l'Observatoire de Paris — LESIA
Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

Durham University

MICROGATE

PLDA

Green Flash

High performance computing for real-time science

System Down-select Criteria

Mid-term Review, 1 Feb 2017

European Commission

Project #671662 funded by European Commission under program H2020-EU.1.2.2 coordinated in H2020-FETHPC-2014

Objectives

- Twofold:
  - Demonstrate European expertise in real-time HPC
  - Case study: A real-time control system for the E-ELT

- We are investigating many technology options and building prototypes
  - These prototypes will be completed by Oct 2017

- There needs to be a down-select process amongst these to provide a final prototype RTC system capable of E-ELT scale MCAO (MAORY)
  - The final down-select will be made in late 2017.
  - Full integration and testing to Sept 2018 (WP8)

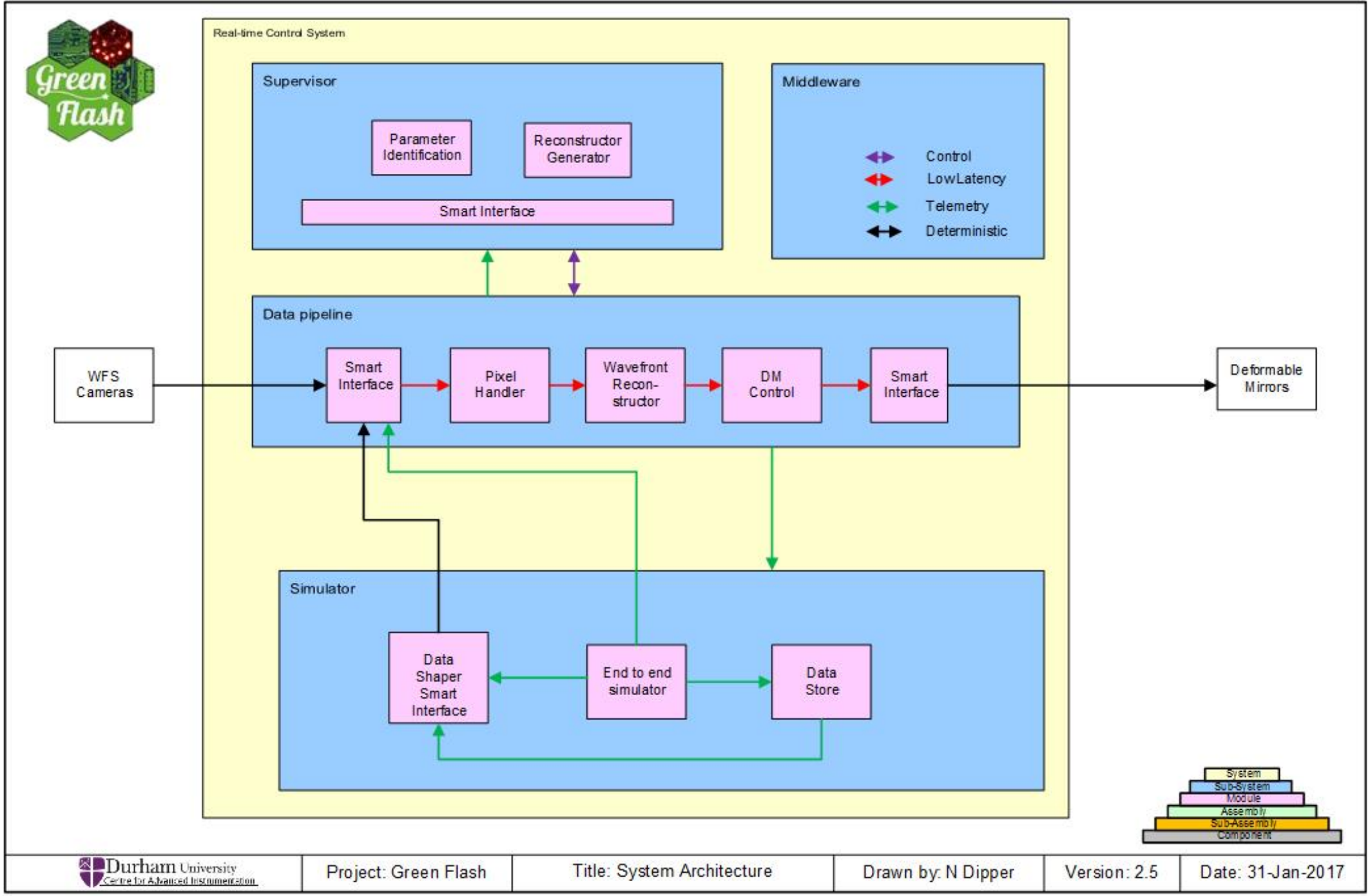
(Objective) Down-selection Criteria

Based on System Engineering definitions

- The top-level architecture was defined at PDR
- This has been slightly modified and simplified to assist in the down-selection
- The down-selection process is under development
- It is being fully defined in a ‘System Down-select Criteria’ document
- Based on selection at multiple system engineering levels
- Top level requirements flow down to each level
- Lower level selection (component, assembly, sub-assembly) will be made during the prototyping phase of each sub-system
- Down-selection for the final prototype will be at the sub-system level

GreenFlash Sub-systems

1. Data pipeline
2. Supervisor
3. Real-time simulator
4. Middleware


Real-time Control System
Supervisor
Parameter Identification
Reconstructor Generator
Smart Interface
Middleware
Control
LowLatency
Telemetry
Deterministic
Data pipeline
WFS Cameras
Smart Interface
Pixel Handler
Wavefront Recon-structor
DM Control
Smart Interface
Deformable Mirrors
Simulator
Data Shaper Smart Interface
End to end simulator
Data Store
System
Sub-System
Module
Assembly
Sub-Assembly
Component
Durham University Centre for Advanced Instrumentation
Project: Green Flash
Title: System Architecture
Drawn by: N Dipper
Version: 2.5
Date: 31-Jan-2017

