

ARTEMIS Tool Platforms

Strategy and Implementation

Version 43

February 10, 2011

# **Foreword**

This document describes the actual status of the ARTEMIS Tool Platform strategy and implementation plan.

The purpose of this document is to present a state of the ARTEMIS Tool Platform Strategy and Implementation, refine the objectives presented in the ARTEMISIA MASP, and propose a plan for the next steps.

It serves the following objectives:

* To be circulated to the whole ARTEMIS community in order to collect its inputs
* To be used as the basis for the discussions during the Artemisia Summer Camp on the topic of Tool Platforms
* To proposes definitions, guidelines and actions, for which the ARTEMISIA Steering Board approval will be requested, in particular :
	+ The definition of what is a Tool Platform
	+ The categorization of Tool Platforms
	+ The guidelines on related Intellectual Property
	+ The basic Governance principles for the implementation of a tool platform
	+ To support tool platform integration activities in projects funding
	+ To prescribe guidelines in Calls for Proposals regarding the way projects should address the link to tool-platforms
	+ To outline the next steps
	+ To record in an appendix the list of current candidate Tool Platform projects, and maintain this list up to date

It is the consolidated basis that may serve as input to the ARTEMIS SRA, AWP documents, for the next editions as far as the Tool Platform topic is concerned.

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# ARTEMISIA Working Group on Process & Tools

The following persons are already active in a core group, which will impulse the impetus to the project, or have made contributions to this paper:

* François Bichet, Chief Technology Strategist at Dassault Systems, ARTEMISIA Vice-president, chairing the ARTEMISIA Process & Tools working group
* Pr. Dr. Werner Damm, Member of the Offis Board, Chairman of SafeTrans
* Dr. Heinrich Daembkes, VP System & SW Engineering EADS Defense & Security
* Christian Schyr, AVL
* Joseph Sifakis, CNRS Research Director
* Vera Lauer, Daimler, Manager E/E Concepts and Technologies, E/E Architecture and Standards, Daimler
* Dr Jan J.H. van den Biesen, Vice President, Philips Research
* And a sub-group headed by Pr Werner Damm, coordinating the inputs from :
	+ Airbus Germany
	+ AVL
	+ EADS
	+ Siemens
	+ Fraunhofer
	+ DLR
	+ OFFIS
	+ SafeTRANS Steering Board, including Klaus Beetz (Siemens), Werner Damm (OFFIS), Detlef Evers (Airbus D), Klaus Grimm (Daimler), Wolfgang Klingenberg (Bosch), Peter Liggesmeyer (Fraunhofer IESE), Ottmar Bender (EADS, substituting Heinrich Daembkes), and Josef Affenzeller (AVL).
* The following additional persons also provided inputs during the kickoff meeting
	+ Stan Smits , Philips Healthcare
	+ Gerard Beenker, NXP
	+ Laile Gide, Thales
	+ Ad ten Berg, Artemisia
	+ Fabrice Derepas, CEA List
	+ Axel Mauritz, EADS Innovation Works
	+ Petri Liuha, Nokia
	+ Erwin Schoitsch, ARC
* Marco Cesena from Finmeccanica also provided inputs, most of which proposing criteria for tool platform projects . These are listed in appendix III [Criteria Tool Platform Label](https://artemis-ia.eu/publication/download/label-criteria-for-tool-platforms.doc)
* Various persons from projects applying to become a platform have also contributed through their comments to improve this document, in particular Dagfin Brodkorp from ABB / I-Fest
* The following persons also contributed during the sep 2010 Tool Platforms physical meeting in Paris : Ad Ten Berg (Artemis-IA), k.l.M.Bertels; Laila Gide (Thalès) ; Werner Damm (Offis), Gerard Cristau (Thalès) Johan lilius (abo), Piero Brozzu (DS), Severine Bellard (Sagem). The Safetrans proposal was discussed during this meeting.

A revised version was subsequently discussed and agreed, under the leadership of Werner Damm and François Bichet (Proposal for Tool Platform process & criteria V4), which content has been inserted in-extenso into the present document.

This Process & Tools platform working group mission is to propose to the ARTEMISIA Presidium and Steering Board the definition of a Tool Platform and the process by which the Tool Platform approach is proposed, validated, planned, and deployed.

Process & Tools Working Group will interact with the ARTEMISIA community through the General Assembly.

# Vision for Tool Platforms

Before describing the proposed targets, we need to define more accurately what the problem is that Tool Platforms intends to solve, what is a Tool Platform and what are the various categories of Platforms.

"Please note that Artemis is using the generic word “Tool Platform” to designate the collaborative development environment of a tool chain that allow to design Embedded Systems (design / build time), in order to clearly distinguish them from “Embedded Software Target Hardware”, that are a set of embedded soft or hard constructs to enable various components to communicate and operate together (at run time)."

Tool Platforms have been anchored in the MASP2009 as an instrument to support sustainability and productivity by sharing research results among projects targeting related objectives, thus contributing to the overall objective of promotion of cross-fertilization and reuse of technology results.

## Tool Platforms strategy

The MASP recognized that “The need for trustable, interoperable tools from reliable sources with assured long-term support is identified in the ARTEMIS-ETP SRA on Design Methods and Tools. The present European dependency on too few companies for tools that are of strategic importance is seen by many as a major weakness and Open Source alternatives, due to small user-bases, are often not workable. Something new is needed.

This new element is the concept of the “ARTEMIS Tool Platform”, of which there may be several – each adapted to particular sector or part of the complete design flow.

Unlike a complete design flow tool-chain, an ARTEMIS Tool Platform will not have a fixed or even physical existence. An ARTEMIS Tool Platform is not intended as a commercial entity. These virtual Platforms are sets of commonly agreed interfaces and working methods, which may evolve and become more refined over time, that allow specific tools addressing a particular element or phase of a design flow to interoperate with other tools addressing the same design goal, so forming a complete working environment. In its simplest expression, it is a specification for interfaces and operating methods. The demands on design tools can be very different between industrial sectors (indeed, even between companies within the same sector, due to product diversity), making a single ARTEMIS solution unrealistic. Therefore a number of ARTEMIS Tool Platforms are foreseen, as shown schematically below[[1]](#footnote-1).

