

# **CMMI v1.1 for a Service-Oriented Organization**

**By Steve Hall, Jeff Ricketts, Diane  
Simpson**

**16 November 2005**

# Overview

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This presentation will describe how CMMI v1.1 was applied to Raytheon Company's Information Technology and Scientific Services (ITSS), a service-oriented company, located in Pasadena, California so that the SCAMPI could be used to assess the process maturity level of the organization.

- **Key components to the success of any endeavor**
  - **Desire – to have a longing for along with a strong intention or aim**
  - **Drive – a strong systematic group effort**
  - **Determination – the power or habit of deciding definitively and firmly**

**These were demonstrated by the ITSS organization**

# Overview

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- **Prelude to the Appraisal**
- **The Appraisals**
  - **The Plan for the Appraisal Approach**
  - **Goal of the Appraisal Team**
- **The Process of Team Building**
  - **Appraisal Team Composition**
  - **Synergy**
- **Understanding the Business & Applying the Model and Appraisal Method**
  - **The interpretations that were established and the balance that is required for keeping the “spirit” of the model,**
  - **Maintaining the integrity of the appraisal,**
- **Summary**

# Raytheon Pasadena – SDSIO Contract

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- **Program information**
  - **Work-Order-Based Service Contract**
    - Focus is on Delivering Defined Services and Products
    - End-user of products and services is the customer
    - Raytheon staff frequently injected into projects lead by customer working along side of other contractors and customers
  - **Organized into 6 departments (web services, GPS applications, IT, Science Systems, Ocean Data Center, and Remote Sensing)**
  - **Number of Staff: 144**
  - **Award: September 1998**
  - **Type: CPAF/CPFF - Contract Work Orders (CWO)**
  - **Period of Performance:**
    - Completed 5 year Base: (Sept/03)
    - Executing 3+2 option years
  - **Scope: 100+ work orders – 63 active**

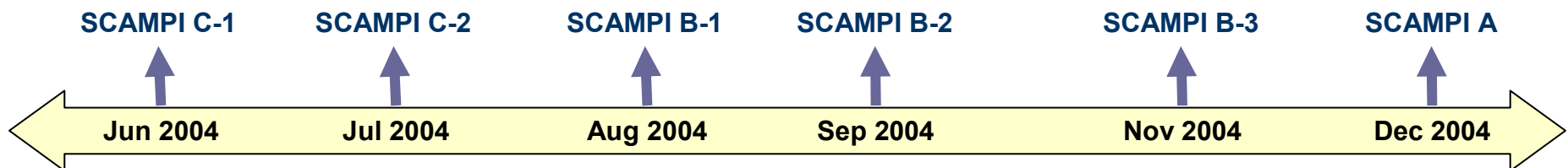
# History of Process Improvement at ITSS

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- **Grass-roots effort from the start -1999**
  - **Special Interest Group (SIG) formed for Process Improvement**
    - The SIG has helped the customer with its own process improvement initiative
- **R6s Introduced as a process improvement framework at Pasadena – 2000**
- **Evolutionary Process starting with CMM – 2001 through 2002**
  - **First attempts were top-down**
  - **Not funded**
  - **Intellectual breakthrough**
    - Introduction of CMMI
    - Bottom-up as the most effective approach
- **CMMI Training and formation of a mentoring relationship with a high maturity Raytheon site – 2003**
- **CMMI steering committee formed with customer and outside Raytheon support – 2003 – SCAMPI planning begins**
- **Customer sets goal to achieve CMMI L2 rating by 2005 and L3 by 2007 – 2003**
  - **Navigation and Mission Design Section achieved CMMI L2 (September 24, 2004)**

# The Appraisals

- **The Goal**
  - Appraise the maturity of Raytheon Company's Information Technology and Scientific Services (ITSS) in Pasadena, California.
  - Ensure the integrity of the appraisal process and outcome
- **The Plan for the Appraisal**
  - Conduct a series of appraisals where process areas reviewed align with the organization's process deployment schedule.
    - Each appraisal event ranged in duration from 3 to 9 days
  - Use the SCAMPI A to determine the process maturity level of the organization



