

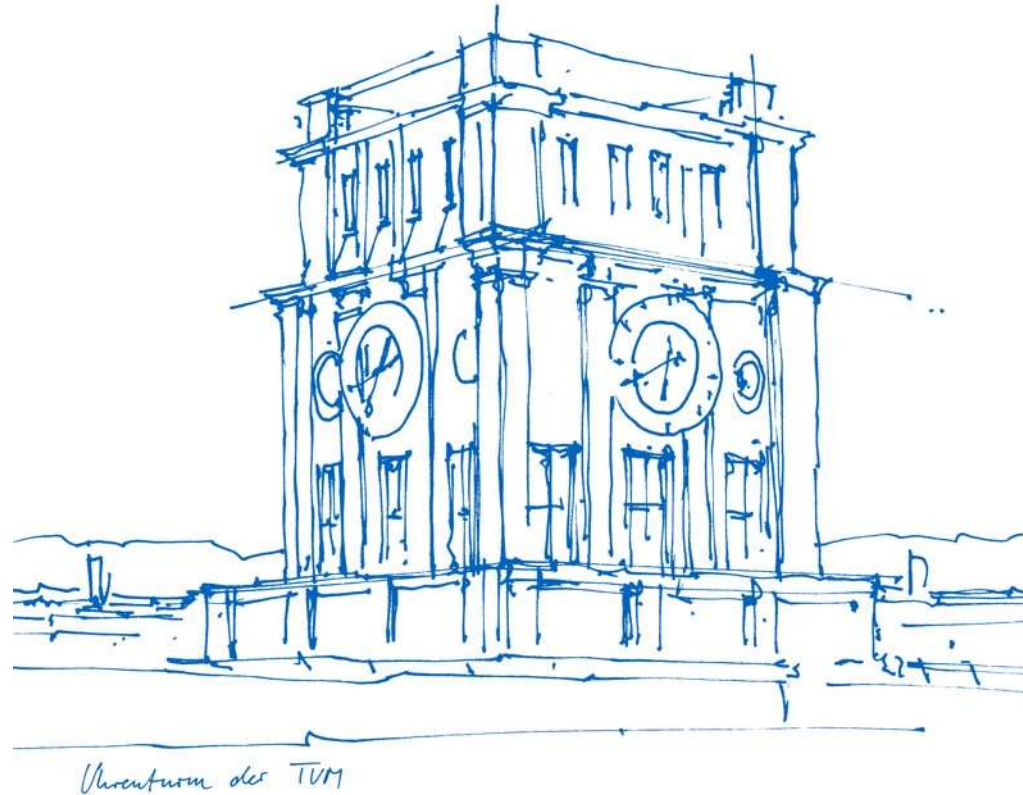
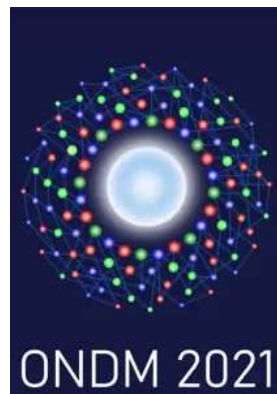
Efficient Optical Core Networks

