

# The National Digital Twin Programme

DAFNI Digital Twin Roadshow  
@University of Sheffield  
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# The National Digital Twin programme

**Data for the public good**  
NIC recommendations



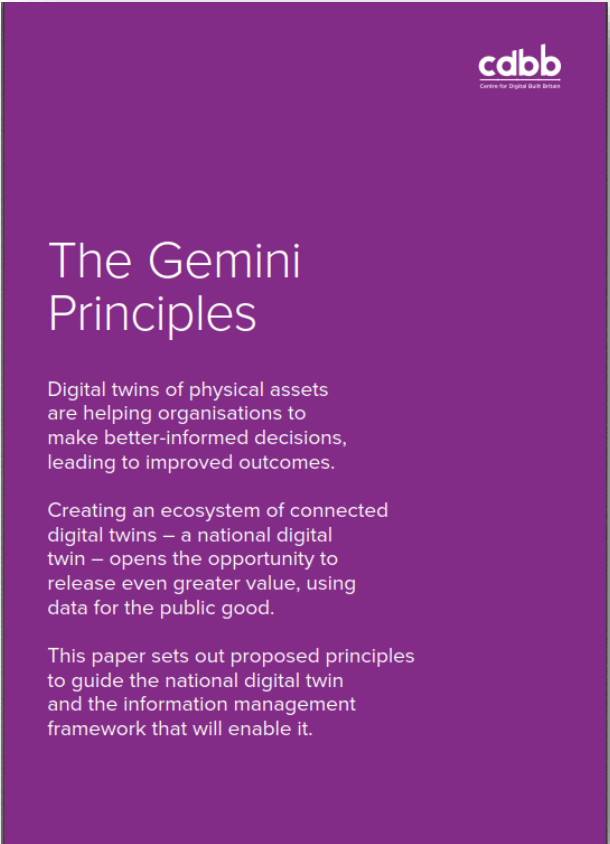
**The National Digital Twin programme**

Led by the **Centre for Digital Built Britain**, with the mission of:

- **delivering an Information Management Framework (IMF)**, enabling secure data sharing and effective information management
- **enabling the National Digital Twin (NDT)**, an ecosystem of connected digital twins that will deliver better outcomes from our built environment
- **aligning** industry, academia and Government on this agenda.



# Guided by the Gemini Principles



**cdbb**  
Centre for Digital Built Britain

## The Gemini Principles

Digital twins of physical assets are helping organisations to make better-informed decisions, leading to improved outcomes.

Creating an ecosystem of connected digital twins – a national digital twin – opens the opportunity to release even greater value, using data for the public good.

This paper sets out proposed principles to guide the national digital twin and the information management framework that will enable it.

**Purpose:**  
Must have clear purpose

**Public good**  
Must be used to deliver genuine public benefit in perpetuity

**Value creation**  
Must enable value creation and performance improvement

**Insight**  
Must provide determinable insight into the built environment

**Trust:**  
Must be trustworthy

**Security**  
Must enable security and be secure itself

**Openness**  
Must be as open as possible

**Quality**  
Must be built on data of an appropriate quality

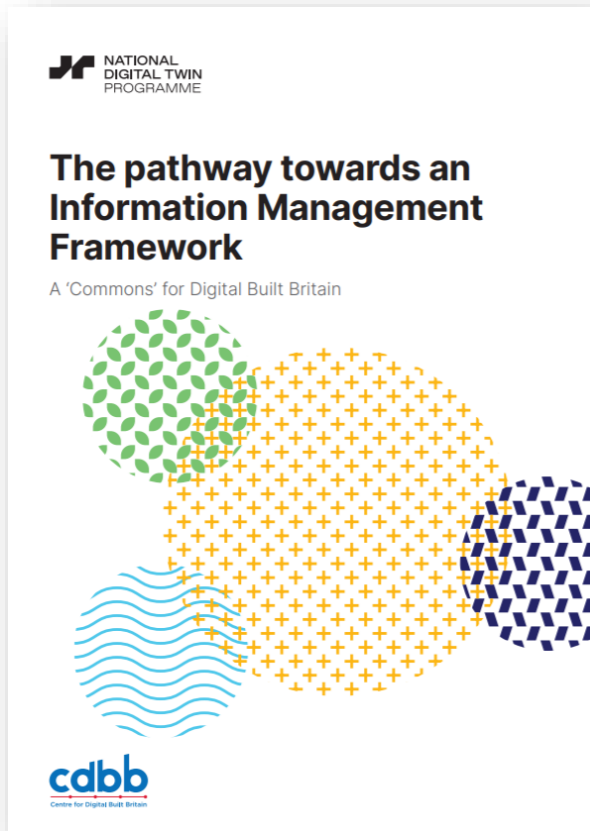
**Function:**  
Must function effectively

