TRA Plan

D6.1

Document Code:	AUR-UPM-PL-0005
Document Version:	4.0
Document Date:	28/03/2022
Internal Reference:	DOC00205382

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004291

Signature Control

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Changes Record

Rev	Date	Author	Affected section	Changes
1	2021-10-27	M.A. de Miguel	All	Initial issue
2	2021-11-24	M.A. de Miguel	All	General minor changes
3	2021-12-01	M.A. de Miguel Ana I. Rodriguez	All	General changes
4	2022-03-28	M.A. de Miguel	6	ORS01 was incorrectly placed among the descriptive KPIs. That line is removed from “Table 1 Operational KPIs”. The ORS01 KPI duplicated line is removed from Table 5.

Index

1. Introduction

1.1.Purpose, scope, and content

This document contains the Technical Readiness Assessment (TRA) Plan, in the AURORA project. There is a specific task (T6.1) in WP6 to prepare this plan. WP6 reuse Euclid facilities for the demonstration of the technology facilitates the assessment of a higher TRL for the AUTORA tool suite.

The Relevant TRL is understood accordingly with the H2020 "WP General Annexes - Extract from Part 19 - Commission Decision C(2014)4995 G. Technology readiness levels (TRL)", as shown below, which lightly differ from ESA Definition (ESA uses the ISO standard 16290 Space systems – Definition of the Technology Readiness Levels (TRLs) and their criteria assessment).

In AURORA GA and in this document, we assume that the current QGen TRL is TRL-4 "Technology validated in lab":

- QGen is an open-source code generation and model verification tool-set that grew out of the European projects Project-P (http://www.open-do.org/projects/p), Hi-MoCo and Gene-Auto.
- In 2021, the QGen code generator is being qualified at Tool Qualification Level 1 (TQL-1), which is the highest level of qualification recognized by the FAA and DO-178C standard.

The AURORA project has acquired the QGEN subscription for the Project duration of 2 years. The subscription includes toolset support and unlimited access to AdaCore experts for the products and programming languages:

- QGen native toolset to verify and debug Simulink(R) and Stateflow(R) models and generate Ada or MISRA C code for x86 GNU Linux (64 bits) native and Windows (64 bits) native.

1.2.Motivation and objectives of the project

The AURORA project aims to provide a European tool suite for the process of development and validation of a critical Auto-coded Flight software product in the Space domain and the demonstration of Auto-coding technology in an industrially relevant environment.

The WP3 AURORA package makes use of current EUCLID AOCS validation facilities at SENER Aeroespacial, which is an industrially relevant environment for this key enabling technology). WP6 will review the results in the WP3. AURORA CA [AD3] proposes to use this demonstrator as a use case that allows one to increase current level to TRL-6.

The TRA plan provides key data to demonstrate evidence to improve QGen TRL. The objective is to prepare the key data that are necessary to conduct an effective TRA for QGen including:

- A description of key technology.
- The System / Mission Requirement for the Applicable Mission Classes, including the Operational Environment/Concept of Operations and performance.
- Validated R&D Results using EUCLID AOCS Demonstrator in the relevant operational environment.

From WP3 and WP4 deliverables, the AOCS/GNC Code Generator (QGen) Technology Demonstrator and the Flight SW Autocoding Life-cycle Process Definition respecively, WP6 is conducting and reporting the TRA for QGen:

- Verification of the demonstration exercise, the degree of similarity of SW incorporating the new technology to the actual Euclid systems application. The degree to which required levels of performance are achieved, and in the needed environment.
- Viability: The viability of the technology being advanced, including both technical (risk) and programmatic viability (effort) needs to be clearly established. In particular, it is important to know if a given technology can indeed be further developed and, if so, with what technical risk and effort.

2. Applicable and reference documents

2.1.Applicable Documents

ID	Title	References	Rev.
AD1	ECSS – Space Engineering Software	ECSS-E-ST-40C	2009/03/06
AD2	AURORA Grant Agreement	GA number 101004291	--
AD3	AURORA Consortium Agreement (CA)	CA Nº 101004291 AURORA	--

2.2.Reference documents

ID	Title	References	Rev.
RD1	TASTE	https://taste.tools/	N/A
RD2	TECHNOLOGY READINESS LEVELS HANDBOOK FOR SPACE APPLICATIONS		TEC-SHS/5551/MG/ap
RD3	HORIZON 2020 – WORK PROGRAMME 2014-2015. General Annexes G. Technology readiness levels (TRL)		

3. Terms, Definitions, and Abbreviated Terms

The acronyms and abbreviations of this document are listed below.

