dyson

Accelerating Control Systems Development from Research to Production

Romain Guicherd

dyson

I learned that the moment you want to slow down is the moment you should accelerate

James Dyson

Technology milestones
1993–2024

DC01 upright vacuum
1993

DC02 cylinder vacuum
1995

CR01 Contrarotator™
2000

DC15 upright vacuum
2005

Dyson Airblade™ dB
2006

Dyson Cool™
2009

Dyson DC35
2010

Dyson Hot+Cool
2013

Dyson Airblade™ V
2013

Dyson Cinetic™
2013

Dyson Humidifier
2013

Dyson 360 Eye™
2015

Dyson CSYS™ task light
2015

Dyson Supersonic™
2016

Dyson Pure Cool™
2018

Dyson Airwrap™
2018

Dyson Airblade 9kJ
2019

Dyson Corrale™
2020

Dyson V15 Detect™
2021

Dyson Zone™
2022

Dyson Gen5detect™
2022

Technology milestones
1993–2024

Dyson Airstrait™
2023

Dyson V15s Detect Submarine™
2023

Dyson Micro™
2023

Dyson 360 Vis Nav™
2023

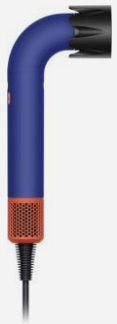
Dyson Purifier Big+Quiet ™ Formaldehyde
2023