Carmen Mas-Machuca

Sai Kireet Patri

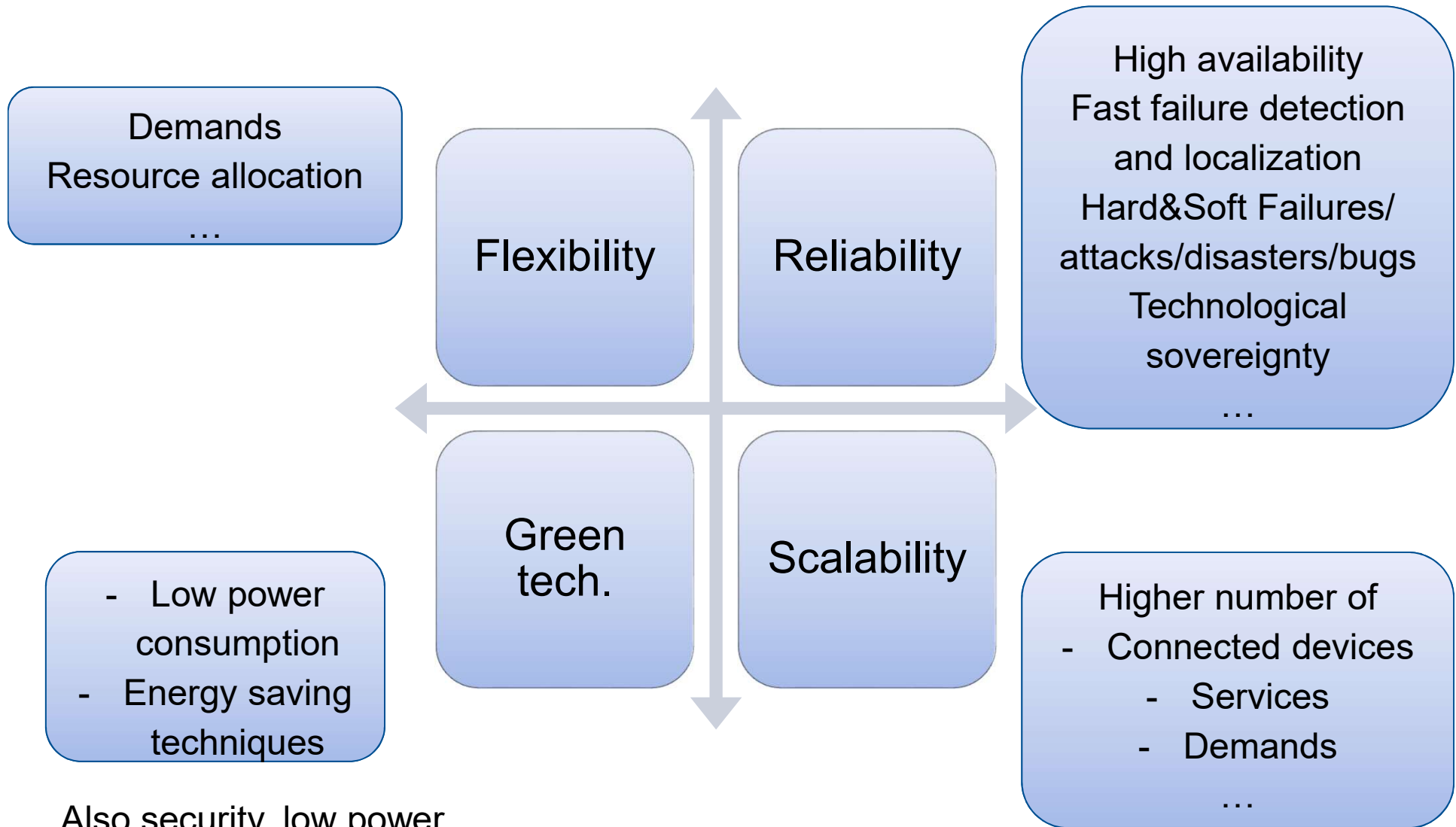
Amir Varasteh

Achim Autenrieth



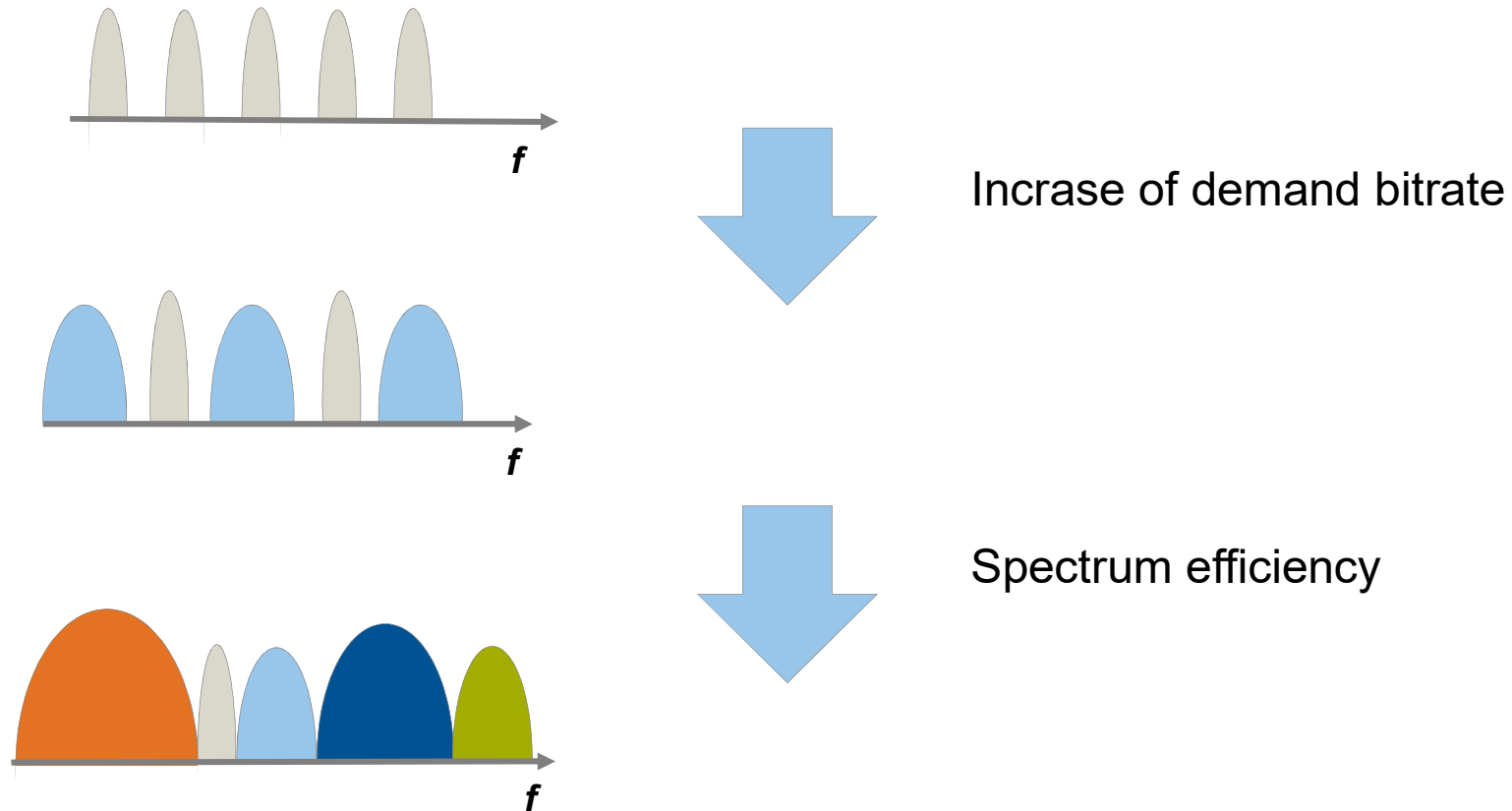
Uhrenturm der TUM

Towards 6G...



Also security, low power consumption, Ultra-Low latency multiple tech. Coexistence, etc.

