
CERN

The IT Department & Innovation in Computing

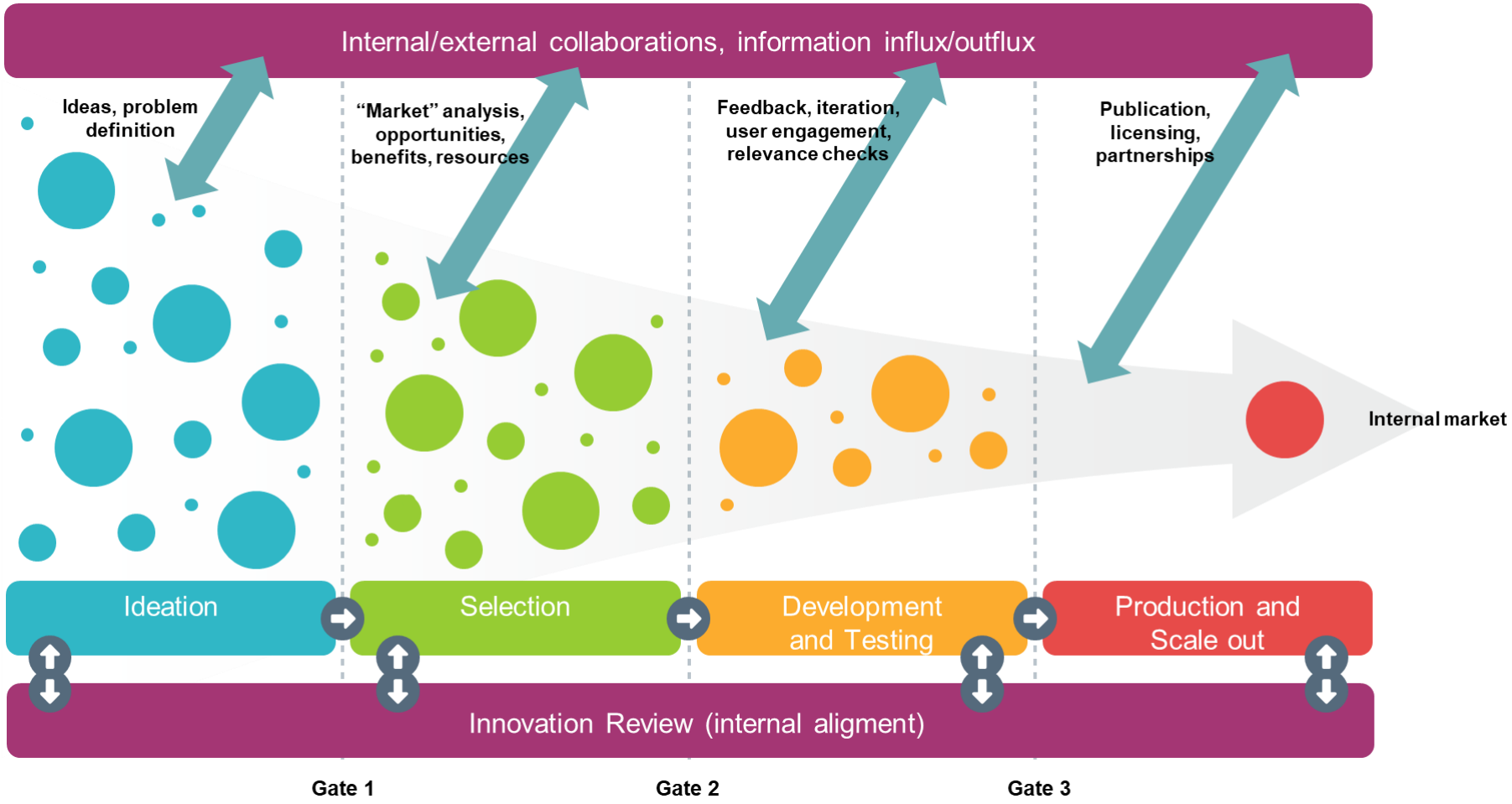
Alberto Di Meglio
Head of Innovation
IT Department

Open Innovation

"Innovation is the process of turning ideas into solutions to generate value"

