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"

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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"
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”

- ATAM® is extensive & thorough
  - Similar to CMMI SCAMPI
  - Estimate: 35-70 staff-days, 5-8 weeks for Small/Med Evaluations

- Streamlined & Focused:
  - Less Formal, Cheaper, Faster
  - Program Architecture Team still involved, but
    Stakeholder involvement reduced
  - Smaller Footprint is Attractive
  - Quick Turns for Spiral / Incremental development
  - Well suited for multi-site projects using collaboration tools (sharing checklists, templates, etc.)

- Our effort estimates for “ATO-Lite”
  - 5-14 staff-days over 2-3 weeks, Team of 4-6 people

“ATO-Lite” Effort Should Be ~20% of an ATAM® Effort
How Adjusted:
Selected Quality Attributes & Their Concerns

- **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
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

- Robert J Curry – RMS
- Walter F. Guiot – RMS
- Anthony E Sabatino – RMS
- Philip J Sementilli – RMS
- Terry D Jensen – NCS
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- Barry E Thelen – NCS
- Robert D. Stell – IIS
- Rolf Siegers -- IIS
- John H. Steele – SAS
- Patrick H. Murphy – IDS
- Melanie F. Davis – RTSC

### References

- *Class Book, Implementing and Managing Enterprise Architecture*, Barnett Data Systems and The Zachman Institute for Framework Advancement, April, 2004