



European Component Oriented Architecture (ECO) Collaboration Programme: Volume III Part 6: Platform Requirements Reference Manual

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Note: *This specification represents the output of a research programme and contains mature high-level concepts, though low-level mechanisms and interfaces remain under development and are subject to change. This standard of documentation is recommended as appropriate for limited lab-based evaluation only. Product development based on this standard of documentation is not recommended.*

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4 Abbreviations

API	Application Programming Interface
ASC	Application Software Component
ECO A	European Component Oriented Architecture
FIFO	First In First Out
IP	Internet Protocol
Id	Identifier
OS	Operating System
PC	Personal Computer
POSIX	Portable Operating System Interface
RFC	Request For Comments
RT	RealTime
UTC	Coordinated Universal Time
XML	eXtensible Markup Language

5 Introduction

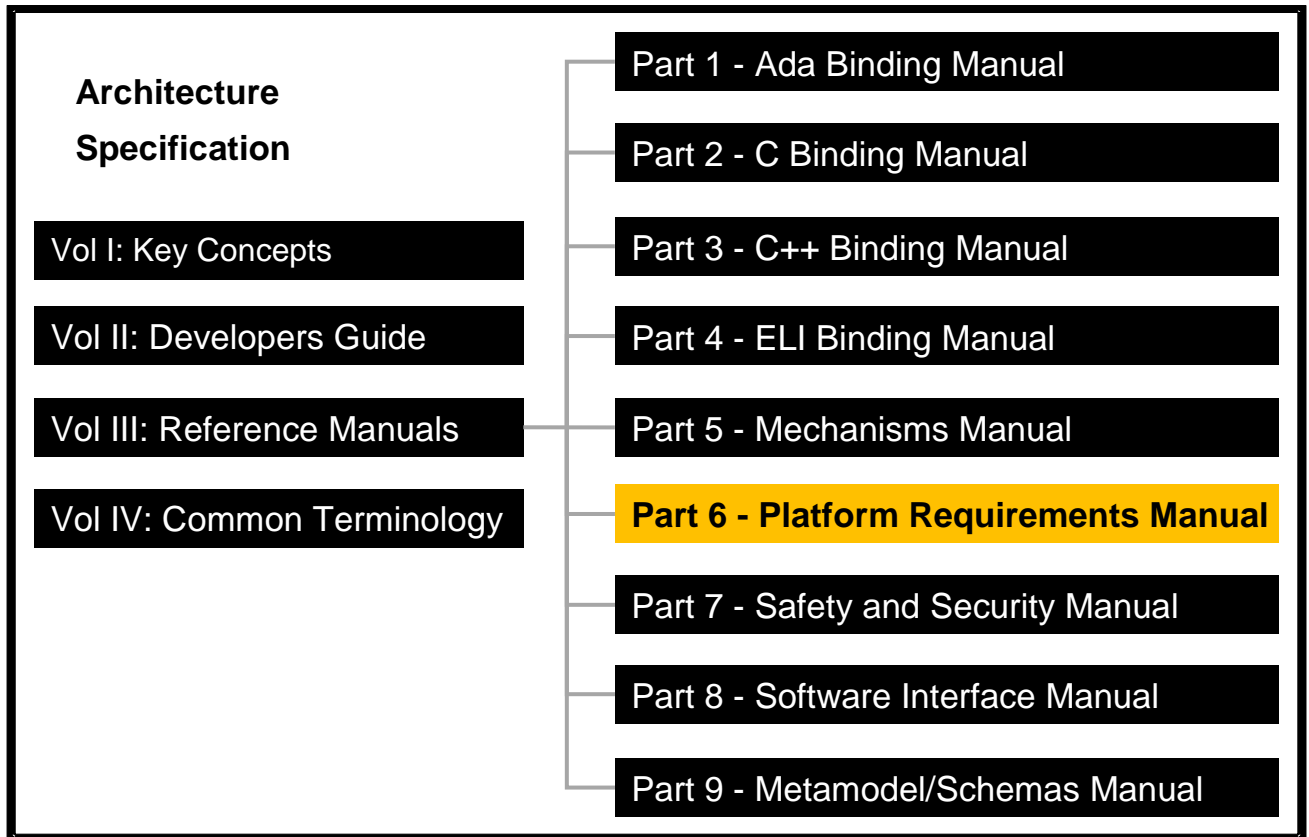


Figure 1 – ECOA Documentation

The ECOA Architecture Specification provides the definitive specification for creating ECOA-based systems. It describes the standardised programming interfaces and data-model that allow a developer to construct an ECOA-based system. It is introduced in Key Concepts (Reference 1) and uses terms defined in the Common Terminology (Reference 11). For this reason, the reader should read these documents, prior to this document. The details of the other documents comprising the rest of the ECOA Architecture Specification can be found in Section 8.