AOCS	Altitude, Orbit, and Control System
CA	Consortium Agreement
ESA	European Space Agency
GA	Grant Agreement
TRA	Technical Readiness Assessment
TRL	Technical Readiness Level
WP	Work Package

4. General Objectives of Evaluators

4.1.General Objectives

The AURORA GA [AD2][AD3] identifies several challenges and objectives Tool suite certainly contributes to the development of Critical Space Technologies for European Non-Dependence and Competitiveness, very much in line with the European Non-Dependence Process. One challenge is to improve the TRL of QGen technology. The estimated initial TRL is 4 and the target TRL are 6/7 for an operational certified tool. Both the initial and target TRLs are understood accordingly with the H2020 "WP General Annexes - Extract from Part 19 - Commission Decision C(2014)4995 G. Technology readiness levels (TRL)". There are dedicated tasks for coordinating the AURORA Systems Engineering related actions that support the tool suite development and verification planning, including a SW Development Plan for the target TRL-6 for an operational certified tool. The next figure includes the general structure of AURORA WPs. EUCLID is used as development project in some WPs such as WP3 and WP4. In these WPs, EUCLID is rebuilt using QGen technologies. These developments will be used in WP6 to make readiness assessment evaluations.

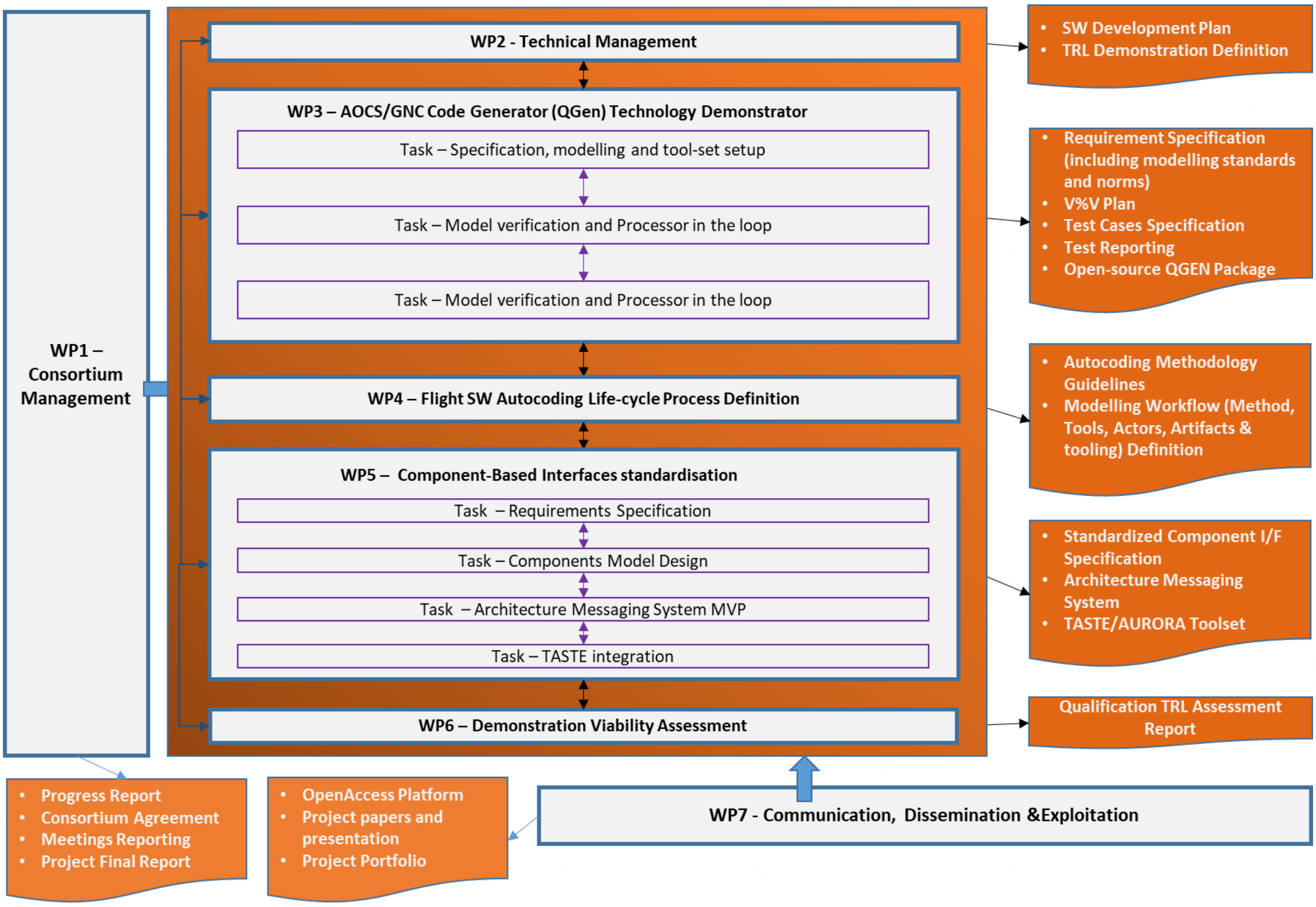

Figure 1 – AURORA Work Packages and outcomes (from AD1)

The Euclid facilities for the demonstration of the technology facilitate the assessment of a higher TRL for the AUTORA tool suite.

