OFCnet Birds of a feather: Designing and Operating the Next Generation Optical Photonic Networks.

Moderators: Cees de Laat, University of Amsterdam
Reza Nejabati, University of Bristol

Program

Time	Title	Presenter
0:00	Welcome, introduction	Cees de Laat
0:10	Introduction to OFCnet	Marc Lyonnais, chair OFCnet
0:20	OFC Demozone	Marco Ruffini, Ben Puttnam, DemoZone
0:30	Panel introduction	Reza Nejabati
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	Hübel Hannes	AIT
	Richard Murray	Orcacomputing
	Daniel Kilper	TCD
	Inder Monga	ESnet
	Jörg-Peter Elbers	ADVA
	Each gets 5 minutes to present, 5 minutes to discuss	
1:35	General discussion with audience on outcomes & next steps	
2:00	close	

Context

Starting in 2023 OFCnet brings a new opportunity to the exhibition to demonstrate products, concepts, solutions, research and architectures in a live high speed optical network connected to the leading research and education networks worldwide. This increased focus on designing and building next generation Optical Networks will expand exposure on connectivity, emerging technologies, Quantum Computer networks, programmability and network software applications for big data applications.

You will hear in a moment from the OFCnet chair

Goal for this BOF

In this BOF we propose a workshop series that solicits papers and demonstrators reports on all aspects of building networks out of components and using those networks for the whole range of commodity to extreme applications. The aim of the workshop series is to bridge and expand between the Technical Programs Demo Zone and the newly created OFCnet. Furthermore, we will solicit input on possible challenges and awards for demonstrating novel new architectures, technologies and implementations.

- a clear direction, scope and format for a workshop series to start in 2024
- identify co-chairs for such workshop
- publication venue
- potential challenges and awards to be formalised in a call for participation for 2024

Some questions to us all

Scope ?

- Optical photonics networks
- Wireless - Optical integration
- Monitoring & Measurement
- QoS
- Control plane
- Capacity / Capability
- Quantum
- AI & ML

Target participants ?

- Academia
- National Laboratories
- Industry R & D
- Startups
- Educators & Students

Some more

Incentives

- Publications – what venues?
- Posters & short papers
- Student contests
- Challenges
- Awards
- Demo’s get time in EXPO 1
- …

And some more

The way forward

- Go for workshop / symposium
- Half / full day?
- How optimally work with Demo Zone
- Next years co-chairs
- …

Example at SC:

https://scinet.supercomputing.org/community/indis/about/

Topics of interest @SC include, but are not limited to:

- Data-intensive distributed data application architectures
- Software-defined networking (SDN) and Network Function Virtualization (NFV) in service of data science and industry applications
- High-performance data transfer applications and techniques
- Science DMZs and other campus network architecture constructs
- Requirements and issues for network quality of service (QoS) or experience (QoE)
- Multi-domain networking, including hybrid clouds, multi-domain authorization, data sharing, and data privacy
- Intent-based Networking
- Network measurements, monitoring tools, and traffic analytics
- Use of machine learning and AI for autonomous or self-driving networking
- Network management: diagnostics, troubleshooting, fault management, performance monitoring, configuration management, and scheduling
- High-performance networking protocols and novel network architectures
- Securing high-speed networks
- Cross-layer network architectures and concepts
- Innovative networking solutions to solve massive data movement in both science and industry applications
- Network and Data Infrastructure for AI or HPC Workloads

