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Deliverable D6.1

Training and support material for project internal and external usage

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Abstract

This document constitutes deliverable D6.1 of the Arrowhead Tools project.

WP6 supports and proactively guides use case tasks in WP7,8 and 9 on how to use the tools of WP5, according to the engineering process of WP2 and the Toolchain architecture of WP4 for a solution implementation based on the SOA framework of WP3.

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1. Introduction

The goal of WP6 is to support and proactively guide the users of the Arrowhead technology, by providing the appropriate training material covering the engineering process, the SOA framework and associated tooling. Hence, this goal shall be achieved by structuring the reference material available and identifying the expectations regarding training material. It is considered that the targeted training material shall be made available for project internal and external usage, as well as for users of different levels of expertise.

In this perspective, the Task T6.1 targets the definition of conformity criteria and verification method to be applied for building consistent quality training material, as well as associated good practices. The definition of these conformity criteria and verification methods will be updated yearly along the course of the Arrowhead Tools project. The deliverable D6.1 consists in the first iteration.

At first, a brief state of the art of training methods is provided.

The third part depicts the methodology for structuring and indexing the training material in the context of the Arrowhead Tools project.

The next sections of this deliverable specify conformity criteria and verification methods of the respective following topics of interests for the project.

- Engineering process training and support material
- SOA Framework training and support material
- Tool chain architecture training and support material
- Tools usage training and support material

The last sections of the deliverable provide the description of the "Arrowhead training tool" use case demonstrator and its corresponding training and support material as example reference.

2. Structuration and cartography of training material

This section aims at constituting an entry point for accessing training material in the scope of the project, for project-internal dissemination as well as for external dissemination. This requires to characterize and index training material.

The resulting cartography aims to be used for positioning the available training material, as well as identifying needs for training material not yet available.

The advantage is for users and potential trainees to retrieve the material of interest to them or to express their needs for additional training material. For experts and tool providers to provide available trainings and ensure their accessibility, or to identify requirements for additional training material in their area of expertise.

2.1. Overview of available content

This section aims at a global description of the content. See part 4 for a more detailed description.

2.1.1. Training repository

The training material shall be made available in the project Owncloud repository, in the corresponding folder in WP6:

<https://atmospheres.research.ltu.se/owncloud/index.php/f/833352>

2.1.1. General Material

The current Arrowhead Framework is located at <http://www.github.com/arrowhead-f>. Here code, documentation and installation and usage instructions are available.

A slack-forum <http://www.slack.com/> is available where support can be requested. The forum is monitored daily.

Several training videos are already available in the Youtube channel <https://www.youtube.com/user/ArrowheadProject>.

Existing training material regarding Arrowhead:

- IoT Automation - Arrowhead Framework, Jerker Delsing, CRC Press, 2017
- Web site, <http://www.arrowhead.eu>
- Documentation from old Arrowhead project, <http://www.arrowhead.eu/arrowheadproject>
- Arrowhead Framework, home page, links to github code repository, <http://www.github.com/arrowhead-f>
- Arrowhead Tools home page, <http://www.arrowhead.eu/arrowheadtools>

- Existing tutorials (cf. BME, LTU) can be found at Arrowhead Tools owncloud repo, WP6/Training Material

2.1.2. WPs material

WP4 has provided as part of D4.1 deliverable a couple of documents (named O1 and O2) found in <https://atmospheres.research.ltu.se/owncloud/index.php/f/673373>. These are meant to be

guidelines in defining tools and toolchains from our side. With a significant expansion and refactor they can also constitute the basis for training material.

2.1.3. Workshops

The following project internal workshops are planned for the first 18 months of Arrowhead Tools:

- Porto WS, Day 2 and Day 3 of the Porto WS provides training on basic level Day-2 and advanced level Day-3
- Arrowhead Tools spring 2020 WS, March/April
- IEEE NOMS WS on Management for industry 4.0, April 20-24, 2020
- For the final Arrowhead Tools event in 2022 initial contact has been made with IEEE ICPS conference planned for Warwick/Newcastle UK, May 2022. This will be another major event for training related to WP6 and Arrowhead Tools results.

3.1. Cartography of concepts, methods and tools of Arrowhead

This part is to be built upon inputs of AHT methodology, during M6-M18

2.2. Training Description

This section depicts the necessary information about produced trainings, for successfully integrating them in the Arrowhead training repository.