Dyson Supersonic™ Flyaway Smoother
2023

Dyson Chitosan™ styling range
2024

New Dyson Airwrap™ attachments
2023

Dyson Supersonic r™ Professional
2024

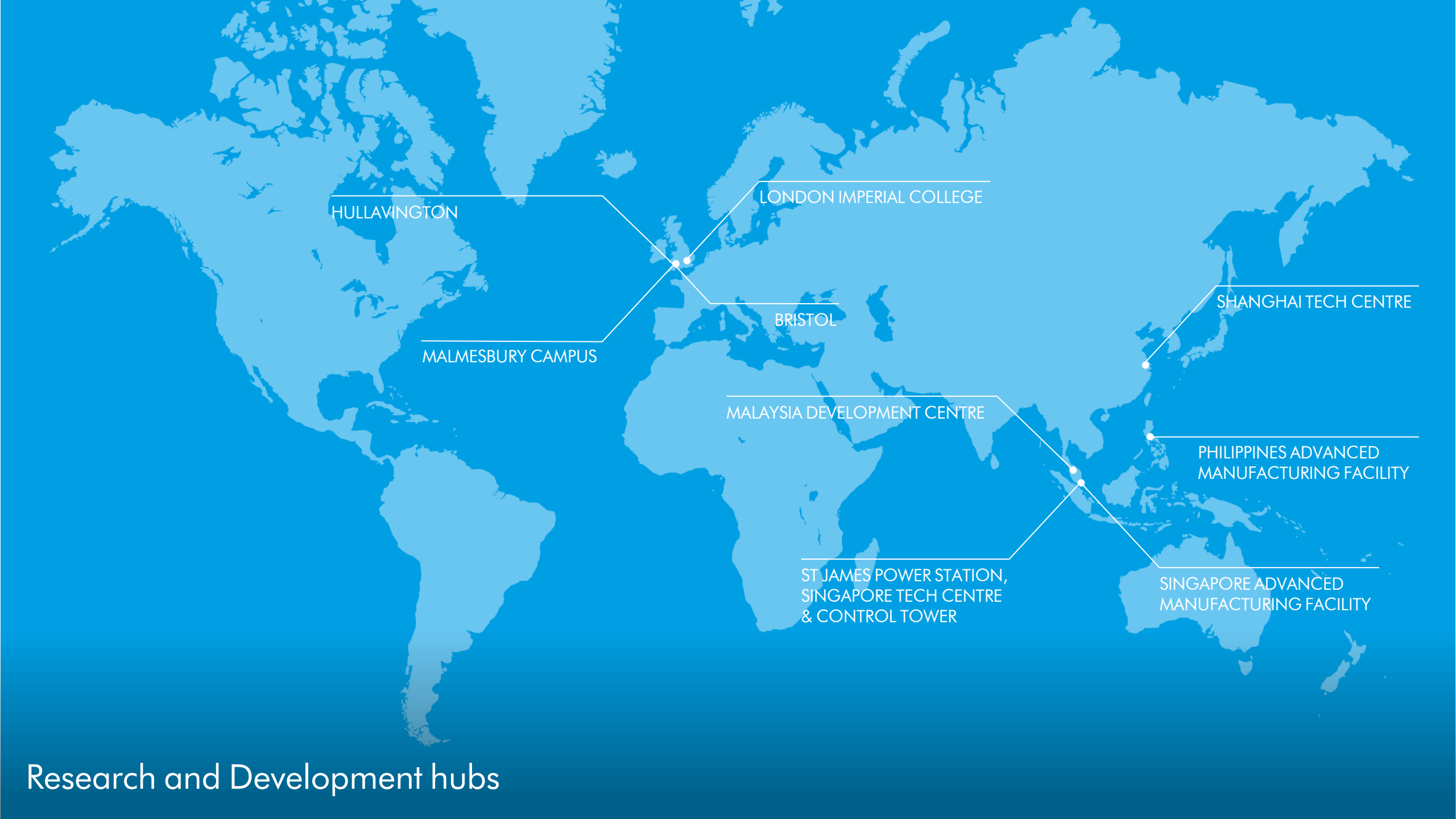


Dyson Supersonic Nural™
2024

Dyson WashG1™
2024

Dyson OnTrac™ headphones
2024

Dyson Airwrap i.d.™
2024



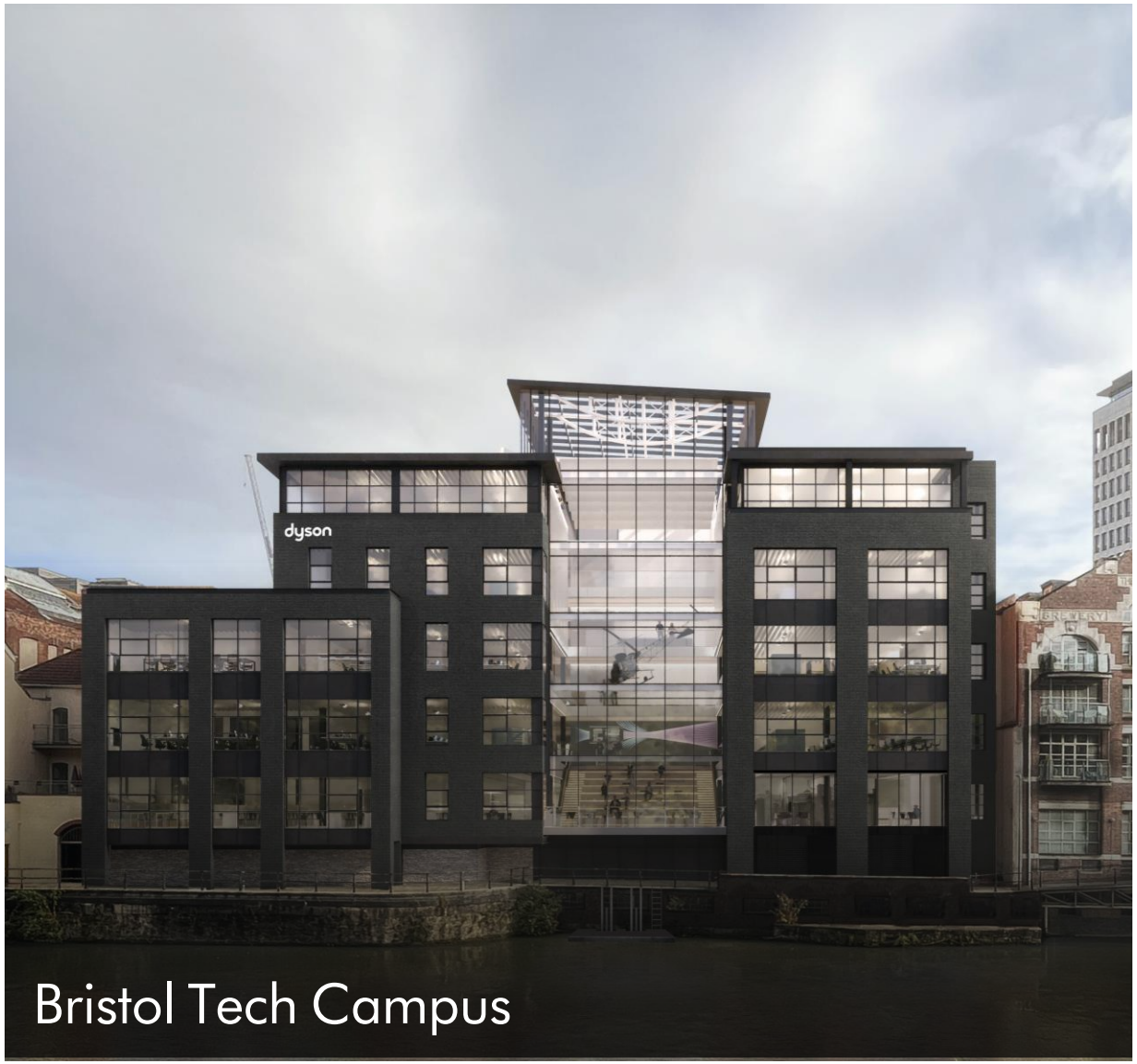