**Federation**  
Must be based on a standard connective environment

**Curation**  
Must have clear ownership, governance and regulation

**Evolution**  
Must be able to adapt as technology and society evolve

# The pathway towards an IMF



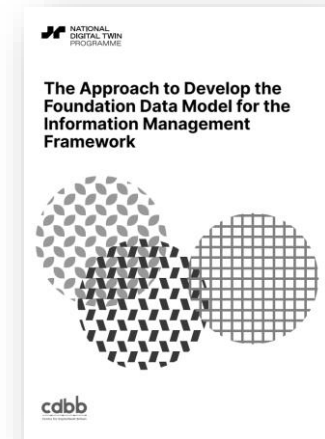
## Technical core of the IMF

1. **Foundation Data Model** – a consistent, clear understanding of what constitutes the world of digital twins
2. **Reference Data Library** – the particular set of classes and the properties we will want to use to describe our digital twins
3. **Integration Architecture** – the protocols that will enable the managed sharing of data

# Since the 'pathway'

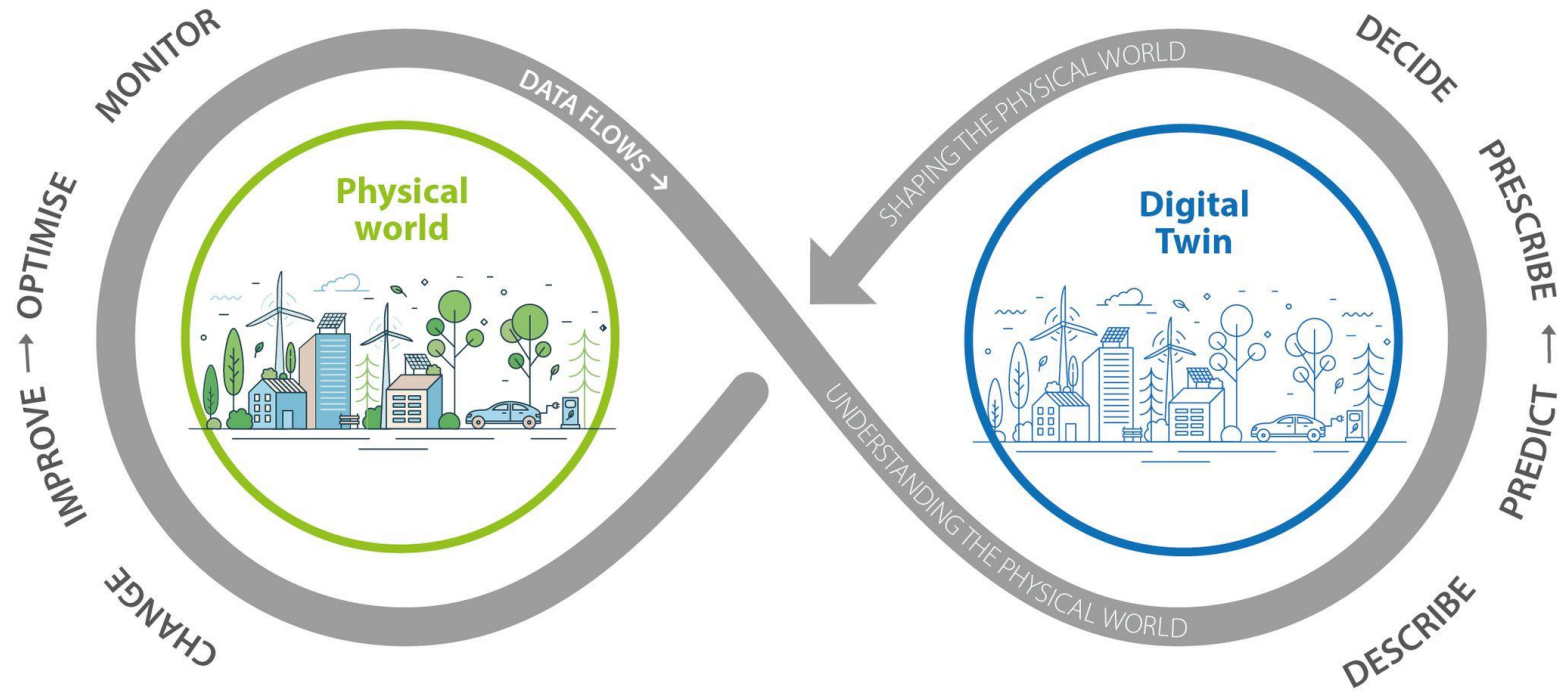


To inform requirements and choices for the FDM and RDL

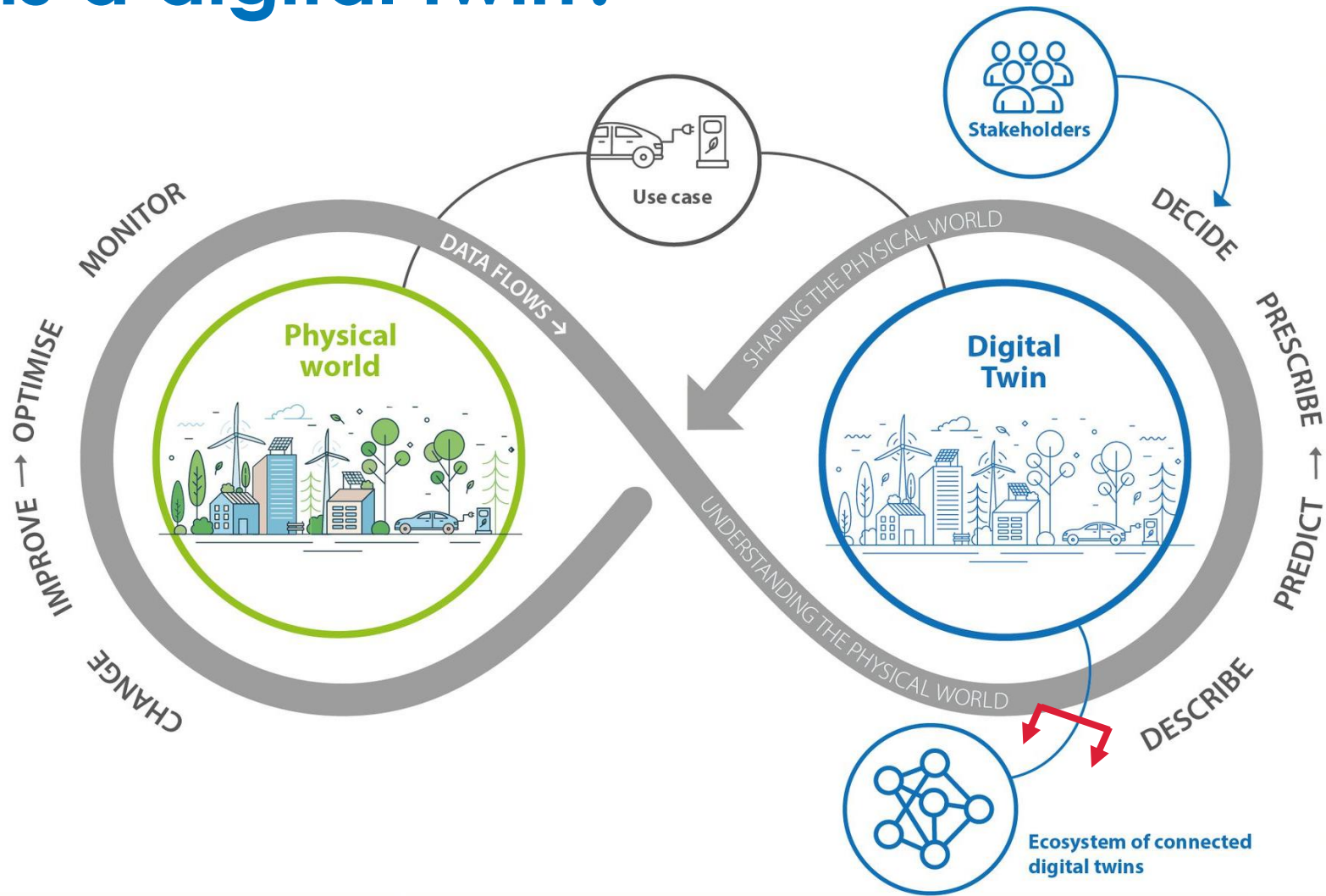


coming soon

# What is a digital twin?



# What is a digital twin?



# Elements of the integration architecture

**Data consumers** are suppliers (including product and service providers), regulators, auditors, clients, developers, scientists, etc.



Result  
Query

Authorised view on NDT

What information can I use or get authorisation for



Discovery protocol

Digital Commons: Reference Data Library (Distributed / Federated)  
Digital Commons: Foundation Data Model

Authorisation layer

Secure operations

Catalogue

Distributed Messaging System enabled by the Integration Architecture



Submit

Mapping

Published digital twins