# The Appraisals

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- **The Approach**

- **The intent of the SCAMPI C events was to understand the business model employed by the organization**
  - **These events were primarily used as information gathering through interview sessions by the team with the practitioners**
  - **In the effort to understand the business model, the appraisal team sought to find answers to such questions as:**
    - **What is the product and when does sell-off occur?**
    - **What is the management structure that is in place?**
    - **Who plans, assigns and monitors the work?**
    - **What are the technical requirements?**
    - **What is verified; what is validated and when?**
    - **What are the work products and how are they controlled?**
  - **In between information gathering sessions within each event, the team explored possible parallels between the business model and the CMMI**
  - **As parallels between the business model and the CMMI were identified and agreed upon, they were recorded as the “Group Memory”**
  - **Feedback was also provided to the organization, primarily in the form of recommendations and requests for information**
- **In between SCAMPI C events, process and templates evolved to incorporate feedback from the appraisal team**

# The Appraisals

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- **The Approach cont.**
  - **The intent of the SCAMPI B events was to provide feedback to the organization based on their business model and its mapping to the CMMI**
    - **Through the conclusions drawn by the appraisal team and other activities undertaken by the organization prior to the first SCAMPI B event, the organization concluded their business model was primarily that of a service organization**
    - **The team appraised the evidence provided according to the understandings established for the service business model to the work products created to deliver the service**
    - **The record of the team's agreements on model interpretations was updated to reflect additional understandings which were identified during each event**
    - **Rules of coverage for contributions to the organizational repository were established**
    - **Weaknesses were identified for the organization to address.**
  - **In between SCAMPI B events, process and templates continued to evolve to incorporate feedback from the appraisal team**



# The Appraisals

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- **The Approach cont.**

- **The intent of the SCAMPI A Event was to appraise the process maturity level of the organization and provide feedback on strengths and weaknesses**

- **Direct evidence in the form of work products created or employed during the course of delivering the service was appraised in accordance with the established interpretations of the model**
  - **Established rules of coverage for contributions to the Organizational repository were applied**
- **Interviews were used to satisfy the SCAMPI requirement for indirect evidence; Interview coverage included 100% of the projects and organization**
- **Strengths and weakness were identified**
- **A rating was determined**

# The Process of Team Building

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- **Appraisal Team Composition**
  - **Team composition underwent a number of changes, including**
    - **Planned “tag team members”**
    - **Dropouts and replacements**
  - **Changes to the team make-up occurred in 2 slots of the 9-member team**
  - **Overall, the impact of the changes to team membership was not significant and from one perspective had an added benefit**
    - **The impact was lessened by the fact that the changes occurred between events**
    - **The added benefit was that each change presented an opportunity for the team to validate its interpretations of the model as applied to the service business model**
  - **The final team composition included internal (ITSS) employees, external (Raytheon Fullerton employees) and independent contractors**
    - **3 internal (ITSS Pasadena)**
    - **3 external (Raytheon Fullerton)**
    - **2 external (non-Raytheon independent contractors)**
    - **Lead appraiser**

# The Process of Team Building

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- **Synergy**
  - 5 of the external members had previous experience as appraisal team members
  - 1 internal member and 2 external members came from organizations with high maturity levels
  - Having an appraisal team with this kind of experience resulted in:
    - Feedback included examples of how organizational weaknesses could be addressed rather than just listing the weaknesses
      - Many of the examples provided were implemented by the organization
    - The teams ability to “connect the dots” in real time to identify the available evidence for satisfying some of the model’s requirements
    - Feedback identifying available evidence that would satisfy multiple PAs under review

## Understanding the Business and Applying the Model

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- The most important thing we used in getting a handle on applying CMMI to a service based organization was to understand the life-cycle of a typical service contract
- Once the life cycle was defined, everything fell into place...



# Life Cycle of a Services “Type” Contract Work Order (CWO)

Phase	1					2			3				4				5		
Role	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Customer	Develop new work	Develop SOW, discuss cost (informal)	Send SOW to CTM										Approve or disapprove WCP and Pricing	If WCP & Pricing are not approved go to column 8					
Raytheon Department Manager	Develop new work	Develop SOW, discuss cost (informal)					Assign CWO manager and lead to project			Sign WCP, Pricing						Update department WAD			
Raytheon CWO Manager								Creates WCP		Sign WCP, Pricing						Create Charge Numbers	Schedule (n PMERS)		
Raytheon Project Lead	Develop new work	Develop SOW, discuss cost (informal)																Assign Team	
Project Team Member	Develop new work	Develop SOW, discuss cost (informal)																	Start work
Customer CTM				Verifies SOW is within EDSIO contract scope	If not within scope, send back to customer									If WCP and Pricing are not approved, Raytheon CWO Manager re-does					
Raytheon PM						Assign new work to Department Manager				Sign WCP, Pricing									
Customer Contracts					If SOW OK, send to Raytheon contracts							Send WCP & Pricing to Customer			Issue CWO#				
Raytheon Contracts						Forward SOW to Department Manager				Sign WCP, Pricing	Send WCP and Pricing to Customer Contracts								
Raytheon Finance									Pricing	Sign WCP, Pricing						Create Charge Numbers	Schedule (n PMERS)		
Model Map	RD, REQM	RD, REQM	RD, REQM	RD, REQM	RD, REQM	PI	PI	PP	PI, PP	VER, VAL, PI, RD, REQM	VER, VAL	VER, VAL, PI	VER, VAL, PI	VER, VAL, PI	PI	PI	PI, PP	PI, TS	TS, IPM