There are several models of Innovation developed in the past 40+ years

The one we take as base model is the **Open Innovation** framework



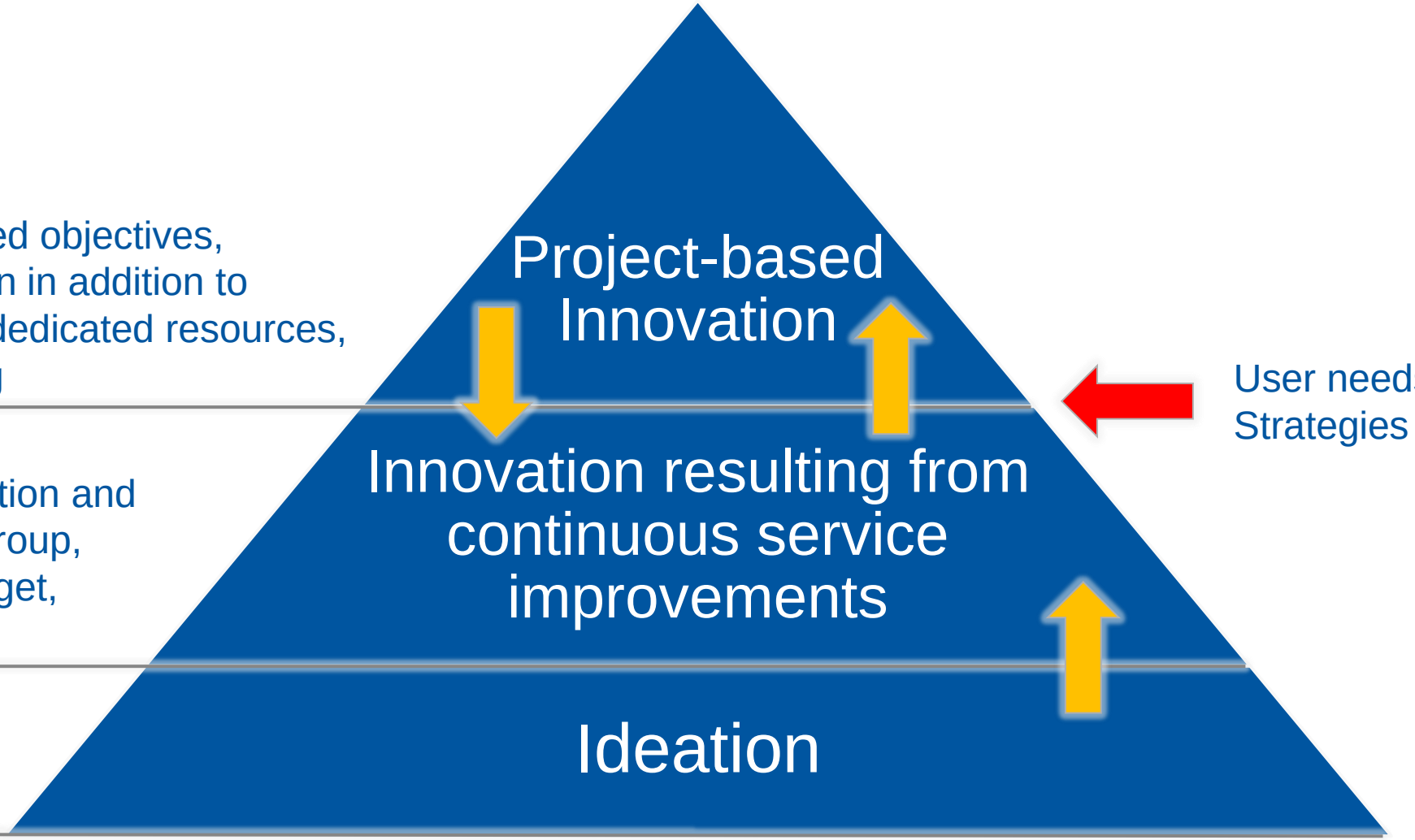
Chesbrough, Henry William (1 March 2003). *Open Innovation: The new imperative for creating and profiting from technology*. Boston: Harvard Business School Press. ISBN 978-1578518371.

Innovation scopes

Innovation activities within stated objectives, expected results, transformation in addition to evolution, longer-term impact, dedicated resources, formal monitoring and reporting

Part of the continuous optimisation and evolution of services in each Group, within standard operations budget, standard reporting

Informal channels and discussions, multiple formats



Innovation and collaboration channels

IT Projects	KT Projects	CERN Programmes	CERN openlab	Strategic Partnerships	EC Programmes
From Engagement, Technical Delivery, IT Ideation Core strategic activities	KT Funds Medical Apps CIPEA Impact Fund CERN & Society Foundation, etc.	Quantum Technology Initiative DS&AI Initiatives Open Science	Industrial and academic projects Short/Medium-Term Public/private R&D partnerships	Ex. other international organisations (ex. WHO, ESA) Long-term industrial collaborations	Horizon Europe EOSC EuroHPC EQF Open Science

Internal funding

Co-development, investments, external funding
IT invests in supervision, knowledge, infrastructure

Programmes complementarity and alignment

IT Innovation Roadmap


ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

IT Department

Innovation Roadmap

V. 0.1

14 March 2023

Formal document describing the Innovation strategy, objectives, processes, collaboration channels, etc.

Being developed in collaboration across the IT Department functions and technical groups and the CERN community

Internal draft was completed in September 2023 and is undergoing a broad review across the community with a plan to publish in June 2024

The document represent the high-level strategy, directions and objectives for the different innovation activities in the IT Department in collaboration with CERN, other organisations, academia, and industry