The SW Development plan (Deliverable D2.3) for AURORA establishes the development approach for the AURORA Toolset detailing the methodology to be followed through the Project. The SDP coordinates the

AURORA Systems Engineering activities that support the tool suite development and verification planning including a SW Development Plan for the target TRL-6 for an operational certified tool.

The Code Generator Validation & Verification Plan (Deliverable D3.3) describes the verification and validation activities and AOCS Verification Facilities. This plan is intended to:

- Demonstrate compliance to the AOCS/GNC Code Generator requirements defined for the AOCS/GNC Code Generator of AURORA.
- Demonstrate functional equivalence of the generated code using the AURORA Code Generation facility and procedures with respect to the reference case selected, which is the EUCLID mission AOCS design. This also includes the use of the EUCLID AOCS/GNC Verification facilities with the autogenerated code.

The AURORA team will perform a validation and verification strategy based on the requirements verification throughout the scope of the Project plus additional testing activities to demonstrate functional equivalence of the generated code using the EUCLID AOCS development heritage in SENER Aeroespacial, including some verification facilities and test specifications adapted to the simplified case.

This approach will ensure that the QEGN is able to generate autocode from Simulink models which is functional equivalent to that using other existing commercial tools. This approach is aligned with TRA Plan goals which pursue the assessment of a higher TRL up to level 6 for the complete procedure based on QGEN Toolsuite, certifying its application for automatic code generation for AOCS/GNC from Simulink models.

4.2.Process of the Application of TRA Plan

The TRA Plan includes three main phases:

1. Definition of the details of the TRA plan. This plan includes the identification of KPIs to provide TRL evidences and the criteria to do their evaluations. This plan will be centered on the evaluation of two TRL levels TRL6 and TRL7.
2. Quantification of key data. This phase will be elaborated on in task T6.2. This phase will include the preparation of the key data TRA for QGen and some of key data for previous version of EUCLID project. Those two evaluations will be used as comparison evaluators that will be used as evidence.
3. The final phase will reuse the key data produced in the previous phase to report the TRA for QGen. The key data will be used to perform a comparative analysis of development cost with previous technologies and QGen technologies, evaluate the applicability of QGen technologies and their impact on the software development process, and validate the results produced with QGen technologies.

The next Figure 2 – TRA Plan Phases includes the different phases and activities developed in every phase:

1. Definition of TRA Plan:
    a. Definition of KPI categories and KPI
    b. Definition of TRL analyzed
    c. Definition of KPI quantification for the evaluation of TRLs
2. Evaluation of key data
    a. Compilation of evidences for the assessment, gathering data on indicators and additional information where necessary. The results of this gathering are used for the evaluation of KPIs.
    b. Monitoring the specific targets of the KPIs to evaluate for the different models and projects.
    c. Quantification of KPI and Generation of evidences.

3. Analysis of key data and evaluation of TRL.
    a. Integration of key data produced for the different projects and models.
    b. Evaluation of TRL 6 and 7
    c. Elaboration of conclusions.

