How the Rational Unified Process Supports ISO 12207

Philippe Kruchten  
Director of Process Development  
Rational Software Canada  
April 2002

“My organization must be compliant to the ISO standard 12207; how can the RUP help me achieve this?”

The international standard ISO/IEC 12207:1995—Information Technology—Software Lifecycle Processes (ISO 12207 further in this paper), establishes a common framework used by software practitioners to speak the same language when describing their software processes. It is not a complete ready-to-use process, but only a framework that identifies, names, and relates the various (sub)processes that constitute this domain.

The Rational Unified Process® or RUP® (RUP further in this paper) is a process framework, but unlike ISO 12207, it comes not empty, but prepopulated with a wealth of guidance, methods, techniques, templates, and examples, out of which a concrete process can be instantiated.¹

The purpose of this paper is to

- provide a brief overview of ISO12207
- point to some light terminology differences that may throw off the RUP practitioner (or the ISO 12207 literate)
- describe how the RUP supports the various parts identified in ISO 12207, where it fills the blanks, and to what extent²

An Overview of ISO12207

Figure 1, which is extracted from ISO 12207 (Figure C2, in Annex C), represents a good map of ISO 12207.

It shows 3 classes of processes:

- primary lifecycle processes (section 5. in ISO 12207)

¹ Rational Unified Process and RUP are registered trademarks of Rational Software Corporation.
² Reference is RUP version 2002.05
supporting lifecycle processes (6.)
organizational lifecycle processes (7.)³

These classes can be organized in views, and decomposed into activities, themselves decomposed in tasks. ISO 12207 stops, however, at the level of activities and it only occasionally mentions specific tasks, although never in a mandatory fashion.

Figure 1. ISO 12207 Processes, Views, and Key Activities (Source: Figure C.2 in the Standard)

³ Numbers in Figure 1 refer to the sections and subsections of the Standard; hence they do not start with 1.
ISO 12207 only defines, names, and indicates activities that *should* take place—it never prescribes how they should be accomplished. It is completely neutral in terms of methods, techniques, languages, tools, or organizational structure.

It is important to note that the focus of ISO 12207 is primarily on the *acquisition* and *supply* of software, and only secondarily on the *development* of software. The Standard is intended for use in a two-party situation, but “may equally apply when the two parties are […] the same organization.” This is visible on Figure 1, where the *Contract View* is emphasized. In contrast, the generic RUP is focused primarily on software development.

**Differences in Terminology**

There are a few and somewhat subtle differences in terminology between the RUP (or the SPEM Software Process Engineering Metamodel, for that respect) on one hand, and ISO 12207 on the other hand, especially when the same word or phrase is used in both.

- **Lifecycle**: ISO 12207 uses the term “life cycle” to describe the structure (the “architecture”) of a complete process, that is, the collection of processes (in the ISO 12207 sense) needed to take a body of software from conception to disposal, whereas in the RUP the term “lifecycle” is used to describe the unrolling (“enactment”) of the process over time, and it is focused on development cycles, phases, iterations, milestones, and so forth, on a timeline, and therefore it is related to planning. The RUP speaks of an iterative lifecycle or waterfall lifecycle, for example. ISO 12207 is silent on the shape of the process.

- **Task and Activities**: In ISO 12207, a task is a “set of elementary or atomic actions to be performed.” These correspond to the RUP *Activities* and *Steps*. Activities in ISO 12207 are sets of cohesive tasks, therefore more akin to the RUP concept of *Workflow Detail*.

- **Process**: An ISO 12207 process corresponds roughly to the RUP concept of a *Discipline*, but there are more processes in ISO 12207 than there are disciplines in the RUP.

- **Output**: This is the term used in ISO 12207 for an *Artifact* resulting from an activity (Deliverable Workproduct in the SPEM). ISO 12207 also uses “non-deliverable item” for artifacts that are not delivered.

- **Supporting and Organizational Processes**: ISO 12207 establishes a distinction, where the RUP calls them all *Supporting Disciplines*. In ISO 12207, configuration management is a supporting process, and project management an organizational process.

---

4 Moreover, the RUP spells it “lifecycle” in one word, while ISO 12207 spells it in two words: “life cycle.”
- **Infrastructure process**: In ISO12207 this term corresponds to the RUP *Environment Discipline*. The word infrastructure does not refer to the infrastructure of the software (OS, middleware, etc.).

**RUP Coverage of ISO 12207**

Refer again to Figure 1. The various colors for the ISO 12207 processes and activities indicate the level of support that an organization seeking to implement or comply to ISO 12207 will find in the RUP, as delivered by Rational Software.

- **green**: The RUP provides in-depth coverage of this area. This is not to say that the RUP should be used “as is,” out of the box. It should be tailored to suit the development conditions of the project, but usually by eliminating some aspects, not by adding some more.

- **yellow**: The RUP provides some coverage, but it is likely that the organization will need to complement it with process elements: artifacts, activities, guidelines, and so on, that are specific to its domain, industry, or company, or from other processes.

- **red**: The RUP does not provide anything significant in this area, beyond very general elements such as reviews, principles, and some techniques.