Research and Development hubs

Dyson engineering offices

United Kingdom

Southeast Asia

Upcoming tech campuses




Mechanical technology
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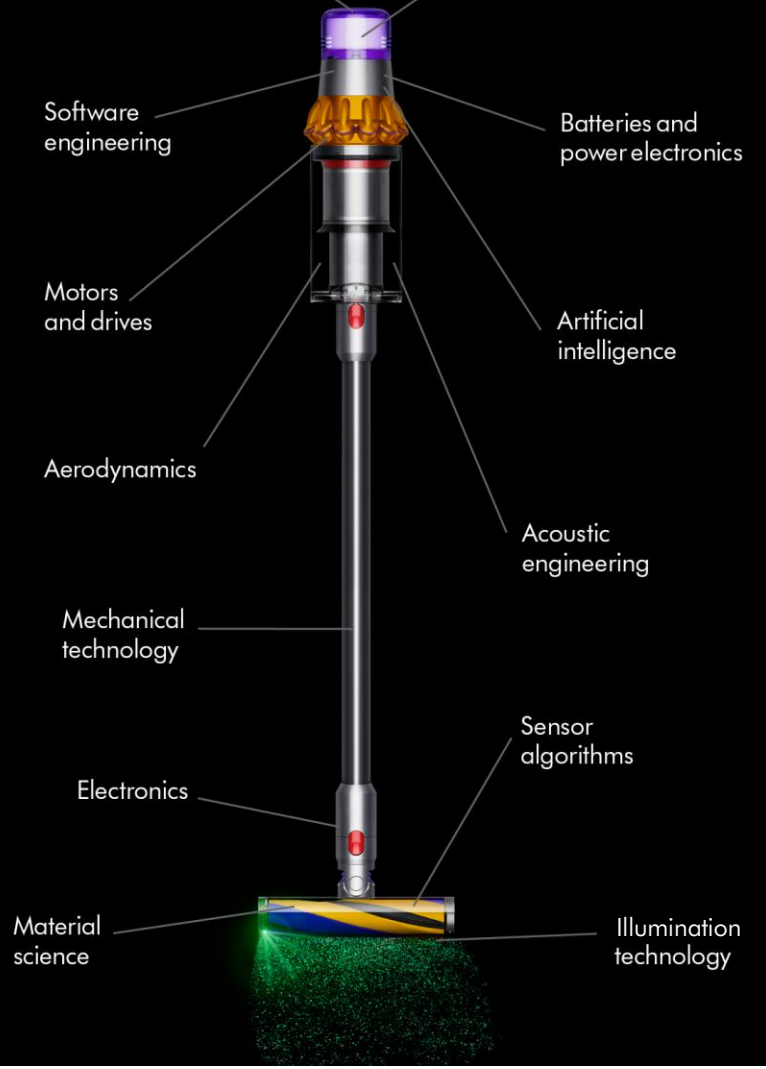
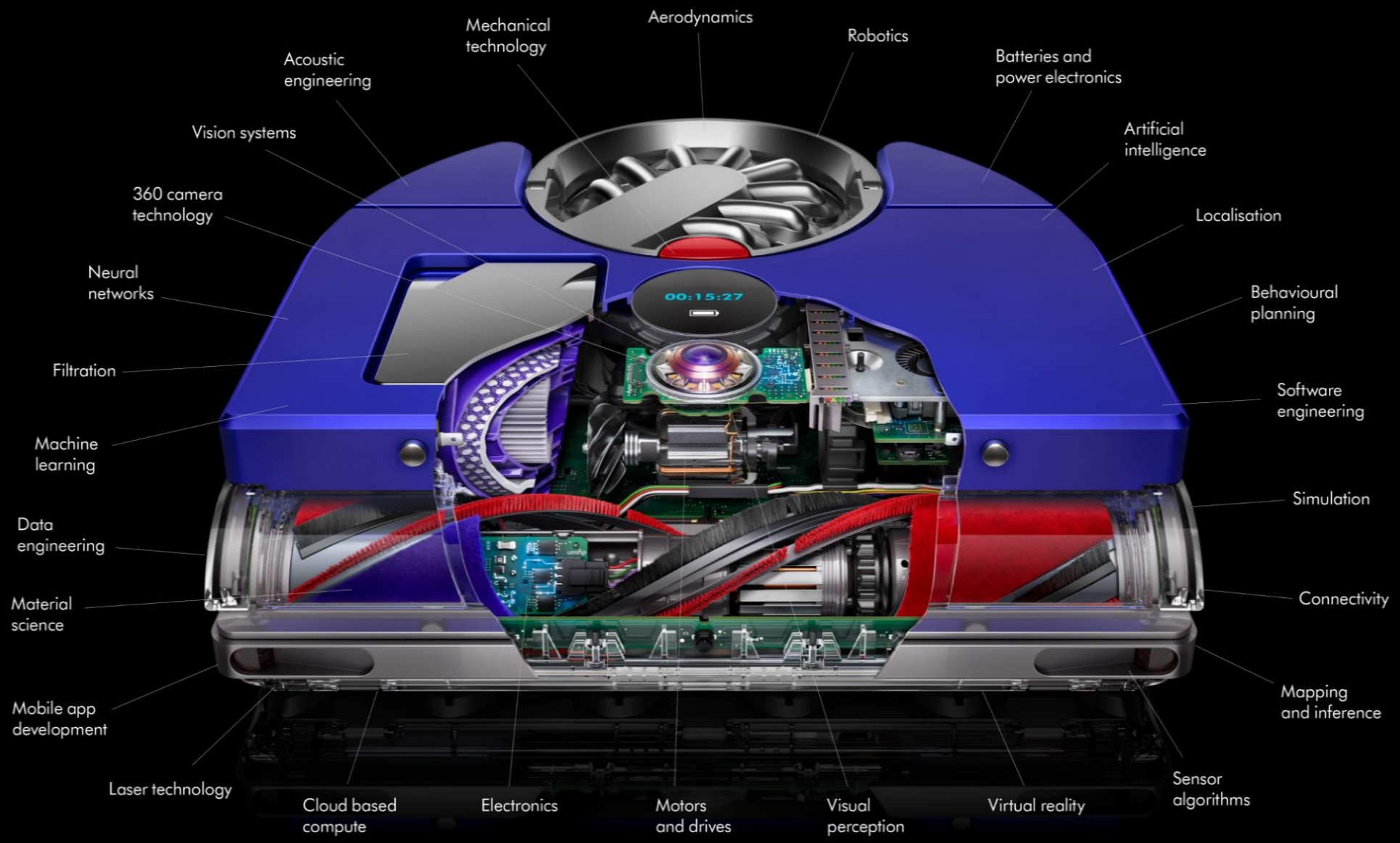
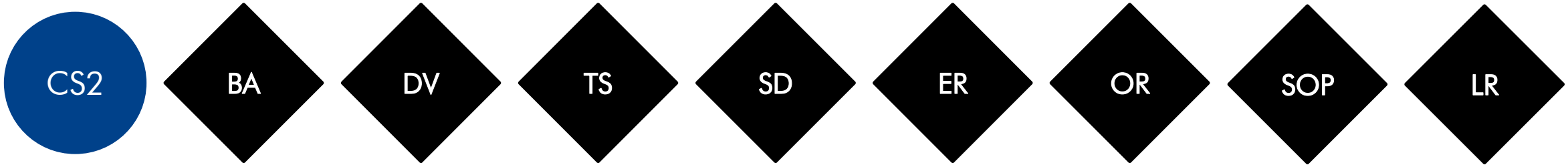
DC01