The ECOA Architecture Specification consists of four volumes, as shown in Figure 1:

- Volume I: Key Concepts
- Volume II: Developer's Guide
- Volume III: Reference Manuals
- Volume IV: Common Terminology

This document comprises part of Volume III Part 6 of the ECOA Architecture Specification, and describes the high level requirements for the conformity of platform to ECOA.

The purpose of this document is providing sets of requirements to help ECOA Platform or ECOA Reference Platform providers to build the right product and to help system integrators to check the conformance of their procurements.

The document relies on other Reference Manuals of the ECOA Architecture Specification and refers to them. The assumption is made that any ECOA Platform or ECOA Reference Platform is delivered at least with a Toolset, a Version Description and a User's Manual.

This document is structured as follows:

- Section 6 describes the generic high level requirements for any ECOA Platform,
- Section 7 describes the high level requirements for an ECOA Reference Platform.

The requirements use the following keywords for which the definitions are taken from the RFC 2119:

- SHALL – This word, or the terms "REQUIRED" or "MUST", mean that the definition is an absolute requirement of the specification.
- SHOULD - This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- MAY - This word, or the adjective "OPTIONAL", mean that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item.

6 Generic Requirements for an ECOA Platform

This section provides generic high level requirements that a platform shall satisfy to claim a conformance to the ECOA Standard and then be identified as an ECOA Platform.

Id.	Requirement
	Implementation
GPR.1	The ECOA Platform shall conform to an identified version of the ECOA Standard (i.e. a given version of the Volume III of the ECOA Architecture Specification).
GPR.2	The ECOA Platform shall support at least one language binding.
GPR.3	Any language binding (of the bindings identified in the ECOA Standard) shall be supported in its entirety.
GPR.4	The platform shall be delivered with its logical model (see logical-system.xml in [2, 10]).
GPR.5	The ECOA Platform shall map ECOA Modules onto realtime preemptible FIFO tasks based on the ECOA Module priorities.
GPR.6	The ECOA Platform shall map Protection Domains onto segregated memory spaces.
GPR.7	The ECOA Reference Platform should store logs in a non-volatile memory.
GPR.8	The ECOA Platform should enable the Application Software Components to use OS API (where such API is available), these Application Software Components being considered as drivers.
GPR.9	The software update of the ECOA Platform should be done on Integrator's site.
	Hardware
GPR.10	Each computing element in an ECOA Platform shall be synchronized to a single version of a time reference common across the whole ECOA Platform.
GPR.11	The maximum skew, from the ECOA Platform common time, shall be no more than 1msec.
	Usage
GPR.12	The ECOA Platform or its Toolset may provide a centralised capability to deploy binary elements (e.g. executables, platform-specific data) on Computing Nodes.
GPR.13	The ECOA Platform or its Toolset may offer a central capability to remove totally a deployment (e.g. erase of temporary or platform-specific data, release of platform-level resources used for the deployment, etc.).
GPR.14	The ECOA Platform or its Toolset may provide a centralized capability to access logs generated by Application Software Components through the ECOA Log API or by the ECOA Platform itself (e.g. to signal of an internal problem).
GPR.15	Logs generated by the ECOA Platform shall be interpretable for a person not involved in the development of the ECOA Platform, i.e. the origin and a