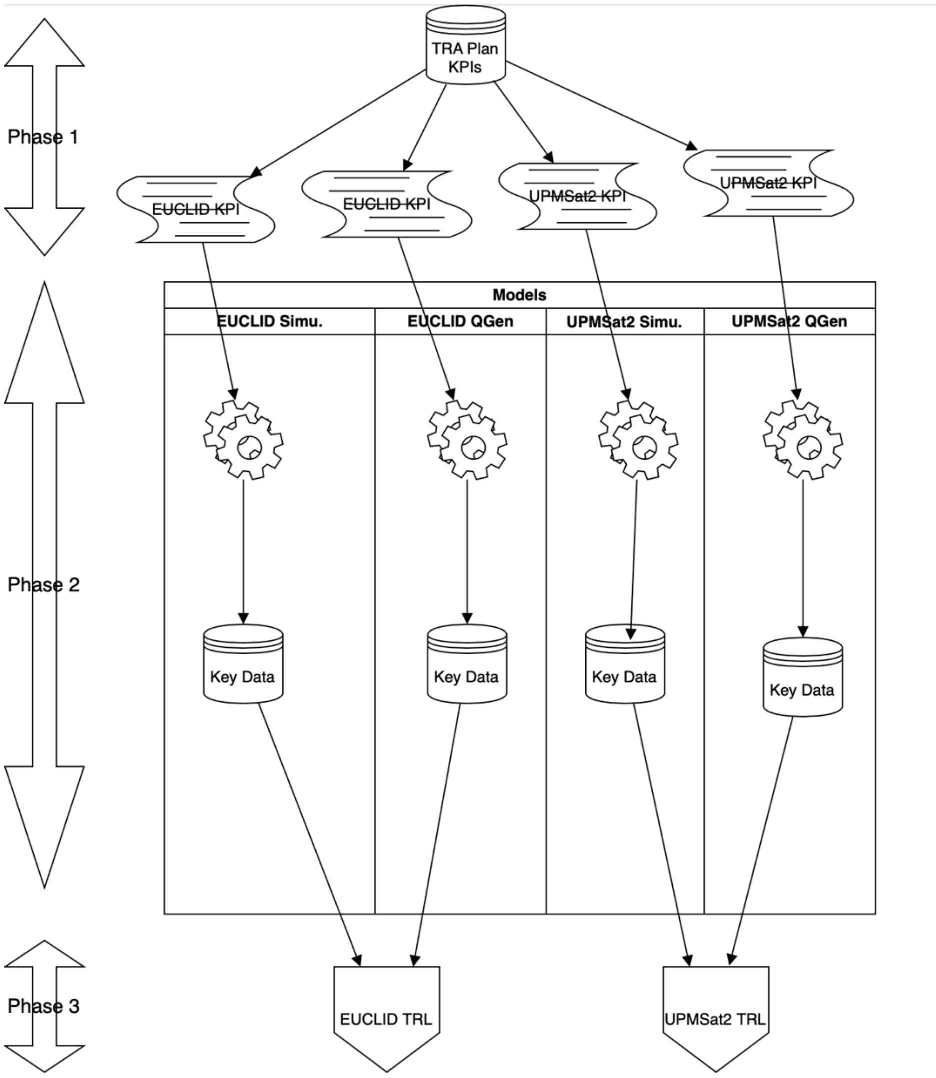

Figure 2 – TRA Plan Phases

5. Identification of QGen Readiness Evaluators

5.1.Demonstrators

EUCLID is a space mission to study the nature of the dark universe: dark matter and dark energy. To carry out its purpose, the mission will investigate the relationships between the distances, shapes, and redshifts of cosmic structures and their evolution. To do this, a range of techniques will be used including Weak Gravitational Lensing (WGL) and Barionic Acoustic Oscillations (BAO), by combining observations from both a visual imager (VIS) and a near-infrared spectrometer and photometer (NISP). EUCLID will be used as a demonstration project to evaluate the key data that will be used in quantification of QGen TRA. The ESA's Euclid Mission, where SENER is the prime contractor, includes Mathworks AOCS/ GNC model-based algorithms.

5.1.1. EUCLID

Euclid AOCS System, where the AOCS flight software is partly autocoded from Matlab as part of the on-board computer. Euclid mission's timeframe for lift-off starting in mid-2022 from the Guiana Space Centre.