Connectivity
Filtration
Software engineering
Batteries and power electronics
Motors and drives
Artificial intelligence
Aerodynamics
Acoustic engineering
Mechanical technology
Sensor algorithms
Electronics
Material science
Illumination technology

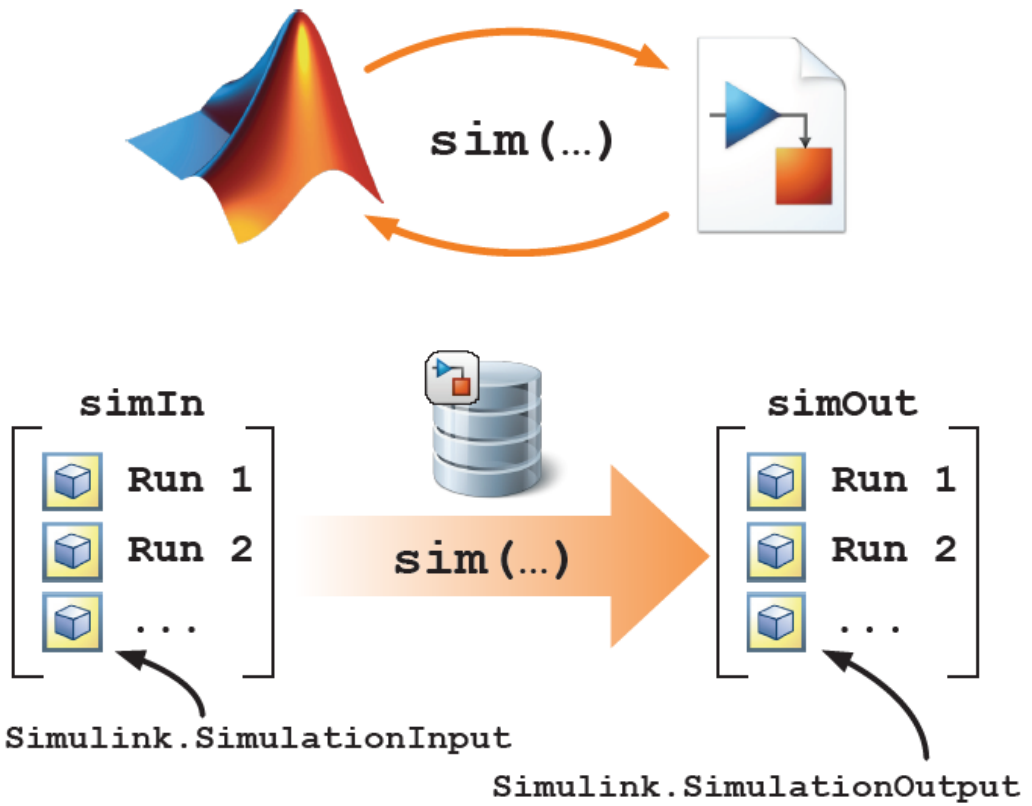

Mechanical technology
Aerodynamics
Robotics
Acoustic engineering
Batteries and power electronics
Vision systems
Artificial intelligence
360 camera technology
Localisation
Neural networks
Behavioural planning
Filtration
Software engineering
Machine learning
Simulation
Data engineering
Connectivity
Material science
Mapping and inference
Mobile app development
Sensor algorithms
Laser technology
Cloud based compute
Electronics
Motors and drives
Visual perception
Virtual reality
00:15:27

1. Technologies and initial product concepts are started in our research department
2. Mature technologies are transferred to the RDD department for further development
3. Project reaching production maturity are launched to market
4. Post-production updates



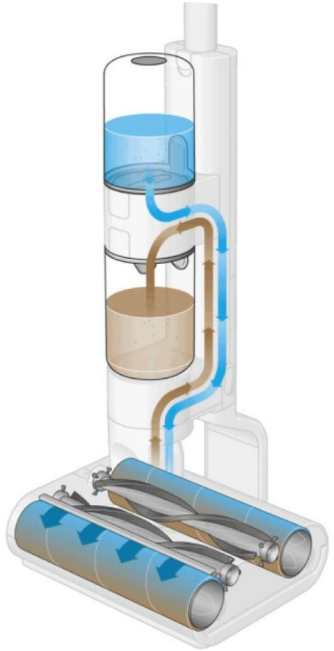
Dyson digital motor

- Simulations allow to optimize the Dyson Digital Motors (DDMs) design
- Large-scale batch of simulations can be run efficiently
- Simulations are conducted on our simulation computers using parallel computing
- Large sweep of design parameters
- Simulation framework package can be distributed and maintained within Dyson



Dyson's first dedicated wet cleaner for hard floors

- Start from top level requirements
- Refine into subsystem requirements
- Link between requirements and actual system implementation
- Track implementation progress
- Understand impact of design changes
- ➢ **Simulink Requirements Manager**