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BoF
Introduction of OFCnet

Marc Lyonnais, OFCnet
Chair

The Demonstrations

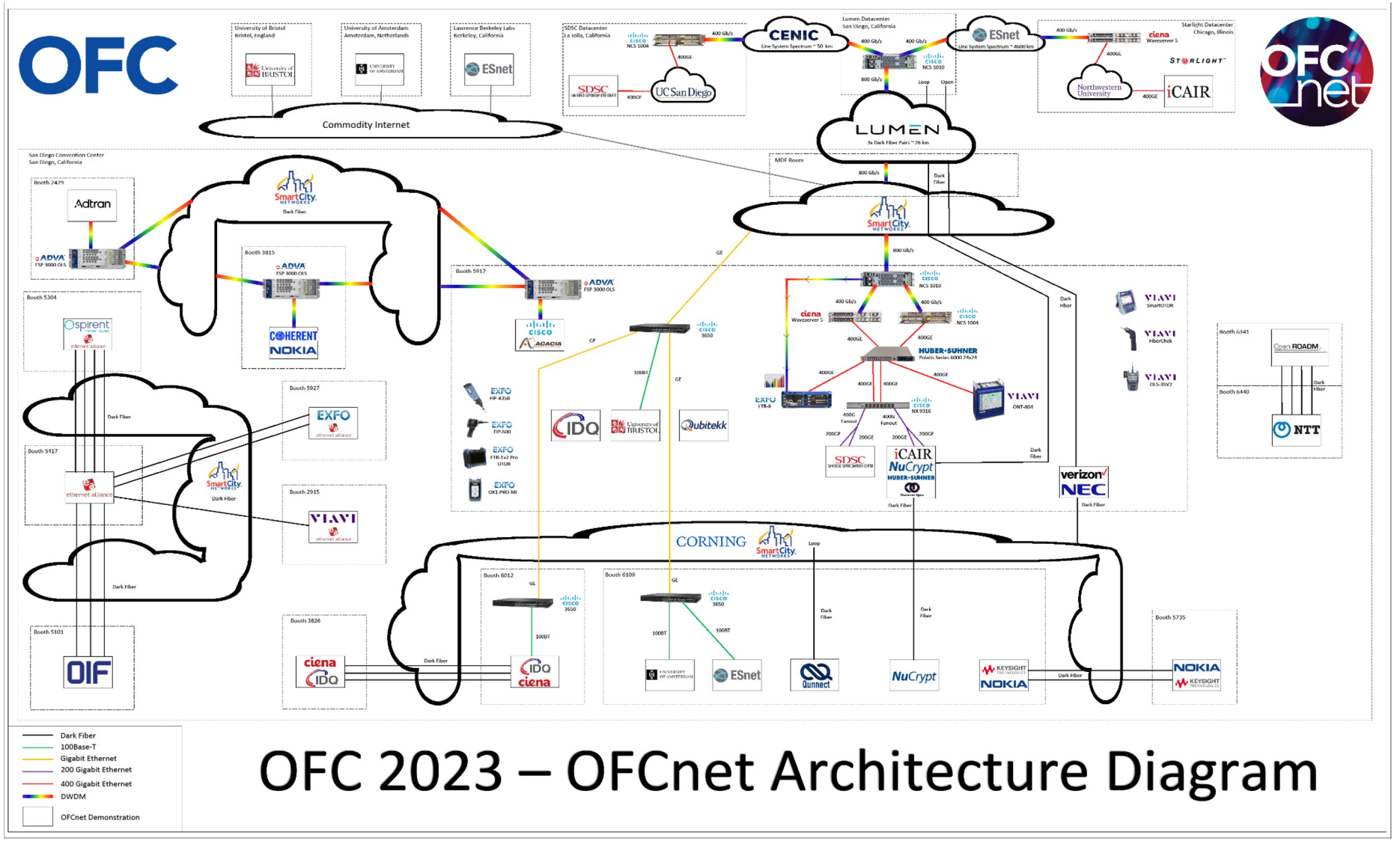
- 19 demonstrations confirmed will be supported by OFCNet.
- We have them distributed on 3 OFCnet Booths
  - Booth 5917 Main 40x40
  - Booth 6109 Secondary 30x20
  - Booth 6440 10x20 Booth
- 5 Quantum Networking Demonstrations
- 14 Classical demonstration that highlights the different possibilities of Network research and exhibitions

OFC Theatre 3 Panel for OFCnet

Each session is 30 minutes.

1. OFCnet - **Tuesday, 7 March, 13:15 - 13:45**
2. OFCnet Optical Engineering and Maintenance **Tuesday, 7 March, 14:15 - 14:45**
3. OFCnet Quantum Key Distribution **Tuesday, 7 March, 16:15 - 16:45**
4. OFCnet Quantum Network - Coexistence, Transporting Entanglements **Wednesday, 8 March, 11:00 - 11:30**
5. OFCnet High Performing Networks Demonstrations **Wednesday, 8 March, 11:40 - 12:10**
6. OFCnet - Backstage Pass: Highlighting the unsung heroes of optical connectivity **Wednesday, 8 March, 13:00 - 13:30**
7. OFCnet Emerging Technologies **Thursday, 9 March, 11:00 - 11:30**

The Network Diagram



The Team (24)