The following information are necessary:

1-Position of the training considering the cartography of concepts, methods and tools in the scope of the project. See **Fel! Hittar inte referenskälla.**

2-Competency it aims to develop/improve

- List of trained skills
- Targeted level

3-Definition of prerequisites

- Preexisting knowledge and level of expertise
- Prior training courses required
- Working environment and tools involved

4-Training method

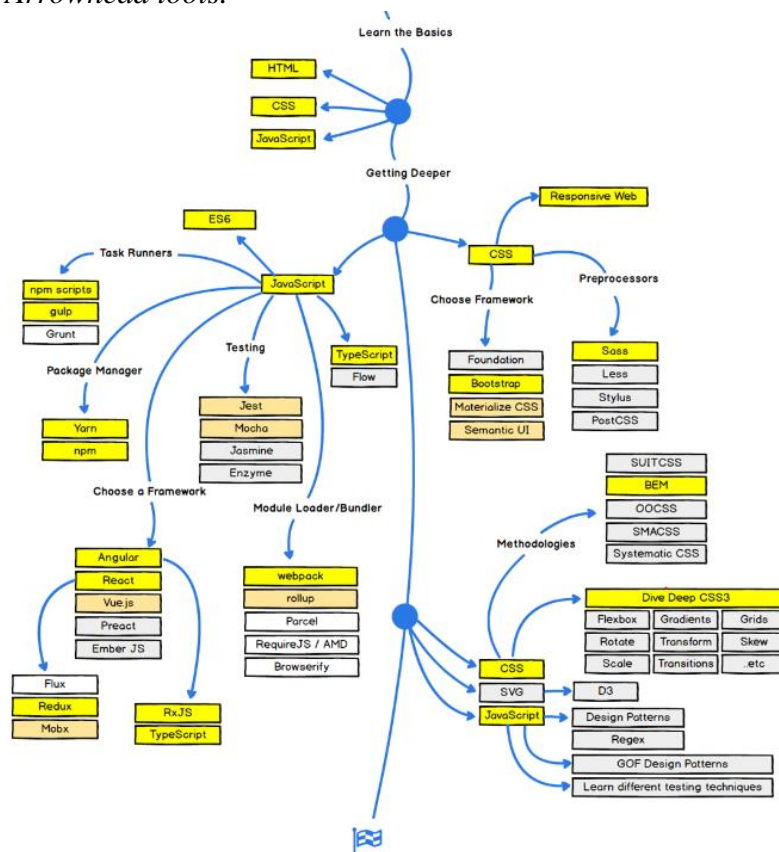
- Blended Learning: A style of education in which students learn via electronic and online media as well as traditional face-to-face teaching.
- Teaching Packages: A collection of materials used to conduct a course whether a traditional, group-based course or another type of learning event.
- Tutorial
- Training Videos
- Virtual Reality (VR) and Augmented Reality (AR)
- Workshop

5-Duration

5.1. Learning paths

In order to support users and trainees in the adoption of the Arrowhead tools, framework and methodology, some thematic learning paths shall be provided. The learning paths aim to give awareness to potential users about the use and positioning the technologies, tools, languages and their associated usage in a given context. Furthermore, it enables users to quickly position themselves regarding their already acquired skills and consider next steps for training.

Below is an example of a learning path in another context than Arrowhead tools - i.e. for Web frontend development. In the task T6.1, we shall consider how such representation could apply to the context of Arrowhead tools.



Example of learning path

3. Conformity validation process of trainings

This section describes the quality criteria required for trainings to be integrated in the Arrowhead tools context in a consistent manner, as well as the corresponding verification methods. *This part will be detailed during M6-M18*

3.1. Common criteria

Criteria that shall apply to all trainings.

3.2. Criteria for SOA Framework training and support material

Criteria that shall apply only to SOA Framework trainings.

3.3. Criteria for tool chain architecture training and support material

Criteria that shall apply only to tool chain architecture trainings.

3.4. Criteria for tools usage training and support material

Criteria that shall apply only to tools usage trainings.

3.5. Verification methods

The verification methods include all the steps and actions performed upon reception of the training material for acceptance as Arrowhead tools training.

4. Deliverable content

This table shows which objectives that are addressed by this WP and how these are supported.

#	Project Objective	Contribution
1	Reduction of solution engineering costs by 20-50%	Training and support in the usage of WP2,3,4 and 5 results is managed and performed by WP6
2	Interoperability for IoT and SoS engineering tools	Training and support in the usage of WP2,3,4 and 5 results is managed and performed by WP6
3	Interoperability and integration of data from legacy automation engineering tools to the Arrowhead Framework integration platform	Training and support in the usage of WP2,3,4 and 5 results is managed and performed by WP6
4	Integration platform interoperability with emerging digitalisation and automation framework	Training and support in the usage of WP2,3,4 and 5 results is managed and performed by WP6
5	Flexible, interoperable and manageable security for digitalisation and automation solutions	Training and support in the usage of WP2,3,4 and 5 results is managed and performed by WP6
6	Training material (HW and SW) for professional engineers	Training material is produced and governed within WP6

4.1. Deliverable content: Engineering process training and support material

Additional info may be available from:

Gianvito Urgese	gianvito.urgese@polito.it	+39 011 090 7042
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Jan van Deventer	jan.van.deventer@ltu.se	+46 920 493 316