Here it can be seen how tools developed in various research projects can be linked via the platforms into viable solutions as part of a complete chain. This also includes the possible inclusion of existing (commercial or open-source) tools. Note that a development project can yield a tool or tools which is/are compatible with more than one Platform. Also, the Platform concept does not impose a specific business model: these can be aimed towards a specific commercial implementation (a future ambition), can expressly address the Open Source paradigm, or even a mixture of these. A Tool Platform can also form the core of an ARTEMIS ecosystem.

ARTEMIS-JU will ask future project proposers to voluntarily indicate, for information, what target platforms they intend to address in the course of the project or in the future. This will build the visibility on this critical topic, and inform a Working Group that will be set up by the Industry and Research Committee to establish the requirements for candidate Platforms. Further details of the Tool Platforms strategy can be found on the ARTEMISIA web site.”

Unfortunately, so far no strategy and instruments for its implementation are in place to avoid the un-coordinated emergence of tool platforms with overlapping scopes.

Without further guidance by ARTEMIS, there is a high risk, that the significant efforts of setting up such tool platforms are replicated, and that the intended objectives of tool-platforms to serve as a focal point for gathering related research results is lost. Within ARTEMIS such development could lead to a proliferation of competing platforms, counteracting the overarching strategic objective of the promotion of cross-fertilization and reuse of technology results.

## Definition of Tool Platforms

“Tool Platforms” are set of services to a community enabling it to pool Intellectual Property, Methodology, Components or Services, in accordance with a specific architecture, in order to avoid duplicate efforts when developing, maintaining, or using them.

A particular type of platforms are “glue platform”, which purpose is solely to connect together components while preserving local properties at global level..

This paper covers considerations of platforms in the broadest sense, not restricting the scope to the “glue” platforms, although this technology is obviously of critical importance.

The ARTEMIS R&D Tool Platforms for Embedded Systems will focus on pooling:

* Intellectual Property
* System, S/W and H/W Development Services (at build time), to help the ARTEMIS in-work projects to deliver their innovative Embedded Systems development applications across multiple disciplines and partner companies
* S/W Components (run-time usage), for the customer working with the applications resulting of ARTEMIS projects to help developing Embedded Systems.

In order to properly support sharing and pooling across a community, platforms need to also provide the following:

* Tool Platform long term sustainability, i.e. data persistency.
* Tool Platform capability to ensure data validation, consistency, lifecycle, change propagation and configuration
* Tool Platform capability to support interoperability between the tool Products or Services proposed by the contributing members, interoperability with other tool platforms or the outside world, and the definition of conformance testing procedures to be applied to guarantee various predefined levels of interoperability
* Tool Platform capability to support the collaborative business processes across partners
* Tool Platform capacity to support dissemination
* Tool Platform capability to protect IP and facilitate IP trading

Last, but not least, platforms must ensure that the various polled components do operate properly together, i.e. are able to maintain their quality of service when interoperating at runtime. Thus the platforms must also to provide the following services:

* Verification of compliancy to the appropriate architectural style
* Composition and connectivity architecture and services to guarantee the overall quality of service

As ARTEMIS deals with embedded systems, one needs also to be clear about what is meant by “hardware platform”.

1. There is first the host hardware, which will be used to support the services provided by the tool platform to the community. The hardware may be typically subcontracted to a specialized hosting company, which guarantees the level of services, and performs the hardware related operations: backups, maintenance, etc..
2. There is also another topic: the hardware, which is the target platform for the execution of the Embedded Software that will be delivered. This topics also includes the associated generic or industry specific middleware, for example Web Services middleware, Automotive ECU’s, Automotive Bus Controllers, Aerospace Integrated Modular Avionics hardware, etc.

Some market platforms such as Autosar have spent a lot of efforts to provide an isolation layer to make the solutions developed trough the platform independent from the target hardware and communication middleware. For examples constructs such as the so-called ‘Autosar basic software’, or ‘Autosar virtual bus’ contribute to such independence. This gives the system providers a lot of flexibility in the sourcing of their hardware components, with the associated productivity and agility gains.

As an example, in healthcare, the “Integrating the Healthcare Enterprise (IHE)” initiative brings together vendors all over the world to test their middleware implementation of interoperability standards such as DICOM and HL7 in a so-called “Connectaton”.

To clarify the vocabulary, which may be confusing as the above cases reflect a completely different reality, we will use the word “Hosting Hardware” for case 1) above, and use the word “Embedded Software Target Hardware” for case 2).

Hosting Hardware is in general a non-issue, providing the related lifecycle costs are properly planned in the tool platform business model.

Embedded Software Target Hardware support is an important consideration for tool platform projects. It is certainly also a valid goal for Artemisia tool platforms to ensure some form of independence of the generated code from the target hardware. This needs to be taken into consideration when evaluating tool platforms, which generate Embedded Software.

