

A Light-weight Architecture Trade Off Process Based on ATAM®

A Panel Presentation: Sharing Experiences with ATAM®

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Overview

- We created a process we named “ATO-Lite” (Architecture Trade Off Lite), derived from SEI's ATAM®.
 - “ATO Lite” is a front-end tool that assists architects with development of robust, focused architectures in a time- and cost-effective manner
- We identified a subset of ATAM® activities as a less formal, less thorough, and less time- and cost-intensive execution of ATAM®
 - One of the benefits of this “abridged” version of ATAM®, is that it can be applied as part of the initial architecture development (i.e., in a “forward looking” fashion)
- Many projects are employing spiral and/or incremental development
 - A process such as the ATO-Lite will fit into each of these cyclical, quick turn development models

ATO-Lite Context

- We work extensively with Net-Centric Systems Architectures
- We have a Significant Focus on "Mission Assurance" (MA)
 - Needed to make MA a more visible part of our N-C Architectures
- Discussions drove a Special Project to answer:
 - Where does Mission Assurance assert itself in a Net-Centric Architecture?
 - How can we be sure that we address Mission Assurance at an architectural level?
- Quickly settled on ATAM®
 - Provided the pattern for a structured method
 - Tailored through our MA focus to become "ATO-Lite"

ATAM® as a Model for ATO-Lite

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A Side-bar on "Mission Assurance"

- As hard to define as Love...
 - Weakness or Strength?...
- Short Answer:
 - Mission Assurance is... *Whatever it needs to be to assure the success of the solution in the context of the **entire mission problem space**.*
- Our Mission Assurance Home Page:
 - "Mission Assurance is the discipline to manage inherent risk in an affordable manner to maximize mission success, and this leads to having 'No Doubt'"
- COL Robert Barry, US Army, TRADOC:
 - "Make it personal, keep it simple and keep it rugged — that's Mission Assurance"

Just a taste of what drives us at Raytheon...

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Genesis & Evolution of ATO-Lite

- First cut at Tailoring based on Expertise & Experience
 - E.g., selected subset of Quality Attributes, Utility Tree, Templates, etc.
- Refined/Piloted using artifacts from Existing N-C Program
 - Validated and refined "First cut" using Representative Architecture
- Published the Results
 - "Technology Today" article (an external Raytheon publication)
 - System/Software Technology Annual Symposium (Raytheon internal event)
- Enhanced by Raytheon "System Engineering Training Development Program" (SETDP)
 - Used & Refined ATO-Lite through application to live programs
 - Demonstrated benefits to those live programs
- ATO-Lite is now part of Raytheon Architecting Process and Best Practice

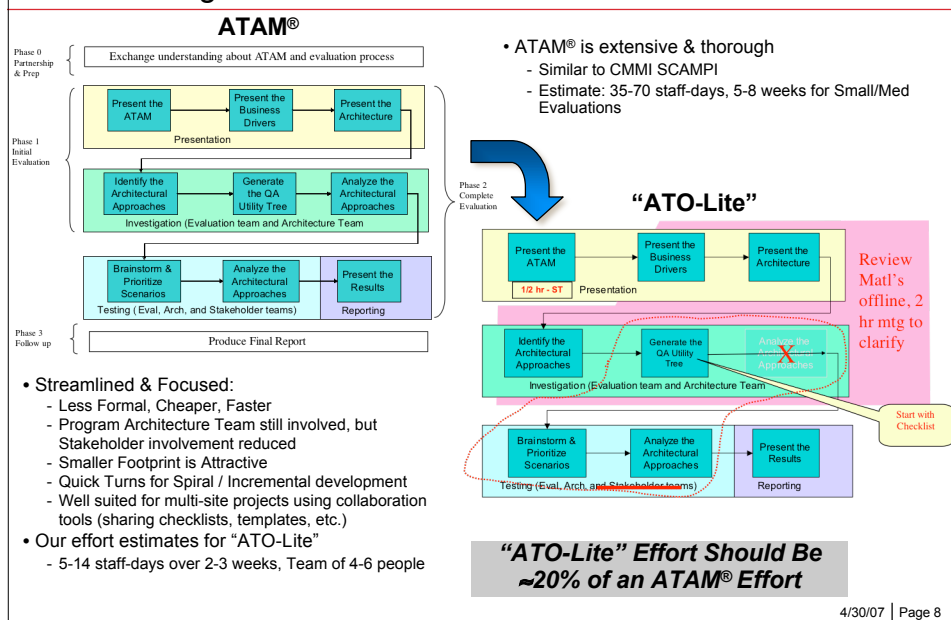
For this Panel, we were asked...