Objectives at a glance

Open Science and Impact
Technology and services
Scale-up, collaborations

Artificial Intelligence
Algorithms, Platforms and Services

Computing
Heterogeneous Infrastructures and Software

Data Storage and Management
Hierarchical storage and data distribution

Long-term investigation

SDIs

Digital Twins

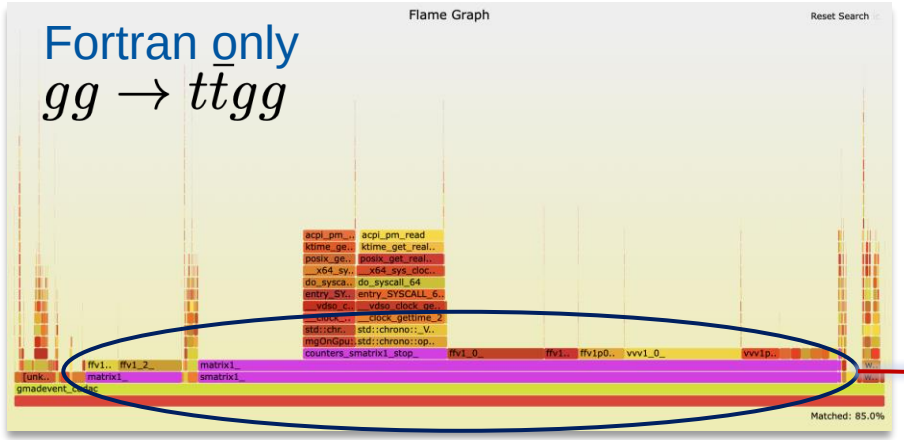
Foundation Models

Quantum Technologies

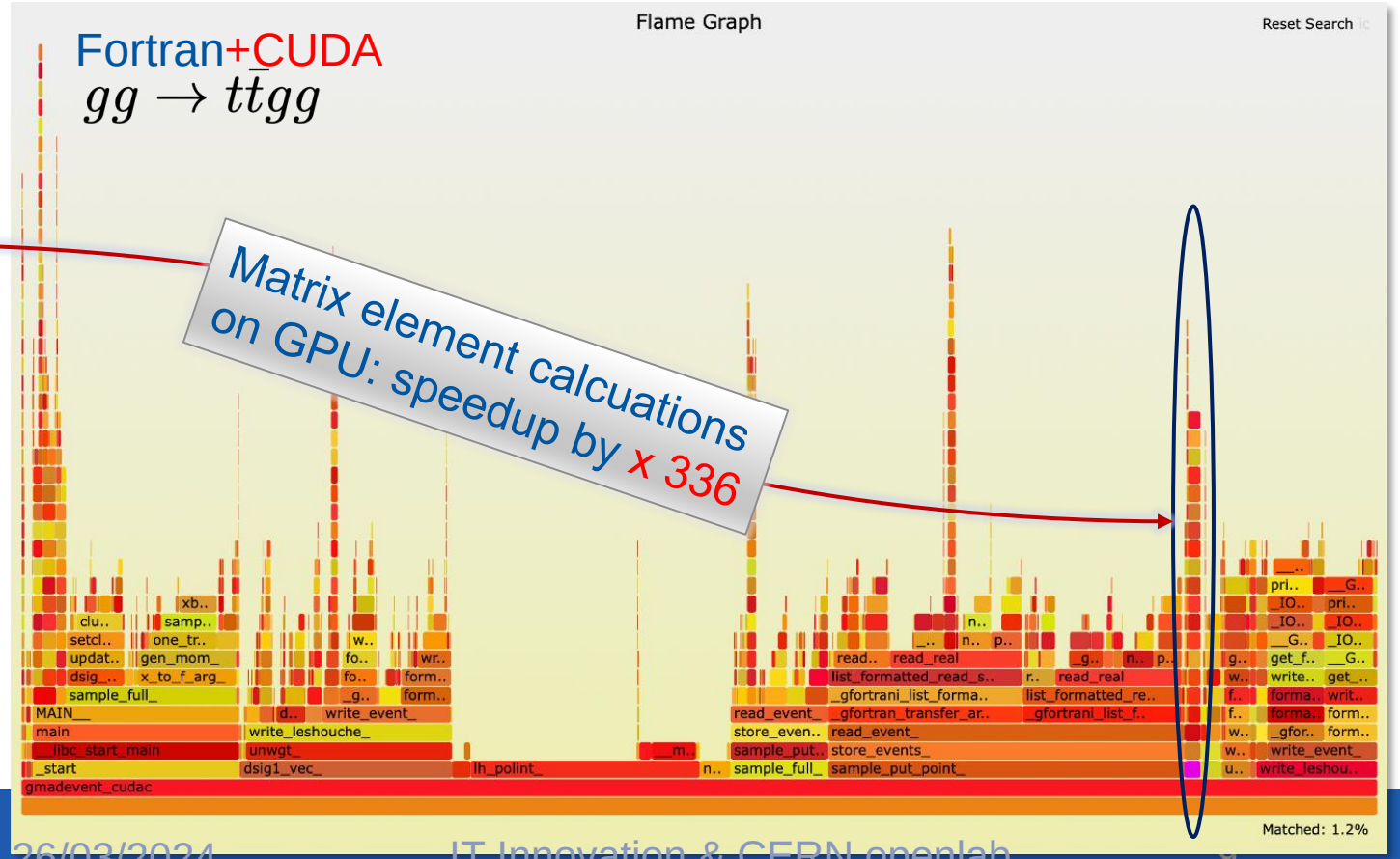
The Next Generation Triggers **aims to facilitate improvements to LHC data collection and processing beyond current capabilities**, while looking forward to future data collection needs. The R&D work done to optimise the High-Luminosity (HL)-LHC phases **will provide critical insight to develop future detectors and data flows for the even more ambitious objectives of the Future Circular Collider (FCC)** currently in its Feasibility Study phase. Such an ambitious programme requires co-development partnerships with experts in academia and industry to accelerate the achievement of the objectives.

Hardware acceleration of MC event generation

Increasing event throughput of the Madgraph5_aMC@NLO event generator by offloading the compute intensive “matrix element calculations” on GPUs