## Categorization of Tool Platforms

In order to facilitate communication about platforms, ARTEMIS has defined a high-level taxonomy of the tool platforms that are in use today or will be in the near future, based on the service they provide:

| **Tool PlatformType** | **CommonTool Platform capabilities** | **Scope /Focus** | **Examples(in red: from Artemis projects)** |
| --- | --- | --- | --- |
| **Project Collaboration Platforms** | * Project Information, News
* Milestones, Deliverables
* Document Management
* Meeting Planning
* Forum
* Development Flow Management, Process Best Practices
 | Project and document oriented | SharePoint, ProjectPlace |
| **Software DevelopmentServices Platforms** | * Source Code Management
* Code Versioning
* Tools Interfaces
* S/W Development Best Practices templates
 | Software throughput management | Eclipse, Subversion Server |
| **Embedded S/W & System Interface Modeling Platforms** | * Meta-Models
* Model Authoring or Model Transformation Tools
* System-level Analysis Tools
* Code Generation
* Hardware & Communication Insulation Layers definition tools
* System-level Interfaces specification
* Overall Best Practice Processes and Dataflow
 | Software development, System-level Interfaces development | Autosar, Cesar |
| **System Modeling Platforms** | * As above, but focused on general Systems (Mechanical, Fluids, Electrical, Human, Environmental, Systems of Systems), such as Modelica-based Platforms
* Provide modeling for both the controlling software and the controlled plant
* H/W S/W Co-modeling and Co-simulation capabilities
* Leveraging other platforms for S/W
* PLM level Processes and Best practices
* Such platform is particularly useful when the implementation technology has not yet been selected
 | Product Systems Engineering |  Modelisar |
| **Manufacturing Platforms** | * For production embedded software
 | Manufacturing Systems Engineering, Robotics | Socrades |
| **Glue Platforms** | * Heterogeneous Systems generic Composition and Interconnection
* Local Properties conservation at global level. Proofs.
* Execution glue generation
* Formal foundation
 | Formal Interoperability | BIP, Speeds, Ptolemy II,SOFIA |
| **Dissemination Platforms** | * Downloading
* On-line Purchasing
 | User Community Management | SourceForge |
| **On-line Content Trading Platform** | * IP Uploading and marketing
* IP Downloading & Buying
* Trading Processes
 | B2B | IP trading sites3Dvia |

# Governance principles about Tool Platforms

The following basic principles will guide ARTEMIS in the formulation of the tool platform overall approach (the rules of the game):

### Business Model

ARTEMIS should not prescribe any specific business model for a tool platform, such as freeware or licensed. Moreover Web 2.0 emerging hybrid business models should be encouraged, which leverage advertising, referencing, etc.

ARTEMIS should recommend embedding in tool platforms mechanisms for IP protection and trading in order to create a powerful Embedded Systems vendors supply chain. Such business community is needed order to boost the development Europe competitiveness in Embedded Systems, in particular as far as SME’s are concerned

### Source Code

ARTEMIS should not prescribe any model for source code delivery for tool platforms nor for the tools, such as open-source or proprietary. It is anticipated that hybrid open-proprietary models will coexist, where for example some components are open-source, while some are proprietary

ARTEMIS will advise on a policy to discourage the use of viral open source licenses

### Platform Variety

ARTEMIS should not impose the development of a single platform. This would be unrealistic at this stage of maturity of the Industry and of the technology. On the opposite, ARTEMIS should encourage the development of focused Platforms delivering properly and quickly exactly what is needed for the competitiveness of a given industrial segment

ARTEMISIA will define the Tool Platform related requirements for the dissemination of projects and propose a format to capture and disseminate consistently this information.

ARTEMISIA will endeavor to publish a map of the tool platforms and their applicability. This should be used by future projects to decide whether they wish to relay on an existing tool platform or create a new one for a specific market segment

For critical market segments it is reasonable to envisage several competitive tool platforms, in order to support alternative technical approaches. In such cases process shall be put in place to ensure over time convergence of the key interfaces, and their appropriate formal standardization.

It is however not the intention to allow a costly proliferation of tool platforms, which could be too widely redundant, and would be impossible to make properly interoperable. Therefore ARTEMISIA will label upfront a number of tool platforms, which meet the appropriate criteria of quality, scalability, value to support specific markets, etc. The labeling process will be proposed by the Process & Tools group, and decided by the Artemisia Steering Board and Presidium.

### Momentum toward Platform Interoperability

ARTEMIS should encourage strongly the various Tool Platforms to agree over time on some common interfaces or components in order to facilitate interoperability.

It is though recognized by ARTEMIS that the various tool platforms will very rarely be 100% interoperable. Taking onboard such objective would both dramatically slow down innovation and increase the costs. The goal is to share the subset of Interfaces that will provide at low cost the basic interoperability needed by the targeted cross-segments integration, while freely pursuing innovation for the most advanced or specialized functions (low-hanging fruits approach)

The following diagram is a high-level representation of the efforts needed to complete, integrate and market a project. The ARTEMIS tool platform strategic goal is to minimize the interoperability costs.



Interoperability is an on-going journey. ARTEMIS will develop mechanisms to encourage the progressive development of platforms interoperability.

Artemis will support projects to investigate the most successful mechanisms available in various industries or laboratories to ensure generic tool platform interoperability, and assess how they could be put at the disposal of tool platform providers to help them to make their platforms more interoperable.

### Tool Platform Operations Ownership

In order to ensure platforms readiness and availability, ARTEMIS recommends that Platforms are managed by a single responsible legal entity, or a set of entities bound by a consortium agreement.

Of course the intent is that tool platforms group large communities of contributors at build time, i.e. when shared IP, products or services are collaboratively defined.

### Ecosystem of Communities

ARTEMIS objective is to develop an ecosystem of various communities around the ARTEMIS platforms. Tool Platform should be encouraged to make innovative proposals toward this goal. Communities may come from : ARTEMISIA, Industry, SME’s R&D institutes & universities, Students, Competitiveness Clusters (such as EICOSE, etc…), Centers of Excellence, Public Authorities, etc.

Tool Platform should plan the way to deliver their intended value to these communities, and maintain momentum

### On-line Artemisia Tool Platform blog

Artemisia is putting at the disposal of its members a blog dedicated to the Artemisia Tool Platform community. Artemisia members are encouraged to use it extensively, in to interact at best with the Tool Platform working group and to the Artemisia community

### Recommendations for the ARTEMIS Calls

Some projects will respond to ARTEMIS calls by providing platform proposals. They should follow the following guidelines :

They will need to be clear on the type of tool platform they propose and the scope of the platform. If necessary they should describe what is excluded from the tool platform

They should describe the intended business model for the platform

As far as non-platform projects are concerned, ARTEMIS recommendation that should be worked out should address the following guidelines :

They should, in their responses to ARTEMIS calls, bidders indicate what tool platforms they intent to support, in particular what labeled tool platforms they intend to support.

