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# Space data and information transfer systems — Mission operations common object model

*Systèmes de transfert des informations et données spatiales — Modèle d'objet commun des opérations de mission*



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The Consultative Committee for Space Data Systems

Recommendation for Space Data System Standards

# MISSION OPERATIONS COMMON OBJECT MODEL



## RECOMMENDED STANDARD

## CCSDS 521.1-B-1

## BLUE BOOK

**February 2014**

# AUTHORITY

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This document has been approved for publication by the Management Council of the Consultative Committee for Space Data Systems (CCSDS) and represents the consensus technical agreement of the participating CCSDS Member Agencies. The procedure for review and authorization of CCSDS documents is detailed in *Organization and Processes for the Consultative Committee for Space Data Systems* (CCSDS A02.1-Y-3), and the record of Agency participation in the authorization of this document can be obtained from the CCSDS Secretariat at the address below.

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# FOREWORD

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# DOCUMENT CONTROL

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# 1 INTRODUCTION

## 1.1 GENERAL

This Recommended Standard defines the Mission Operations (MO) Common Object Model (COM) in conformance with the service framework specified in annex B of Mission Operations Services Concept (reference [C1]).

The MO COM is a generic service template that provides a Common Object Model to the Mission Operation services defined in reference [C1]. These Mission Operations services are defined in terms of the COM and the Message Abstraction Layer (MAL) (reference [2]).

## 1.2 PURPOSE AND SCOPE

This Recommended Standard defines, in an abstract manner, the COM in terms of:

a) the operations necessary to provide the service;

b) the parameter data associated with each operation;

c) the required behaviour of each operation;

d) the use of the model.



It does not specify:



a) individual implementations or products;

b) the implementation of entities or interfaces within real systems;

c) the methods or technologies required for communications.

## 1.3 DOCUMENT STRUCTURE

This Recommended Standard is organised as follows:

a) section 1 provides purpose and scope, and lists definitions, conventions, and references used throughout the Recommended Standard;

b) section 2 presents an overview of the concepts;

c) section 3 presents the COM specification;

d) section 4 is a formal specification of the COM data structures;

e) section 5 is a formal specification of the COM errors;

f) section 6 details the location of the formal service specification Extensible Markup Language (XML) schema.

## 1.4 DEFINITION OF TERMS

**Software Component** (component)**:** A software unit supporting the business function. Components offer their function as Services, which can either be used internally or which can be made available for use outside the component through Provided Service Interfaces. Components may also depend on services provided by other components through Consumed Service Interfaces.

**Hardware Component:** A complex physical entity (such as a spacecraft, a tracking system, or a control system) or an individual physical entity of a system (such as an instrument, a computer, or a piece of communications equipment). A Hardware Component may be composed from other Hardware Components. Each Hardware Component may host one or more Software Components. Each Hardware Component has one or more ports where connections to other Hardware Component are made. Any given Port on the Hardware Component may expose one or more Service Interfaces.

**Service:** A set of capabilities that a component provides to another component via an interface. A Service is defined in terms of the set of operations that can be invoked and performed through the Service Interface. Service specifications define the capabilities, behaviour and external interfaces, but do not define the implementation.



**Service Interface:** A set of interactions provided by a component for participation with another component for some purpose, along with constraints on how they can occur. A Service Interface is an external interface of a Service where the behaviour of the Service Provider Component is exposed. Each Service will have one defined ‘Provided Service Interface’, and may have one or more ‘Consumed Service Interface’ and one ‘Management Service Interface’.



**Provided Service Interface:** A Service Interface that exposes the Service function contained in a component for use by Service Consumers. It receives the MAL messages from a Consumed Service Interface and maps them into API calls on the Provider component.

**Consumed Service Interface:** The API presented to the consumer component that maps from the Service operations to one or more service data units contained in MAL messages that are transported to the Provided Service Interface.

**Management Service Interface:** A Service Interface that exposes management functions of a Service function contained in a component for use by Service Consumers.

**Service System:** The set of Hardware and Software Components used to implement a Service in a real system. Service Systems may be implemented using one or more Hardware and Software Components.

**Service Provider** (provider)**:** A component that offers a Service to another by means of one of its Provided Service Interfaces.

**Service Consumer** (consumer)**:** A component that consumes or uses a Service provided by another component. A component may be a provider of some Services and a consumer of others.

**service data unit, SDU**: A unit of data that is sent by a Service Interface, and is transmitted semantically unchanged, to a peer Service Interface.

**Service Capability Set:** A grouping of the service operations that remains sensible and coherent, and also provides a Service Provider with an ability to communicate to a Consumer its capability. The specification of services is based on the expectation that different deployments require different levels of complexity and functionality from a service. To this end a given service may be implementable at one of several distinct levels, corresponding to the inclusion of one or more capability sets.

**Object:** A thing which is recognised as being capable of an independent existence and which can be uniquely identified. An object may be a physical object such as a spacecraft or a ground station, an event such as an eclipse, or a concept such as telemetry parameter. It forms the fundamental part of a service specification, e.g., a parameter definition, a parameter value at a given point in time, a command. There are no requirements on what an object may be except that it must be possible to uniquely identify an instance of it.



**Event:** A specific object representing 'something that happens in the system at a given point in time'.



**Activity:** Anything that has a measurable period of time (a command, a remote procedure, a schedule, etc.).



## 1.5 CONVENTIONS

### 1.5.1 NOMENCLATURE

The following conventions apply for the normative specifications in this Recommended Standard:

a) the words 'shall' and 'must' imply a binding and verifiable specification;

b) the word 'should' implies an optional, but desirable, specification;

c) the word 'may' implies an optional specification;

d) the words 'is', 'are', and 'will' imply statements of fact.

NOTE – These conventions do not imply constraints on diction in text that is clearly informative in nature.