	content of the log entry, eventually filtered by some means, shall provide information to determine the proximate cause of the log (e.g. resource exhaustion, technical problem, ECOA System inconsistency, etc.).
GPR.16	The ECOA Platform or its Toolset may offer an off-line filtering capability to analyze logs (per Application Software Component, per Computing Node, etc.).
GPR.17	The ECOA Platform or its Toolset may offer a centralized capability to measure performances (Computing Node/core loads, memory use, etc.).
GPR.18	The ECOA Platform or its Toolset should provide a capability to set its variable elements (e.g. watchdog default values, network stack size, etc.).
GPR.19	The ECOA Platform or its Toolset may provide a capability to monitor and log interactions at service link level.
GPR.20	The ECOA Platform or its Toolset should provide a centralized capability to command ECOA Module and Application Software Components lifecycles.
GPR.21	The ECOA Platform or its Toolset should provide a centralized capability to select starting lifecycle states (e.g no autostart of ECOA Supervision Modules)
GPR.22	The ECOA Platform or its Toolset should provide a centralized capability to report/monitor the lifecycle states of ECOA Modules and Application Software Components and the availability states of Services.
	<i>Development environment</i>
GPR.23	The ECOA Platform Toolset shall support the editing of platform-specific files (non ECOA files) for the configuration of platform-specific elements (e.g. compiler and linker options, IP address, stack sizes, etc.).
GPR.24	The ECOA Platform Toolset may provide automated generation of elements in support of Application Software Component development (ECOA Module skeletons, makefiles, etc.).
GPR.25	The ECOA Platform Toolset may offer a compatibility mode with the file structure defined in reference [2].
GPR.26	The ECOA Platform Toolset shall support the assembly and the integration of an Application Software Component delivered either in linkable binary (e.g. object code) or in source.
GPR.27	The ECOA Platform Toolset shall provide automatic generation of elements required for the deployment of an Assembly Schema, based on a given Deployment Schema.
GPR.28	The ECOA Platform Toolset may support the incremental compilation and linking of Application Software Components referenced in a given Assembly Schema.
GPR.29	The ECOA Platform Toolset should enable the definition of compiler and linker options specific to an Application Software Component.
GPR.30	The ECOA Platform supplier should offer a standalone software development package for cross-development (compilation, unit testing) of Application Software Components by a person having no access to the ECOA Platform.
GPR.31	The ECOA Platform Toolset should be able to validate the linkages between ASCs at Design Time.
GPR.32	The ECOA Platform Toolset should offer a capability to configure the

	Application Software Component at Design Time.
GPR.33	The ECOA Platform Toolset should offer a capability to configure the Application Software Component at Design Time.
GPR.34	The ECOA Platform Toolset should offer a capability to ensure coarse grain resource allocation at Design Time.
GPR.35	The ECOA Platform Toolset shall offer a capability to ensure fine grain resource allocation at Design Time.
GPR.36	The ECOA Platform Toolset should generate adequate (reviewable) information about how each Protection Domain executable is laid out.
GPR.37	The ECOA Platform Toolset should be able to save and restore multiple configuration settings.
GPR.38	The ECOA Platform Toolset should be able run scripted actions.
	Documentation
GPR.39	The platform version description shall describe at least traceability matrix towards this requirement table, language(s) supported, RTOS employed, hardware interfaces supported, Open Standards supported, statement with regards to single-source dependencies, description of hardware with regards to robustness (i.e. avionic use, etc.), known defects/limitations, change reports for updates, licensing terms for the software, licensing terms for generated software embedded into the built software, available qualification evidence for HW and SW, etc.
GPR.40	The User's Manual shall describe how to setup and install the ECOA Platform in a vehicle platform.
GPR.41	The User's Manual shall describe all specific capabilities of the ECOA Platform (i.e. capabilities offered by this particular ECOA Platform in addition of those defined by the Reference Manuals) (e.g. available OS API).
GPR.42	The User's Manual shall describe the way to operate all generic and specific capabilities/features offered by the ECOA Platform and its Toolset (e.g. how to deploy an Application Software Component delivered in linkable binary or in source code, how to set compiler and linker options specific to an Application Software Component or to a set of Application Software Components, how to use the logging and performance monitoring related functionalities, etc.).
GPR.43	The User's Manual shall provide the Usage Domain (constraints and limitations) (see [13]) of the ECOA Platform, in particular limitations (e.g. maximum size of versioned data, maximum size of messages, maximum number of deployable ECOA Modules per Computing Node, Computing Node computing power, Computing Node memory size, inter-Computing Nodes communication bandwidth, etc.).
GPR.44	Synchronisation accuracy, precision and resolution shall be documented.
GPR.45	The User's Manual shall describe how to lead fine grain scheduling analysis.

Table 1 – Generic requirements for an ECOA Platform

7 Requirements for an ECOA Reference Platform

This section provides high level requirements that a platform shall fit to be an ECOA Reference Platform for training, development, ASC verification, etc.