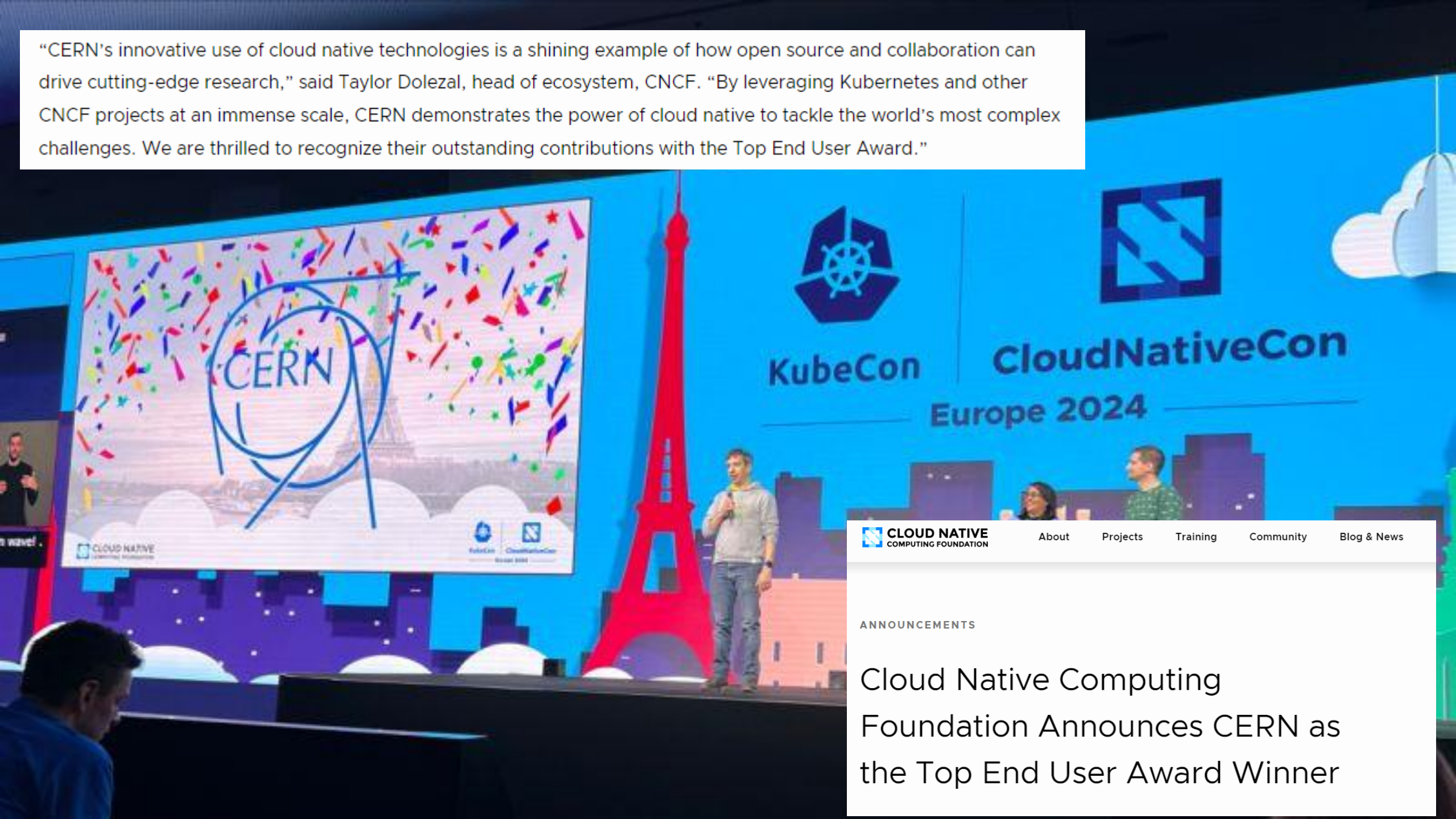


Process	Madevent 262 144 events		
	Total	Momenta+unweight	Matrix elm
$gg \to t\bar{t}gg$	209.3 s	7.8 s	201.5 s
+CUDA Tesla A100	8.4 s	7.8 s	0.6 s
	24.9 x	1.0 x	336 x
$gg \to t\bar{t}ggg$	2507.6 s	12.2 s	2495.3 s
+CUDA Tesla A100	30.6 s	14.1 s	16.5 s
	82.0 x	0.9 x	151 x



Overall application speedups, depending on complexity of physics process

"CERN's innovative use of cloud native technologies is a shining example of how open source and collaboration can drive cutting-edge research," said Taylor Dolezal, head of ecosystem, CNCF. "By leveraging Kubernetes and other CNCF projects at an immense scale, CERN demonstrates the power of cloud native to tackle the world's most complex challenges. We are thrilled to recognize their outstanding contributions with the Top End User Award."



