



DOCUMENT 169-04

DATA REDUCTION AND COMPUTER
GROUP

**COMMON RANGE ARCHITECTURE OBJECT MODEL
APPROVAL PROCESS INVESTIGATION**

WHITE SANDS MISSILE RANGE
REAGAN TEST SITE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
ABERDEEN TEST CENTER
NATIONAL TRAINING CENTER
ELECTRONIC PROVING GROUND

NAVAL AIR WARFARE CENTER WEAPONS DIVISION
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY
NAVAL UNDERSEA WARFARE CENTER DIVISION, KEYPORT

30TH SPACE WING
45TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR ARMAMENT CENTER
AIR WARFARE CENTER
ARNOLD ENGINEERING DEVELOPMENT CENTER
BARRY M. GOLDWATER RANGE
UTAH TEST AND TRAINING RANGE

NATIONAL NUCLEAR SECURITY ADMINISTRATION (NEVADA)

**DISTRIBUTION A: APPROVED FOR PUBLIC RELEASE
DISTRIBUTION IS UNLIMITED**

This page intentionally left blank.

DOCUMENT 169-04

**COMMON RANGE ARCHITECTURE OBJECT MODEL
APPROVAL PROCESS INVESTIGATION**

DECEMBER 2004

Prepared by

**DATA REDUCTION AND COMPUTER GROUP
RANGE COMMANDERS COUNCIL**

Published by

**Secretariat
Range Commanders Council
U.S. Army White Sands Missile Range
New Mexico 88002-5110**

This page intentionally left blank.

TABLE OF CONTENTS

PREFACE	v
ACRONYMS	vii
CHAPTER 1: EXECUTIVE SUMMARY	1-1
CHAPTER 2: DATA REDUCTION TASK DR-31 BREAKDOWN	2-1
2.1 The Need For An Object Model (OM) Standardization Process	2-1
2.2 DR-31: Task 1 and Task 2 Defined	2-1
CHAPTER 3: TASK 1: STANDARDIZATION PROCESS DESCRIPTION	3-1
3.1 Overview	3-1
3.2 Recommended Review Process for Object Model Standardization Requests	3-1
3.3 Guidelines for Initiating an OM Standards Review	3-2
3.4 OM Review Process by DR&CG Team	3-2
3.5 RCC Coordination	3-3
3.6 RCC Pink Sheet Process for OM Standard Review and Acceptance	3-3
3.7 Required Documents Summary	3-4

LIST OF FIGURES

Figure 3-1. Process for a proposed Object Model standard.....	5
---	---

This page intentionally left blank.

PREFACE

The Range Commanders Council (RCC) Data Reduction and Computer Group (DR&CG) sponsored the development and publication of this document. This document represents the release of Task 1 of the DR&CG study effort DR-31, "Common Range Architecture Object Model Approval Process Investigation." The DR&CG Common Range Architecture Committee developed this document to provide the reader with an overview of the process for developing Object Models (OM). The goal is to achieve consistency in developing OM standards throughout the Department of Defense (DoD).

The primary contributors to this report are shown below.

Author: Dr. William T. (Tilt) Thompkins, Jr.
Associate Vice President for Infrastructure
Information Technology, Purdue University
West Lafayette, IN 47906
E-Mail: tilt@purdue.edu

Mr. David Browning
Data Reduction And Computer Group (DR&CG), Associate Member
Representing: Redstone Technical Test Center (CSTE-DTC-RT-F-FL)
Redstone Arsenal, AL 35898-8052
E-Mail: dbrowning@rttc.army.mil

Address questions about this document to the RCC Secretariat.

Secretariat, Range Commanders Council
ATTN: TEDT-WS-RCC
1510 Headquarters Avenue
White Sands Missile Range, New Mexico 88002-5110
Telephone: (575) 678-1107, DSN 258-1107
E-mail usarmy.wsmr.atec.list.rcc@mail.mil

This page intentionally left blank.