Optical technology evolution

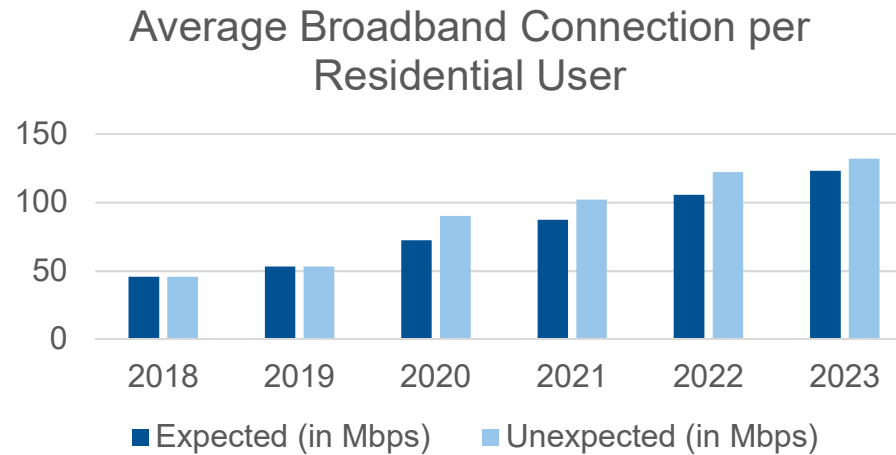
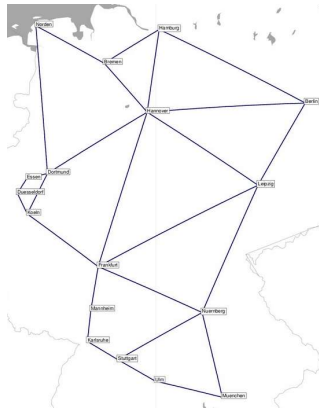


Use of BVT (Bandwidth Variable Transponders) →

Support different configurations (bitrate, modulation, fec) →

min OSNR, required frequency slots (FS)