CLOUD NATIVE COMPUTING FOUNDATION

About Projects Training Community Blog & News

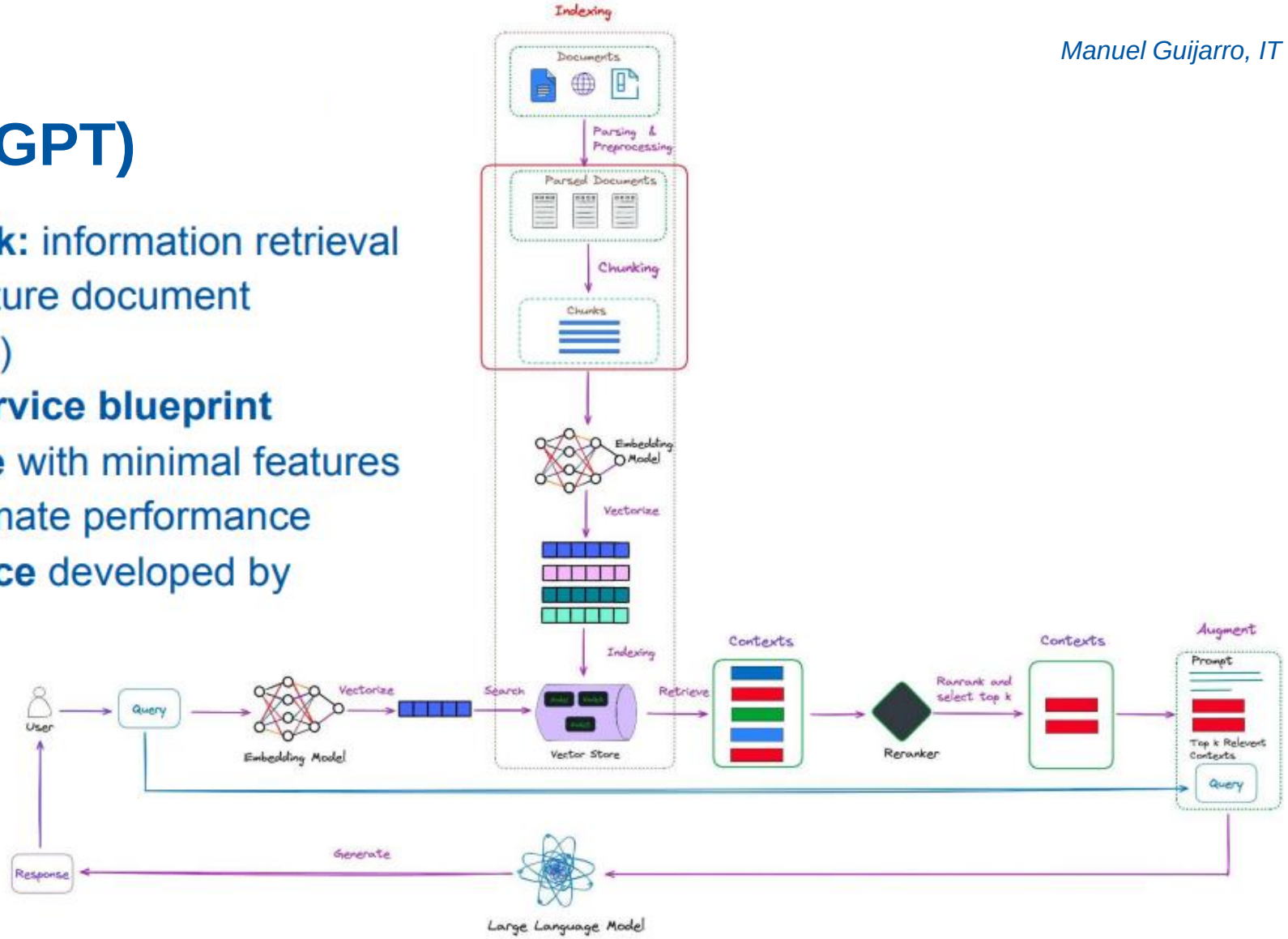
ANNOUNCEMENTS

Cloud Native Computing Foundation Announces CERN as the Top End User Award Winner

Large Language Models Investigations (AKA AccGPT)

Manuel Guijarro, IT

- Selected a **prototype task:** information retrieval
- **First draft** of the architecture document (components, functions, ..)
  - **Seed for the final service blueprint**
- **Initial AccGPT prototype** with minimal features to verify pipeline and estimate performance
  - Adapting **web interface** developed by EN-IM-PLM



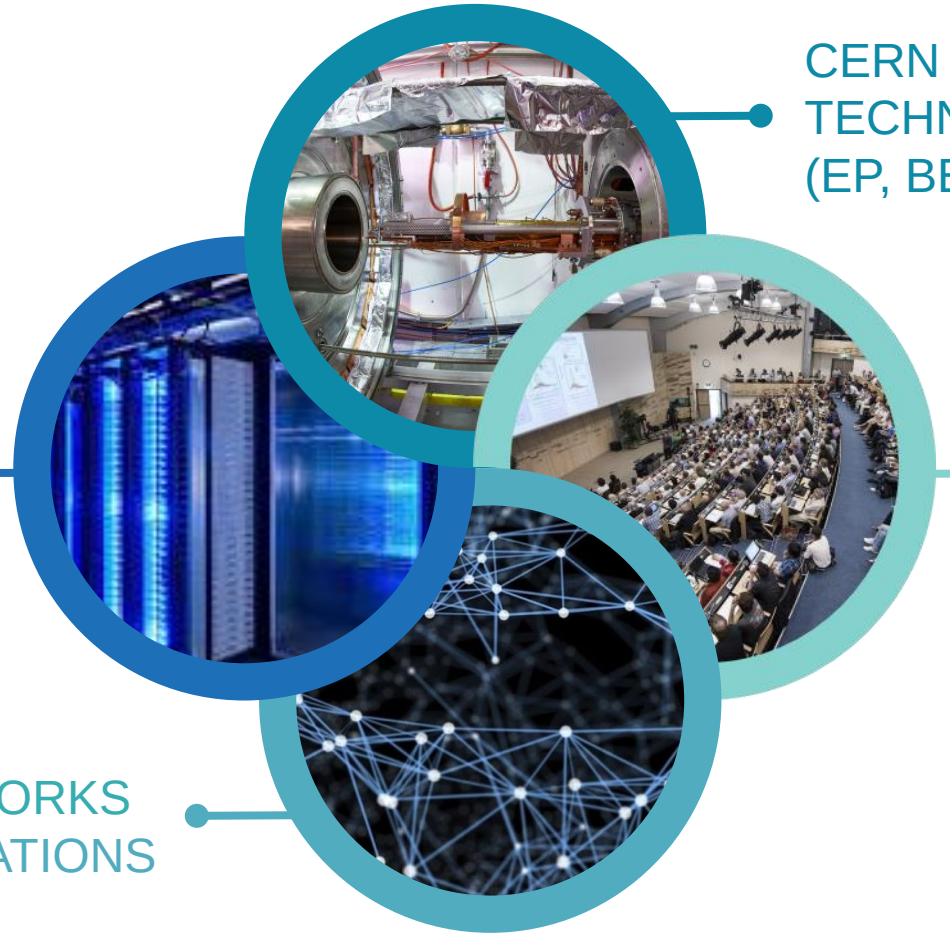
LLM: In-house (AccGPT,..) or external (genAI,..)