Production Object	Type of	Status*
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Material for training in the Engineering process and how the Arrowhead Framework and Toolchain architecture supports it.	Description documentation, presentations, Tutorials and videos.	Planned
<i>To be completed during M6-M18</i>		

*) Available, Planned, Identified (need)

2.1. Deliverable content: SOA Framework training and support material

Production Object	Type of	Status*
IoT Automation – Arrowhead Framework	Book	Available
Arrowhead Framework Crash Course. Introduction to IoT automation and outlook Towards industrial and societal automation and digitisation	Video	Available
Arrowhead Framework Web	https://www.arrowhead.eu/arrowheadframework	Available
Arrowhead Framework Git repository	https://github.com/arrowhead-f	Available
Arrowhead Tools Git repository		Set up
Eclipse open source project training	TBD	Planned for early 2020
Arrowhead Framework coordination telcos	Biweekly, Tuesdays 15.30-17	Running
<i>To be completed during M6-M18</i>		

*) Available, Planned, Identified (need)

3.1. Deliverable content: Tool chain architecture training and support material

Additional info may be available from:

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Federico Montori	federico.montori2@unibo.it

Production Object	Type of	Status*
Material for training in the Engineering process and how the Arrowhead Framework and Toolchain architecture supports it.	Description documentation, presentations, Tutorials and videos.	Planned
<i><u>To be completed during M6-M18</u></i>		

4.1.Deliverable content: Tools usage training and support material

Check for Tools of general type that should be useful for many use cases.

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Federico Montori	federico.montori2@unibo.it

Production Object	Type of	Status*
Material for training in the Engineering process and how the Arrowhead Framework and Toolchain architecture supports it.	Description documentation, presentations, Tutorials and videos.	Identified
Material for training in Design support tool of the Arrowhead Framework.	Description documentation, presentations, Tutorials and videos.	Identified
Material for training in Sandboxing tool of the Arrowhead Framework.	Description documentation, presentations, Tutorials and videos.	Identified
Material for training in Test tool of the Arrowhead Framework.	Description documentation, presentations, Tutorials and videos.	Identified
Material for training in Deployment support tool of the Arrowhead Framework.	Description documentation, presentations, Tutorials and videos.	Identified
Definitions and aspect of tools and toolchains (we mean Arrowhead Tools, not generic ones).	Documentations and images	Planned

Guidelines in declaring your needed tools (dos and don'ts).	Documentations and images	Planned
Why and how a tool is meant to be connected with the arrowhead framework, how to pass information from one phase to another seamlessly	Documentations and images, (videos?)	Planned
An exemple of a toolchain (a set of tools) all connected with the arrowhead framework showing the information flow throughout phases.	technical documentation and CODE	Planned
<i>To be completed during M6-M18</i>		

*) Available, Planned, Identified (need)

5.1.Deliverable content: Training plan

Training activity	Where, when, how	Status*
Workshop in Arrowhead Framework Core and supporting systems and services	Porto 2019-11-12-14	Decided
Seminar on Engineering Process	Porto 2019-11-13	Decided
Seminar on Toolchain Architecture	Porto 2019-11-13	Decided
Seminar on Tools	Porto 2019-11-13	Decided
Eclipse open source project training	TBD	Identified
Design support	TBD	Identified
Integration support	TBD	Identified
Validation support	TBD	Identified
<i>To be completed during M6-M18</i>		

*) Available, Planned, Identified (need)



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9. Conclusions

At this step of the project (M06), the available training material is mainly coming from existing technologies, or is giving some guidelines on understanding of technology to be developed.

Plans for trainings delivery are at an initial step and shall be developed during the coming period.

An updated version of this deliverable (D6.3) is planned at M18.

5.Revision history

5.1.Contributing and reviewing partners

Contributions	Reviews	Participants	Representing partner
Tutorial (SheetCheets)	x	Asma Smaoui	CEA
General improvment	x	Jerker Delsing	LTU
Chapter 4	x	Mats Johansson	LTU
Chapter 4		Federico Montori	Unibo

2.1.Amendments

No.	Date	Version	Subject of Amendments	Author
1	2019-08-01	0.1	Initial draft	Emmanuel Vaumorin
2	2019-09-01	0.2	Integrating new content from partners	Emmanuel Vaumorin
3	2019-09-20	0.3	Integrating new content from partners	Emmanuel Vaumorin
4	2019-10-01	0.4	Integrating new content from partners	Emmanuel Vaumorin
5	2019-10-15	0.5	Integrating new content from partners	Emmanuel Vaumorin
6	2019-11-05	0.6	Polished version for review	Emmanuel Vaumorin

3.1.Quality assurance

No	Date	Version	Approved by
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1	05/11/2019	0.6	Emmanuel Vaumorin
2	05/11/2019	1.0	Jerker Delsing