Product subsystems modelling

- Battery pack
- Electronics and electrical harness
- Motors
- Water pump
- Air pump
- Mechanical system & product floor interaction

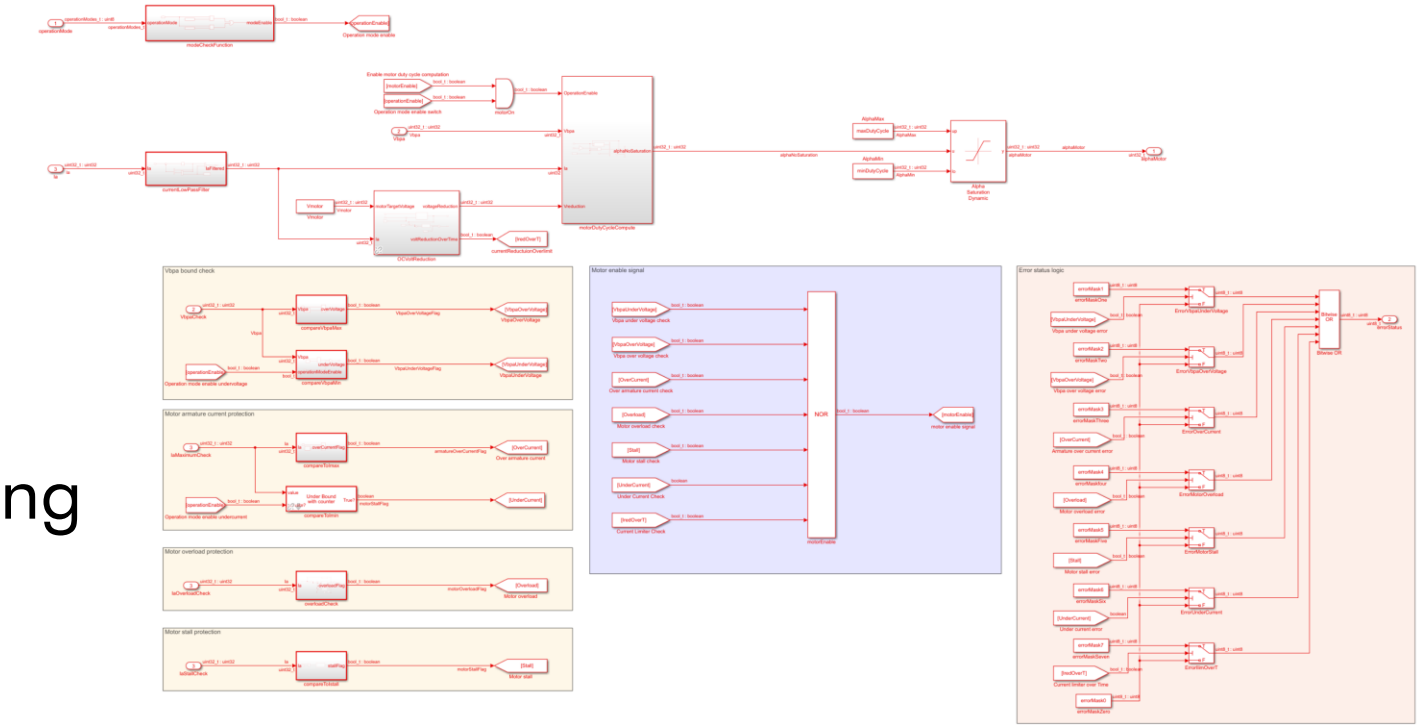
➢ **Simulink and Simscape**

Enables control systems design for the product actuators.

Embedded code generation

- Modelling standards
- Model provides a visual system description of the control
- Enhances team collaboration
- Enables rapid control prototyping
- Creation of custom library for functional block reuse

