Aurora QQen Tool-set

D3.11

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draft	2023-01-16	P. Česák	All	Initial issue
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1. Introduction

1.1. Purpose

This document provides the QGen Toolset Release note to describe the software configuration of QGen and the other tools used for the AOCS/GNC Code Generator (QGen) Technology Demonstrator activity.

More details on the demonstrator configuration and installation steps for the SW Development Environment and the QGen toolchain can be found in [RD02].

1.2. Scope

The scope of this document is limited to QGen, and other tools used with-in the *WP3 AOCS/GNC Code Generator (QGen) Technology Demonstrator* of AURORA , as described in Annex 1 Part A of [AD01].

AURORA is funded under the European Union's Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020) under the H2020 Space work programme 2014. The aim of AURORA is to explore and identify solutions for the application of auto-coded technologies in the software development of space applications, and the demonstration of applicability of auto-coding technologies.

This document is an output of *Task 3.3 Model verification and Hardware in the loop* included in WP4.

This is a confidential report, which has been written for internal purposes (and Commission Services).

The IPR of the Euclid project material (Models, SW, documents, test facilities) that is used as part of the Code Generator demonstrator in AURORA belongs to Sener Aeroespacial.

2. Related Documentation

The following documents in the latest issue/revision are part of this document.

2.1.   Applicable Documents

AD #	Title	Reference	Issue	Rev
[AD01]	AURORA Grant Agreement	GA number 101004291	-	-
[AD02]	Quality Assurance Management Plan	AUR-SAE-PL-0001	-	1
[AD03]	AURORA SW Development Plan	AUR-SAE-PL-0002	-	1.3

Table 1 Applicable documents

2.2.   Reference Documents

RD #	Title	Reference	Issue	Rev
[RD01]	D3.6 QGen Evaluation Report	AUR-ESC-RP-0007	-	4.0
[RD02]	D3.4 QGen Tool-set and SW Development Environment	AUR-ESC-RP-0022	-	3.4

Table 2 Reference documents

2.3.   Acronyms

Acronym	Description
AD	Applicable Document
GA	Grant Agreement
GNC	Guidance, Navigation and Control systems
HIL	Hardware-in-the-loop
N/A	Non-Applicable
PIL	Processor-in-the-loop
RD	Reference Document
SIL	Software-in-the-lopp
SW	Software
WP	Work Package

Table 3 Acronyms

3. AURORA QGen Tool-set

This chapter describes the software configuration of the QGen toolchain.

The QGen toolchain were used within different WP3 phases and includes:

- QGen tool-set,
- manually developed tools,
- other tools used to fulfill WP3 objectives.

3.1. Configurations

Four (4) configurations were used with QGen during WP3:

- Model in the loop (MIL),
- Software in the loop (SIL),
- Processor in the loop (PIL),
- Hardware in the loop (HIL).

The QGen tool-set for the different configurations is composed of several tools as listed in the following table:

Software Item	MIL	SIL	PIL	HIL
QGen Compatibility Checker	21.1	N/A	N/A	N/A
QGen Model Verifier	21.1	N/A	N/A	N/A
QGen Code Generator and QGen Model Debugger	N/A	21.1 22.0w 23.0w	21.1 21.2 22.0w	N/A
Cppcheck	N/A	2.3	N/A	N/A
LDRA Testbed - C_C++ Static and Dynamic Analysis	N/A	9.8.5	N/A	N/A
Source Monitor	N/A	3.5.16.49	N/A	N/A
COV	N/A	GitLab Ref 0e0c8e3f8bd69 28c7149848297 58ef9953ad6b9 1	N/A	N/A
PIL_21.1	N/A	N/A	GitLab Ref ee53fec5c0ce9b 7129c5ed8b488 a07b8047778c8	N/A
PIL_23.0	N/A	N/A	GitLab Ref 4f48a6b0c79fb3 38c83bda83c9a 9ad80919bc221	N/A

Software Item	MIL	SIL	PIL	HIL
HIL	N/A	N/A	N/A	Software Verification Facility at Sener premises

Table 4 Software items with specified version per project phase

3.2.   Software Items

Many different software versions were used during the project. The involved versions are listed in the following table.

Please refer to the Section 6.2 of [RD02] for installation steps.

Software	Version	Link	Issues
QGen	21.1	https://gitlab.com/aurora-software/wp3/-/blob/master/QGen/linux_x86/QGen_21.1.tar.gz	[RD01] Chapter 7 [RD01] Annex A
QGen	21.2	https://gitlab.com/aurora-software/wp3/-/blob/master/QGen/linux_x86/QGen_21.2.zip	[RD01] Chapter 7 [RD01] Annex A
QGen	22.0w	https://gitlab.com/aurora-software/wp3/-/tree/master/QGen/linux_x86/QGen_22.0w	[RD01] Chapter 7 [RD01] Annex A
QGen	23.0w	https://gitlab.com/aurora-software/wp3/-/tree/master/QGen/linux_x86/QGen_23.0w	[RD01] Chapter 7 [RD01] Annex A
Cppcheck	2.3	https://sourceforge.net/projects/cppcheck/files/cppcheck/	https://cppcheck.sourceforge.io/misra.php
LDRA Testbed - C_C++ Static and Dynamic Analysis	9.8.5	https://ldra.com/	N/A
Source Monitor	3.5.16.49	https://www.derpaul.net/SourceMonitor/	https://www.derpaul.net/SourceMonitor/
COV	GitLab Ref 0e0c8e3f8bd6928c714984829758ef9953ad6b91	https://gitlab.com/aurora-software/wp3/-/tree/master/COV	N/A
PIL_21.1	GitLab Ref ee53fec5c0ce9b7129c5ed8b488a07b8047778c8	https://gitlab.com/aurora-software/wp3/-/tree/master/PIL_21.1	N/A

Software	Version	Link	Issues
PIL_23.0	GitLab Ref 4f48a6b0c79 fb338c83bda 83c9a9ad809 19bc221	https://gitlab.com/aurora-software/wp3/-/tree/master/PIL_23.0w	N/A
HIL		N/A[1]	N/A

(1) *Source code and installation guide of this facility is not available to be downloaded due to those being under Euclid licenses.*

Table 5 Software items with installation details

3.3. QGen Configuration Status

The Demonstration of Autocoding technology has been carried out in this project using QGen product by means of practical exercises performed on proprietary internal AOCS model/s or its subsystems from former Euclid mission.

The QGen product has been evaluated through the activities defined in the four test campaigns that are described in section 3.1: MIL, SIL, PIL and HIL.

Those consecutive testing phases have allowed the identification of some issues in the QGen SW Generator that have been resolved in new releases by AdaCore, as detailed in the QGen Evaluation Report [RD01].

The QGen release that is subject to the assessment of a Technology Readiness Level in the *WP6 Demonstration Viability Assessment* of AURORA corresponds to the most recent version that was exercised during the PIL phase, as described in the following table:

Software	Version	Link
QGen Product	23.0w	https://gitlab.com/aurora-software/wp3/-/tree/master/QGen/linux_x86/QGen_23.0w

Table 6 QGen Release

QGen tools and libraries are licensed under perpetual licenses (respectively the GPL license, or free software licenses for the tools, and the GPL license as supplemented by the GCC runtime exception for library units.

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