A World Leading SFI Research Centre

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CONNECT
Centre for Future Networks

Open testbed research infrastructure with Open Ireland and COSMOS

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CONNECT research centres

Trinity College Dublin
The University of Dublin

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European Union
European Regional Development Fund

Science Foundation Ireland sfi For what's next

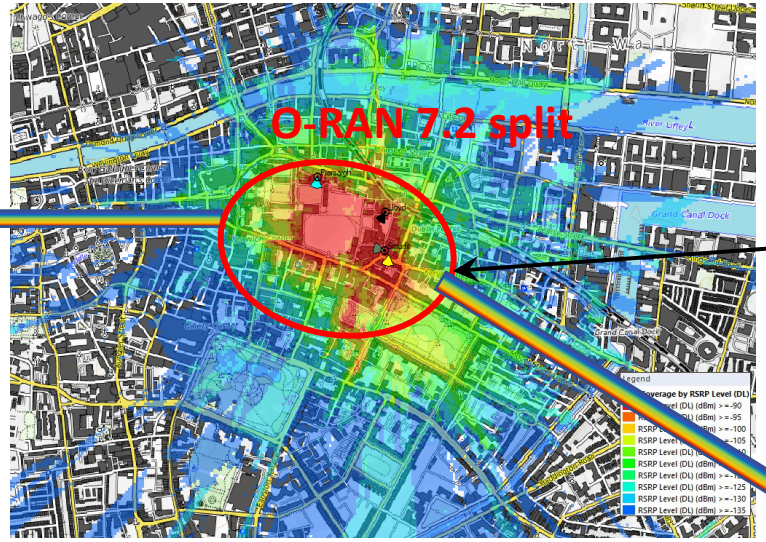
IPIC
BRINGING PHOTONICS TO LIFE

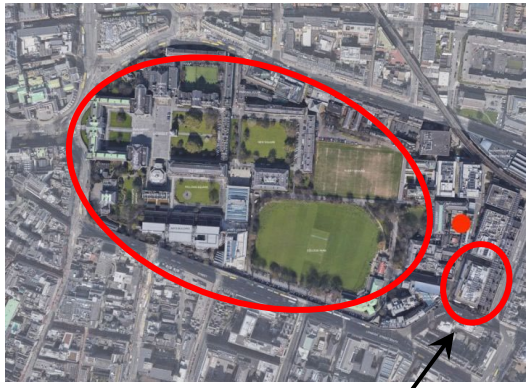
Open Ireland: Ireland's Open Networking Testbed

www.openireland.eu

Based in Trinity College campus

Optical transmission, analog RoF, mmWave-THz



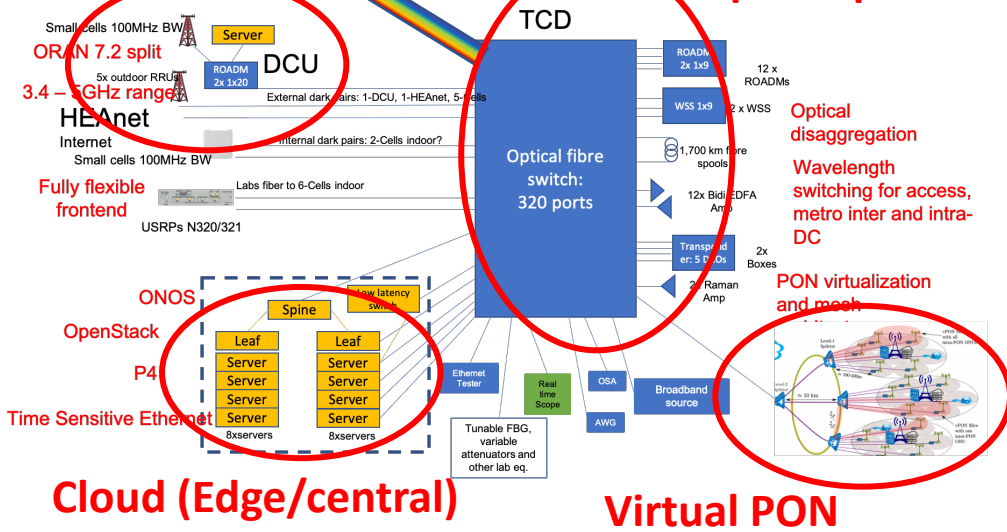


CONNECT research centre building

O-RAN

SDR

Open-Optical



Reconfigurable and **Lego-like** topology reconfiguration with following blocks:

- 1,700km fibre, **SDN ROADMs**, **amplifiers and coherent Tx** (Cassini), virtual PON, OSA, etc.
- **5G O-RAN** (outdoor and indoor); **OpenSource 5G** (OAI and SRS)
- **Edge cloud**, L2 switching, P4 programmability

ComReg 100MHz spectrum license

Existing 3.6 GHz for 5G | **Upper 4 GHz band for 5G**

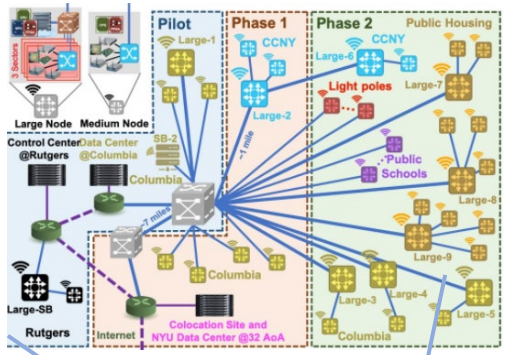
Region		A-Lot		3560 - 3620 B-Lots				
Borders Midlands & West South West East South East Dublin City and Suburbs Cork City and Suburbs Galway City and Suburbs Limerick City and Suburbs Waterford City and Suburbs	Guard Band	Airspan	State Services	Vodafone	Imagine Airspan	Meteor	Three	CONNECT
Frequency Range (MHz)		3410 - 3435	3410 - 3475	3475 - 3580	3580 - 3615	3615 - 3700	3700 - 3800	3850 - 3950