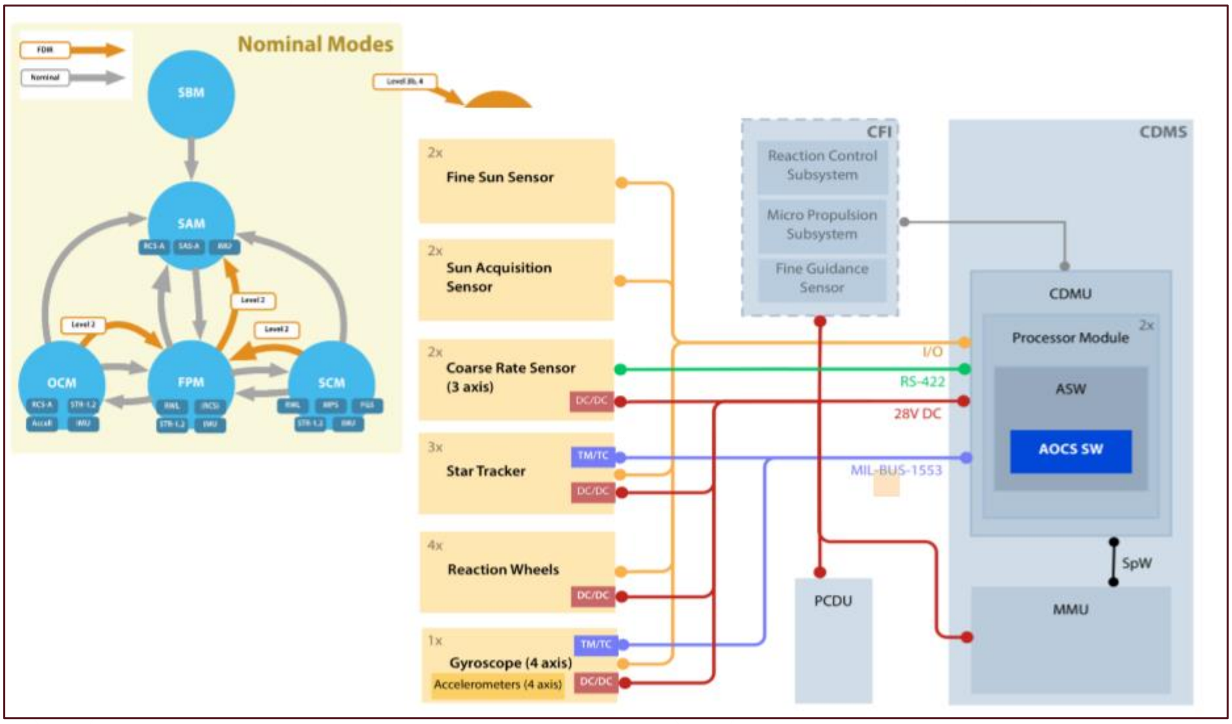

Figure 3 - Extended AOCS Architecture

5.2.QGen Evaluation Models

We will use an addition project example to evaluate the TRL of QGen technologies. UPMSat2 is a satellite developed at UPM and this satellite is in orbit since September 2020. The software of this satellite includes the Attitude Control System, which was modelled in Simulink, and the code generated was integrated into the rest of the software system.

5.2.1. UPMSat2 Nominal Attitude Control

The next figure includes the environment Simulink model of the UPMSat2 Attitude Control System. This model and some other models were used to develop the Attitude Control System and we have reimplemented these models to be reused with TASTE and QGen. TRA Plan KPIs can be quantified in the original version of that project and the new version of the projects. Based on these two key data (key data from the original UPMSat2 version and the new QGen version) we can provide evidence in the evaluation of TRL.

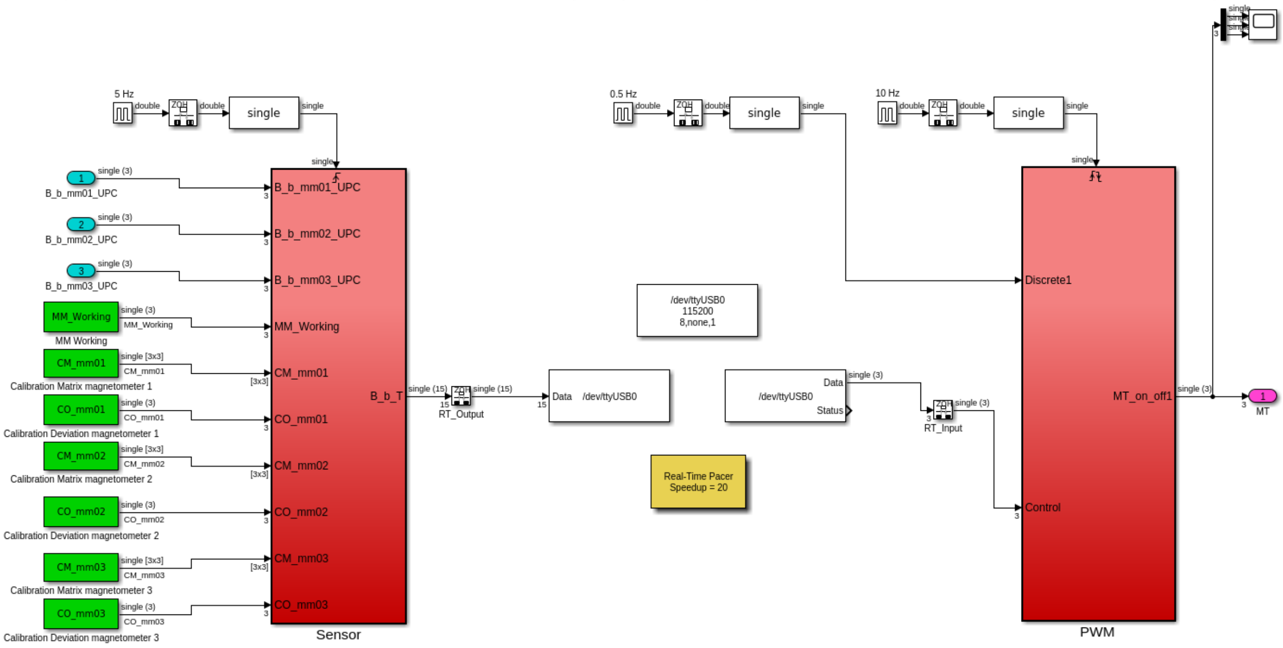

Figure 4 - UPMSat2 Attitude Control Simulink model

6. Identification of Evaluators of QGen Readiness

6.1. KPI Categories

This document includes two main approaches to evaluate QGen applicability in the development of AOCS Space applications. The two perspectives address the problem from two point of view:

1. Identification of problems in the application of QGen from an operational point of view trying to identify problems in its practical application of QGen, and in the integration of a general software life cycle.
2. Quantification of types of problems and AOCS subsystems that can be developed using Simulink and QGen and evaluate the increase in productivity in comparison to conventional software development methods.

The categories of first group are included in the operational indicator categories. The categories of the second group are included in the descriptive indicators.