**Data owners** have the authority and desire to make use of the IMF to provide data to those they have to (or wish to) work with.

Publishing data including, transformation and validation

Data from published digital twins is mapped to the Digital Commons RDL and FDM.

Compliant RDLs are published by a variety of authoritative sources.

← ← ← All the data exchanges are referenced to and based on the Digital Commons RDL and FDM.



# Digital Twin Hub

<https://digitaltwinhub.co.uk/>

**Building Better Connections**

Welcome to the DT Hub. Our mission is to create connections and foster collaboration between digital twin owners and information management experts enabling the UK to realise the potential of connected digital twins.

[Sign up & join 1,219 members](#) or [sign in >](#)

**Community Insights**  
The best content from across DT Hub, hand-picked by us. [See all Insights >](#)

**Explore the DT Hub**  
Check out our resources

- Articles & Publications
- Media
- Downloads

**700+** organisations  
**1250+** members



Glossary  
Case studies  
Academic register  
Videos

**DAFNI National Digital Twin**

An ecosystem of digital twins connected via securely shared data (Gemini Principles 2018).

**The Gemini Principles**

<b>Purpose:</b> Must have clear purpose	<b>Public good:</b> Must be used to deliver genuine public benefit in perpetuity	<b>Value creation:</b> Must enable value creation and performance improvement	<b>Insight:</b> Must provide comprehensive insight into the built environment
<b>Trust:</b> Must be trustworthy	<b>Security:</b> Must ensure security and be secure first	<b>Openness:</b> Must be as open as possible	<b>Quality:</b> Must be built on data of an appropriate quality
<b>Function:</b> Must function effectively	<b>Federation:</b> Must be based on a standardised environment	<b>Custom:</b> Must have clear membership, governance and regulation	<b>Evolution:</b> Must be able to adapt as technology and society evolve

- A single NDT would not be feasible
- A Federation of different Digital Twins
  - Operated by different organisations
  - Coordinated together
- Within an Information Management Framework
  - to enable effective information management across the Digital Twins in the Infrastructure environment.
- Gemini Principles as a guide

www.dafni.ac.uk

# Case studies on the DT Hub



## Colouring London

Colouring London is described by the ODI as an example of a 'successful collaborative data maintenance model' along with Wikipedia, Open Streetmap, Music Brainz...

Organisation Colouring Cities

Sector Cities

Type Gemini principles case study

[See Case Study](#)



## Smart Energy Digital Twin for Bridgend County Borough Council (BCBC), Wales

Buro Happold has developed an in-house Digital Twin tool for district heat network that automates optimised plant, pipe sizing, and network routing based on peak...