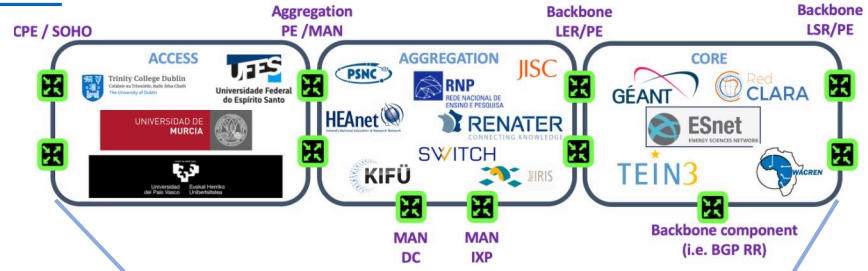
Upper N77 band: 3.8 – 4.2 GHZ

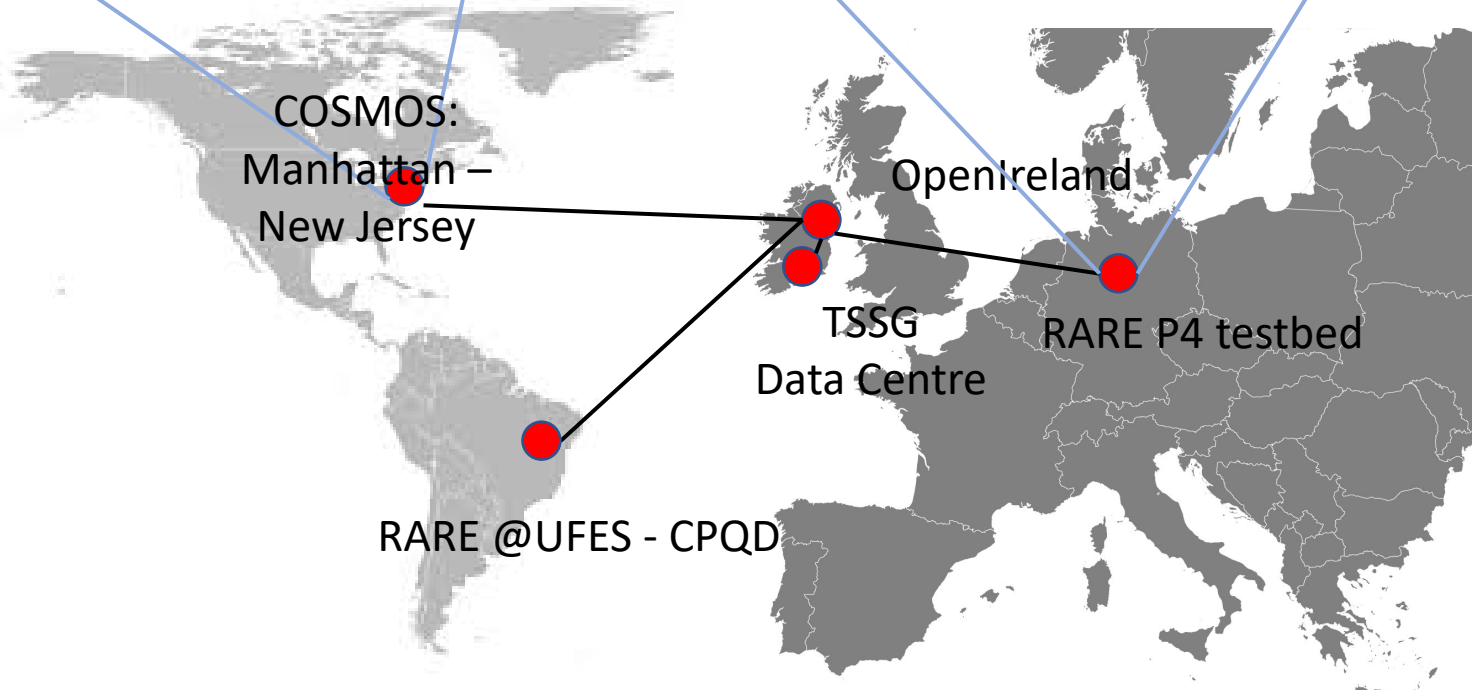
- 5G spectrum enables experimentation with commercial devices (smartphones and future AR, smart cities, etc)
- Use AI to solve complex network interference optimization problems based on real data
- Put together interesting 5G demos, such as smart intersection…

Worldwide reach… and further plans

https://wiki.cosmos-lab.org/wiki

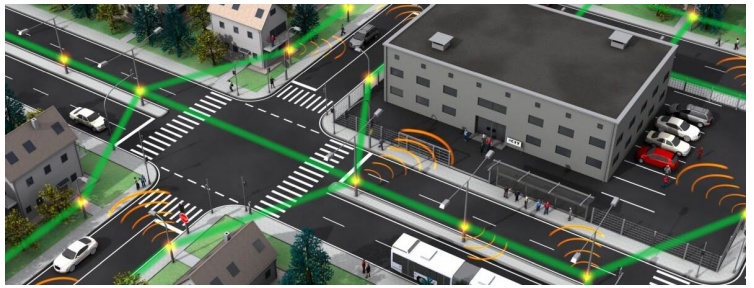




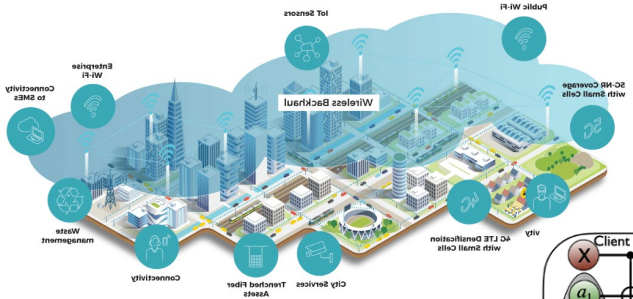


Foundation testbed in CONNECT2
Starting point for further exploration:

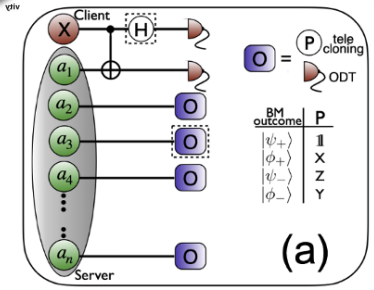
⇒ ***mmWave and THz experimentation***



⇒ ***Connected City Infrastructure***



⇒ ***Quantum Internet***

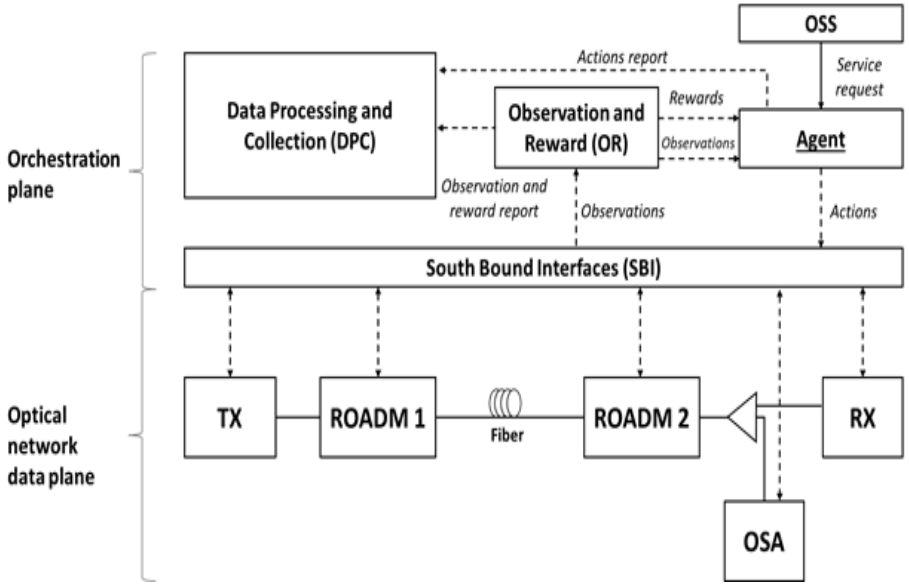


Sample use case: Building a QoT estimation algorithm

POLITECNICO MILANO 1863

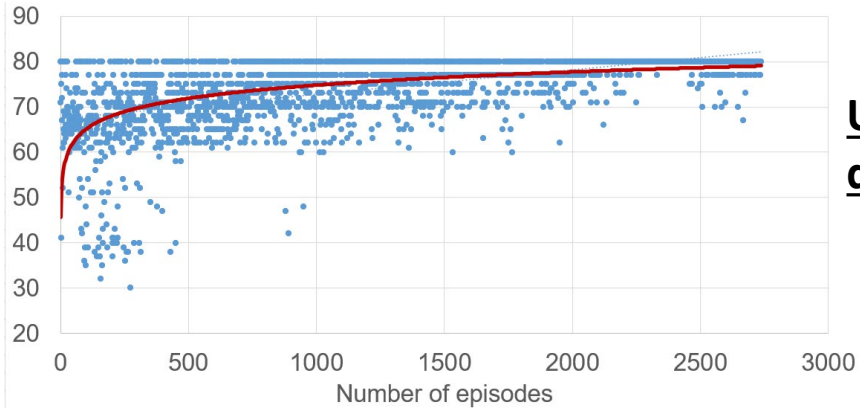
Control plane algorithm development and test based on simulation:

- Online learning through agent that loads the optical spectrum with optical channel and measures OSRN variation
- Through multiple iterations the agent improves strategy for channel selection