CERN | IT Information Technology Department

CERN QTI Phase 2 – Centres of Competence

CERN QUANTUM TECHNOLOGY PLATFORMS (EP, BE, TE, SY)

HYBRID QUANTUM COMPUTING AND ALGORITHMS (IT, EP, TH)



COLLABORATION FOR IMPACT (IT, IPT, IR)

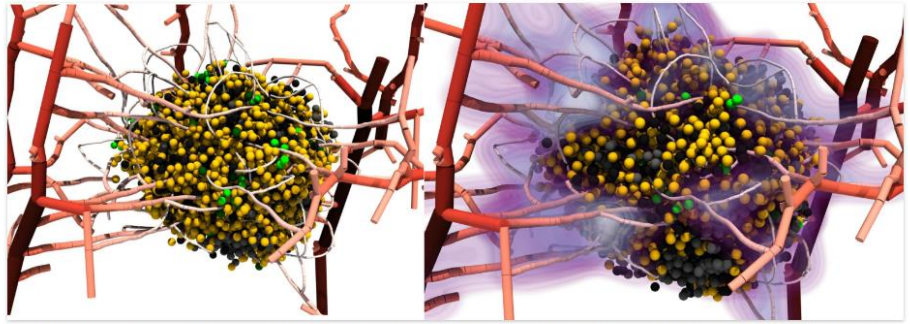
QUANTUM NETWORKS AND COMMUNICATIONS **(IT, BE)**

CERN | QUANTUM TECHNOLOGY INITIATIVE

BioDynaMo: cutting-edge software helps battle cancer

A novel mathematical model developed as part of the BioDynaMo project, born from CERN openlab, mimics vascular tumour growth in breast cancer and its response to treatment

16 JANUARY, 2024 | By Marina Banjac



Final tumour before treatment (left) and at early stage of treatment (right). (Image: adapted from T. Duswald et al., Computer Methods in Applied Mechanics and Engineering, 2024)

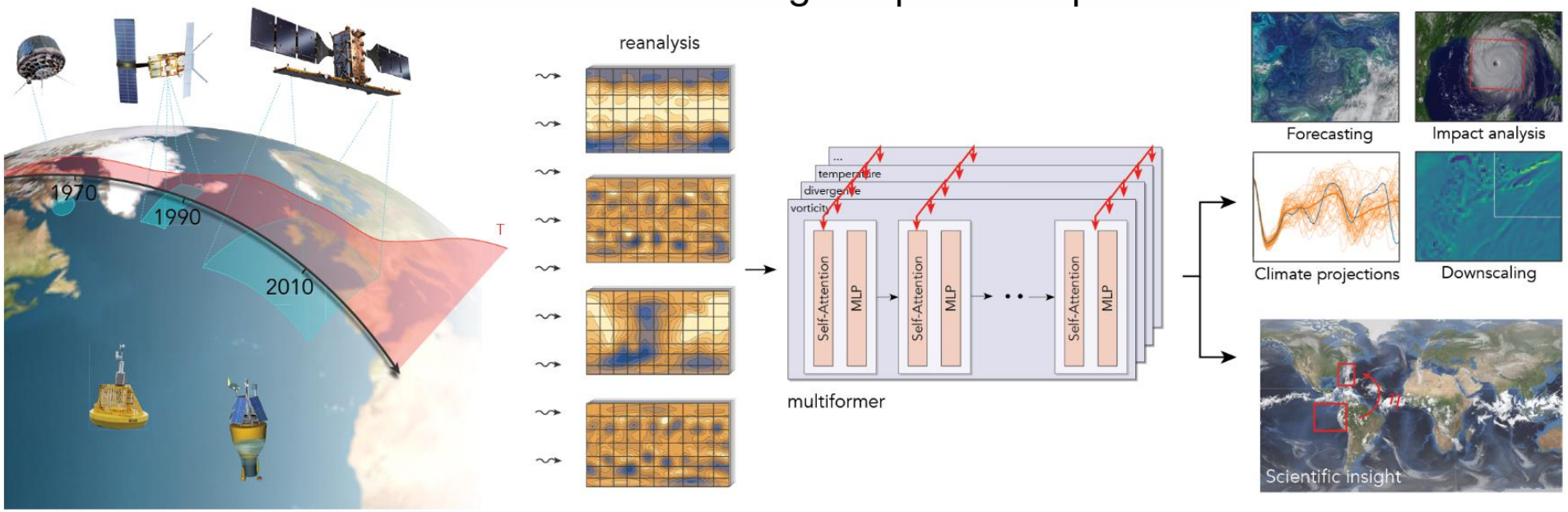
CAiMIRA – CERN Airborne Model for Indoor Risk Assessment

Introduction

CAiMIRA is a risk assessment tool developed to model the concentration of viruses in enclosed spaces, in order to inform space-management decisions. It does this by simulating the airborne spread SARS-CoV-2 virus in a finite volume, assuming homogenous mixing for the long-range component and a two-stage jet model for short-range, and estimates the risk of COVID-19 airborne transmission therein. Please see the About page for more details on the methodology, assumptions and limitations of CAiMIRA.
The full CAiMIRA source code can be accessed freely under an Apache 2.0 open source license from our code repository. It includes detailed instructions on how to run your own version of this tool.