ACRONYMS

ACRONYMS

CRAC
CTEIP
DR&CG
DoD
DR-31
FI2010
JPEG
JIST3

OM
OO
POC
RCC
TENA
UML
XMI
XML

TERMS

Common Range Architecture Committee
Central Test and Evaluation Investment Program
Data Reduction and Computer Group
Department of Defense
Data Reduction and Computer Group - Task Number 31
Foundation Initiative 2010
Joint Photographic Experts Group
Joint Interoperability and Systems Technology for Test and Training (JIST3)
Object Model
Object Oriented
Point of Contact
Range Commanders Council
Test and Training Enabling Architecture
Unified Modeling Language
XML Metadata Interchange
Extensible Markup Language

This page intentionally left blank.

CHAPTER 1

EXECUTIVE SUMMARY

The Charter for the Range Commanders Council (RCC) Data Reduction and Computer Group (DR&CG), Common Range Architecture Committee (CRAC), includes the evaluation of proposed RCC architectural standards as well as the configuration management and distribution of candidate and accepted standards.

The Central Test and Evaluation Investment Program (CTEIP), Foundation Initiative 2010 (FI2010) project has developed the Test and Training Enabling Architecture (TENA) to support test and training range interoperability. As part of the TENA objective, the FI2010 project will be offering proposed architectural standards to the RCC for ratification and management. The first offering from the project will be the common Object Models (OM) being produced and utilized within the TENA architecture. A pathfinder project was established to articulate the issues, provide a process for Object Model standardization, and prepare a guideline for standardization. This pathfinder project is identified as RCC task DR-31, Common Range Architecture Object Model Approval Process Investigation.

This document defines a notional, top-level process that the RCC in general, and the DR&CG in particular, will follow to standardize Object Models.

The detailed process that the DR&CG will use to store, review, modify, and manage the Object Models as they progress through the standardization process, can be seen in the supplement to this document. The title of the supplement is “Document 169-04 (Supplement) Common Range Architecture Object Model Approval Process Investigation.”

This page intentionally left blank.

CHAPTER 2

DATA REDUCTION TASK DR-31 BREAKDOWN

2.1 The Need For An Object Model (OM) Standardization Process

There are currently many activities that strive to enable interoperability between ranges and range resources. Therefore, a significant portion of these activities support the standardization of the data passed between the ranges. In addition, the architectures developed to support range interoperability, such as the Test and Training Enabling Architecture (TENA), have adopted an Object Oriented (OO) approach. When OO-based software is used in conjunction with data standardization, a notion of OM is presented. An OM is the interface to a given system that describes its data and functional capabilities. In other words, it's the "contract" that must be enforced to support interoperability. The Range Commanders Council (RCC) task "DR-31, Common Range Architecture Object Model Approval Process Investigation," was initiated to address concerns regarding the process required to standardize proposed Object Models.

2.2 DR-31: Task 1 and Task 2 Defined

The DR-31 effort was established to support two main tasks:

- a. Task 1 - Develop the initial high-level notional process by which the RCC in general, and the DR&CG in particular, should standardize Object Models.
- b. Task 2 - Develop the high-level notional process that the RCC could store, review, modify, and manage the Object Models as they progress through the standardization process defined in Task 1.

2.2.1 Task 1 Deliverables. For Task 1, the primary process deliverables are in [Chapter 3](#) of this document. The primary deliverables include guidelines as to when a candidate OM should be reviewed, a draft process by which Object Models are reviewed by subject matter experts, and a draft process for revision and final approval of candidate Object Models. Additional deliverables include tutorial and training materials on software architectures and Object Oriented concepts.

Tutorial materials on Software Architecture and Object Oriented concepts were developed and presented at the 98th DR&CG meeting in Salt Lake City. A copy of the tutorial materials can be seen at the PowerPoint briefing "[Software Architecture Concepts and Views UML Introduction](#)" given by the author, William T. (Tilt) Thompkins on 24 March 2003.