Optical network core requirements

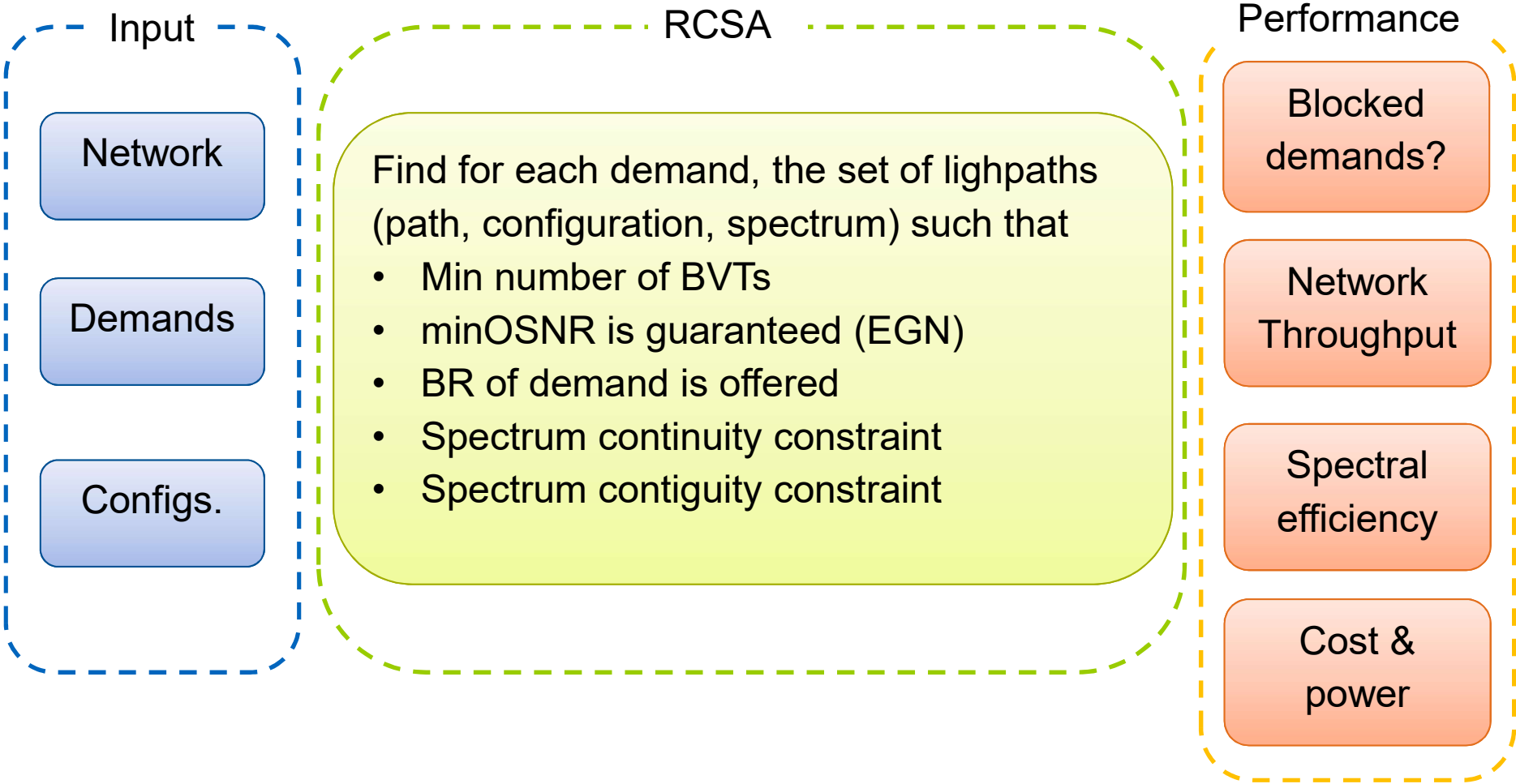


[* Expected = 2018 CISCO VNI Forecast]

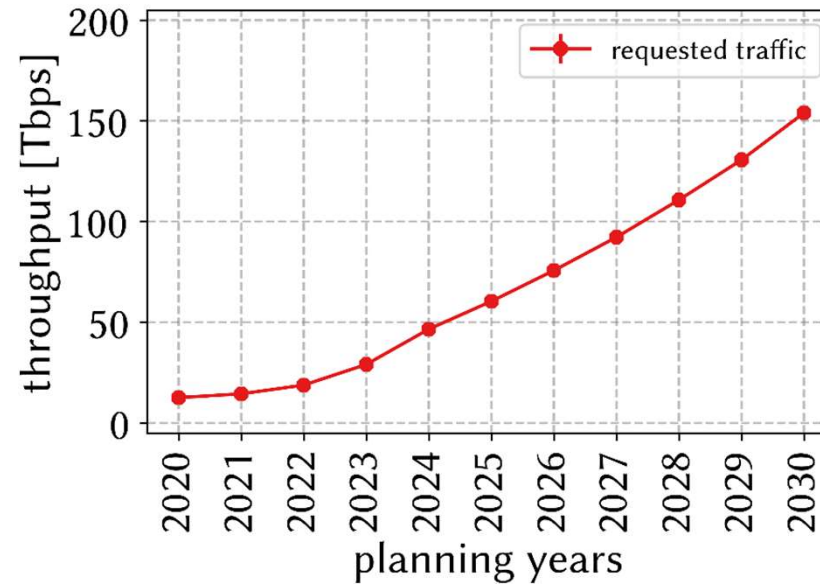
Issues faced by operators:

- How to model realistic traffic models?
- How to cope with traffic increase?
- How to reduce blocked/partially breached demands?
- Increase spectrum utilization efficiency
- Reduce investments (SDM, BDM,...)

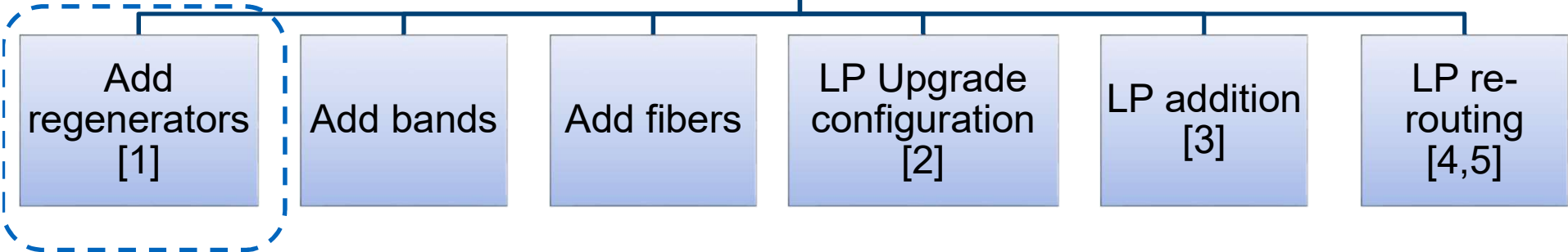
RCSA Problem



Multi-period RCSA problem

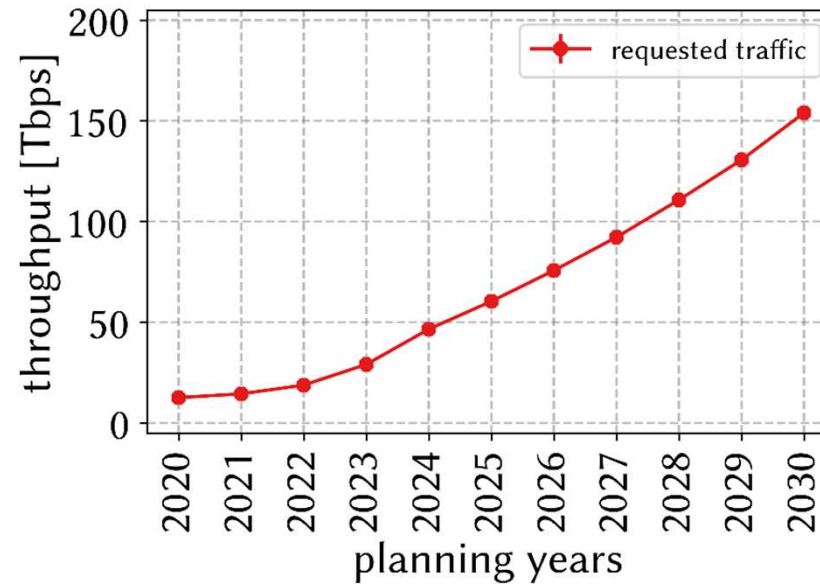


How to cope with the BR increase demands?