The quality of the integration to the of supported tool platforms, and the interoperability will naturally become one of the criteria for project selection, because projects that are not interoperable with other projects have very little chance to bring their expected results in a real-life industrial environments

The projects will be allowed, at their own initiative, to take into account the tool platform integration costs into their program costs.

Projects will also be encouraged to describe in their exploitation business model how the recurring cost of integration of their solution will be funded once the project is completed

### Standards

It is intended to leverage as much as possible current standards, or de-facto standards.
Artemisia will encourage projects to contribute to International and European Standards.

A Tool platform should define policies for conformance tests of the tools, and/or interoperability across tool platforms. In order to go enforce conformance, Artemis will rely on the definition of standards, either promoting the definition of new International Standards, or participating to existing standards in order to make them support the new technologies

### Openness

No prescription is made on Tool Platform business model

No prescription is made on Tool Platform source code availability

Tool Platforms Interoperability interfaces need to be made publically available

### Platform maturity

Artemis objective is to support as well projects for relatively mature platforms and projects for new, innovative and therefore necessarily less mature platforms. In order to make the level of maturity of the platform visible to potential future platform users, it is recommended to qualify such level by using the TRL (Technology Readiness Level) index. The description of such index is given in appendix.

## Relationship to the other Artemisia Working Groups

### SRA, MASP, AWP:

The Tool Platforms strategy and implementation is one of the key ARTEMIS objectives, and is naturally addressed by the working groups, producing those documents. This document is the input to these groups as far as Tool Platforms are concerned.

In particular, the following contributing entries will be proposed:

### In the SRA:

* Artemis Tool Platform strategy as an entry in the Artemis Innovation Environment section

### In the MASP:

* Tool Platforms as a key Artemis initiative (together with SME Involvement, Business Models, Education, Standards, Collaborative Innovation, External relations)
* Role and benefits of Tool Platforms
* Types of Tool Platforms
* Overall process for Tool Platforms
* Policy statement (IP, etc.)

### In the AWP:

* Call Priorities for Tool Platforms, and Applications usage of Tool Platforms
* Selection Criteria
* Biding Guidelines

### Reference Designs and Architecture, Seamless Connectivity & Middleware:

These working groups provide direction on the content of the projects, i.e. properties of the generated embedded system at run time.

On the other hand, the Tool Platform working group provides direction on how the design tools could interoperate and be used collaboratively, at design and build time.
These two working groups address fully complementary objectives.

Such solutions will be delivered over time by the actual projects, of 3 kinds:

* Tool Platform projects
* Application projects leveraging the existing or future Tool Platforms
* Some Application projects that might remain stand alone, either because they solve niche problems, or because they are not yet mature enough to be integrated, or for any other specific reason.

The Tool Platform initiative will propose incentive mechanisms to ensure that interoperability between these projects is actually properly planned and funded, thus enabling progressive convergence of these Tool Platforms, this without inhibiting innovation.

### Design Methods & Tools:

This working group has defined what the key processes and the tools associated with them., together with the technical challenges to address.

Here also, this is content, complementary to this document, which is focused on guidelines to drive at best the projects toward such content.

### Innovation Environment:

This working group has developed a set of proposals, in particular for community management, open source development, and standards development.
The present document proposes a way to deliver interoperable tool platforms, which will strongly contribute to the proposed community management objectives.

Regarding Open Source, this document supports equally open source and proprietary approaches, promoting integrated environments. The application of viral open source, however is discouraged.

Finally, this document explains how interoperability standards may be progressively defined among partners through the overall Artemis process.

### ARTEMISIA Ecosystem for Platforms

Here is an initial list of organizations that ARTEMISIA plan to liaise with on the topic of platforms strategy and implementation:

* COIE’s
* EICOSE
* IHE
* Eclipse.org

# ARTEMIS Tool Platform implementation plan

Here are some initial principles that ARTEMIS should deploy to implement the tool platform strategy, according to who is concerned.

### Principles of Implementation

#### Tool Platform providers

* The tool platforms are developed under the responsibility of a single organization, such as for example a software vendor, a joint-venture, a not-for-profit organization, an open-source organization, or a consortium of such organization under a common governance structure, which will be called here the ‘tool platform provider’.
* The tool platform provider may operate under various business models, such as self-funded, applying for public funding, open-source, or selling its software and services.
* The tool platform vendor shall provide all information needed to the partners wishing to integrate to his tool platform, such as API’s, documentation, support.

ARTEMISIA Organization

* ARTEMISIA will recommend and/or label upfront a number of focus tool platforms, which meet the appropriate criteria of quality, scalability, value to support specific markets, etc. It is not the intention to label a large number of platforms, as this would lead to a proliferation of solutions, which would be impossible to make properly interoperable.
* ARTEMISIA will then suggest that, in their responses to ARTEMISIA calls, bidders indicate what labeled tool platforms they intent to support.
* The quality of the supported tool platforms will naturally become one of the criteria for project selection, as is a fact that projects that are not interoperable with other projects have very little chance to bring their expected results in a real-life industrial environments

Project bidders

* The bidding partners will indicate in their proposal what tool platforms they intent to support, and take into his program costs the costs of integration of their solutions to the targeted platforms. This is a critical point of this whole approach: without such funding, the integration would never happen properly, resulting in not interoperable projects, of low value to the market
* This process guarantees that integration to tool platforms is a full project deliverable and is properly funded.

Illustration of the ‘à la carte’ integration of project platforms



### The multi-platform convergence process

This approach will enable many projects to each support one or several tool platforms, as needed by the market they intent to serve.

This system will de-facto build the pressure from the projects onto the tool platform providers to start standardizing their API’s in order to reduce the number of project plugins to develop, and allow the projects to be operative on as many tool platforms as possible.

It will be in the own interest of tool platform providers to cooperate together and comply with this pressure because they naturally wish as many as possible projects on their tool platform.