**5. Primary Lifecycle Processes**

This is the area where the RUP will bring much substance, particularly in the *Engineering View*, where the RUP provides an organization all it needs to define the Development Process (5.3), and most of what it needs for the Maintenance Process (5.5).5

The RUP does not cover the Operation Process (5.4) except for Operational Testing. But as noted above, the current RUP does not cover the *Contract View*: Acquisition and Supply Processes (5.1 and 5.2)—these are not its main focus. It should be noted, however, that the RUP provides extensive guidance in Requirement Management, which plays an important role in the interactions between supplier and acquirer.

**6. Supporting Lifecycle Processes**

The RUP provides great support for Configuration Management (6.2), and good to moderate support for all others (6.2-6.8).

---

5 See article in The Rational Edge [Software Maintenance Cycles with the RUP](#)
7. Organizational Lifecycle Processes

The RUP provides full support for the Management Process (6.2)\(^6\), Infrastructure Process (6.2), and Improvement Process (6.3) in what it calls the Environment Discipline. It does not cover Training Process (7.4), beyond the development of training material.

Table 1 gives the ISO 12207-literate reader a few entry points into the RUP for each process.

Table 1. Where to Find ISO 12207 Processes in the RUP 2002

<table>
<thead>
<tr>
<th>ISO 12207 Process</th>
<th>Corresponding RUP Elements (some ISO 12207 activities are in italics)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.1 Acquisition Process</strong></td>
<td>Not covered, except elements related to Requirements</td>
</tr>
<tr>
<td><strong>5.2 Supply Process</strong></td>
<td>Not covered, except elements related to Requirements</td>
</tr>
<tr>
<td><strong>5.3 Development Process</strong></td>
<td>Disciplines: Requirements, Analysis and Design, Implementation, Test &amp; Deployment</td>
</tr>
<tr>
<td></td>
<td><em>Process Implementation</em> is covered by the creation of a Development Case (Role: Process Engineer) and a Software Development Plan (Role: Project Manager)*</td>
</tr>
<tr>
<td><strong>5.4 Operation Process</strong></td>
<td>For <em>Operational Testing</em> See Role: Deployment Manager</td>
</tr>
<tr>
<td><strong>5.5 Maintenance Process</strong></td>
<td>Selected activities in the Disciplines: Requirements, Analysis and Design, Implementation, Test (subset of the development process)</td>
</tr>
<tr>
<td></td>
<td><em>Problem and modification analysis</em>, is covered by activities in Discipline: Configuration and Change Management</td>
</tr>
<tr>
<td></td>
<td><em>Migration</em> is not covered, nor is <em>Software Retirement</em></td>
</tr>
<tr>
<td><strong>6.1 Documentation Process</strong></td>
<td>Note that all disciplines produce artifacts that are documents. See Templates.</td>
</tr>
<tr>
<td></td>
<td>For delivered product documentation see Role: Tech Writer, Graphic Artist, Course Developer and their associated activities</td>
</tr>
<tr>
<td><strong>6.2 Configuration Management Process</strong></td>
<td>Discipline: Configuration and Change Management and parts of Deployment</td>
</tr>
<tr>
<td><strong>6.3 Quality Assurance Process</strong></td>
<td>Discipline: Project Management See concept: Evaluating Quality</td>
</tr>
<tr>
<td><strong>6.4 Verification Process</strong></td>
<td>Discipline: Project Management</td>
</tr>
<tr>
<td><strong>6.5 Validation Process</strong></td>
<td>Discipline: Project Management; Activity: Project Acceptance Review</td>
</tr>
<tr>
<td><strong>6.6 Joint Review Process</strong></td>
<td>Discipline: Project Management; see various reviews</td>
</tr>
</tbody>
</table>

\(^6\) although the RUP does not cover financial and human resources aspects—neither does ISO12207…
6.7 Audit Process

ISO 12207 Process | Corresponding RUP Elements (some ISO 12207 activities are in italics)
--- | ---
6.7 Audit Process | Discipline: Project Management

See its 9 reviews and assessment activities. The RUP explicitly calls for Configuration Management Audits and also allows other kinds of audits to be performed as the owning organization or the customer requires them (planned in the QA Plan), but they are not called out explicitly in addition to these reviews.

6.8 Problem Resolution Process

Discipline: Project Management; Activities: Develop Problem Resolution Plans and Handle Exceptions and Problems

See also several activities in the Discipline: Configuration and Change Management such as Submit Change Request; Review Change Request; Make Changes, and so on, and note that many Change Requests are the outcome of review activities.

7.1 Management Process

Discipline: Project Management

Process implementation is also covered by the creation of a development case (Role: Process Engineer) and several plans, part of the Software Development Plan, are developed by other roles in other disciplines.

7.2 Infrastructure Process

Discipline: Environment; Role: Tool Specialist and System Administrator, and their associated activities

7.3 Improvement Process

Discipline: Environment; Role: Process Engineer, and its related activities

7.4 Training Process

Role: Course Developer and its associated activities

Also Step: Train Project Staff, in activity: Acquire Staff

Conclusion

For an organization that wishes to comply with the ISO 12207 standard, adopting the RUP will give a serious “leg up,” as it provides very detailed process guidance in many of the aspects that must be covered. The RUP is especially strong in the areas of the Development Process, most of the Supporting Processes (for example, Configuration Management), and in the Project Management Process. However, the RUP today does not provide coverage for the acquisition and supply of software, except in the area of Requirements Management, which plays an important role in the supplier-acquirer
interactions. The few differences of terminology between the two should not be a stumbling block.