Example of

Product Breakdown

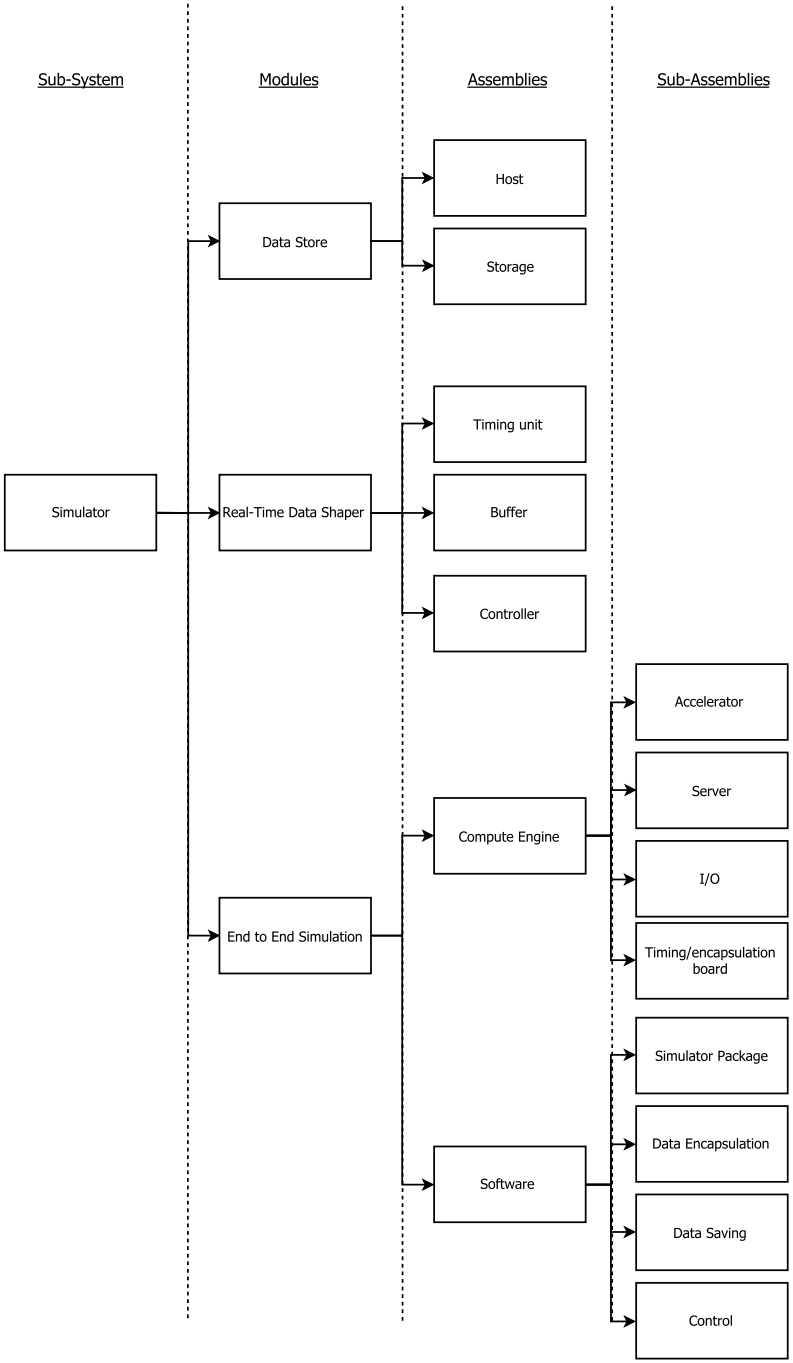
Structure:

The

Real-time

Simulator

GreenFlash Simulator Product Breakdown Structure



Example: Down-selection Matrix (Incomplete)
Data Pipeline Sub-System

Requirement	Weighting	Option 1	Option 2	Option 3
R3.10 (Frame rate)	<1 to 5>	<1 to 5>	<1 to 5>	<1 to 5>
R3.20 (Latency)	..	.	.	.
R3.30 (Modularity)	.	.	.	.
R5.10 (Telemetry)	.	.	.	.
R7.20 (Interfaces)	.	.	.	.
R7.5 (Configuration)	.	.	.	.
R8.32 (Calibration)	.	.	.	.
R8.34 (Temporal filtering)	.	.	.	.
Total Score:	-			

Option 1: Fully FPGA-based microserver prototype
Option 2: GPU accelerator cluster prototype
Option 3: MIC accelerator cluster prototype

Example: Smart Interconnect module definition and down-selection

PLDA Slides

System Down-select Criteria Document

- This document will define the down-select process
- It will define the methodology to be used.
- There will be a section for each of the 4 sub-systems
- The down-select criteria will be stated for that sub-system then for each module (and to lower levels where required).
- The options to be evaluated will be identified by the relevant work-package leader and agreed with all partners.
- Wherever there is more than one option there will be a down-select matrix against both functional and non-functional requirements.
- The matrices will be populated from the results of testing of prototypes at the relevant level

Green Flash Deliverables

- This is a 3 year research program on techniques for real-time HPC.
  - The standards and techniques can be applied to any instrument requiring real-time HPC
  - The development of techniques / options will continue throughout the 3 years

- In year 3, a final down-selection will be made aimed at a prototype RTC to meet the requirements of the E-ELT MCAO system MAORY

Final delivery:

1) A set of standards
2) The full design and results of the testing of all options and prototypes
3) The full design and results of the testing of the MCAO capable prototype