This will lead to the emergence of new ARTEMIS interface standards, shared by several platforms.

It is critical that this process happens progressively over time, when needed, in order to avoid that a too early standardization freezes innovation.
It is accepted that awaiting standardization there might be for a while some duplication of plug-in. This process is quite sane as it allows innovation to develop and also adaptation to specific markets.

The overall tool platform methodology brings the following benefits:

* 1. It enables several tool platforms to co-exist, thus preserving competition and innovation
	2. It ensures through the funding mechanisms that projects do integrate themselves to tool platforms, but of course without forcing projects to integrate to tool platforms if this would not make sense for their market.
	3. It naturally builds the pressure to tool platforms providers to harmonize and standardize over time their interfaces when it is appropriate.

Illustration of the progressive convergences
toward an ARTEMIS Standard for Embedded Systems Platforms



### Tool Platform technology

ARTEMIS will mainly take as criteria to assess the value of tool platform their chances to be widely adopted by the industry.

Therefore the tool platforms which leverage the explosion of web-based collaboration and Software as a Service will be encouraged. The intent is here to boost the development of collaborations across European partners on Embedded Systems, by making as easy and as possible such collaboration.

# ARTEMIS Tool Platforms Process

## Scope of ARTEMIS WG Tool Platforms

The development of Tool Platforms can serve two purposes (which are not mutually exclusive):

(a) Platforms may serve as an open standard for methods, processes and tool integration; they are used as such in pre-competitive R&D projects (i.e., ARTEMIS projects) to focus R&D activities and guarantee sustainability of project's results.

(b) Platforms do have a strong business case; an industrial strength implementation of a platform would be of great benefit to both, end users and vendors supporting such a platform.

Exploitation strategies for tool platforms are generally seen not be in the scope of this working group.

The Artemis-IA Tool Platforms Working Group objective is to propose to the Steering Board and the Presidium the approach for the Artemis Tool Platform strategy, and the methods to implement it. These strategy and methods are inputs to the SRA, MASP, AWP; which are the reference documents.
The Artemis-IA Tool Platforms Working Group does not deal with content, but only with methodology. It will not favor any platform proposal. It will however publish a status of the candidate platforms in order to provide stakeholders with the appropriate visibility on consolidated information, and may formulate, to both the platform owners and the steering board, suggestions aimed at accelerating platforms convergence.

The Artemis-IA Tool Platforms Working Group does not favor platforms with a specific TRL level (high or low TRL). Platform with a large variety of in and out TRL's may be funded by Artemis, according to the industry and PA's priorities, which are expressed in the SRA, MASP and AWP documents.

The Artemis-IA Tool Platforms Working Group will pay particular attention in his recommendations to platforms in their early stages (low TRL), because in the early stages, the alignment of the platform with Artemis priorities, and the planning of its integration with the other platforms are much easier and cheaper.

It is also important to distinguish the following:

1) The platform definition & open standards publication by the project consortium

2) The platform implementations, by the project consortium, by S/W vendors or Open Source bodies.

For each topic, the TRL (technology maturity level) is an important indicator for the community to assess the platform readiness.

The role of Artemis is to promote the platform definition, implementations and interoperability, but Exploitation strategies for tool platforms are generally seen not be in the scope of this working group.

For purpose (a), platform implementations need not necessarily be of production quality or have a high TRL. Additionally, platforms are an essential part of the ARTEMIS eco system. Therefore, an early exchange of initial platforms between R&D projects should be supported. Last, but not least, standards related to interoperability defined by platforms must be open, not proprietary. This does not apply to implementations.

## Lifecycle of a platform

The participants of the meeting foresee the following lifecycle for (successful) Platforms:

An initial platform (“ARTEMIS RTP candidate”) is build by an ARTEMIS project. During this time, responsibility for the platform is with the project consortium.

The project has succeeded in building an initial platform, which has received the label “ARTEMIS labeled Reference Technology Platform”. During this time, responsibility for the platform is with one or several entities that supports and maintains the platform and ensures its dissemination (especially to follow-up projects).

An interim governance structure is responsible for cross-project harmonization of the emerging open standard defined by the platform. It decides about modifications/extensions of this standard as well as about inclusion and compliance testing of components into the platform.

After gaining maturity, the standard could be proposed to a standardization body (such as OMG, IEEE, ISO, SAE, etc.), which will take over the maintenance of the standard.

The ARTEMIS Working Group on Tool Platforms focuses mainly on steps 1 and 2 of this lifecycle.

## ARTEMIS Calls for project proposals

The ARTEMIS Call for Project Proposals and the Evaluation Criteria for Project Proposals should be changed to strongly recommend for each Project Proposal a section describing which “ARTEMIS labeled RTP” will be used (if any) for projects building an additional platform, a positioning statement from existing “ARTEMIS labeled RTPs”

# Tool Platform Criteria

NOTE: Chapter 8 & 9 will also be published as a stand-alone document "Artemis-IA Tool Platform Labeling Criteria", and submitted for approval by the Steering Board.

This section describes criteria for labeling platforms as ARTEMIS Tool Platforms. Emphasis has been put on three points, namely

to facilitate an early installment of initial tool platforms, that (initially) do not need to have market quality

the integrating role of the Tool Platform in establishing ecosystems around tool development

to ensure sustainability of platforms

### Functional coverage

Platform type (according to ARTEMIS-IA classification)

assignment to ARTEMIS sub-program(s)

(intended) functionality of the platform and its tools, including instruments to ensure interoperability

Lifecycle coverage

which part(s) of the product lifecycle is/are covered

### Market

Market perspectives (not detailed market analysis)

### Industrial backup

Platform receives backup by

Large Enterprises

Vendors, SMEs,

Research organizations

As demonstrated e.g., by their

commitments (effort) in projects to build/use/... the platform

commitments to support sustainable operation of the platform (see below)

### Integration concept

Integration of existing tools into platform

* Measures for targeted support of Interoperability Standards
* The scope of existing standards targeted, or the project of introducing new standards when appropriate
* The openness, completeness, simplicity of published or targeted API's to support planned interoperability or customization

Integration of platform into ARTEMIS platform eco-system

* Positioning to existing platforms
* Interfaces to existing platforms

Measures for platform transparency

Availability of the platform Technological Readiness Level (TRL). The TRL level itself is not a criteria : projects with low or high TRL should not be favored. However, the fact that the TRL is exposed and justified is a criteria.