OFCnet
Marc Lyonnais (Chair) Ciena
Randy Giles (Vice Chair) Optica
Casey Foulds (Program Manager) uTD

Network Architecture
Scott Kohlert (Team lead) Ciena
Sergey Ten (Co team Lead) Corning
Maurizio Gazzola Cisco
JP Velders uVa

Logistics
Jim Stewart (co-Team Lead) UETN
Jessica Pagonis (co-Team Lead) Optica
Claudia Maurer (co Team Lead) Optica

Academic, Research lab and Industry Outreach
Cees DeLaat (co-Team Lead) UVA
Rodney Wilson (co-Team Lead) Ciena

Network Build
Scott Kohlert Ciena
Sana Bellamine (Team Lead) CENIC
Tunde Sanda CENIC
Imre Fodi uVa

Demonstrations organization
Carl Williams (co-Team lead) CJW Quantum Consulting
Chris Tracy (co-team Lead) Esnet
Kevin Quire UETN
Gwen Amice EXFO

Communications
Jennifer Inglisa (co-Team Lead) Optica
Becky Bosco Optica
Rich Finlinson (co-Team Lead) UETN
Eve Griliches (Cisco)
Dave Brown (Nokia)

OFCnet Network Supporter

OFCnet Volunteers

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Using OFCNeT for demo sessions

Marco Ruffini, Ben Puttnam

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Integrating OFCNeT into demo session

- Benefits of using of OFCnet for some demonstrations?
  - Boost impact & significance
  - Showing applicability to commercial networks
  - Adaptability to a more diverse range of scenarios
  - Make use of equipment otherwise not available

Possible issues & Solutions

- Demo development requires long times: not clear how OFCNeT can be made available for development and test for a number of months before OFC
- Also requires expertise to be made availale on OFCNeT (system, interfaces, etc,)

➔ Have cooperative demos, with local OFCNeT partner involved

➔ Provide 24/7 OFCNeT helpdeks

➔ Build a digital twin for OFCNeT used for demo integration

The competition aspect

- OFCNeT could set up a number of challenges open for competition:
  - Network control plane:
    - Efficient set up of wavelength channels: adding number of paths over given topology, while keeping change in OSNR below a given target
    - Survivability challenge: operate network restoration with timing and % of recovery as KPIs
  - Transmission: system demo over real fibre
  - Quantum coexistence…

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Thank you

Contact: Marco.Ruffini@tcd.ie

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OFCNET – some thoughts

Andrew Lord

BT Group

OFCNET Discussion

Opportunities

Level playing field for rapidly growing number of innovative start-ups in the industry

Lower impedance route for institutions to demonstrate capabilities at OFC

Potential for interoperability demonstrations

Independently managed / characterised infrastructure increases credibility of demonstrated technology

An exciting way to develop the OFC demo zone

A route for OFC to diversify into tangential areas

Hurdles

Who would manage it? It sounds time-consuming so would need funding / maintenance

How is it time-managed, given that OFC itself is short?

How do we create a low entry point so start-ups can benefit (i.e. not dominated by large equipment vendors)

Initiatives like this are easier to start than to keep going. How do we built longevity into the model?

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ORCA COMPUTING

“QUANTUM DATA CENTRE OF THE FUTURE”