Id.	Requirement
	Implementation
RPR.1	The ECOA Reference Platform shall conform to an identified version of the ECOA Standard.
RPR.2	The ECOA Reference Platform shall fully support in its entirety any binding used by Application Software Components logged in the ECOA Catalogue (see business model).
RPR.3	The ECOA Reference Platform shall be delivered with its logical model (see logical-system.xml in [2, 10]).
RPR.4	The ECOA Reference Platform shall map ECOA Modules onto realtime preemptible FIFO tasks based on the ECOA Module priorities.
RPR.5	The ECOA Reference Platform should provide a RT FIFO preemptible scheduler per processor.
RPR.6	The ECOA Reference Platform shall map Protection Domains onto segregated memory spaces.
RPR.7	The ECOA Reference Platform shall store logs in a non-volatile memory.
RPR.8	The ECOA Reference Platform shall enable the Application Software Components to use POSIX/Windows API, these Application Software Components being considered as drivers.
RPR.9	The software update of the ECOA Reference Platform shall be done on site in less than one hour.
RPR.10	The ECOA Reference Platform shall support user configuration of network exchanges (e.g. choice of security features) to facilitate communications with sufficiently high speed and low latency (e.g. by removing the default firewall by default or by setting level of security of the IP layer).
RPR.11	The ECOA Reference Platform shall support user configuration of system services to facilitate execution of real-time applications (e.g. by removing useless database services).
	Hardware
RPR.12	The ECOA Reference Platform shall use widely available hardware and software resources (PC, open OS, etc.).
RPR.13	The ECOA Reference Platform, in a minimal configuration to support ASC using the strict ECOA API defined in the Reference Manuals, shall be capable of running on a single standalone development workstation.
RPR.14	The ECOA Reference Platform shall enable, in a transparent manner, the easy addition of network endpoints or memory on hardware resources.
RPR.15	Each computing element in an ECOA Platform shall be synchronized to a single version of a time reference common across the whole ECOA Platform.

RPR.16	The maximum skew, from the ECOA Platform common time, shall be no more than 1msec.
	Usage
RPR.17	The ECOA Reference Platform or its Toolset shall provide logins and separate workspaces for multiple users.
RPR.18	The ECOA Reference Platform or its Toolset shall provide a centralised capability to deploy binary elements (e.g. executables, platform-specific data) on Computing Nodes.
RPR.19	The ECOA Reference Platform or its Toolset shall provide a centralised capability to deploy multiple Assemblies on distinct parts of the hardware resources.
RPR.20	The ECOA Reference Platform or its Toolset shall offer a central capability to remove totally a deployment (e.g. erase of temporary or platform-specific data, release of platform-level resources used for the deployment, etc.).
RPR.21	The ECOA Reference Platform or its Toolset shall provide a centralized capability to access to logs generated by Application Software Components through the ECOA Log API or by the ECOA Platform itself (e.g. to signal of an internal problem).
RPR.22	Logs generated by the ECOA Reference Platform shall be interpretable for a person not involved in the development of the ECOA Reference Platform, i.e. the origin and the content of a log entry, eventually filtered by some means, shall provide information to determine the proximate cause of the log (e.g. resource exhaustion, technical problem, ECOA System inconsistency, etc.).
RPR.23	The ECOA Reference Platform or its Toolset shall offer an off-line filtering capability to analyze logs (per Application Software Component, per Computing Node, etc.).
RPR.24	The ECOA Reference Platform or its Toolset may offer an on-line filtering capability to analyze logs (per Application Software Component, per Computing Node, etc.).
RPR.25	The ECOA Reference Platform or its Toolset shall offer a centralized capability to measure performances (Computing Node/core loads, memory use, etc.).
RPR.26	The ECOA Reference Platform or its Toolset shall provide a capability to set its variable elements (e.g. watchdog default values, network stack size, runtime-level checks, etc.)
RPR.27	The ECOA Reference Platform or its Toolset shall provide a capability to monitor and log interactions at service link level.
RPR.28	The ECOA Reference Platform or its Toolset shall provide a centralized capability to command ECOA Module and Application Software Component Runtime Lifecycles.
RPR.29	The ECOA Reference Platform or its Toolset shall provide a centralized capability to select starting lifecycle states (e.g no autostart of ECOA Supervision Modules).
RPR.30	The ECOA Reference Platform or its Toolset shall provide a centralized capability to report/monitor the lifecycle states of ECOA Modules and Application Software Components and the availability states of Services.