6.1.1. Descriptive Indicators

Categories of KPIs to be used for descriptive purposes:

1. Descriptive Indicators - QGen Applicability. This category includes KPI that evaluates the applicability of QGen into new projects and in the migration of Mathworks projects to QGen.
2. Descriptive Indicators - Productivity Increase. These KPI are estimation of increase of productivity in QGen and Simulink technology application.
3. Descriptive Indicators – Estimation of software quality. These are KPIs that quantify the increase in software quality.

6.1.2. Operational Indicators

Categories of KPI to be used to quantify operational readiness of QGen:

1. Operational Indicators - Reuse of Simulink Models. These KPIs quantify the practical problems in the reuse of MathWorks projects in QGen.
2. Operational Indicators - Integration of QGen Models. These KPI evaluate the problems of integration of QGen generated code into general software architectures.
3. Operational Indicators - AdaCore QGen Support. AdaCore maintains the implementations of QGen, and they provide technical support in their application. These KPIs evaluate the quality of this tool support.

6.2. Evaluation Purposes

The KPI included in the TRA Plan evaluates the maturity of QGen technologies to be used in the development of industrial projects.

6.3. Evaluation Process

The next section represents the set of KPIs to be used in the TRL evaluation processes. Some KPIs are based on the comparison of values quantified in Mathworks Simulink models and the equivalent QGen Simulink models. The evaluation process will provide key data with the quantification of KPIs for evaluators included in Section 5.

6.4. KPI Tables

This section includes the set of KPIs to be used for the evaluation of evidence that guarantees the readiness assessment of QGen in AOCS projects. The next table includes the set of KPI classified considering the categories presented in the previous section. The table includes the description of KPIs, the general purpose of the KPI, and the unit used for the representation of reference values.

AURORA Project Category	KPI Code	KPI Description	General Purposes	Units
Operational Indicators Integration of QGen Models	OIQ01	Integrable in software architecture	Evaluate whether the QGen code is integrable into other software architectures	Boolean
Operational Indicators Integration of QGen Models	OIQ02	Interoperability with other software elements	Evaluate if QGen code can reuse other software elements	Boolean
Operational Indicators Integration of QGen Models	OIQ03	Integration of Simulink/QGen models and TASTE models	Evaluate whether QGen is integrable into TASTE	Boolean
Operational Indicators Integration of QGen Models	OIQ04	Number of Simulink models integrated in the TASTE software architecture model	Evaluate complexity of the process of integration of Simulink/QGen and TASTE	Number of models
Operational Indicators Management of the QGen Model	OMQ01	Modelling tools provide support to automatize the QGen code generation process.	Estimate the complexity of QGen usability with modeling tools	Number of tools
Operational Indicators AdaCore QGen Support	OAS01	Number of QGen tool support done to AdaCore	Estimate the support needed in the applicability of QGen	Number of support requests
Operational Indicators AdaCore QGen Support	OAS02	AdaCore response time for support requests	Estimate the time needed to solve QGen applicability problems	Average time of requests
Operational Indicators AdaCore QGen Support	OAS03	Number of issues and bugs sent to AdaCore	Estimate the maturity of QGen tools	Number of issues/bugs
Operational Indicators AdaCore QGen Support	OAS04	Time to solve bugs	Estimate the maturity of QGen tools	Number of days to solve a bug
Operational Indicators Reuse of Simulink Models	ORS01	Modified Blocks. Percentage of modified blocks for QGen compatibility: % modified Blocks = nModifBlocks/nBlocks Where the evaluation unit is the reference model (not including internal reference models)	Estimation of effort to reuse Simulink models	Percent

Table 1 Operational KPIs

AURORA Project Category	KPI Code	KPI Description	General Purposes	Units
Descriptive Indicators QGen Applicability	DQA01	Number of QGen models used in project development	Estimate applicability of QGen in projects	Number of models
Descriptive Indicators QGen Applicability	DQA02	Complexity of Simulink models used in projects: number of Simulink elements	Estimate the complexity of QGen models integrated in practical projects	Average number of elements
Descriptive Indicators QGen Applicability	DQA03	Time development of Simulink models	Estimate the effort to develop Simulink models	Hours of engineer effort
Descriptive Indicators Productivity Increase	DPI01	General increase in productivity	Estimate the reduction of development effort	Percent
Descriptive Indicators Productivity Increase	DPI02	Reduction of tests	Estimate the reduction in testing time	Percent
Descriptive Indicators QGen Applicability	DQA004	Maximum subsystem depth. Number of subsystem nesting levels	Estimate the complexity and maintainability of Simulink/QGen models	Nesting Levels
Descriptive Indicators QGen Applicability	DQA005	Maximum number of basic Simulink blocks. Number of basic blocks per function	Estimate the complexity and maintainability of Simulink/QGen models	Number of blocks
Descriptive Indicators QGen Applicability	DQA006	Maximum number of nested bus structures. Number of levels of nested structures in model bus interfaces	Estimate the complexity and maintainability of Simulink/QGen models	Number of nested structures in model bus interfaces
Descriptive Indicators Productivity Increase	DPI003	Deviation from reference models. Error tolerance in the MIL validation environment with respect to the reference Euclid models.	Evaluate a comparison of current Simulink models results and QGen models results.	Error tolerance
Descriptive Indicators Productivity Increase	DPI004	Deviation from MIL reference. Error tolerance in the MIL-SIL validation environment with respect to the MIL reference values.	Evaluate a comparison of MIL-SIL environment and QGen models results	Error tolerance
Descriptive Indicators QGen Applicability	DQA007	Code cyclomatic complexity. Number of linearly-independent paths through a function.	Estimate the complexity and maintainability of Simulink/QGen models	Number linear-independent paths
Descriptive Indicators Productivity Increase	DPI005	Maximum number of nested statements in a function.	Evaluate a comparison of complexity of traditional development methods and QGen models results	Number of nested statements