OFC Demonstration suggestion

NCC:
End user
Application
Advanced materials

PQshield:
PQC for access
Authentication

KETS:
QKD security (L2)
QRNGs
Encryption

Univ. of Bristol
SDN
Encryption
Multi-party access
QKD

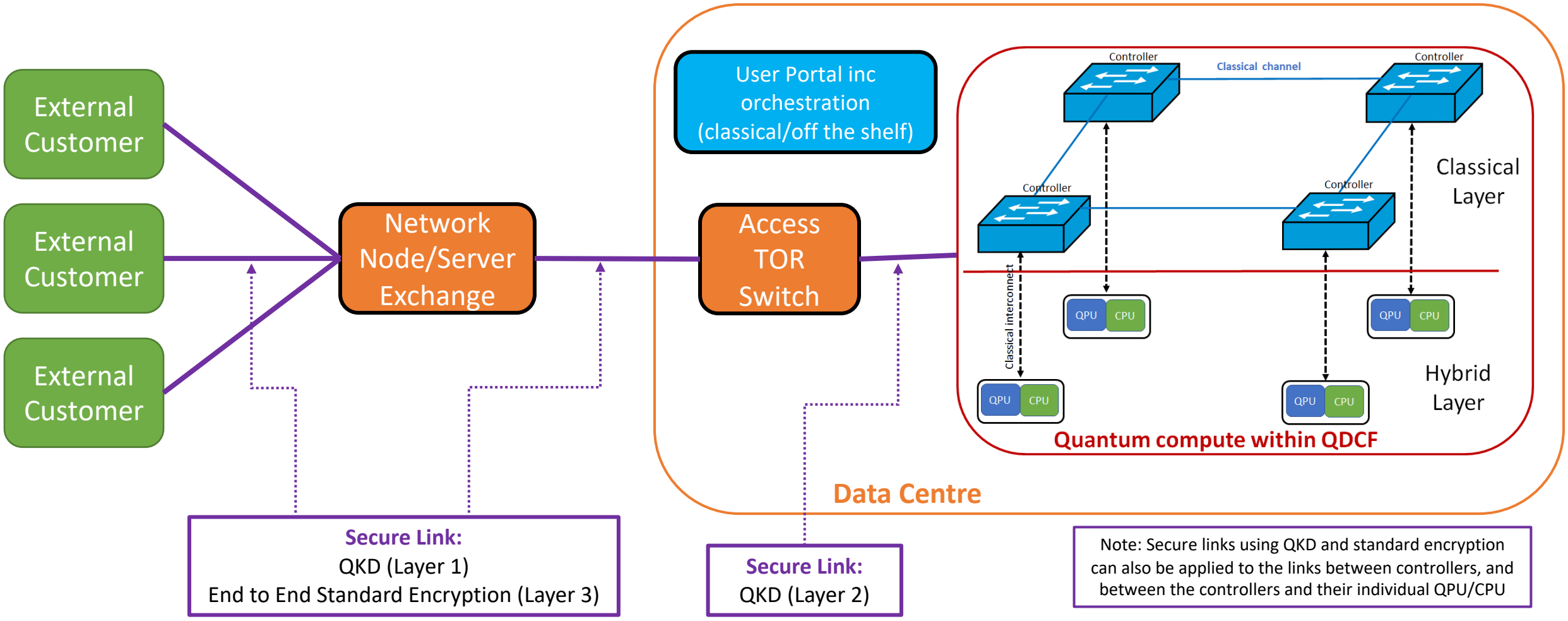
BT:
Data centre
Use cases
Telecom Infrastructure