Calculator | Expert app

EMP²: Environmental modelling and prediction platform



CIPEA CERN Innovation Programme on Environmental Applications

interTwin

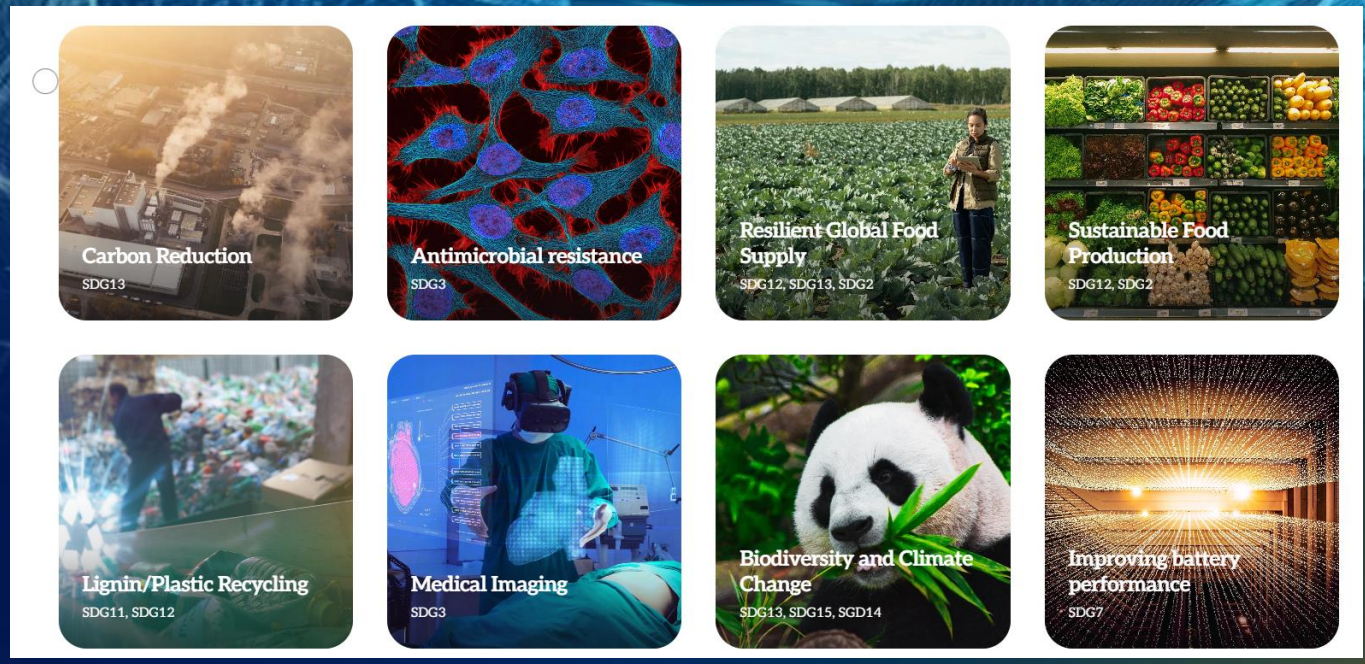
OQI
Open Quantum Institute

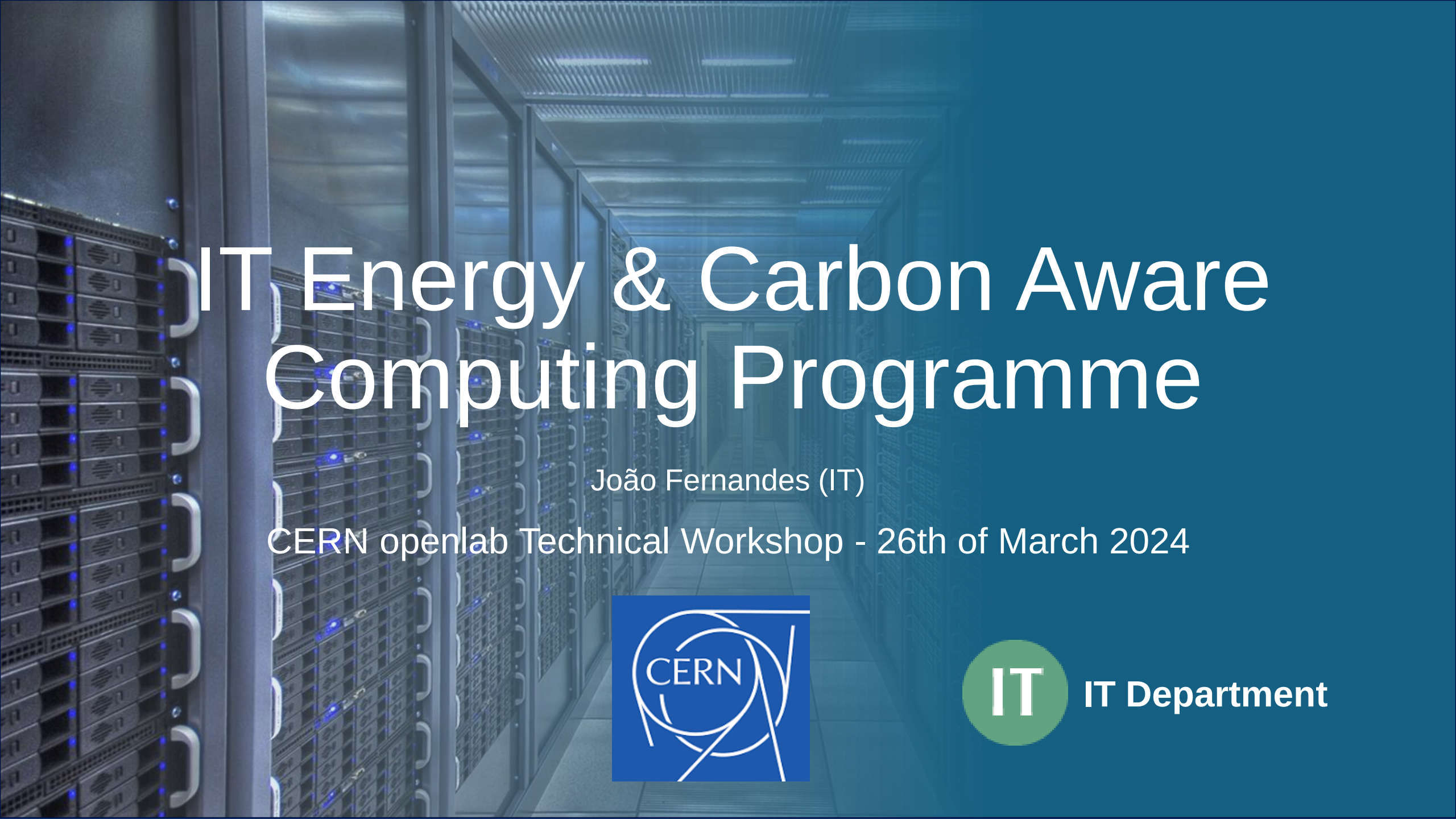
Home Journey Access Applications Education Diplomacy Get Involved

