



Embedded **Software in the Military: Today's Challenges and Tomorrow's Opportunities**

Doug Locke, Ph.D.
Locke Consulting, LLC
www.douglocke.com



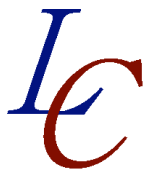
Today's Challenges

- Formerly, military systems consisted of hardware, aided by software
 - Weapons – e.g., artillery, aircraft
 - Sensors – e.g., pressure, infrared
 - C⁴I – tracking boards
- Today, military systems can be said to consist of software, with just enough hardware for the software to work!
- Most embedded military software is
 - Over budget
 - Behind schedule
 - Of mixed quality
- Why?



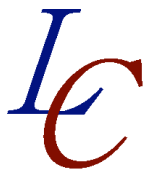
Why?

- Systems and Software architecture issues
 - Architectures are incomplete
 - Shows components, but often missing inter-component communication, collaboration, and cooperation, and non-functional characteristics (e.g., performance, availability, etc.)
 - Standards-based COTS decisions frequently made prematurely based on incomplete architecture



Why?

- Software Development issues
 - Use of weak languages and inappropriate infrastructure products & communications mechanisms
 - Under-performing software processes (esp. planning & tracking)
- Performance issues
 - Today's hardware assumed to be infinitely fast, so response time is assumed to be easy to achieve
- Software stability issues
 - Complexity is incompletely handled, so resulting system becomes fragile



Tomorrow's Opportunities

- Ensure complete software architectures
 - Define components
 - Emphasize communication, collaboration, and cooperation among components
 - Identify COTS / GOTS at architecture level
 - Identify major infrastructure elements
- Reduce component complexity
 - Ensure that software components
 - Minimize interfaces
 - Minimize resource sharing
 - Maximize autonomy



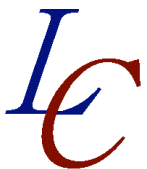
Tomorrow's Opportunities

- Participate in standards efforts to enable much greater COTS / GOTS use
 - E.g., POSIX, CORBA, UML, Java
 - Add critical capabilities (real-time, security, safety)
- Complex systems should evaluate use of
 - Real-time Java
 - Real-time CORBA
 - Real-time UML extensions



Conclusions

- Software is the defining element in embedded military systems
 - Systems must be defined in order of
 - Requirements
 - Software architecture
 - Hardware definition
- Don't forget the basics, like
 - Complete software architecture
 - Planning and Tracking





Doug Locke, Ph.D.
Locke Consulting, LLC
www.douglocke.com