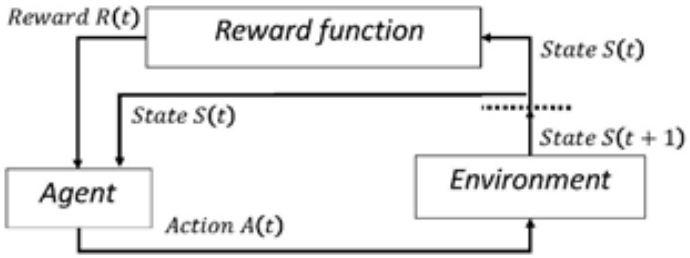


Work carried out with Politecnico di Milano optical group

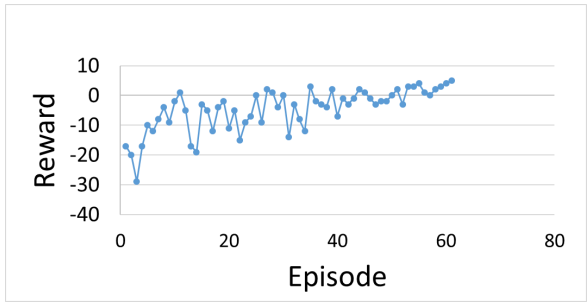
How many channels are allocated without disruptions?



Use of simulated data plane



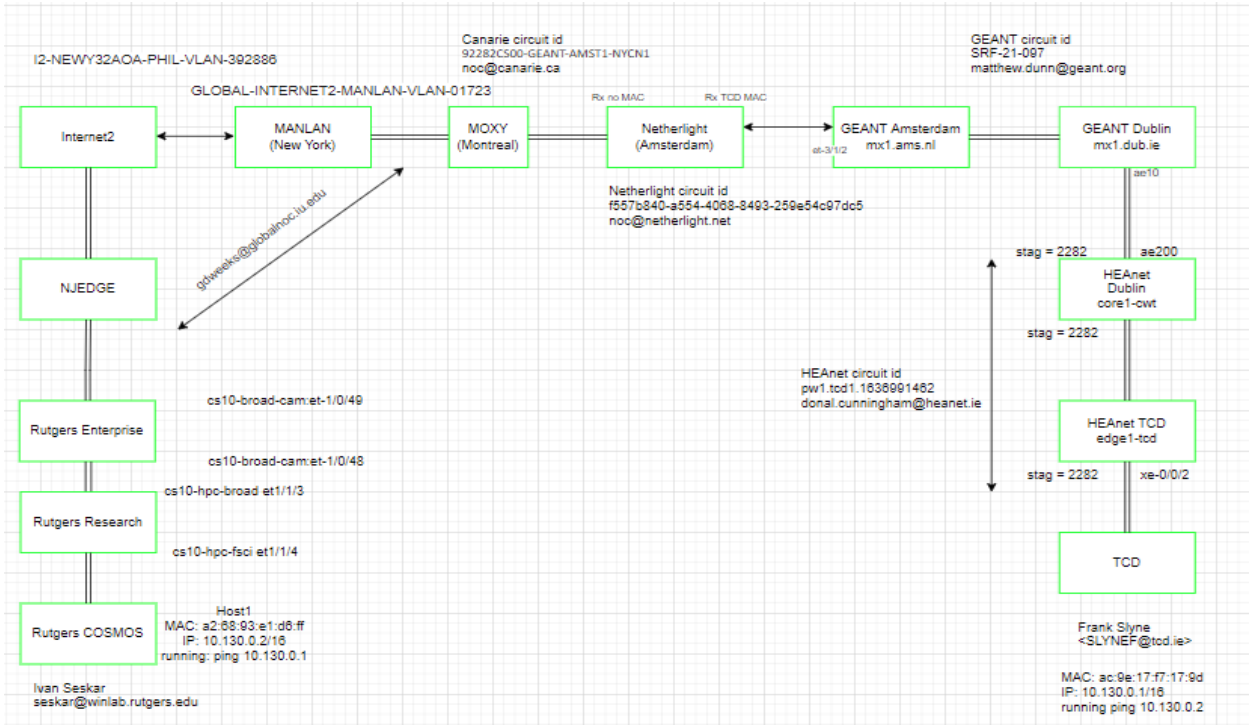
ONIS OPERATION TIMINGS		
	OSA-based OSNR computation	ROADM-based OSNR computation
Algorithm initialization	3.15 s	
Single step channel opening + OSNR + reward	1.31 s	
Episode (full spectrum filled)	2400 s (40 mins)	182.2 s (3 mins)
OSNR computation	25.84 s	1.18 s