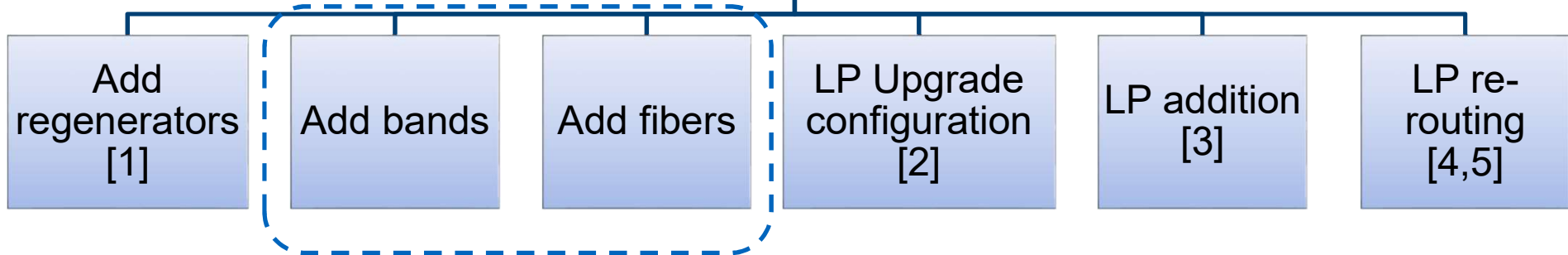


[1] ONDM2021 „Transmission-Aware Bandwidth Variable Transceiver Allocation in DWDM Optical Networks”

Multi-period RCSA problem



How to cope with the BR increase demands?