2.2.2 Task 2 Deliverables. For Task 2, the primary deliverables include detailed data management definitions and supporting technologies necessary to properly manage the submission, review, and maintenance of proposed OMs. Task 2 deliverables are in the supplement to this document. The title of the supplement is "Document 169-04 (Supplement) Common Range Architecture Object Model Approval Process Investigation."

This page intentionally left blank.

CHAPTER 3

TASK 1: STANDARDIZATION PROCESS DESCRIPTION

3.1 Overview

While considerable latitude is available to RCC groups to define their internal processes to develop and review standards, these processes must fit within a clearly defined and managed RCC process for reviewing and promulgating standards across individual test ranges. These processes insure that all relevant groups are included in the review process and that all test ranges agree to and are able to implement the standard.

The following sections outline the process for Object Model standardization requests and illustrate how the detailed Object Model subject review (detailed in Document 169-04 (Supplement) Common Range Architecture Object Model Approval Process Investigation) is integrated into this process. This process also provides uniform support to enable the individual groups to manage the overall process for acceptance and distribution of OM standards. An overview of the notional, top-level review process is shown in Figure [3-1](#) at the end of this chapter.

3.2 Recommended Review Process for Object Model Standardization Requests

The DR&CG Chair is assigned the primary responsibility as focal point for the Object Model standard submissions, the DR&CG review process, and the final coordination with the RCC members. An overview of the process is as follows:

- a. An OM Working Group initiates the process by submitting a proposed OM standard to the DR&CG Chair for review and approval. Any group(s) or individual(s) submitting an OM standard for review will be referred to as an OM Working Group.
- b. The DR&CG Chair will conduct a review of the OM standard proposal to ensure it meets the guidelines for review (see [paragraph 3.3](#) below). Proposals not meeting the guidelines will be returned for needed changes.
- c. For proposals meeting the guidelines, the Chair will appoint a DR&CG review team and a DR&CG review team leader to conduct the review.
- d. The DR&CG team leader will coordinate a review of the OM by the DR&CG team (see [paragraph 3.4](#)) and forward the findings and recommendations to the DR&CG Chair.
- e. The DR&CG chair will appoint a “Pink Sheet” point of contact (POC) for proposals that have been recommended for approval (see [paragraph 3.5](#))
- f. The “Pink Sheet” point of contact (POC) will forward the proposal to the RCC Secretariat for final coordination and RCC ratification.
- g. The RCC Secretariat will provide coordination support between the Pink Sheet POC, the DR&CG Chair, and the appropriate RCC members and committees (see [paragraph 3.6](#)).
- h. Once coordinated and approved by the RCC, the DR&CG Chair will coordinate publication of the new OM standard with the RCC Secretariat.

3.3 Guidelines for Initiating an OM Standards Review.

The DR&CG Chair will initiate a review when an OM draft standard proposal is received from a DoD community member, a test range, or RCC member. The OM standard must be in use on at least one test range and must contain the minimum OM documentation. The minimum documentation is outlined below and detailed descriptions are provided in “Document 169-04 (Supplement) Common Range Architecture Object Model Approval Process Investigation.”

The minimum OM documentation is defined to be:

- a. The OM metadata - The metadata fields must be provided to put the OM definition and submission into context.
- b. The Object Model - The Object Model must be graphically depicted using Unified Modeling Language (UML) notation as a standard class diagram.
- c. Use case - While in UML a use case is only one of many diagrams, here we refer to a use case as several UML diagrams. A use case can be a UML-based use case model or the FI2010 use case template. If UML diagrams are used, the Use Case, Sequence, and Deployment diagrams are required.
- d. Metamodel - A graphical or textual representation of the metamodel used during the OM definition

Unless otherwise specified, the Object Model and Use Case diagrams shall be presented to DR&CG Chair in the UML Standard XML metadata Interchange (XMI) 1.0 format. This format allows for diagram interchange between various UML tool programs. As standards evolve, it is recommended that the DR&CG adjust this requirement to meet new standard definitions. In addition, a Joint Photographic Experts Group (JPEG) format is also required for a quick-look capability.

The OM submission package may either be sent to an e-mail address designated by the DR&CG Chair or to a DR&CG-supported on-line submission process or system.