AURORA Project Category	KPI Code	KPI Description	General Purposes	Units
		Note: retrieved for comparison to traditional manual code metrics Note: retrieved for comparison to traditional manual code metrics		
Descriptive Indicators Productivity Increase	DPI006	Number of statements. Note: retrieved for comparison to traditional manual code metrics	Evaluate a comparison of complexity of traditional development methods and QGen models results	Number of statements
Descriptive Indicators of Software Quality	DSQ001	Proportion of comments within the generated functions. Comment frequency = nCommentLines (excluding headers)/nCodeLines (excluding blanks) Note: retrieved for comparison to traditional manual code metrics	Estimate the maintainability of generated code with QGen	Percent
Descriptive Indicators Productivity Increase	DPI007	Code size. Number of lines of generated code per function (including comments but not including blank spaces) Note: retrieved for comparison to traditional manual code metrics.	Estimate increase of software productivity based on autocade application	Number of code lines
Descriptive Indicators of Software Quality	DSQ002	Code branch coverage results. Coverage % of branches during SIL unitary test verification for each function	Estimate the dependability and reliability of QGen based application	Percent
Descriptive Indicators of Software Quality	DSQ003	Code statement coverage results. Coverage % of function statements during SIL unitary test verification for each function. This evaluation will be applied at Software SIL.	Estimate the dependability and reliability of QGen based application	Percent
Descriptive Indicators of Software Quality	DSQ004	Code branch coverage results. Coverage % of branches during SIL unitary test verification for each function. This evaluation will be applied at Software SIL	Estimate the dependability and reliability of QGen based application	Percent
Descriptive Indicators of Software Quality	DSQ005	Code statement coverage results function. Coverage %	Estimate the dependability and	Percent

AURORA Project Category	KPI Code	KPI Description	General Purposes	Units
		of function statements during PIL unitary test verification for each function. This evaluation will be applied at Software PIL.	reliability of QGen based application	
Descriptive Indicators of Software Quality	DSQ006	SIL test execution. Percentage of exercised SIL test without error execution. This evaluation will be applied at Software SIL.	Estimate the dependability and reliability of QGen based application	Percent
Descriptive Indicators of Software Quality	DSQ007	PIL test execution. Percentage of exercised PIL test without error execution. This evaluation will be applied at Software PIL.	Estimate the dependability and reliability of QGen based application	Percent

Table 2 Descriptive KPIs

6.5.Assessment Levels

Horizon 2020 Work program 2014-2015 [RD3] includes following guide or handling TRL in H2020 projects: Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

Technology Readiness Levels	Description
TRL1	Basic principles observed
TRL2	Technology concept formulated
TRL3	Experimental proof of concept
TRL4	Technology validated in lab
TRL5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL6	Technology demonstrated in a relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL7	System prototype demonstration in operational environment
TRL8	System complete and qualified
TRL9	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Table 3 Horizon 2020 Work program 2014-2015 TRLs

In this document and in the rest of WP6 tasks, we will use those TRL levels (Table 3) in the evaluation of TRL plan.

The Demonstration viability assessment is supported by ESA Technology Readiness Levels Handbook that published ESA [RD2], although as shown below, ESA TRLs are lightly differ from H2020 Definition (ESA uses the ISO standard 16290 Space systems – Definition of the Technology Readiness Levels (TRLs) and their criteria assessment).The TRL levels that propose this ESA handbook are:

Technology Readiness Levels	Description
TRL1	Basic principles observed and reported. Lowest level of technology readiness. Scientific research begins to be translated into applied research and development.
TRL2	Technology concept and/or application formulated. Once the basic principles are observed, practical applications can be invented, and R&D started. Applications are speculative and may not be proven.
TRL3	Analytical and experimental critical function and/or characteristic proof-of- concept. Active research & development is initiated, including analytical / laboratory studies to validate predictions regarding the technology.
TRL4	Component and/or breadboard validation in a laboratory environment. Basic technological components are integrated to establish that they will work together.
TRL5	Component and/or breadboard validation in relevant environment. The basic technological components are integrated with reasonably realistic supporting elements so that it can be tested in a simulated environment.
TRL6	System/subsystem model or prototype demonstration in a relevant environment (ground or space). A representative model or prototype system is tested in a relevant environment.
TRL7	System prototype demonstration in a space environment. A prototype system that is near, or at, the planned operational system.
TRL8	Actual system completed and "flight qualified" through test and demonstration (ground or space). In an actual system, the technology has been proven to work in its final form and under expected conditions.
TRL9	Actual system "flight proven" through successful mission operations. The system incorporating the new technology in its final form has been used under actual mission conditions.