Organisation Buro Happold

Sector Energy

Type Community case study

[See Case Study](#)



## Network Digital Twin – Knowledge Management

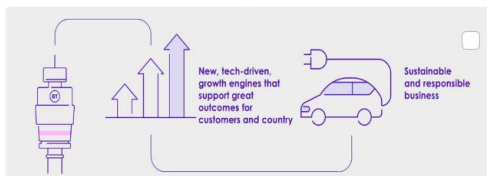
As part of the Network Digital Twin project, we are developing applications that leverage the capabilities of digital twins. This project aims to create a digital twin of...

Organisation BT

Sector Telecoms

Type Community case study

[See Case Study](#)



## Reducing Network Energy Consumption and Carbon Footprint

Our organisation uses significant amounts of electricity to



## Disaster Planning and Mitigation - Typhoon preparedness and response

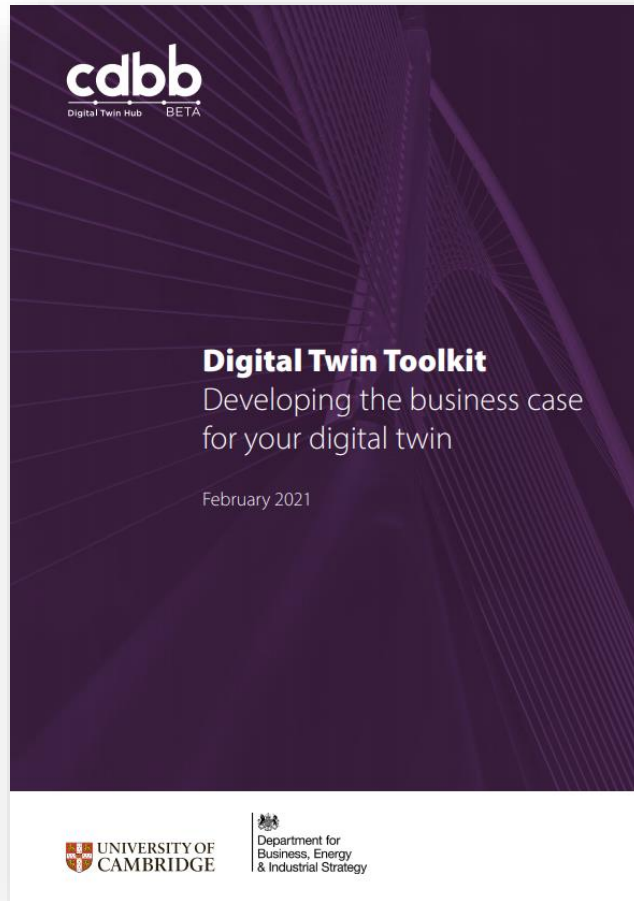
The purpose of this digital twin is to improve disaster



## City-scale Digital Twin Prototype for Cambridge

The Cambridge City-scale Digital Twin (CDT) project addresses a local policy aspiration of developing a