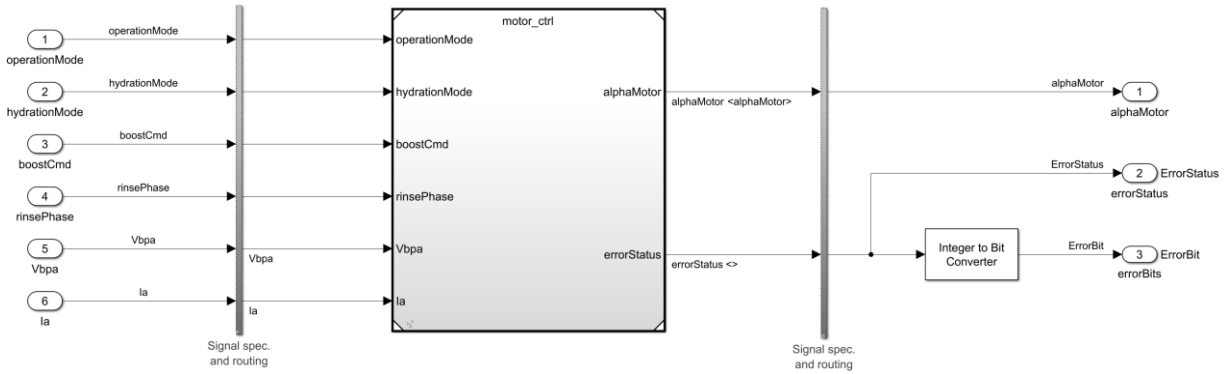
➢ **Simulink Embedded Coder**



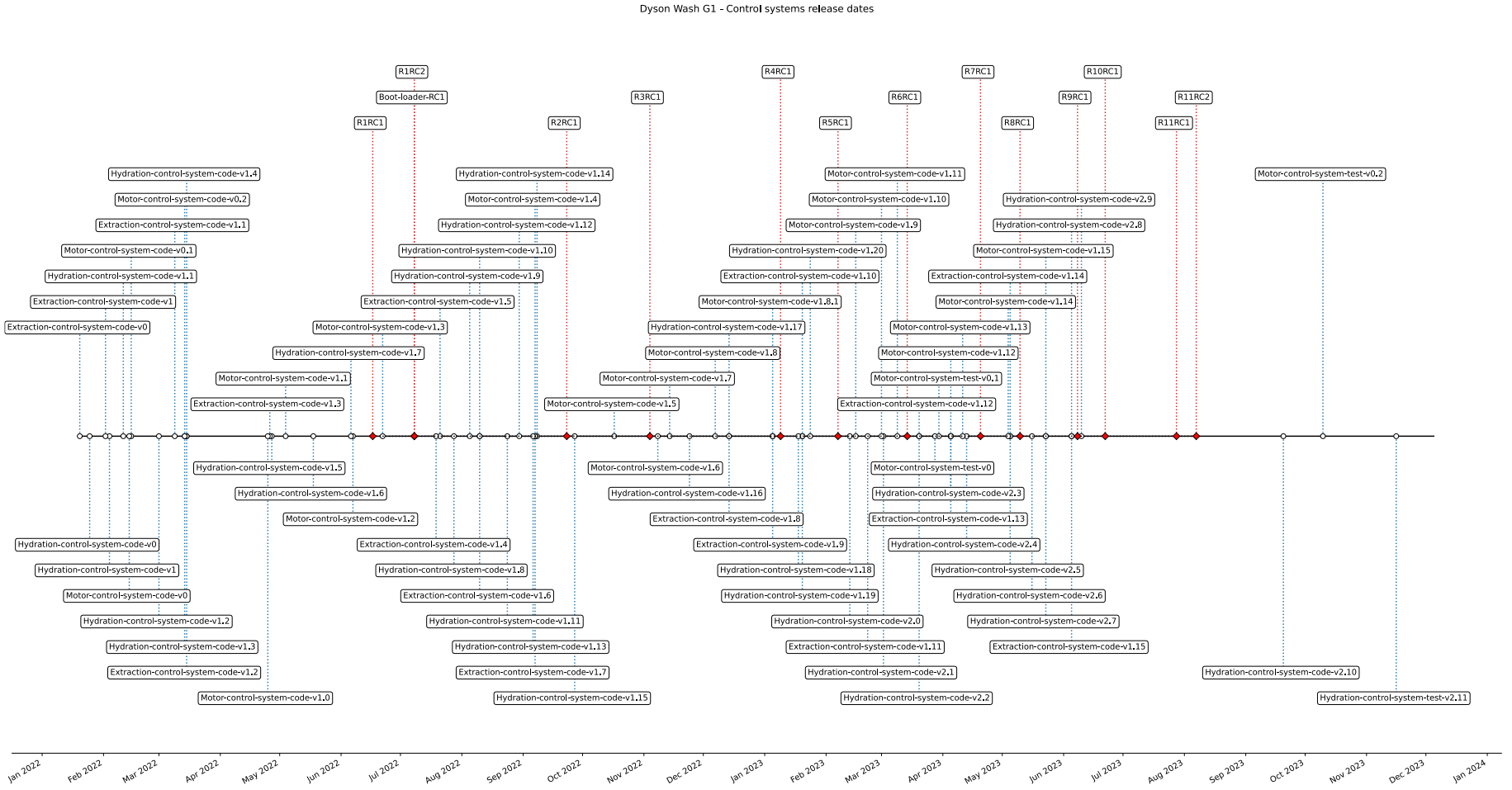
- Model testing to improve robustness
  ✅ Zero defect delivery
- Link tests to requirements
- Model-in-the-loop (MIL) tests
- Software-in-the-loop (SIL) tests
- Processor-in-the-loop (PIL) tests
- Coverage analysis (model & code)

➢ **Simulink Test**

➢ **Simulink Coverage**



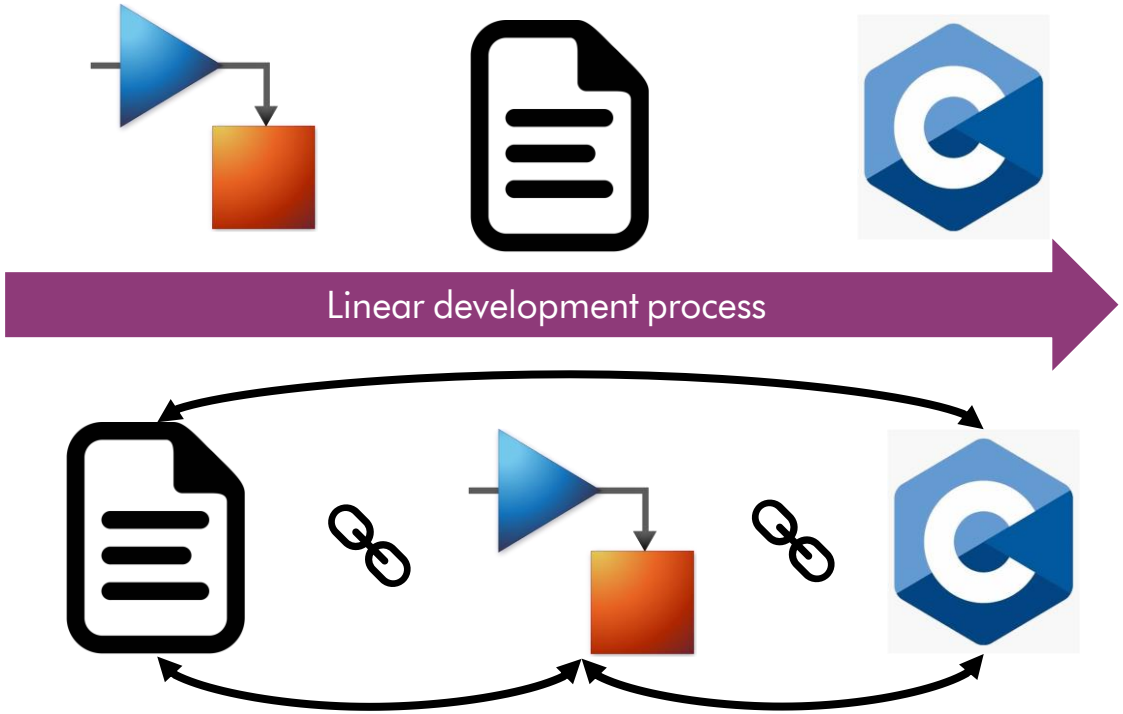
Dyson WashG1™ control systems release timeline