Table 4 ESA TRLs

In the AURORA project, the estimated initial TRL for QGen technology is 4 and the target TRL are 6/7 for an operational certified tool. In Section 6.4 we included the set of KPI to be used for the evaluation of QGen readiness assessment. In the next table, we include the estimation of reference values that QGen should achieve for the applicability of QGen at levels TRL 6/7.

KPI Code	KPI Description	Units	Reference Values TRL 6/7
OIQ01	Integrable in software architecture	Boolean	True
OIQ02	Interoperability of with other software elements	Boolean	True
OIQ03	Integration of Simulink/QGen models and TASTE models	Boolean	True
OIQ04	Number of Simulink models integrated in the TASTE software architecture model	Number of models	> 4
OMQ01	Modelling tools provide support to automatize the QGen code generation process.	Number of Tools	> 1
OAS01	Number of QGen tool support done to AdaCore	Number of support requests	N/A
OAS02	AdaCore response time for support requests	Average time of requests	< 2 days
OAS03	Number of issues and bugs sent to AdaCore	Number of issues/bugs	N/A
OAS04	Time to solve bugs	Number of days to solve a bug	< 4 days
ORS01	Modified blocks. Percentage of modified blocks for QGen compatibility: % modified Blocks = nModifBlocks/nBlocks Where the evaluation unit is the reference model (not including internal reference models)	Percent	<25% For common functions based on Simulink models (not applicable to embedded Matlab based functions due to incompatibility with QGen).
DQA01	Number of QGen model used in the project development	Number of models	> 3
DQA02	Complexity of Simulink models used in projects	Average number of elements	> 15
DQA03	Time development of Simulink models	Hours of engineer effort	N/A
DPI01	General increase in productivity	Percent	N/A
DPI02	Reduction of tests	Percentage	N/A
DQA004	Maximum subsystem depth. Number of subsystem nesting levels	Nesting Levels	<15 (Ref: MR-150)

KPI Code	KPI Description	Units	Reference Values TRL 6/7
DQA005	Maximum number of basic Simulink blocks. Number of basic blocks per function	Number of blocks	<300 (Ref MR-160)
DQA006	Maximum number of nested bus structures. Number of levels of nested structures in model bus interfaces	Number of nested structures in model bus interfaces	<4 (ref MR-250)
DPI003	Deviation from reference models. Error tolerance in the MIL validation environment with respect to the reference Euclid models.	Error tolerance	0 (no difference)
DPI004	Deviation from MIL reference. Error tolerance in the MIL-SIL validation environment with respect to the MIL reference values.	Error tolerance	1e-15
DQA007	Code cyclomatic complexity. Number of linearly independent paths through a function.	Number linear-independent paths	N/A
DPI005	Maximum number of nested statements in a function.	Number of nested statements	N/A
DPI006	Number of statements. Note: retrieved for comparison to traditional manual code metrics	Number of statements	N/A
DSQ001	Proportion of comments within the generated functions.	Percentage	N/A
DPI007	Code size. Number of lines of generated code per function (including comments but not including blank spaces)	Number of code lines	N/A
DSQ002	Code branch coverage results. Coverage % of branches during SIL unitary test verification for each function	Percentage	>80%
DSQ003	Code statement coverage results. Coverage % of function statements during SIL unitary test verification for each function	Percentage	>80%
DSQ004	Code branch coverage results. Coverage % of branches during SIL unitary test verification for each function. This evaluation will be applied at Software SIL	Percentage	>80%

KPI Code	KPI Description	Units	Reference Values TRL 6/7
DSQ005	Code statement coverage results function. Coverage % of function statements during PIL unitary test verification for each function. This evaluation will be applied at Software PIL	Percentage	>80%
DSQ006	SIL test execution. Percentage of exercised SIL test without error execution. This evaluation will be applied at Software SIL.	Percentage	90% (integration test) 100% (verification test)
DSQ007	PIL test execution. Percentage of exercised PIL test without error execution. This evaluation will be applied at Software PIL	Percentage	90% (integration test) 100% (verification test)

Table 5 Reference Values for the TRL 6/7 target

7. Lists

7.1. List of Tables

7.2. List of Figures

Aurora

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004291