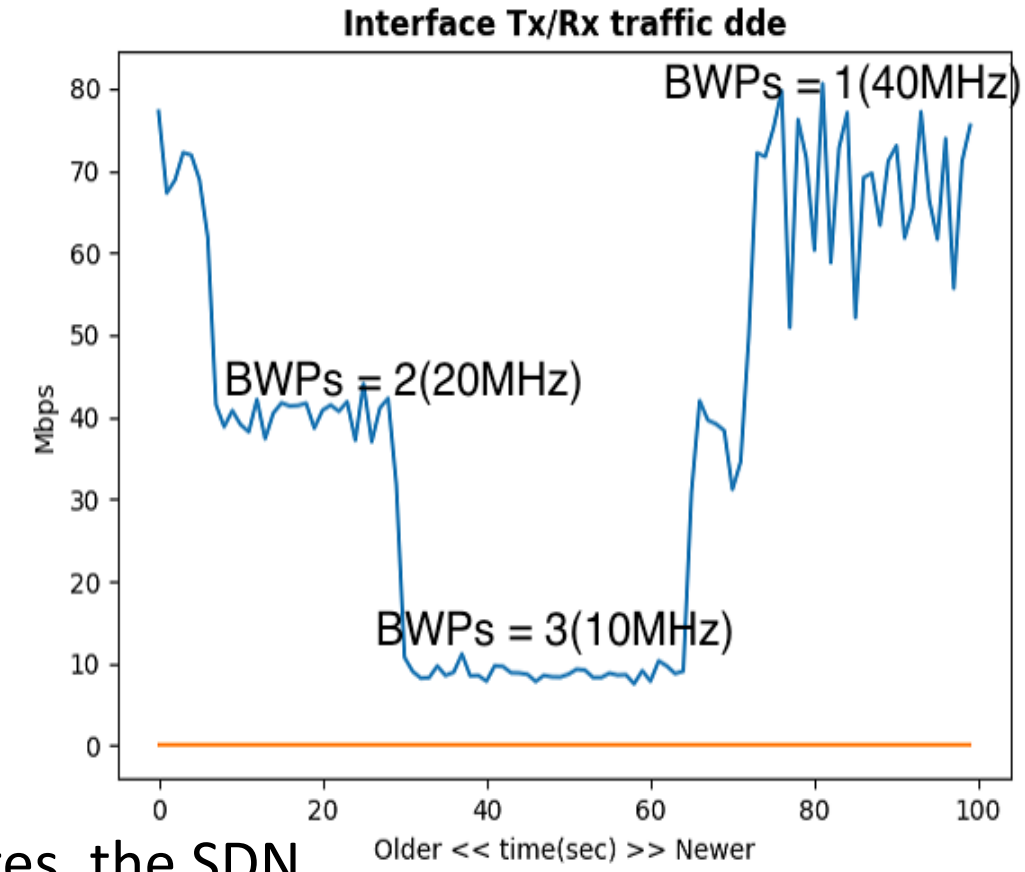
OpenIreland - COSMOS Demo

- Assume traffic variation from a user application (COSMOS), affects the bandwidth required in cells in Open Ireland.
- The use case is that of a service provider in COSMOS that wants to offer dedicated capacity towards users that are outside its area (Open Ireland).