# Support Process Areas

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- **PPQA is performed at the Org level while PMC, M&A, and RskM are performed at the project level, as expected. These processes are maintained throughout the projects life cycle like any other type of contract with status rolled up and analyzed at the Org level.**

# Planning Process Areas

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- **Project Planning (PP) and Integrated Project Management (IPM) for a service contract is performed after the contract award and maintained throughout the projects life cycle with status rolled up and reviewed at the Org level**

# Org Process Areas

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- **As expected, Organizational Training (OT), Organizational Process Focus (OPF), and Organizational Process Definition (OPD) are performed at the Org level (EPG and HR)**
- **In addition Supplier Agreement Management (SAM) and Configuration Management (CM) are also performed at the Org level for all contracts**



# Engineering Process Areas

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- **As we anticipated, this is the area that created the greatest amount of “mind bending” in applying CMMI to a service organization**
- **Lets look at the interpretation of these PAs...**

# Requirements Development (RD)

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- What are requirements to a service organization other than “Give me 3 people for 6 months”??
- What was realized is the requirements should focus on the services they provide:
  - RTSC Pasadena Operations shall provide effective management for the project.
  - RTSC Pasadena Operations shall provide adequate staffing for the project.
  - RTSC Pasadena Operations shall provide sufficient facilities and equipment for the project.
  - RTSC Pasadena Operations shall manage project expenses as specified in the project Work Control Plan.
  - RTSC Pasadena Operations shall provide adequate organizational support for the project.

# Requirements Management (RM)

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- So..If you have a set of requirements that generally don't change how do you manage them??
- Well, what you manage are the derived requirements unique to the different projects, recorded in the project's *Work Control Plan (WCP)*.
  - **Derived from the customer's (JPL) SOW**
  - **WCP common template facilitates this derivation**
    - **This facilitates consistency with requirements and project plans' & work products**
- The requirements in the Work Control Plan are mapped to the Organization's requirements providing the bi-directional traceability
- Requirements are managed using a change control system

# Technical Solution (TS)

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- How would you apply a Technical Solution to the need for providing people to perform a task??
  - The WCP is also used to identify customer needs to provide the service
    - facilities
    - finances
    - management
    - support
  - DAR is used identify appropriate personnel
    - Do they need a web designer or a rocket scientist?
    - How long will they be needed?
    - DAR is also used to select an alternate
      - What if your primary candidate gets hit by lightning?

# Product Integration (PI)

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- The principal product supplied to our customer is:
  - Staff
  - Supported by
    - Management, IT, Facilities, tools, training, and process infrastructure
- Product Integration is the assembly of the service solution
  - cost
  - WCP (designated facilities, support/tools, management and staff)
- Management team and customer review the integrated solution and provides feedback to the CWO manager.

# Verification (VER)

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- The verification environment – Described in task diary
- Verification procedures – The Project Development Plan (PDP) describes the “exit criteria” associated with each task
- Peer reviews – The Work Control Plan (WCP) and PDP are peer reviewed using accepted methods and collection of statistics
- Verification of selected work products
  - The Raytheon supervisor managing the Contract Work Order (CWO) goes through the task diary and verifies each task is IMPLEMENTED according to established exit criteria
  - When this verification is complete, the customer is notified signaling the beginning of the validation phase

# Validation (VAL)

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**Validation is the customer formally acknowledging that a task has been implemented to their satisfaction. Project lead marks task as COMPLETE in the diary when this customer acknowledgement has been received and documents when and how this acknowledgement was obtained**

# Summary

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- **CMMI V1.1 can be applied to a Service Organization**
  - The interpretations that were established and the balance that was required to keep the “spirit” of the model
  - The integrity of the appraisal was maintained
  - The benefit of knowledge sharing from a more mature organization with it’s “sister organization”
  - The development of a set of enablers by Raytheon ITSS that can be applied to other Raytheon service organizations and increasing the ROI for this exercise
  - Benefits to the organization as its processes continue to improve