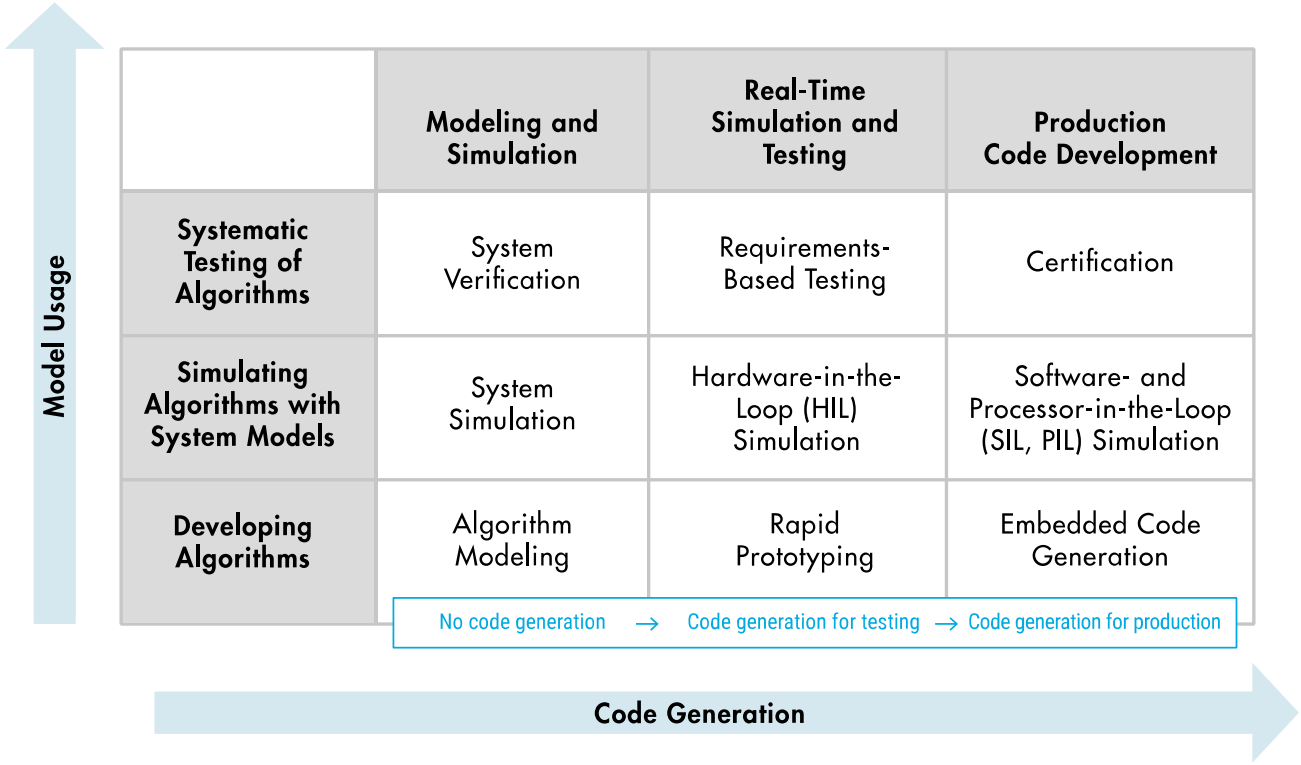
Adopted key philosophy: *"Small frequent incremental releases"*