UCL:
Fast switches based on FPGAs
Entanglement

ORCA:
Quantum Processors
Memories
Software for processors

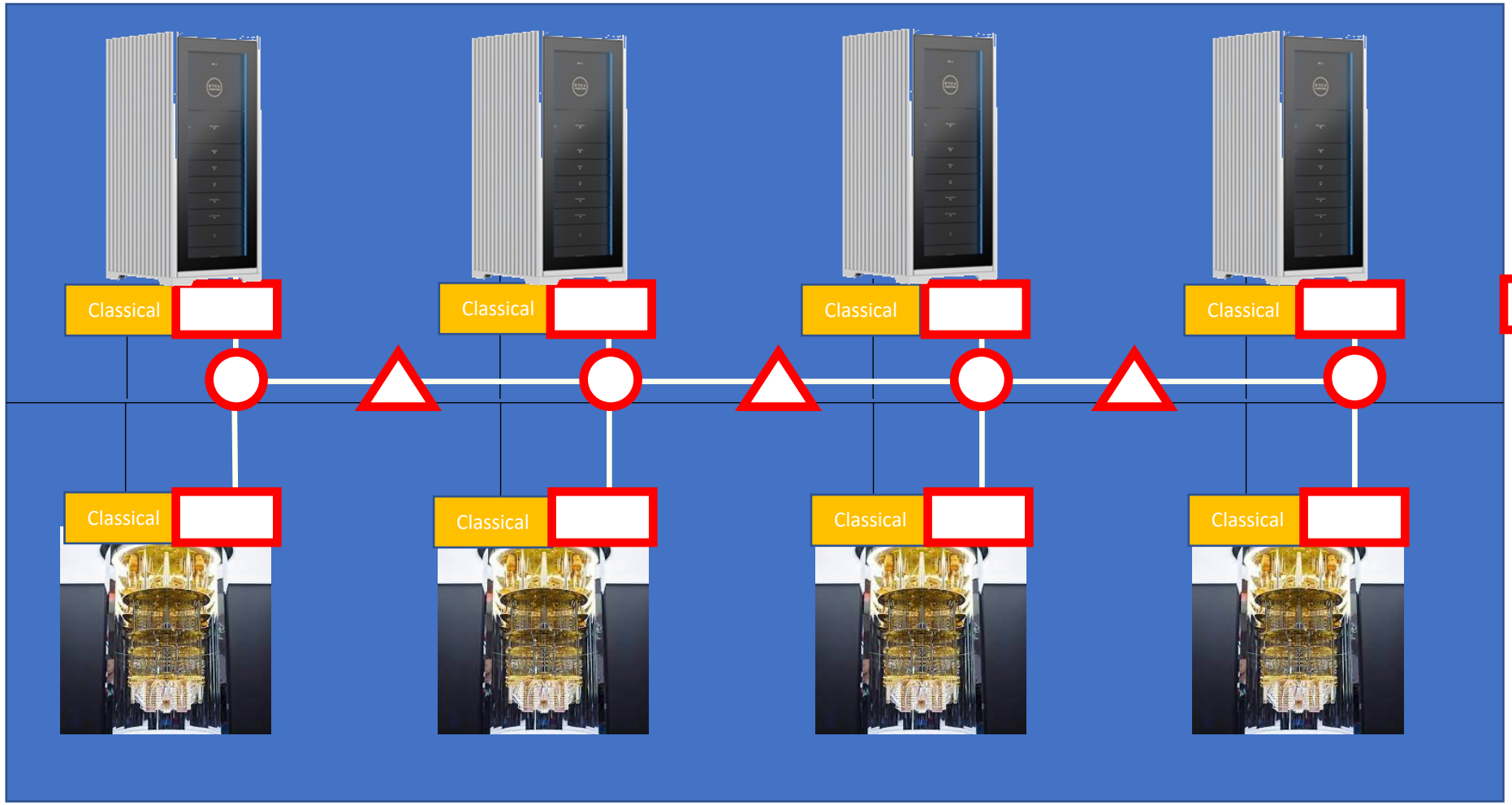
Riverlane:
Software for quantum computing

Note: Access switch can also connect to other Quantum Compute and Classical compute racks



Note: Secure links using QKD and standard encryption can also be applied to the links between controllers, and between the controllers and their individual QPU/CPU

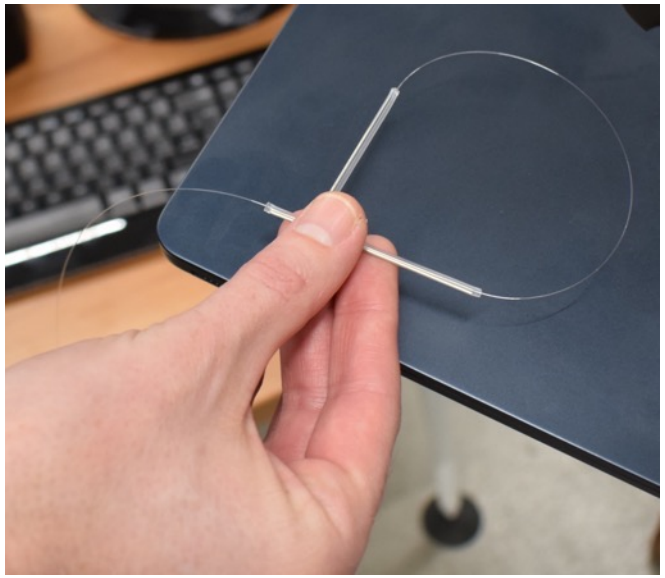
Networked quantum- quantum



Demo day


KAO DATA
river Lane
The Operating System for Error Corrected Quantum Computers
KETS


ORCA COMPUTING




KAO DATA
river Lane
The Operating System for Error Corrected Quantum Computers


KETS
Quantum Entropy as a Service
Distributing high speed keys to over virtual machines in quantum environments

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Using OFCNet to address the AI problem

Dan Kilper

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TU Dublin Technological University Dublin
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AI Problem

- Very few data sets, limited types of data
  - Privacy and business issues for operators
  - Often end to end, lacking in detail
- Many, many papers with little means of comparison
  - Are we doing better with our ML algorithms?
  - How do we benchmark and compare data?