Dedicated 10G link COSMOS-OpenIreland



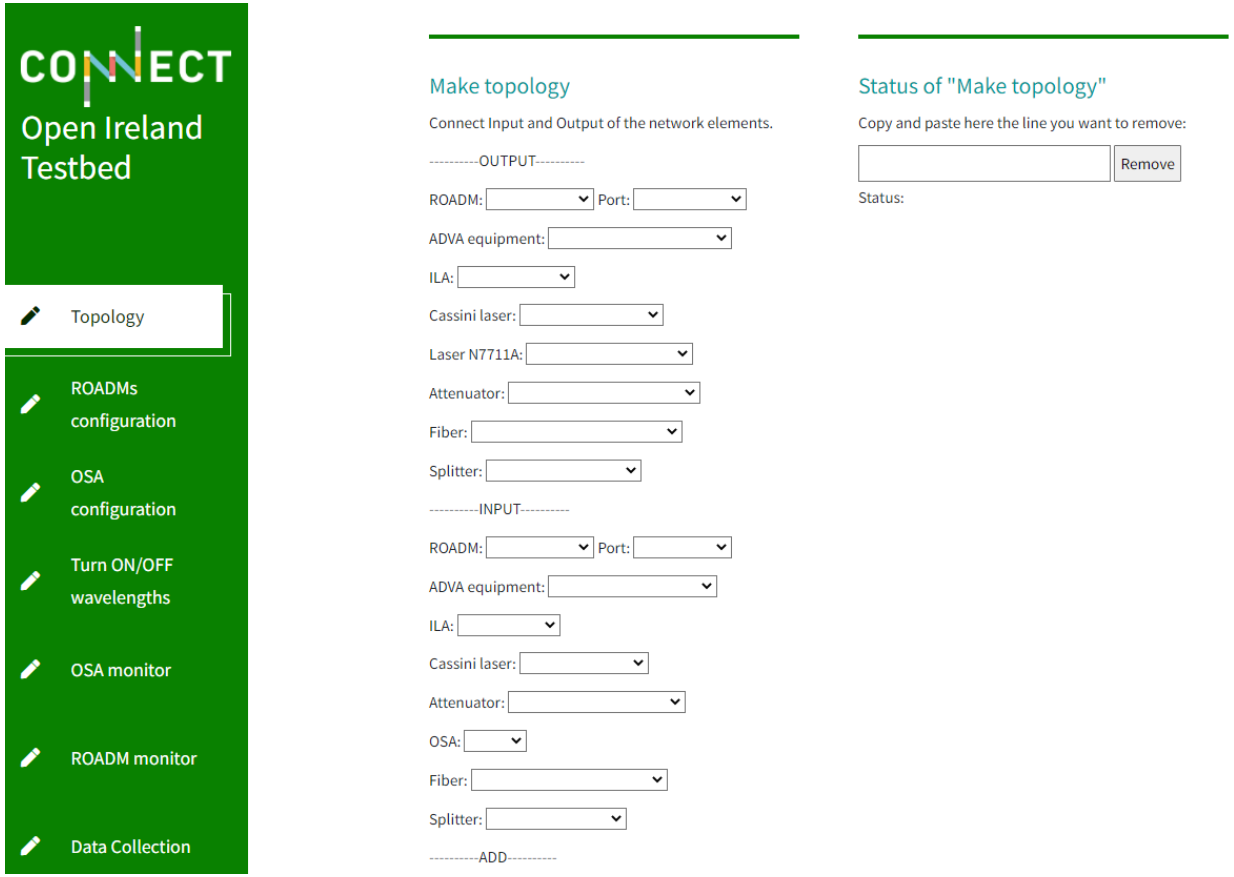
Implemented on OAI 5G



As the capacity requirement changes, the SDN controller reduces the bandwidth required (i.e., to save on bandwidth resources)

Running optical experiments

Experiments can be built through python APIs and/or GUI



Access individual elements (including lab equipment, i.e., spectrum analyzer)