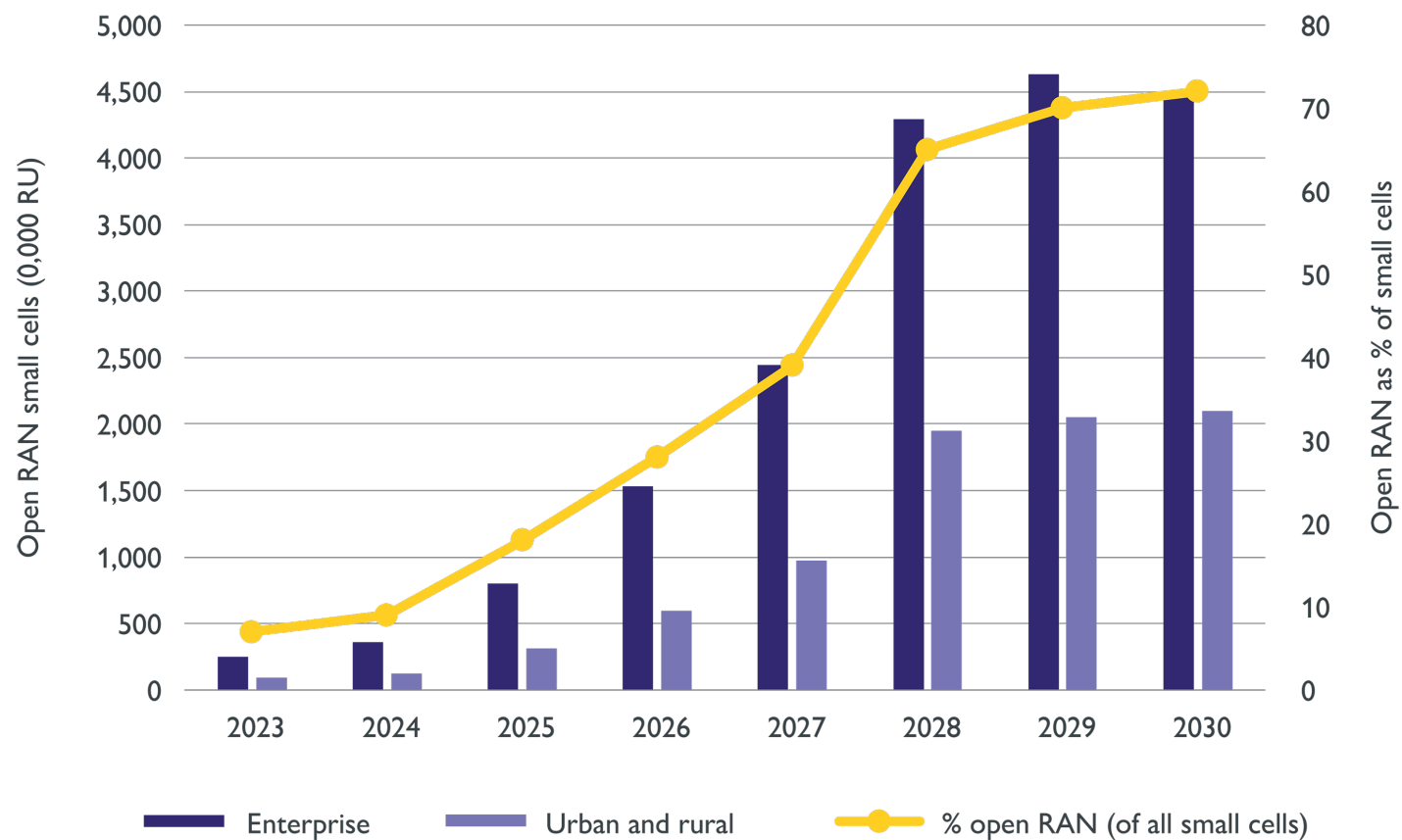




# SCF Championing Open Networks & Disaggregation

**Ryan Husbands, BT**  
**WI Lead**

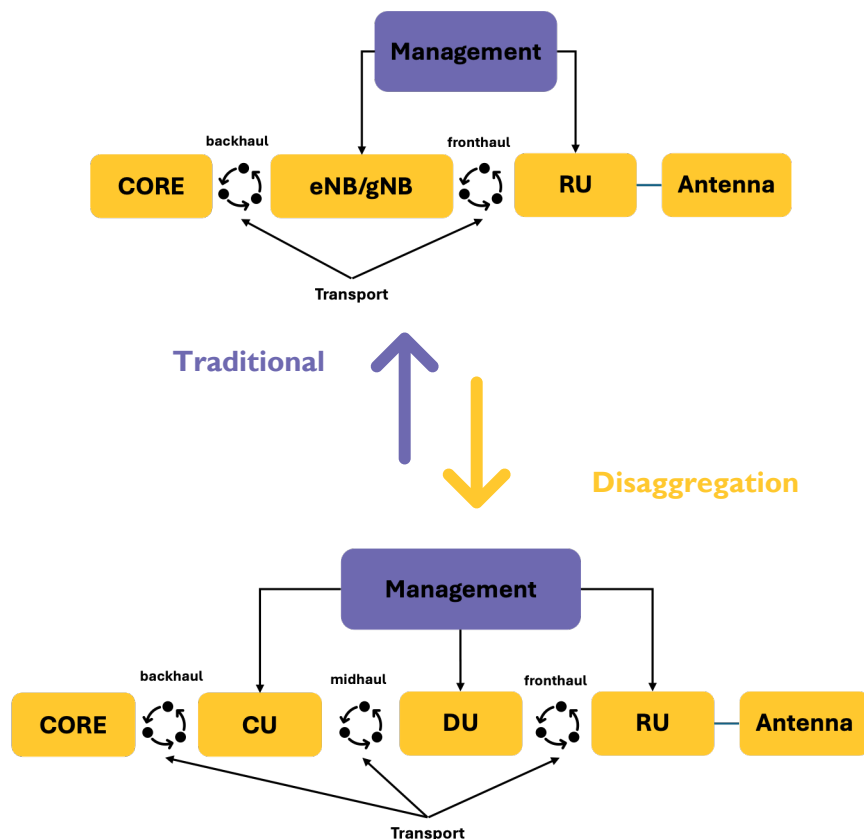
# Open Architectures



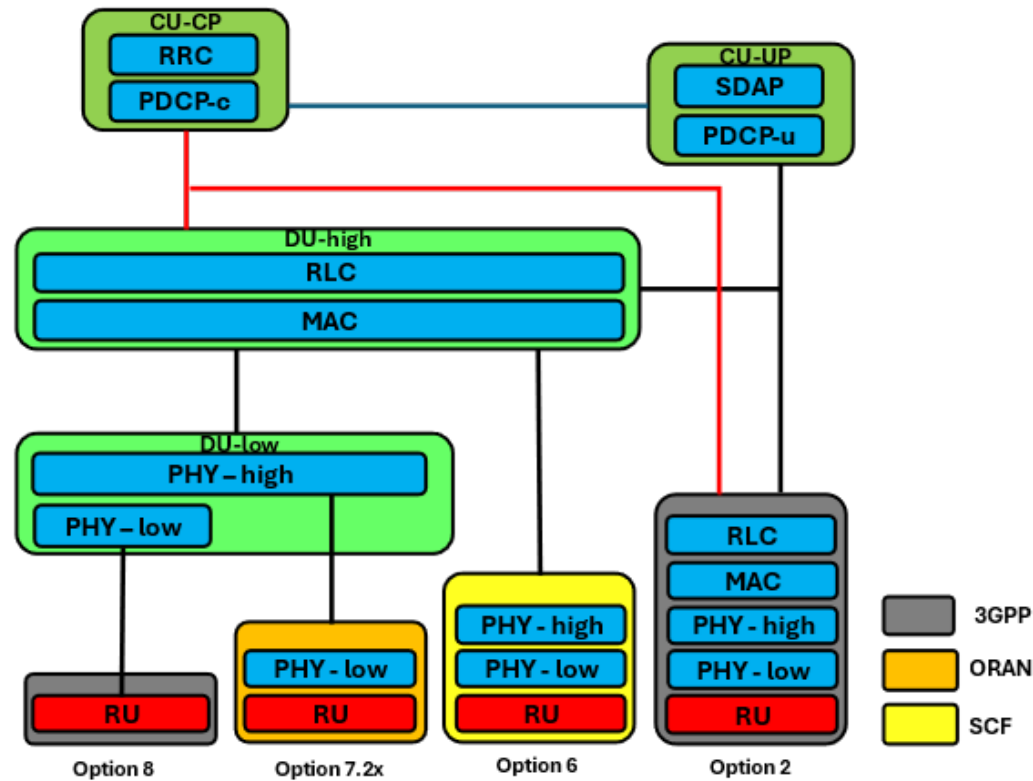


# Network Architectures

- Consider the pros and cons of these different RAN architectures
  - characteristics
  - cost of transport vs compute
- Key Input: throughput requirement
- **DARTS**=DisAggregated RAN Transport Study