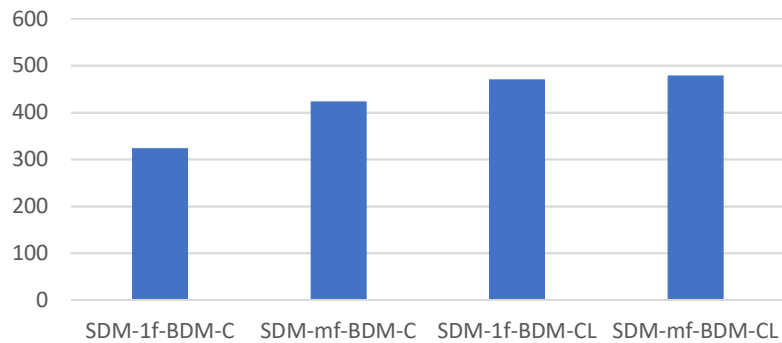


SDM vs BDM

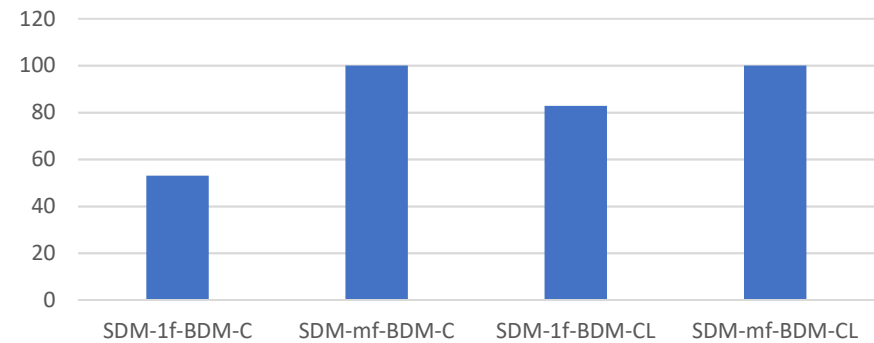


		BDM	
		C	CL
SDM	1f		
	mf		

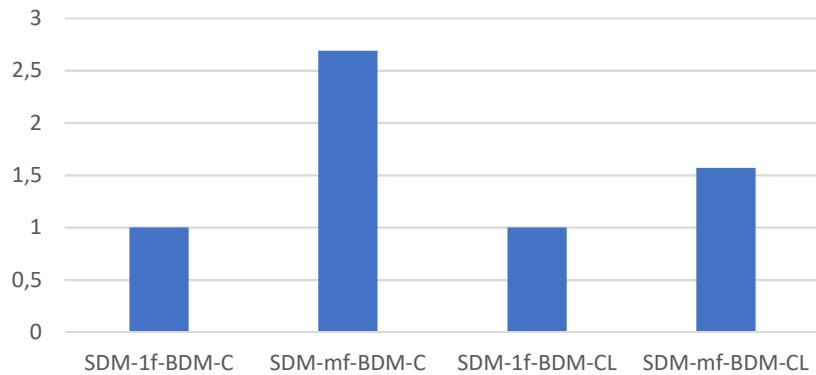
Throughput



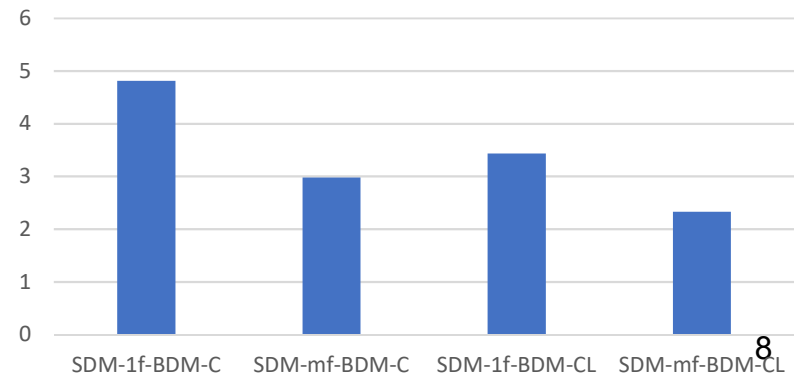
Allocated



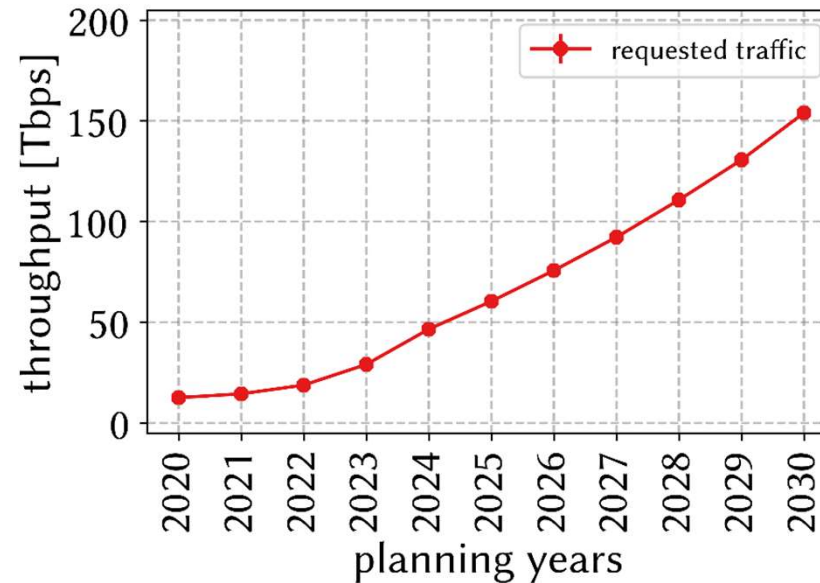
Avg. Fiber/link



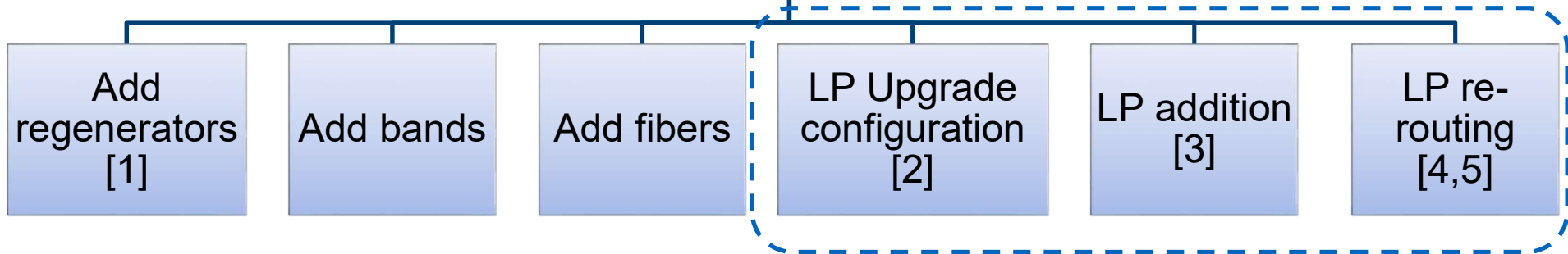
Avg. Spe. eff.



Multi-period RCSA problem



How to cope with the BR increase demands?



[2] OFC 2020 „ HeCSON: Heuristic for Configuration Selection in Optical Network Planning”