# Digital Twin Toolkit (Gemini Programme)



**Optimisation – future**  
Predictive maintenance

**Operations – current**  
Control of autonomous systems

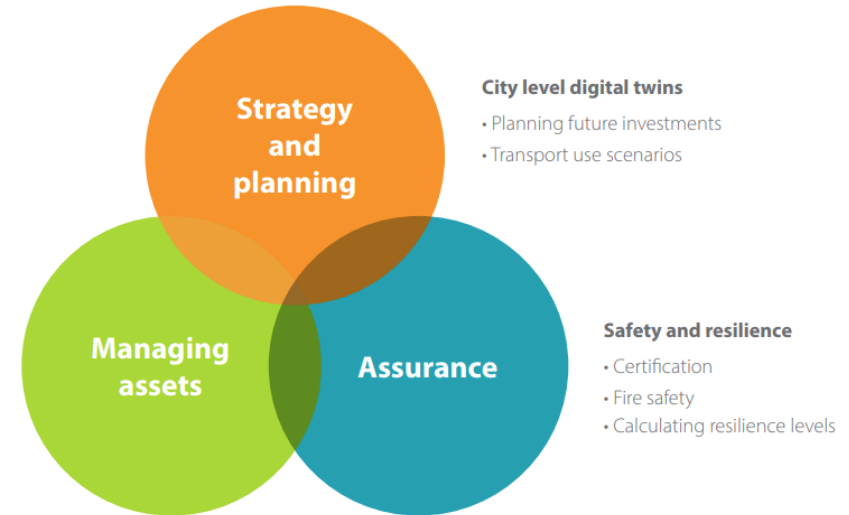
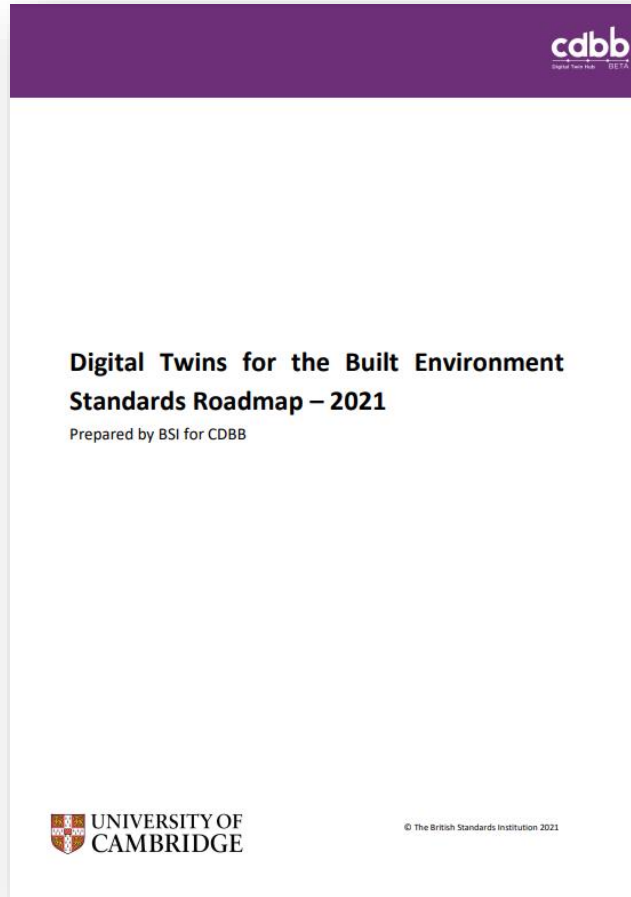


Figure 3. Use case framework

# Standards & Skills



# DAFNI and the NDTp

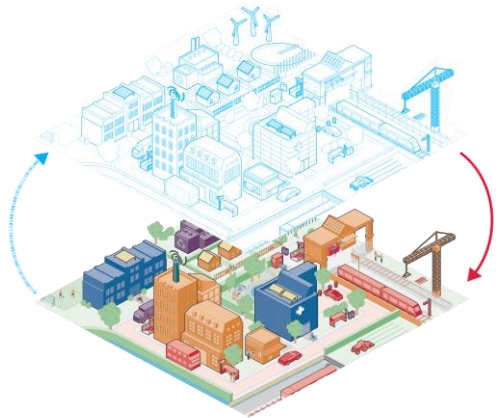
## Collaboration across the delivery programme

- Member of the Digital Framework Task Group
- Named contributor to the DT Toolkit
- Heavily involved on the Digital Twin Hub through articles, surveys and presentations

## Some examples of how DAFNI can support the NDT

- Secure repository for national infrastructure data and models
- Collaborative platform to research and develop digital twins of infrastructure assets
- Computing performance to scale up
- Data hub and storage capacity to share, create and integrate data

# Join the community



Join the DT Hub  
[www.digitaltwinhub.co.uk](http://www.digitaltwinhub.co.uk)

Contact us  
[ndtprogramme@cdbb.cam.ac.uk](mailto:ndtprogramme@cdbb.cam.ac.uk)

Stay up to date  
Join the Gemini Call  
Tuesdays 10:30 - 11:00