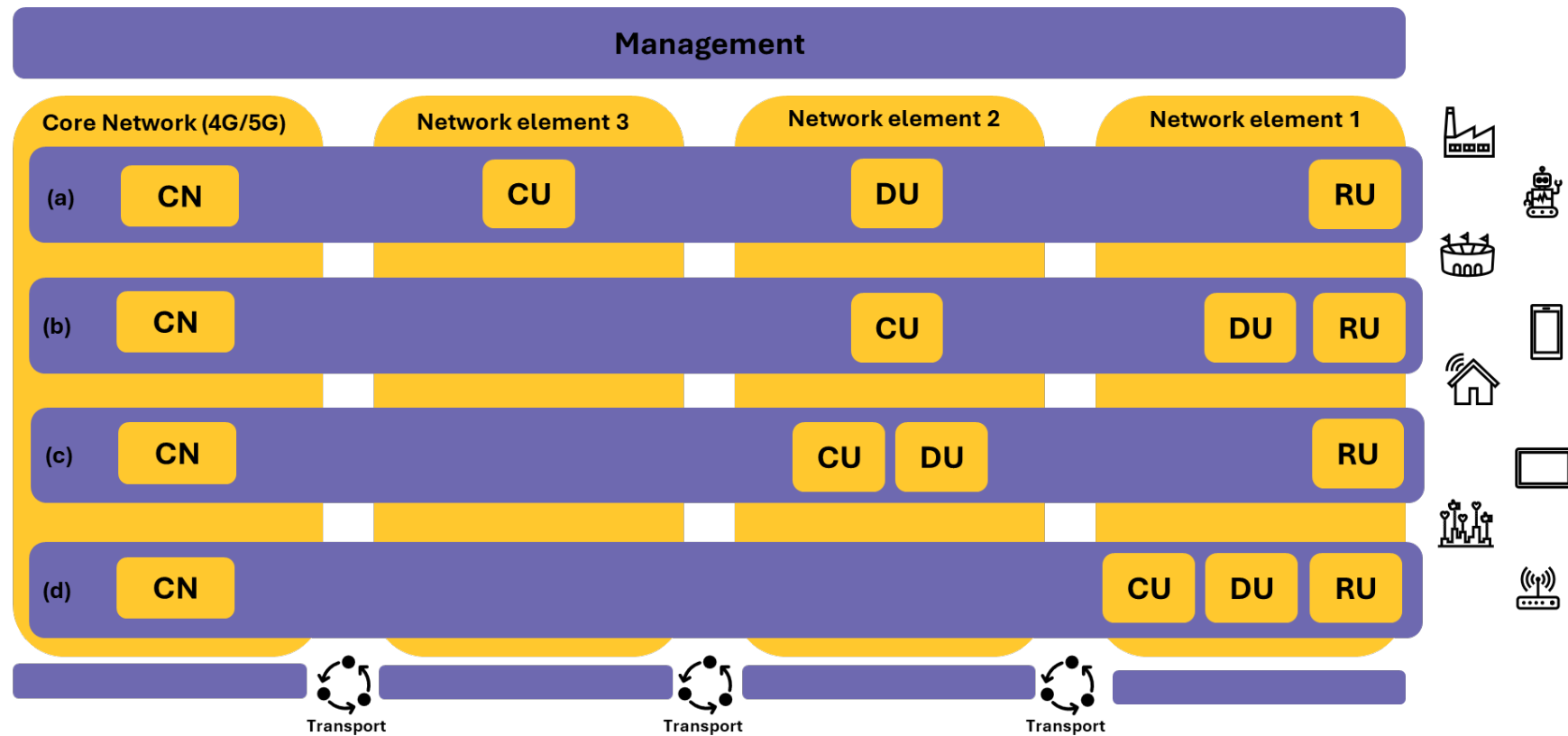


# Split Options:



- **Basic Tradeoff among various Splits:**
  - Fronthaul Bandwidth vs. Coordination Benefits
  - Others include:- Cost-Flexibility-Ecosystem etc.