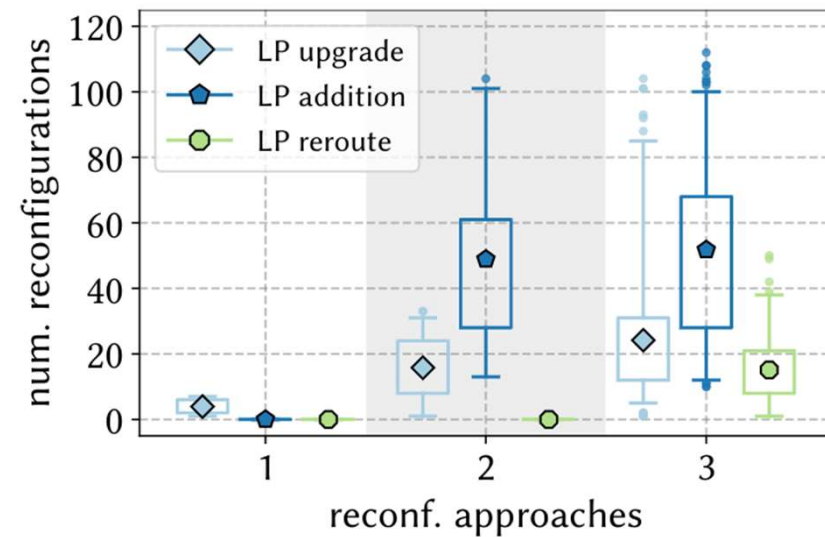
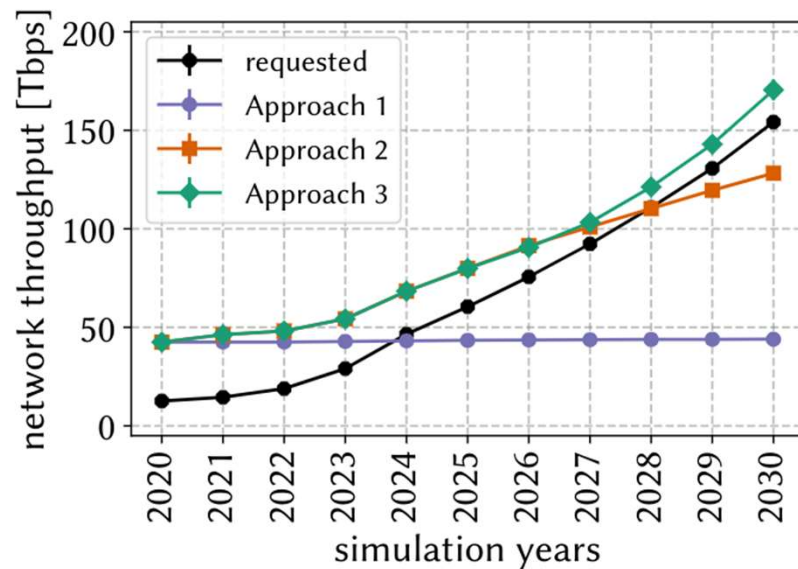
[3] ECOC 2020 „Planning Optical Networks for Unexpected Traffic Growth”

[4] OFC2021 „Towards Dynamic Network Reconfigurations for Flexible Optical Network Planning”

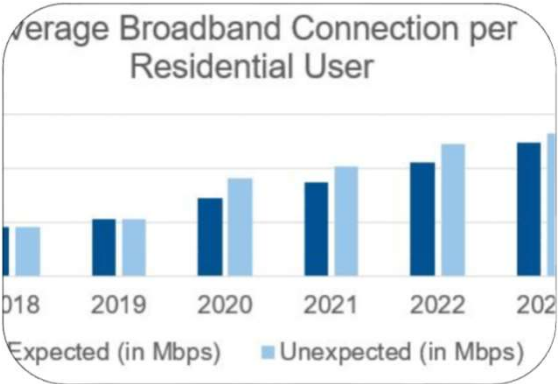
[5] ONDM2021 „Evaluation of Lightpath Deployment Strategies in Flexible-Grid Optical Networks”

Case study: Nobel-Germany

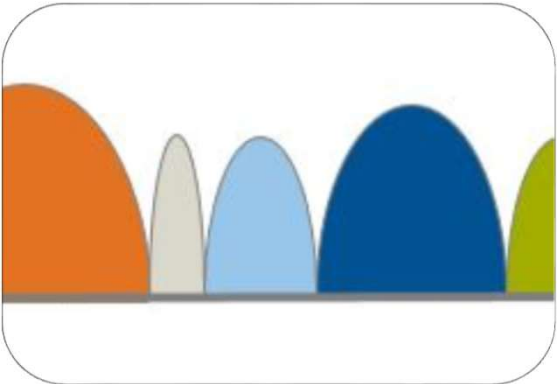
- Comparing three approaches:
 - Approach 1: LP Upgrade
 - Approach 2: LP Upgrade + LP Addition
 - Approach 3: LP Upgrade + LP Addition + LP Reroute



Conclusions



5G/6G keep increasing BW requirements of demands



Spectral efficiency



Coping with requirements at lowest cost