(S3M) :
Software Maintenance Capability
Maturity Model

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Overview

- The need for a software maintenance capability maturity model (S3M)
- How the model was developed
- Overview of the model architecture
- Advanced Practices
Need for S3M

IT Business Mgmt | Operations
--- | ---
Value | Service Level & Business Svc Management
IT Strategy | Business Performance Management

Integrated Governance Enablement
- IT Mgmt System Operation
- Architecture Management
- Project & Portfolio Management

Risk & Compliance Management | Operations Change & Config. Mgmt
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Data Governance | Asset & Workforce Management

Service Management capabilities support integrated governance
- Stakeholder Requirements Management
- Solution Requirements Management
- Solution Analysis & Design
- Solution Implementation & Build
- Solution Test
- Solution Deployment

- IT Financial Management
- IT Research And Innovation
- Customer Satisfaction Management
- Job Scheduling
- Service Marketing and Sales
- Capacity & Performance Management
- Supplier & Contract Management
- Release Management
- Risk Management
- Marketing Management
- Job Scheduling
- Knowledge Management
- Problem Management
- Monitoring & Event Management
- Incident & Contact Management

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Need for S3M

- Trying to assess all IT processes (for improvement)
- ISO15504 and CMMi focus
  - Software Development and Maintenance Projects
  - Teams of developers
- Software Maintenance Specific Processes (*SWEBOK*)?
  - Transition
  - Part of a Service Level Agreement
  - Acceptance/Rejection of Change and Corrective Requests
  - Planning Maintenance activities
  - Supporting operational software
- In 1994 Bell Canada and NORTEL funded a master student to develop a software maintenance assessment kit to add to Trillium.
What current CMM could help?

<table>
<thead>
<tr>
<th>Year</th>
<th>Software Engineering CMM proposals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>Bootstrap</td>
</tr>
<tr>
<td>1992</td>
<td>Trillium</td>
</tr>
<tr>
<td>1993</td>
<td>CMM©</td>
</tr>
<tr>
<td>1994</td>
<td>Camélia, automated testing (Kra94)</td>
</tr>
<tr>
<td>1996</td>
<td>TMM (Bur96), Zit96, Dov96</td>
</tr>
<tr>
<td>1997</td>
<td>Som97</td>
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<tr>
<td>1998</td>
<td>Esi98, Top98, Baj98</td>
</tr>
<tr>
<td>1999</td>
<td>Wit99, Vet99, Sch99</td>
</tr>
<tr>
<td>2000</td>
<td>Cob00, Str00, Bev00, Lud00</td>
</tr>
<tr>
<td>2001</td>
<td>Kaj01d &amp; 01e, Ray01, Sch01, Luf01, Tob01, Sri01, ITIL01</td>
</tr>
<tr>
<td>2002</td>
<td>CMMi®, Nie02, Mul02, Vee02, Pom02, Raf02, Sch02, Ker02, Cra02</td>
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</tbody>
</table>

and more: CMMi for services, ASL,...
Step by step build S3M

1. Understand the knowledge area
2. Look in standards to find processes, activities and best practices
3. Look to Framework and SWEBOK to create domains and KPAs
4. Look to Best practice guides and MMFs for practice details

5. Build or Refine the model Architecture
6. Find a test site and conduct a trial of the model
7. Modify model as necessary
8. Review the content with Independent Experts
Sources to build $S^3_M$:

- Zitouni/Abran Software Maintenance Model
- Camélia model
- $CM^3$ Corrective Maintenance Maturity Model
- ITIL
- IT Service CMM
- Cobit
- Malcolm Baldrige

Framework:
- ISO/IEC TR 15504 part 2 (Spice)
- ISO/IEC 12207, Information Technology Software Life Cycle Processes
- ISO/IEC 14764, Software Engineering, Software Maintenance
- IEEE 1219, Standard for Software Maintenance

CMMI® Software Eng. v1.1 Process Area/Specific Practice

Standards

Best Practice guides and Maturity Models
Use of CMMi structure in S3:M:

- Contains the essential elements of effective processes for software related activities
- Contains a framework that provides the ability to generate multiple models and associated training and assessment materials. These models may represent:
  - software and systems engineering
  - integrated product and process development
  - new disciplines
  - combinations of disciplines
- Provides guidance to use when developing processes
Referenced documents in S3\(^{M}\)

Are consensus-based documents and standards that codify best practice. These documents have seven essential attributes that aid in process engineering. They:

- represent the collected experience of others who have been down the same road;
- tell in detail what it means to perform a certain activity;
- can be attached to or referenced by S3\(^{M}\);
- help to assure that software engineers have the same meaning for a software maintenance activity;
- increase professional discipline;
- protect the business, client and the buyer;
- aim to improve the software maintenance products.
Model Context (Scope)
S3M Process model

Operational Processes
- Software Transition
- Event and Service Request Management
- Operational Support
- Corrections
- Evolutions
- Versions and Upgrades
- Monitoring and Control