Measures for sustainable operation

* Concept for sustainable operations after the initial project ends, e.g.
	+ which organizations supports the platform
		- storage
		- maintenance
		- optional: further development
	+ processes to ensure consistency of extensions
	+ business model for the tool platform support
	+ measures that ensure dissemination of the platform
		- Dissemination to follow-up projects that

- use the platform

- perform further development of the platform

* + - Advertisement of platform

- e.g., by ARTEMIS Tool Platform WG blog, etc.

Development plan for the platform, as the platforms are expected to show increasing TRL's over time. Should this not be the case, recovery plans will be requested.

# Tool Platform Process for Tool Platform providers and users

### Step 1: ARTEMIS RTP candidate

An ARTEMIS project that implements (part of) an RTP may at any time – as early as the project-outline phase of the project starts, but typically after project start – apply for the status of “ARTEMIS RTP candidate” for their RTP. The application will be directed to the ARTEMIS-IA Steering Board and shall contain all information necessary to assess the criteria given in Appendix III [Criteria Tool Platform Label](https://artemis-ia.eu/publication/download/label-criteria-for-tool-platforms.doc) of this document. Since this application is at the start of a project – or even earlier – the provided information will typically be in the form of plans and intentions.

The ARTEMIS WG Tool Platforms assesses the provided information and record the application with comments regarding the completeness of provided information, publishes it on the Tool Platform blog, and informs the Steering Board. At this stage, the criteria “Integration concept” (especially: Interoperability with and demarcation to existing platforms) and “Measures for sustainable operation” (especially: dissemination to follow-up projects) are given special consideration.

The project informs regularly the ARTEMIS WG Tool Platform and/or the Steering Board about the progress in implementing the RTP and the associated measures. The Tool Platform Working Group publishes this information through the communication channels of ARTEMIS.

### Step 2: ARTEMIS labeled RTP

At some moment an ARTEMIS RTP candidate may apply to become an ARTEMIS labeled RTP. Again, all information necessary to judge the labeling criteria from Appendix III [Criteria Tool Platform Label](https://artemis-ia.eu/publication/download/label-criteria-for-tool-platforms.doc) have to be provided, this time detailing what has actually been done/ implemented. This application is again directed at the Steering Board.

The ARTEMIS WG Tool Platform advises the Steering Board in their decision, this time taking all labeling criteria equally into account. The Steering Board decides to award the label “ARTEMIS promoted RTP”.

In case the Steering Board decides to reject the RTP application, the rejection decision must be supported by a clear motivation describing which label criteria have not been met. Also suggestions must be given how to improve the RTP to enable a re-application for the label.

After a rejection decision, RTP candidates are allowed to re-apply for the label after they have improved the RTP.

RTP Users (i.e., R&D projects) that want to use an ARTEMIS labeled RTP – either as a tool in their own R&D work or even to extend the functionality of the RTP – have to negotiate terms of use with the organization that supports the RTP (see 'Measures for sustainable operation' in Appendix III [Criteria Tool Platform Label](https://artemis-ia.eu/publication/download/label-criteria-for-tool-platforms.doc)) according to the conditions set up by that organization.

The tool platforms may at a later stage formally apply for international standards, and search complementary support or funding from PA's or European standards bodies. This process is independent from the Tool Platform Labeling process, and although it is in many cases strongly recommended, it is not mandatory. However Tool Platform must make clear whether they will apply for existing standards or propose new ones.



 Example of a typical Tool Platform plan

### Step 3: Labeling Re-assessment

Artemis-IA will reassess after 3 years the platform label in order to ensure that progress has been achieved along the labeling criteria, especially those on organization of the tool platform support and the TRL level.

### Note on Artemis-IA role:

Artemis-IA is not a software engineering body, and has not the mission to carry-out a technical expertise of the architecture, quality and relevancy to market of the candidate Tool Platforms. Therefore Artemis-IA will check availability of documentation, clearness, completeness rather than content.

Artemis-IA mission is to create an environment, in which an eco-system of platforms will develop and evolve in a dynamic fashion. The viability and success of each platform will be decided by its market, i.e. by the projects electing to develop on this platform.

Artemis-IA mission is of course also to strongly promote a dynamics of interoperability across platforms, as described in the MASP.

# Value of the ARTEMIS Tool Platforms approach

The ARTEMIS tool platforms approach has been crafted to provide the best trade-off between key conflicting objectives:

* The need to support at best market requirements for a specific segment (one size does not fill all), while limiting tool platform proliferation
* The need for integration between solutions in order to support cross-segment integration
* The high cost of such integration
* The need to standardize to avoid the redundant cost of multiple plug-ins
* The need for innovation not to be inhibited by too wide or to early standards
* The need to preserve competition in key segments
* The need to provide an integrated set of on-line services to the end-user
* The need to evolve a tool platform after its initial deployment

We believe that the ARTEMIS tool platform strategy will greatly enhance the value of the individual ARTEMIS projects and lead to the definition by Europe of the future Embedded Systems world standards. As a result Europe will take the leadership position for integrated Embedded Systems development methods and tools.