Development environment	
RPR.31	The ECOA Reference Platform Toolset shall support the editing of platform-specific files (non ECOA files) for the configuration of platform-specific elements (e.g. compiler and linker options, IP address, stack sizes, etc.).
RPR.32	The ECOA Reference Platform Toolset shall provide automated generation of elements in support of Application Software Component development (ECOA Module skeletons, makefiles, etc.).
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RPR.37	The ECOA Reference Platform Toolset shall support the definition of compiler and linker options specific to an Application Software Component.
RPR.38	The ECOA Reference Platform supplier should offer a standalone software development package for cross-development (compilation, unit testing) of Application Software Components by a person having no access to the ECOA Reference Platform.
RPR.39	The ECOA Reference Platform Toolset shall be able to validate the linkages between ASCs at Design Time.
RPR.40	The ECOA Reference Platform Toolset shall offer a capability to configure the Application Software Component at Design Time.
RPR.41	The ECOA Reference Platform Toolset shall offer a capability to configure the Application Software Component at Design Time.
RPR.42	The ECOA Reference Platform Toolset shall offer a capability to ensure coarse grain resource allocation at Design Time.
RPR.43	The ECOA Reference Platform Toolset shall offer a capability to ensure fine grain resource allocation at Design Time.
RPR.44	The ECOA Platform Toolset should generate adequate (reviewable) information about how each Protection Domain executable is laid out.
RPR.45	The ECOA Platform Toolset should be able to save and restore multiple configuration settings.
RPR.46	The ECOA Platform Toolset should be able run scripted actions.
Documentation	
RPR.47	The ECOA Reference Platform Version Description shall describe at least traceability matrix towards this requirement table, language(s) supported, RTOS employed, hardware interfaces supported, Open Standards supported, statement with regards to single-source dependencies, description of hardware with regards to robustness (i.e. avionic use, etc.), known

	defects/limitations, change reports for updates, licensing terms for the software, licensing terms for generated software embedded into the built software, available qualification evidence for HW and SW, etc.
RPR.48	The User's Manual shall describe how to setup and install the ECOA Reference Platform in IT facilities.
RPR.49	The User's Manual shall describe all specific capabilities of the ECOA Reference Platform (i.e. capabilities offered by this particular ECOA Reference Platform in addition of those defined by the Reference Manuals)(e.g. available OS API).
RPR.50	The User's Manual shall describe the way to operate all generic and specific capabilities/features offered by the ECOA Reference Platform and its Toolset (e.g. how to deploy an Application Software Component delivered in linkable binary or in source code, how to set compiler and linker options specific to an Application Software Component or to a set of Application Software Components, how to use the logging and performance monitoring related functionalities, how to create logins and workspaces, etc.).
RPR.51	The User's Manual shall describe the Usage Domain (constraints and limitations) (see [13]) of the ECOA Platform, in particular limitations (e.g. maximum size of versioned data, maximum size of messages, maximum number of deployable ECOA Modules per Computing Node, Computing Node computing power, Computing Node memory size, inter-Computing Nodes communication bandwidth, etc.).
RPR.52	Synchronisation accuracy, precision and resolution shall be documented.
RPR.53	The User's Manual shall describe how to lead fine grain scheduling analysis.

Table 2 – Requirements for an ECOA Reference Platform

8 References

Ref.	Document Number	Version	Title
1.	IAWG-ECOА-TR-001	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume I Key Concepts
2.	IAWG-ECOА-TR-002	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume II Developers Guide
3.	IAWG-ECOА-TR-003	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 1: Ada Binding Reference Manual
4.	IAWG-ECOА-TR-004	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 2: C Binding Reference Manual
5.	IAWG-ECOА-TR-005	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 3: C++ Binding Reference Manual
6.	IAWG-ECOА-TR-006	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 4: ELI and Transport Binding Reference Manual
7.	IAWG-ECOА-TR-007	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 5: Mechanisms Reference Manual
8.	IAWG-ECOА-TR-009	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 7: Approach to Safety and Security Reference Manual
9.	IAWG-ECOА-TR-010	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 8: Software Interface Reference Manual
10.	IAWG-ECOА-TR-011	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume III Part 9: Metamodel and XSD Schemas Reference Manual
11.	IAWG-ECOА-TR-012	Issue 2	European Component Oriented Architecture (ECOА) Collaboration Programme: Volume IV Common Terminology
12.	RFC 2119	March 1997	Key words for use in RFC's to Indicate Requirement Levels
13.	AC-20-170	10/28/10	Integrated Modular Avionics Development, Verification Integration, and Approval Using RTCA/D0-297 and Technical Standard Order-C153

Table 3 - Table of ECOА references