Previous projects development followed a document-based approach

Model-based design development was adopted with the Dyson WashG1™



Step by step model-based design adoption



- Incremental adoption of model-based design

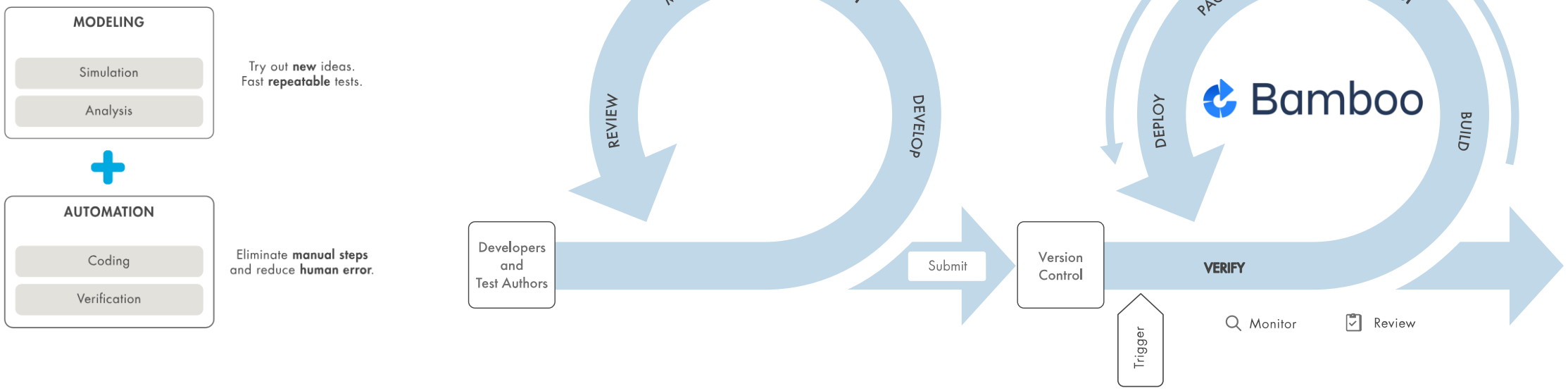
Harnessing simulations to accelerate our design phases

1

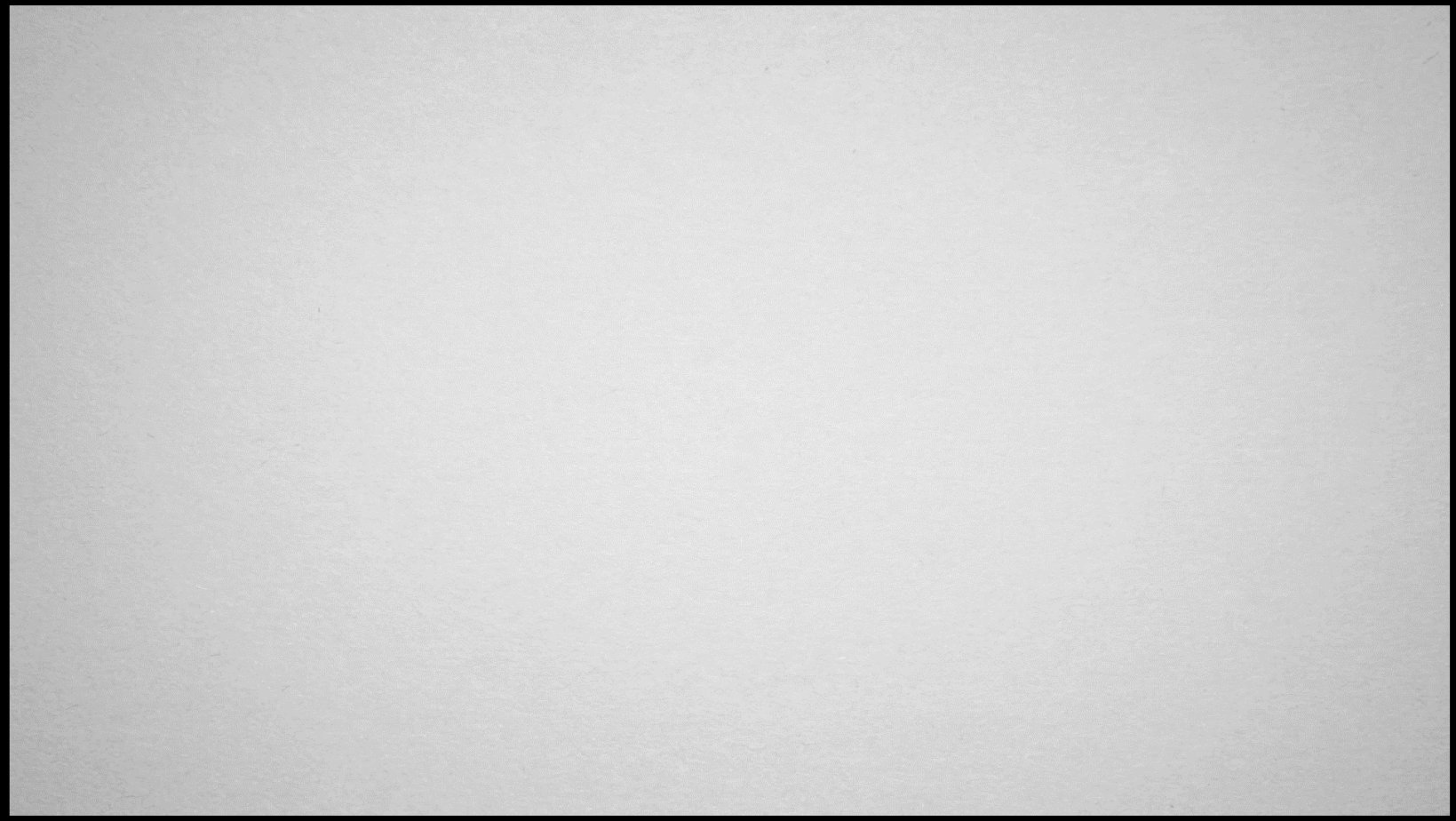
Improving our development process with the use of model-based design

2

- Simulations guide and accelerate technology and product developments
- Model-based design workflow becomes a company standard
- Increased use of automation (Continuous Integration)



Thank you



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