# Appendix 1: List of the current candidate Tool Platforms

Hereafter is the list of projects that have been reported to consider becoming an Artemis Tool Platform. Obviously most projects need to mature their design and implementation before being in a position to submit a full proposal to become a platform.

|  |  |
| --- | --- |
| **Tool Platform Name** | **SOFIA** |
| **Artemisia Tool Platform Type** | **Glue Platform** |
| **Date of formal application** | Jul 09, 2009 |
| **Applicants** | tsalmon@arces.unibo.it; petri.liuha@nokia.com |
| **Leading Partner** | NOKIA |
| **History** | ARTEMIS Call 1 Project |
| **Proprietary / Open Source** | TBA |
| **Description** | SOFIA is a platform for sharing interoperable information in smart environments applications. The platform implements a “Smart Space”. A Smart Space is a search domain of information describing the objects existing in the environment, including the environment itself. Information may originate from heterogeneous legacy and embedded devices or may be produced by appropriate aggregators. The platform is very simple and it may be discovered and accessed as a Service (e.g. a NoTA service, a Web Service, an OSGi Service). Information is represented in an application independent format (RDF) and its interoperability and semantics are based on common ontologies. Its functionality may be extended with domain ontologies and with information manipulation applications. For example context-awareness, access control and security may be added in this way. The platform is agnostic with respect to ontology, programming language, service and communication levels, as well as hosting device/system. The platform and its application development environment are one candidate of Artemis collection of embedded systems “glue” platforms. They are expected to be the main result of SOFIA, a Call 1 Artemis project led by Nokia |
| **Technology Readiness Level** | TRL1, to be confirmed |
| **Contact** |  |

|  |  |
| --- | --- |
| **Tool Platform Name** | **i-FEST** |
| **Artemisia Tool Platform Type** | **Electronics Modeling & H/W S/W Co-design Platforms** |
| **Date of formal application** | Feb 17, 2010 |
| **Applicants** | dagfin.brodtkorb@no.abb.com  |
| **Leading Partner** | ABB |
| **History** | Artemis Call 2 Project |
| **Proprietary / Open Source** | TBA |
| **Description** | iFEST will specify and develop an integration framework for establishing and maintaining tool chains for engineering of complex industrial embedded systems; a significant technical contribution in the field of embedded systems technology. Specific emphasis is placed on open tool chains targeting HW/SW co-design for heterogeneous and multi-core solutions, and life cycle support for an expected operational life time of several decades.  |
| **Technology Readiness Level** | TRL1, to be confirmed |
| **Contact** | Martin Törngren, Professor in Embedded Control Systems, ICES director Work and postal address:KTH - Royal Institute of TechnologySchool of Industrial Engineering and ManagementDivision of Mechatronics, Dept. of Machine DesignBrinellv. 83, SE-100 44 Stockholm, Sweden Map: <http://www.md.kth.se/about/coordinates/index.shtml> Mobile: +46-(0)70-4446307Tel: +46-(0)8-790 6307Fax: +46-(0)8-20 22 87  |

|  |  |
| --- | --- |
| **Tool Platform Name** | **CESAR** |
| **Artemisia Tool Platform Type** | **Embedded S/W & System Interface Modeling Platforms** |
| **Date of formal application** | Not yet formal |
| **Applicants** |  |
| **Leading Partner** | AVL |
| **History** | Artemis Call 1 Project |
| **Proprietary / Open Source** | Mixed |
| **Description** | CESAR will bring significant and conclusive innovations in the two most improvable systems engineering disciplines:* Requirements engineering, in particular through formalization of multi viewpoint, multi criteria and multi level requirements,
* Component based engineering applied to design space exploration, comprising multi-view, multi-criteria and multi level architecture trade-offs.

Multi-viewpoint based development processes assure that not only functional aspects but also safety, costs, robustness, timeliness, etc. are captured and documented in a form allowing validation and verification to be performed. Multi-criteria based design processes allow for optimization of designs to multiple objectives functions for such extra-functional characteristics of designs, a key for achieving competitive products.  CESAR intends to provide industrial companies with a breakthrough in system development by deploying a customizable systems engineering ‘Reference Technology Platform’ (RTP) making it possible to integrate or interoperate existing or emerging available technologies.  Relying on use-cases and scenarios from Aerospace, Automotive, Automation and Railway, CESAR is strongly industry driven. |
| **Technology Readiness Level** | TRL1, to be confirmed |
| **Contact** |  |

|  |  |
| --- | --- |
| **Tool Platform Name** | **Genesys** |
| **Artemisia Tool Platform Type** | **Electronics Modeling & H/W S/W Co-design Platforms** |
| **Date of formal application** | Not yet formal |
| **Applicants** | * Vienna University of Technology, Institute of Computer Engineering
* STMicroelectronics S.r.l.
* Commissariat à l'Ènergie Atomique
* Nokia Oyj
* Thales
* Embedded Systems Institute
* Interuniversitair Micro-Elektronica Centrum vzw
* Technische Universität Darmstadt
* Fundacion European Software Institute
* Valtion Teknillinen Tutkimuskeskus
* Infineon Technologies AG
 | * Centro Ricerche Fiat S.C.p.A
* TTTech Computertechnik AG
* Alma Mater Studiorum - University of Bologna
* Universite Joseph Fourier Grenoble 1
* Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
* Technische Universität München
* Vytauto Didziojo Universitetas
* Ikerlan S. Coop.
* Budapesti Muszaki es Gazdasagtudomanyi Egyetem
* Universidad Politecnica de Madrid
* NXP Semiconductors Netherlands B.V.
* Volvo Technology AB
 |
| **Leading Partner** | TU Vienna |
| **History** |  |
| **Proprietary / Open Source** |  |
| **Description** | The objectives are as follows: * Definition of a **cross-domain architectural style**, which encompasses fundamental architectural principles for an as large as possible common set of platform servicess. In GENESYS these principles are operationalized in the templates of the architectural service specification. The architectural principles guide the architecture designer in such a way that the cross-domain reference architecture meets the ARTEMIS challenges.
* A **reference architecture template** will provide a concise description of platform services. It will be possible to instantiate the template for individual domains in order to meet the specific requirements of an application domain. The sets of platform services at the different integration levels will represent generic component libraries. Any particular instantiation of the template will incorporate a selected subset of the platform services at the respective level of integration (i.e., chip-level, device-level, open or closed system-level).
* Another objective is the development of a **model- and quality-driven development methodology** for the reference architecture template. The fourth objective is the **prototypical evaluation** of the reference architecture template.
 |
| **TRL** | TRL1, to be confirmed |
| **Contact** |  |