- How was ATAM® *Used*?
- How was ATAM® *Adjusted*?
- What *Obstacles* (Challenges to use) did you encounter?
- What *Worked Well* (Good News)?
- What *Lessons* were learned?

How Used

- Initial Focus was Mission Assurance
 - To develop ATO-Lite from ATAM for a Net-Centric Architecture
- Subsequent iteration of ATO-Lite included:
 - Broader ATAM® Quality Attribute coverage
 - Improved documentation of Utility Tree & Templates usage
- ATAM® tools were applied during Initial Architecture Development
 - Architectural development first, then Assessment
 - Building the Architecture using the Assessment tools

How Adjusted: Streamlining ATAM® into “ATO-Lite”



How Adjusted: Selected Quality Attributes & Their Concerns

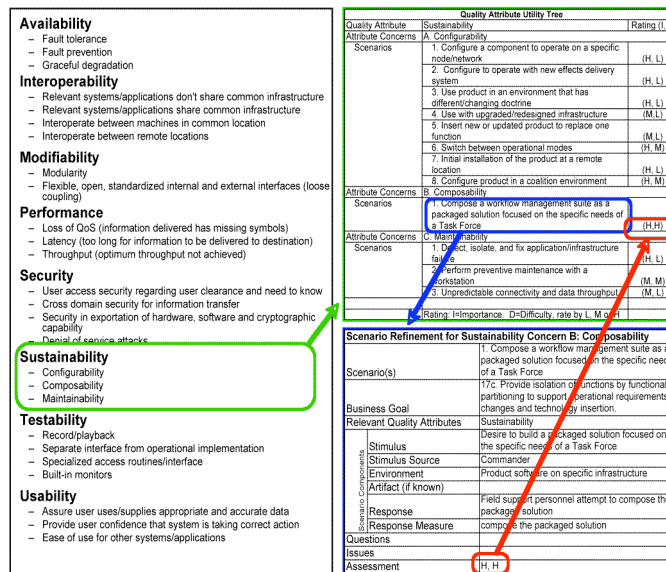
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- **Availability**
 - Fault tolerance
 - Fault prevention
 - Graceful degradation
- **Interoperability**
 - Interoperable with relevant systems/applications that don't share a common infrastructure
 - Interoperable with relevant systems/applications that share a common infrastructure
 - Interoperate between machines in a common location
 - Interoperate between remote locations
- **Modifiability** (*ability to change the product design due to change in requirements or due to change in the external conditions - focuses on development time changes*)
 - Modularity
 - Flexible, open, standardized internal and external interfaces (loose coupling)
- **Performance**
 - Quality of Service (QoS)
 - Latency (*time for information to be delivered to destination*)
 - Throughput (*amount of information delivered per time*)
- **Security**
 - User access security regarding clearance and need to know
 - Cross domain security for information transfer
 - Security in exportation of hardware, software and cryptographic capabilities
 - Denial of service attacks
- **Sustainability** (*ability to keep the product working for its original purpose when external conditions change – focuses on runtime configurability/adaptability*)
 - Configurability
 - Composability
 - Maintainability
- **Testability**
 - Record/playback
 - Separate interface from operational implementation
 - Specialized access routines/interface
 - Built-in monitors
- **Usability**
 - Assure user uses/supplies appropriate and accurate data
 - Provide user confidence that system is taking correct action
 - Ease of use for other systems/applications

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How Adjusted: Quality Attribute Utility Tree & Scenario Analysis Templates Linkage

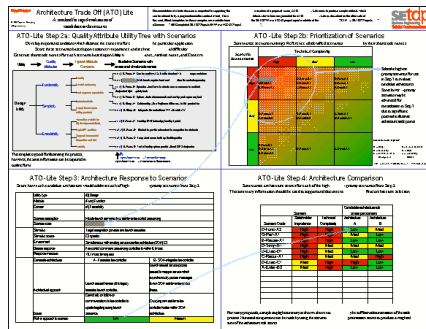
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Obstacles, Challenges & Good News

- No major challenges beyond the expected team dynamics
 - E.g., Consensus Building, Norming-Storming-Forming, etc.
- Creation and Evolution of ATO-Lite **IS** the "Good News"
 - ATAM® provides a robust platform for extension & repurposing



Lessons Learned

- Core ATAM® can be applied to development, not just assessment of an architecture
- It can also be applied to Systems Architectures, not just Software Architectures
- ATO-Lite:
 - Leads to successful ATAM® results
 - Facilitates agility on incremental/spiral development programs
 - Complements "Train as you Fight" with "Develop as you Assess"
 - Works for Systems and Software Architectures

Additional Raytheon Team Participants

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