedded Code](#)

Find and fix critical bugs  
 with CodeSonar. Free  
 evaluation.

[www.GrammaTech.com](http://www.GrammaTech.com)

Ads by Google

The reuse of code has become a universal software development best practice. It speeds time to market by increasing development efficiencies while minimizing the costs associated with brand-new development. The practice of code reuse also enables development organizations to leverage the lessons learned from an existing code base.

However, with code reuse, a balance between risk and reward must be achieved. When legacy software is ported to a new operating system or combined with new code, formerly latent bugs can become active critical defects or high-risk security vulnerabilities. In mission-critical military and avionics systems, software defects can lead to injury, costly malfunctions, and even loss of life.

In fact, improper legacy code reuse was the root cause of the Ariane 5 (unmanned) spacecraft's self-destruction in 1996. The code operated safely in the aircraft's previous version, but the execution context changed, transforming what was a latent bug in the Ariane 4 into a critical bug that caused its successor to explode 37 seconds after launch.

### **The power of architectural analysis**

In industries with large and extremely complex code bases, such as military and avionics, one key element in successful reuse of legacy code is the ability to visualize and analyze the software system architecture. Leading Source Code Analysis (SCA) tools provide software system architects, development managers, and individual software developers with a graphical view of the design of their software directly from existing source code. This graphical view provides a comprehensive understanding of the application's structure and design, allowing the team to assess interfaces, relationships, and logic flow to determine where and how to reuse existing code. Clearly understanding the systems' components and their interrelationships and dependencies is critical to improving the quality and security of software. Additionally, the ability to document system architecture is required to achieve compliance with the DO-178B standard within the avionics space.

## **NEWSWIRE**



• MORE NEWS

### **RELATED:**

**Quick Ship Industrial Encoders from Quantum Devices**  
21 April 2010



**Curtiss-Wright Controls Debuts New Version of its Continuum Vector Signal Processing Subroutine Library Optimized for Intel (r) Processors**  
21 April 2010



**Tanner EDA Releases Version 15 of Widely-installed HiPer Silicon Full-flow Design Suite**  
20 April 2010



**AdvancedTCA Virtual Summit Announced, June 24th, 2010**  
20 April 2010

**Raima to Preview RDM Embedded 10.0, the Upcoming Release of Their Popular Embedded Database, at ESC Silicon Valley 2010**

When reusing legacy code, a comprehensive view of the system's architecture can help development teams in the following ways.

#### *Isolate reusable components*

When reusing components from a legacy software application for a new application, it is necessary to minimize the dependencies of those components on other parts of the software system. To do so, designers must ensure that the component contains only entities related to the component's functionality. A complete view of the system's architecture at all levels enables developers to isolate reusable components and reorganize them for the most efficient reuse of code.

#### *Assess and improve quality of the software system design*

The physical design of a software system might bear little resemblance to its high-level logical design. With a detailed view of the system's architecture, it's possible to:

- Navigate the system hierarchy and explore its structure
- Review a component's dependencies on other components
- View relationships between different components in the system

Through this view, inconsistencies between current implementation and design intent can be uncovered, including inappropriate relationships and dependencies and errors duplicated in different levels of the software hierarchy. This level of understanding allows development teams to assess the quality of the physical software system and implement the desired logical design on the system.

#### *Portability to a new platform*

Recycled code is frequently used in systems designed for platforms other than those for which the native code was originally developed. Ensuring that the in-house or third-

20 April 2010

**Portwell's New PEB-2780VG2A Offers Single Core (N450) or Dual Core (D510) Intel Atom Processor on One Compact Board**



20 April 2010

**PENTAGON 2000SQL Selected by the United States Air Force.**



20 April 2010

**QNX Unveils IEC 61508 Certification Support Package for Safety-Critical Systems**

20 April 2010

**Core Systems releases its RAPTOR-M120 1U Rugged Rackmount Server Featuring Dual Core i7 Processors**



20 April 2010

**Chassis Plans Welcomes John Ranj as Director of Sales and Business Development for Rugged Military Computing and Display Systems**



19 April 2010

**Altera Unveils 28-nm Stratix**

party code will perform as designed on a new platform is challenging. However, a thorough architectural view of the system can help by revealing the application's dependencies on the external environment. With an accurate understanding of the code and its design, the development team can quickly determine the scope of the porting effort and the actions required.

### The architecture of reuse

For military and avionics software development teams, comprehensive visibility and analysis of their software system architecture is critical in ensuring high-quality, secure results when reusing legacy software. Using the architecture capabilities of source code analysis tools, the risks associated with code reuse are greatly diminished, productivity gains are made through more comprehensive design planning, and the efforts required to achieve DO-178B compliance are streamlined.

### References:

[1] Boeing Faces "Pretty Tight" 787 Delivery Schedule, by Michael Mecham, Aviation Week, Sept. 9, 2007, [www.aviationweek.com/aw/generic/story\\_generic.jsp?channel=awst&id=news/aw091007p2.xml&headline=Boeing%20Faces%20%27%27Pretty%20Tight%27%27%20787%20Delivery%20Schedule](http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/aw091007p2.xml&headline=Boeing%20Faces%20%27%27Pretty%20Tight%27%27%20787%20Delivery%20Schedule)

Gwyn Fisher is the chief technology officer at Klocwork and has more than 20 years of global technology experience. He brings a valuable combination of vision, experience, and direct insight into the software developer's perspective. At Klocwork, Gwyn returns to his original passion, compiler theory, to move static source code analysis to the next level. He can be contacted at [gwyn.fisher@klocwork.com](mailto:gwyn.fisher@klocwork.com).

**V FPGA Family**  
19 April 2010

**Fusion Embedded(tm)  
Solutions for Micrium  
µC/OS-III: Partnership  
Extended Due to Customer  
Demand**  
19 April 2010

**Chassis Plans ATXW-5520  
Long Life Industrial  
Motherboard Features Dual  
Westmere Six-Core  
Processors and Intel(r)  
Trusted Execution  
Technology**  
19 April 2010

**Chipworks shows the  
Samsung fabricated Apple  
A4 has more processing  
power than previous  
generation Apple-branded  
processors**  
16 April 2010

**HCC-Embedded Releases  
USB Product Range for TI  
C6000/OMAP  
Microprocessors**  
16 April 2010





©MMX *Military Embedded Systems*. An [OpenSystems Media](#) publication.



[About this Magazine and Website](#) | [Contact Us](#) | [Military Embedded Systems Media Kits](#)