|  |  |
| --- | --- |
| **Tool Platform Name** | **RECOMP** |
| **Artemisia Tool Platform Type** | **Electronics Modeling & H/W S/W Co-design Platforms** |
| **Date of formal application** | Apr 5 2010 Initial enquiry only, not yet formal |
| **Applicants** | * Thales
* EADS
 | * Infineon
* Cister
 |
| **Leading Partner** | Abo Academy |
| **History** |  |
| **Proprietary / Open Source** |  |
| **Description** | * Reduced Certification Costs for Trusted Multi-core Platforms
* RECOMP recognizes the fact that the increasing processing power of embedded systems is mainly provided by increasing the number of processing cores. The increased numbers of cores is commonly regarded as a design challenge in the safety-critical area, as there are no established approaches to achieve certification. At the same time there is an increased need for flexibility in the products in the safety-critical market. This need for flexibility puts new requirements on the customization and the upgradability of both the non-safety and safety-critical critical part. The difficulty with this is the large cost in both effort and money of the re-certification of the modified software, which means that companies cannot fully leverage the advantages of modular software system. RECOMP will provide reference designs and platform architectures together with the required design methods and tools for achieving cost-effective certification and re-certification of mixed-criticality, component based, multi-core systems. The aim of RECOMP is to define a European standard reference technology for mixed-criticality multi-core systems supported by the European tool vendors participating in RECOMP.
 |
| **TRL** | TRL1, to be confirmed |
| **Contact** | Dr. Sébastien Lafond, Åbo Akademi UniversityDepartment of Information Technologies, Joukahainengatan 3-5AFIN-20520 Åbo, FinlandTel: +358 (0)2 215 3328GSM: +358 (0)40 54 64 024Fax: +358 (0)2 215 4732<http://research.it.abo.fi><http://web.abo.fi/~slafond/> |

|  |  |
| --- | --- |
| **Tool Platform Name** | **Interested** |
| **Artemisia Tool Platform Type** |  **Embedded S/W & System Interface Modeling Platforms** |
| **Date of formal application** | Sep 2010Initial enquiry only, not yet formal |
| **Applicants** | * Absint
* TTTech
* Evidence
* Symptavision
* Unis
* Artisan
 | * Sysgo
* Airbus
* Magneti Marelli
* CEA
* Thales
* Siemens
 |
| **Leading Partner** | Esterel Technology |
| **History** |  |
| **Proprietary / Open Source** | Open |
| **Description** | * Cover the full scope of Embedded Systems and Software engineering disciplines, spanning:
* System and Application Software Design Modeling, Verification and Code Generation
* Networking and RTOS execution platforms, Hardware-Dependent Software verification and Code Generation
* Timing analysis and code execution verification
 |
| **TRL** | TRL1, to be confirmed |
| **Contact** | Eric Bantégnies, Esterel technologies |

## Technology Readiness Levels





# Appendix 2: Practical Guidelines for Tool Platforms Stakeholders

## Steps for Tool Platforms Program Managers

### 1- Declare the project as a Tool Platform candidate

At project submission time or at any time after,

* Plan funding for Tool Platform related activities (described below)
* Get registered with the Artemisia Tool Platforms Working Group (fbt@3ds.com)
* Join the Artemis Tool Platform community and connect to the Artemisia Tool Platform Working Group blog
<http://member-platform.artemisia-association.org/phpBB3/index.php>
* Interact on the blog about your project with Artemisia partners, and the Tool Platform Working Group

### 2- Publish Tool Platform information

General Information

* Project Objectives, targeted Industries, targeted Processes
* The Platform Type(s) (according to the Artemisia classification)

Technical Information

* Targeted Functional Capabilities
* Architecture
* Development Environment & Prerequisites

Delivery Mechanisms for end-user availability

* Maintenance and support mechanism
* Targeted Licensing, Pricing

Planning Information

* The planned interoperability with the other declared Artemisia Platforms
* The planned End-User Deliveries, with Technology Readiness Levels (TRL’s)

### 3- Interact with Artemisia Tool Platform Community in order to converge

* On your Tool Platform Functional Capability and Architecture
* On your Tool Platform’s Tool Interfaces when applicable

XML Streams, Web Services, …

On your Tool Platform Interoperability with other Tool Platforms when applicable, in particular for overlapping platforms

Interoperability Scenarios

Data Import / Export Definition

XML Import / Export Definition. Mapping your XML Import/Export to other platforms XML Import / export definitions

Shared Web Services

On the ownership, resources and organization that will be affected to the interoperability joint work

### 4- Define the Test, Validation, Certification mechanism

“If you do it this way, we guarantee it will work”

Test Procedures

Test Data

On-line test & certification service, qualification evidences in terms of scenarios

### 5- Apply for the Artemisia Tool Platform Label if & when it is available

### 6- Once you are labeled, certify Tools on your platform, based on certification procedures and tests

### 7- Before the end of your project, set-up the maintenance organization for your platform, , with the appropriate business model

### 8- Plan the move toward international standards, and apply for adequate funding

## Steps for Tool Platform Customers (Tool Developers)

### 1- Declare your intention to the Artemis Tool Platform Working Group.This is optional but helps the Working Group to identify the most attractive Platforms

### 2- Contact the Tool Platform Provider

### 3- Negotiate Terms and Conditions, obtain S/W access

### 4- Integrate with or develop on top of Tool Platform Services

### 5- Mention the Tool Platform prerequisites in your project deliverables and on your project poster

### 6- Participate to the Working Group Tool Platforms Community

## Steps for Tool Platform End-Users

### 1- Negotiate terms and conditions of use with the Tool Platform Provider and/or the certified Tool vendors

1. See Appendix 1 [↑](#footnote-ref-1)