3.4 OM Review Process by DR&CG Team

The DR&CG review team leader will coordinate a review of the proposed OM standard using the guidelines in the OM Review Process defined below and coordinate with the OM Working Group to gain additional information and complete any needed changes.

- a. The DR&CG review team will be responsible for judging compliance of the proposed OM standard with guidelines, and for judging if the proposed standard merits submission to the RCC as a draft standard.
- b. For accepted OM standard proposals, the review team leader will forward the reviewed standard and documentation to the DR&CG Chair for submission to the RCC Secretariat.

3.5 RCC Coordination

When the DR&CG Chair receives an accepted OM standard proposal from a DR&CG review team, the Chair will initiate final coordination with other RCC members and group. The Chair will proceed as follows:

- a. The DR&CG Chair will appoint a POC for the RCC “Pink Sheet” review (see paragraph 3.6 below).
- b. The Pink Sheet POC will prepare all relevant coordination documentation and cover letters for RCC review and submit them to DR&CG Chair.
- c. The Chair will submit the coordination documents and draft OM standard proposal to the RCC Secretariat.
- d. The RCC Secretariat will ask technical representatives and group chairs to review the draft standard and provide issues and comments to the Pink Sheet POC.
- e. The Pink Sheet POC will address all issues and comments from reviewers, finalize the OM standard proposal, and submit it to the DR&CG Chair.
- f. If approved by the DR&CG Chair, he/she will submit the finalized OM standard proposal to the RCC Secretariat for final coordination with the RCC Taskmaster and publication as an OM standard.

3.6 RCC Pink Sheet Process for OM Standard Review and Acceptance

The RCC Secretariat manages the process for reviewing and accepting an RCC standard. This process is described as the “Pink Sheet” review and allows each of the member ranges to thoroughly examine the draft OM standard and ensure that their range can agree to the requirements of the standard. The process consists of the following steps:

- a. The DR&CG Chair will submit the coordination documents and draft OM standard proposal to the RCC Secretariat (see paragraph 3.5c above). A cover letter with suspense date, identity of the Pink Sheet Point of Contact (POC) to whom comments are to be sent, and distribution limitations must be included.
- b. If the document is to be for unlimited distribution, the Secretariat directs the Joint Interoperability and Systems Technology for Test and Training (JIST3) office to place the draft on the RCC public page under Draft Document Review. Otherwise the Secretariat places the document on the RCC private page.
- c. The Secretariat notifies the RCC Technical Representatives and group chairs that the draft is available for review and comments.
- d. Comments and questions are sent directly to the identified Pink Sheet POC listed on the cover letter. It is the responsibility of the POC to resolve issues identified by reviewers appointed by the Technical Representatives or group chairs and prepare a final draft agreed to by all parties.
- e. The final draft is sent to the RCC Secretariat who will send it to the RCC Taskmaster and Technical Representatives for final review and acceptance as an RCC standard.
- f. If approved, the standard is assigned to the RCC Secretariat for publication.

- g. The Secretariat will provide notification when the OM standard is published on the JIST3 web site.

3.7 Required Documents Summary

The RCC requirements for submitting draft OM standard documents are shown below.

3.7.1 RCC required documents.

- a. Draft standard - RCC documentation requirement is not specified. The DR&CG process will use the OM documentation set described below.
- b. Cover letter - A cover letter with suspense date, a Point of Contact for comments, and distribution limitations.

3.7.2 DR&CG required documents for the Object Model approval process.

- a. The OM metadata - The metadata fields must be provided to put the OM definition and submission into context.
- b. The Object Model - The Object Model must be graphically depicted using UML notation as a standard class diagram.
- c. Use case - While in UML a use case is only one of many diagrams. In this document, we refer to a use case as several UML diagrams. A use case can be a UML-based use case model or the FI2010 use case template. If UML diagrams are used, the use case, sequence, and deployment diagrams are required.
- d. Metamodel - a graphical or textual representation of the metamodel must be used during the OM definition.