The Open Quantum Institute

An initiative hosted by CERN, born at GESDA, supported by UBS

→ Discover more





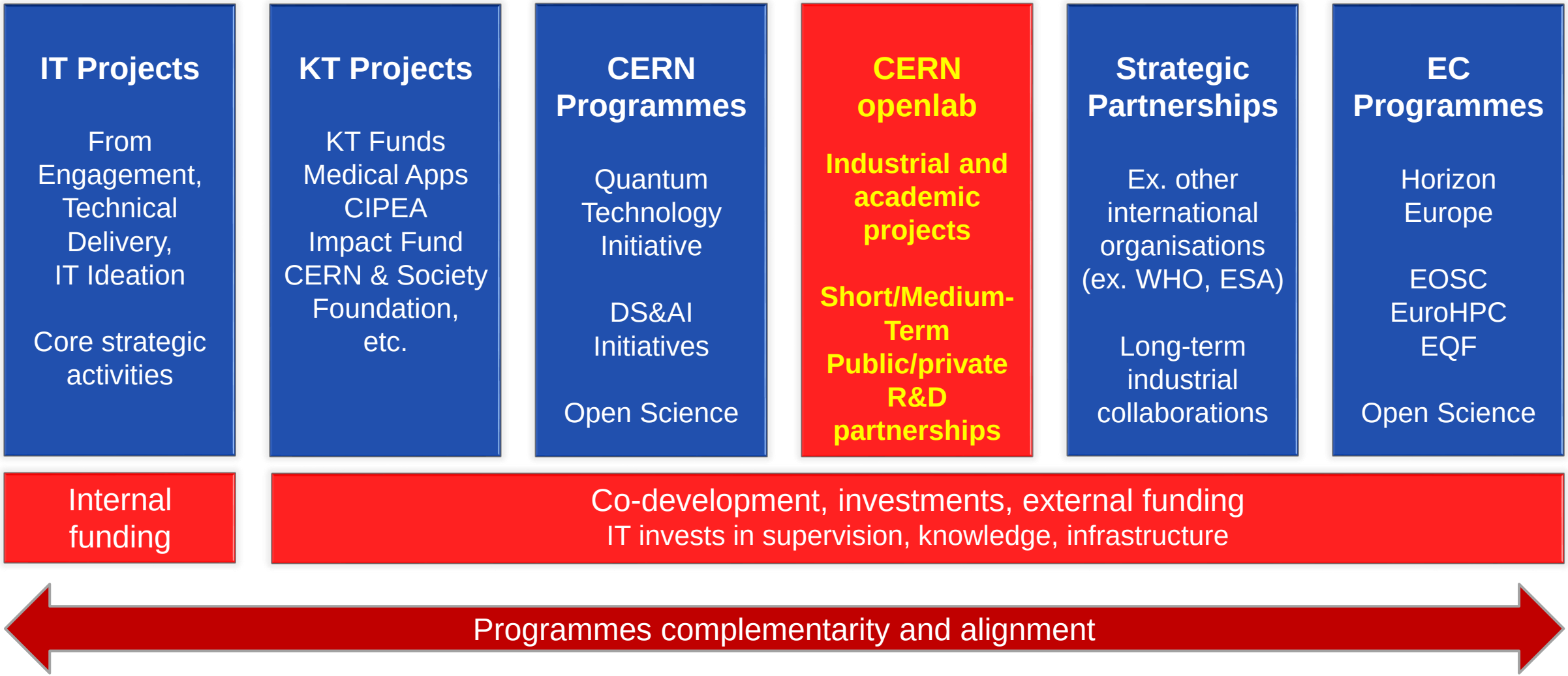
IT Energy & Carbon Aware Computing Programme

João Fernandes (IT)

CERN openlab Technical Workshop - 26th of March 2024

IT Department

CERN openlab as incubator of collaboration with industry across all programmes



Thanks!

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