Ops. Support Processes
- Maintenance Planning
- Maintenance Training
- Verification - Validation
- SLA and Supplier Agreements
- Software Rejuvenation Migration Retirement
- Causal Analysis and Problem Resolution

Organizational Processes
- Software Configuration Management
- Innovation And Deployment
- Measurement and Analysis of Maintenance
- Process and Product Quality Assurance
- Process Definition and Improvement
- Purchasing and Human Resources

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### $S3^M$ - Alignment to CMMi

<table>
<thead>
<tr>
<th>CMMi Process Domains</th>
<th>$SM^{CMM}$ Process Domains</th>
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<tbody>
<tr>
<td>Process Management</td>
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<tr>
<td>Project Management</td>
<td>Maintenance Request Management</td>
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<tr>
<td>Engineering</td>
<td>Evolution Engineering</td>
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<tr>
<td>Support</td>
<td>Support to Evolution Engineering</td>
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</tbody>
</table>
### S3M - Resulting KPA’s

#### SM CMM Process Domains

<table>
<thead>
<tr>
<th>Process Management</th>
<th>Key Process Areas of Software Maintenance</th>
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<tbody>
<tr>
<td>1. Maintenance Process Focus</td>
<td></td>
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<tr>
<td>2. Maintenance Process/Service definition</td>
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<tr>
<td>3. Maintenance Training</td>
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<td>4. Maintenance Process Performance</td>
<td></td>
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<tr>
<td>5. Maintenance Innovation and deployment</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Maintenance Request Management</th>
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</thead>
<tbody>
<tr>
<td>1. Request &amp; Event Management</td>
</tr>
<tr>
<td>2. Maintenance Planning</td>
</tr>
<tr>
<td>3. Monitoring &amp; Control of maintenance requests</td>
</tr>
<tr>
<td>4. SLA &amp; Supplier Management</td>
</tr>
<tr>
<td>5. Quantitative Maintenance Management</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Evolution Engineering</th>
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</thead>
<tbody>
<tr>
<td>1. Transition</td>
</tr>
<tr>
<td>2. Operational Support</td>
</tr>
<tr>
<td>3. Evolution &amp; Correction of software</td>
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<tr>
<td>4. Verification and Validation</td>
</tr>
</tbody>
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<tr>
<th>Support to Evolution Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Configuration Management</td>
</tr>
<tr>
<td>2. Process and Product Quality Assurance</td>
</tr>
<tr>
<td>3. Measurement, Decision Analysis</td>
</tr>
<tr>
<td>4. Problem Management and Causal Analysis</td>
</tr>
<tr>
<td>5. Rejuvenation/Retirement Engineering</td>
</tr>
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S3³M Architecture by levels

- Domain
  - Key Process Area
  - Maturity Level
  - Roadmap
  - Recommended Practice
# S3M - Maturity Levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Level Name</th>
<th>Risk</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-existent</td>
<td>Highest</td>
<td>no sense of process</td>
</tr>
<tr>
<td>1</td>
<td>Initial</td>
<td>Very high</td>
<td>ad hoc maintenance process</td>
</tr>
<tr>
<td>2</td>
<td>Repeatable</td>
<td>High</td>
<td>basic request-based process</td>
</tr>
<tr>
<td>3</td>
<td>Defined</td>
<td>Medium</td>
<td>state-of-the-art process</td>
</tr>
<tr>
<td>4</td>
<td>Managed</td>
<td>Low</td>
<td>generally difficult to achieve now</td>
</tr>
<tr>
<td>5</td>
<td>Optimized</td>
<td>Very low</td>
<td>technologically challenging to attain</td>
</tr>
</tbody>
</table>
Evolution Engineering

1- Transition
2- Operational Support
3- Evolution & Correction of software
4- Verification and Validation

Facets describe different aspects of a KPA

1) Communications with the developer, the owner and the purchasing agent.
2) Management of the transition process.
3) Control of training and knowledge transfer during transition
4) Prepare documentation transfer (includes source code and outstanding problem reports)
5) Participate in user and acceptance tests
S3M in summary

- Model in numbers
  - 4 Process Domains
  - 18 KPA’s
  - 74 Roadmaps
  - 443 Practices with supporting text and references
- French book released in 2006, English book will be released next month (Wiley-IEEE)
Current and planned work

- Agreements with CETIC and SMLab
- New Gold partnerships with Freescale and IBM Australia finalized;
- Release of the English Book and S3M website;
- TRAC+S3M (with SOX compliant process) version release May 2008;
- ARIS and TIBCO based S3M processes version release in 2008;
- Training & certification material 2008;
- Next version underway V3 aligns:
  - ASL framework discussions considered
  - CMMI for Services (v0.5) trials finished integration underway
  - ISO-JTC1-SC7 proposal for S3M process model as part of ISO-15504
  - Lean & Kaizen for manufacturing trials
$S^3M$ toolset - $SM^\text{assess}$
S3M - Process Example (for SOX)
Thank You