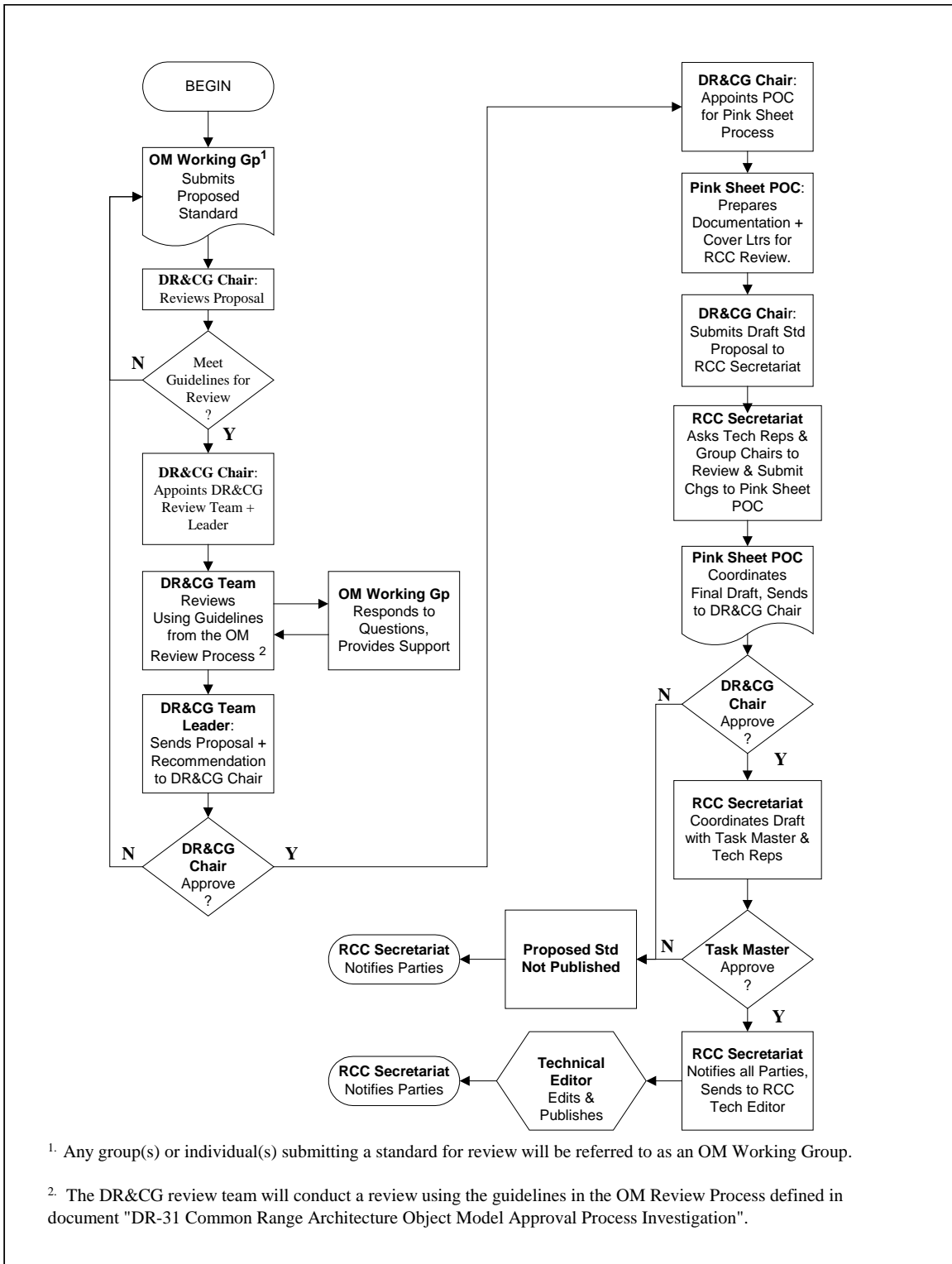


Figure 3-1. Process for a proposed Object Model standard.