OFCNeT Datasets

- Use turn up and operation of OFCNeT to collect data sets
  - Use available methods on systems
  - Allow vendors to trial new data collection technologies
  - Run certain tests such as faults and provisioning
  - Provide output/predictions of standard (non-ML) tools as reference for ML to beat
- Make datasets and reference results public

OFCNeT ML Competitions

- Run annual competitions
  - Target a different challenging problem each year
  - Past year's datasets
    - Run competition prior to conference and have a session on the winning entries
  - Current year's datasets
    - During OFC teams compete using turn up datasets to predict performance during operational test running during conference
    - Winners announced during pdp sessions
- Great way to provide recognition to the talent in our community!

AutoML Decathlon 2022

Diverse Tasks, Modern Methods, and Efficiency at Scale

NeurIPS'22 Competition Track

Carnegie Mellon University | Hewlett Packard Enterprise | Morgan Stanley | Wisconsin University of Wisconsin-Madison

Welcome to AutoML Decathlon!

The AutoML Decathlon is a competition that will evaluate the performance of participants' AutoML methods on carefully curated sets of tasks with an appropriate level of difficulty and coverage in application domain, size, and input/output characteristics.

At the start of the competition we will release 10 public development tasks that vary in their domain (including image, finance timeseries, audio, and natural sciences), problem type (including regression, single-label, and multi-label classification), and scale (ranging from several thousands to hundreds of thousands of observations). These public tasks will be representative of (but distinct from) the final set of test tasks on which participants' AutoML methods will be ultimately evaluated on at the conclusion of the competition. For more background, see our blog post.

A prize of $15,000 will be awarded to the winning team. See the competition description for details.

Final Test Phase Results

Congratulations to Team TrueFit for being the winner of AutoML Decathlon 2022!!

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Thank you

Contact: Dan.Kilper@tcd.ie

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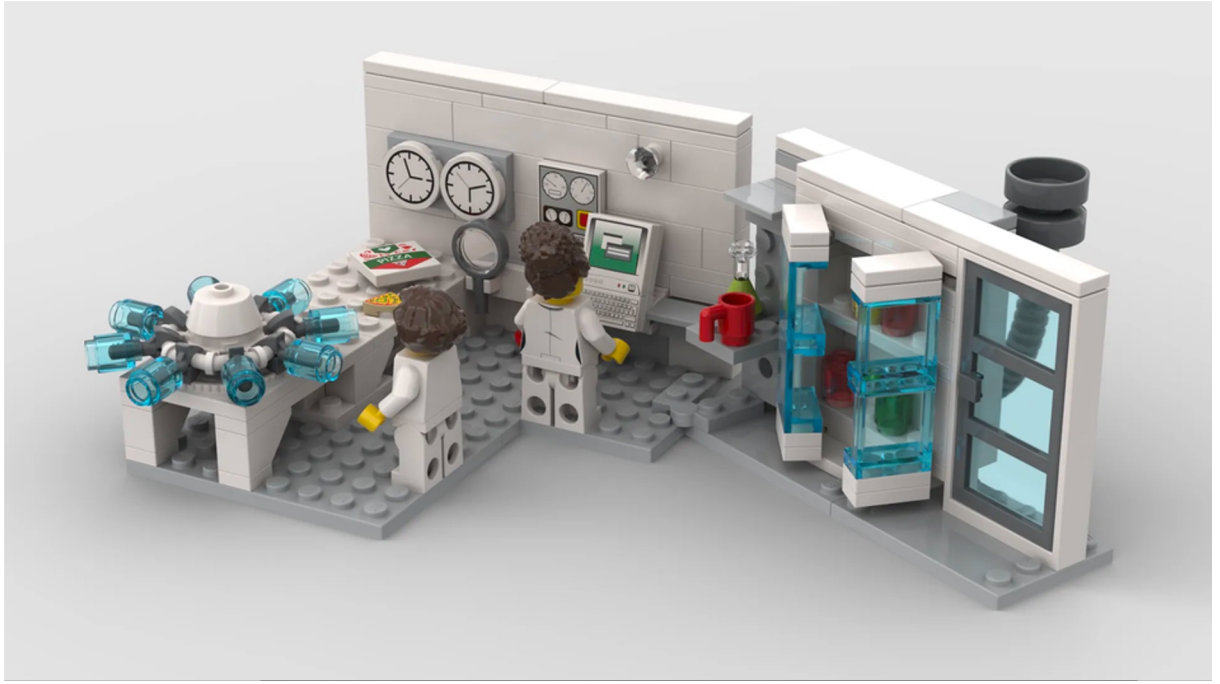
OFCnet BOF

Inder Monga

OFCnet Motivation

Leading products showcased at OFC

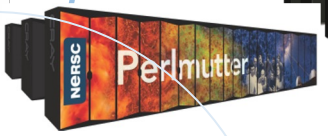
Leading research/systems [working together] showcased at OFC



Testbeds spur research: how can we bring the power of testbeds to attendee-base of OFC?

The vision: A DOE/SC integrated research ecosystem that transforms science via seamless interoperability

Advanced Computing



Laboratory Compute Assets

Cloud Computing

Software

Software and Applications

Digital Twins

Advanced Networking

Sensors at the edge

Advanced Data Management

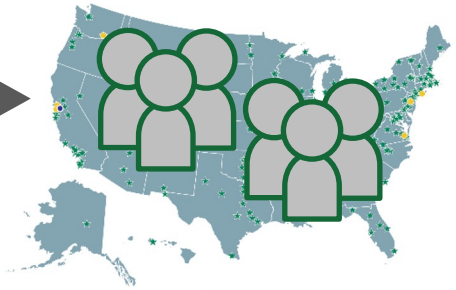
Advanced Data Capabilities

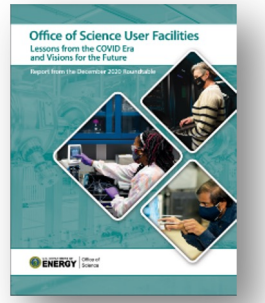
Testbeds

Data Repositories PuRE Data Assets

Strategic goal: Broadening participation

Researchers

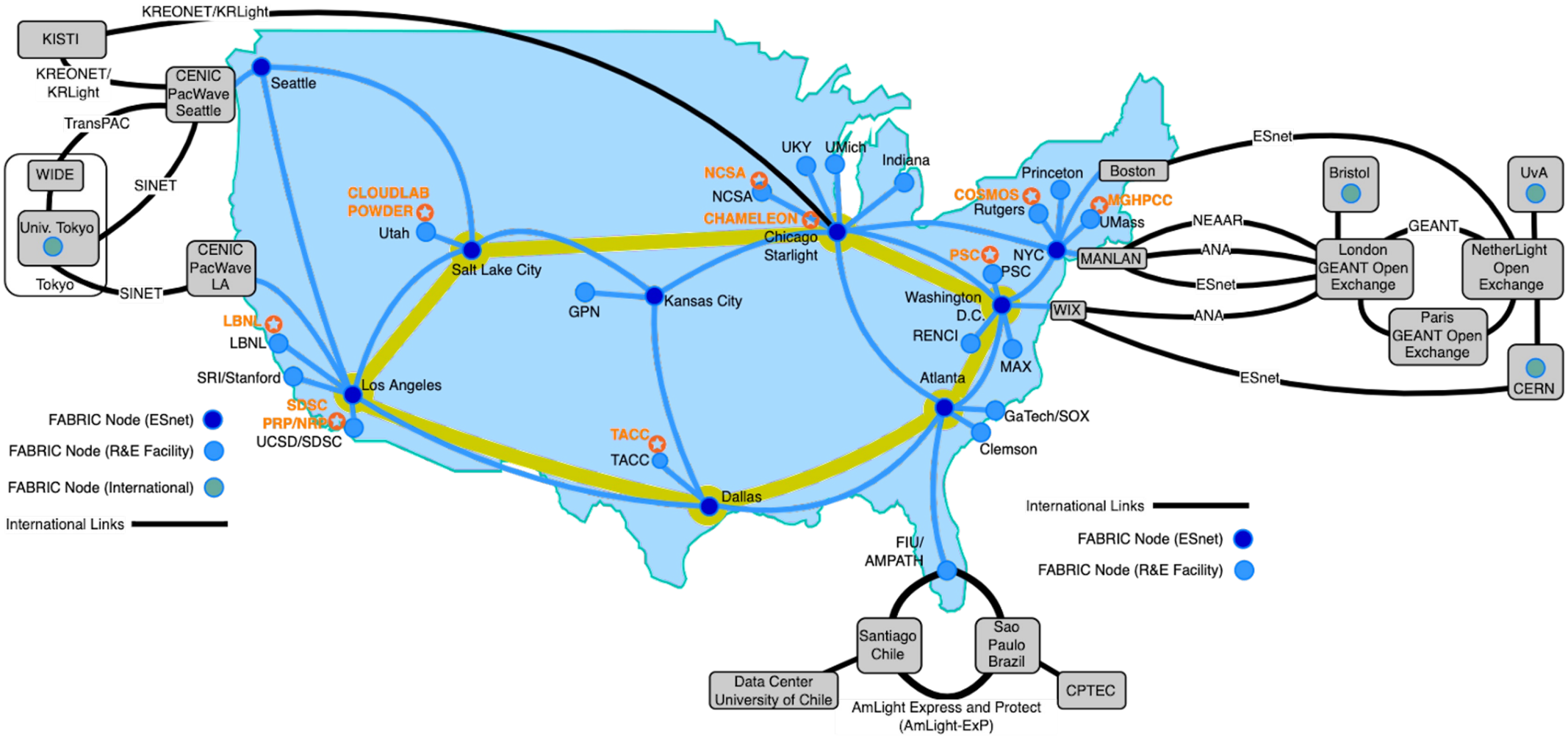




New modes of integrated science

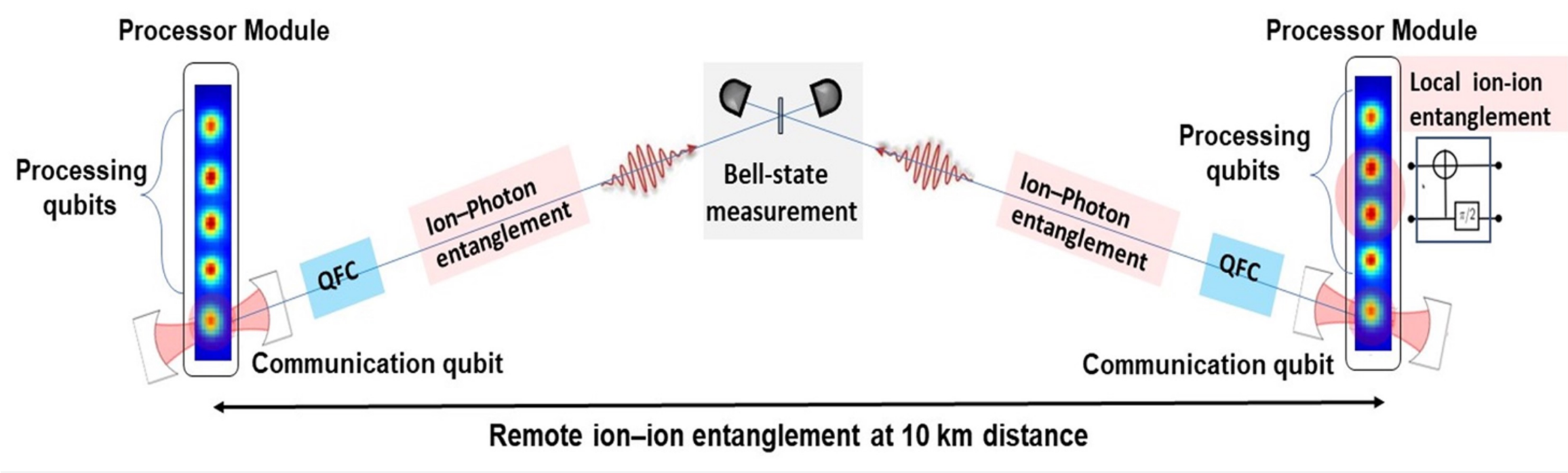
Rapid data analysis and steering of experiments	Novel models for multi-facility allocation/utilization	AI-enabled insight from dynamic, vast multi-modal data	Seamless user interconnectivity via federated IDs

Continental scale network research testbed



FABRIC Topology - with FAB Sites

QUANT-NET: Quantum Network Testbed



Current stage

Design
Tests & Characterisation
Simulations

→ **Construction & Implementation** →

Experimental realizations

OFCnet Technical Workshop Opportunities

- Showcase the use of innovative products and bleeding-edge research in hero experiments
- Share practical learnings of building and using applications using new features for performance gains aka “State of Practice”
- Illustrate the use of global ‘federated’ testbeds and share results

This is different from technical program at OFC as far as I know and potentially see the experiment after the workshop!

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