# Architecture: Network Elements



# Transport Types:

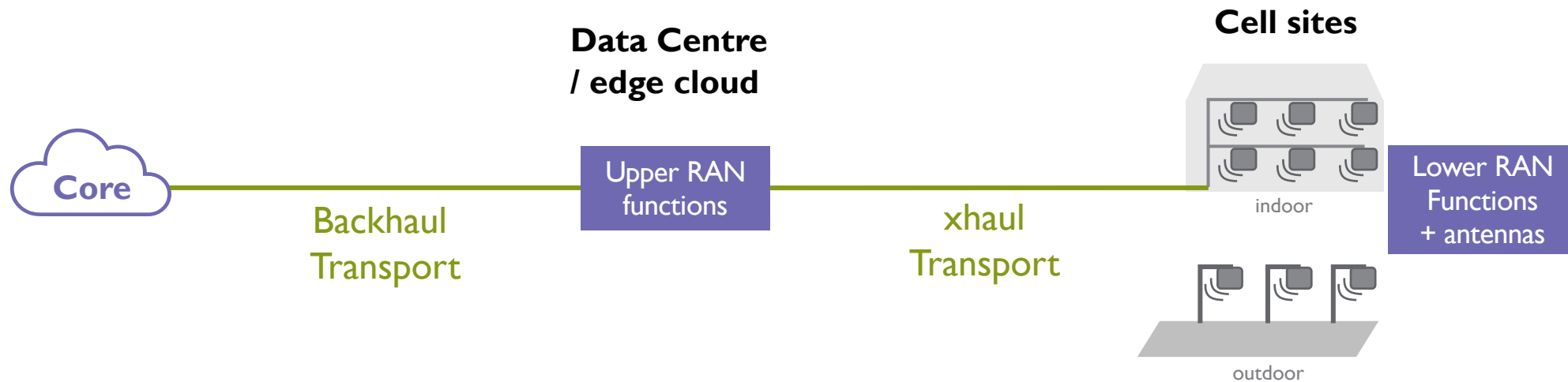


Technology	Typical Bandwidth
Ethernet	1 Gbps–400 Gbps
Fiber Optics	10 Gbps–1.6 Tbps
Wireless: Microwave	100 Mbps–1 Gbps
Wireless: mmWave	2–10 Gbps
Integrated Access Backhaul (IAB)	500 Mbps–2 Gbps
Satellite (GEO)	10–100 Mbps
Satellite (LEO)	50–200 Mbps

# Key parameters to consider when choosing a RAN split



Two-unit split shown

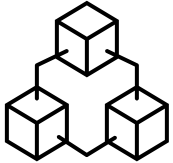


## Factors:

- Cost of space/power/compute at cell site vs data centre
- Cost of transport between sites, which is scaled by throughput requirement
- Throughput impacted by cell site air interface configuration:
  - channel bandwidth, MIMO, peak rate

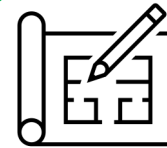
# Additional Optional Considerations

*tending towards mandatory*



## **Modular**

**Modularity** allows for swapping of components, which supports a diversity of deployments.



## **Functional Architecture**

**Network simplification** leading to scalable and flexible deployment models.



## **Software**

**Virtualised Network Functions** realisation of scenarios through software-based features.



## **Sustainable**

**Lower cost deployments** with reductions in digital divide.

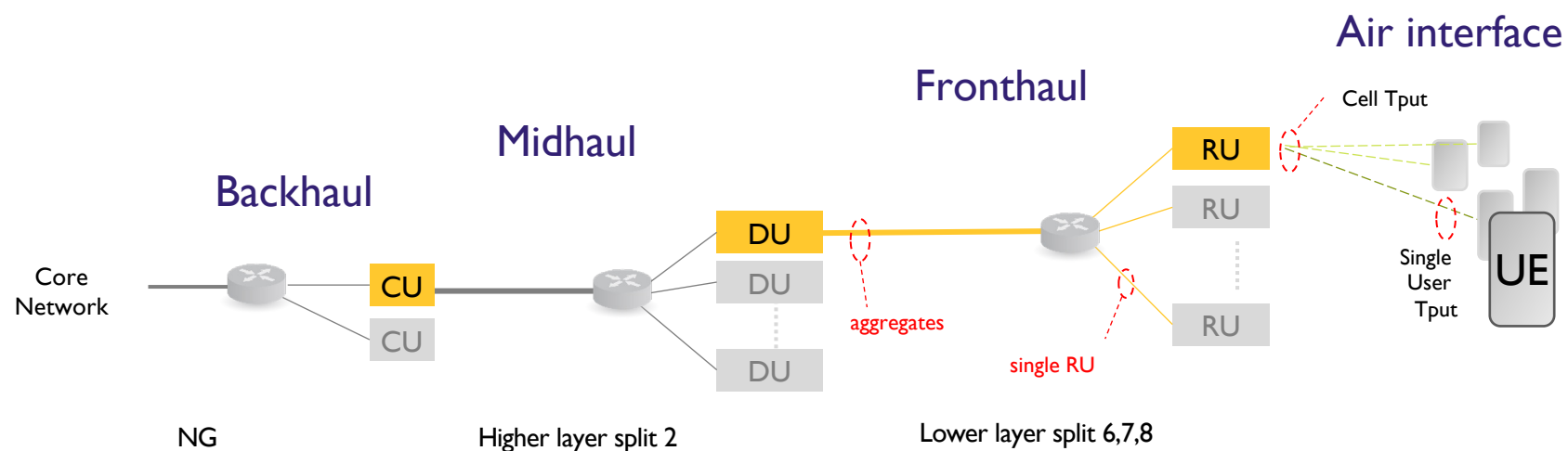




# **DARTS: Dis-Aggregated RAN Transport Study**



# Evaluating Transport Bandwidth

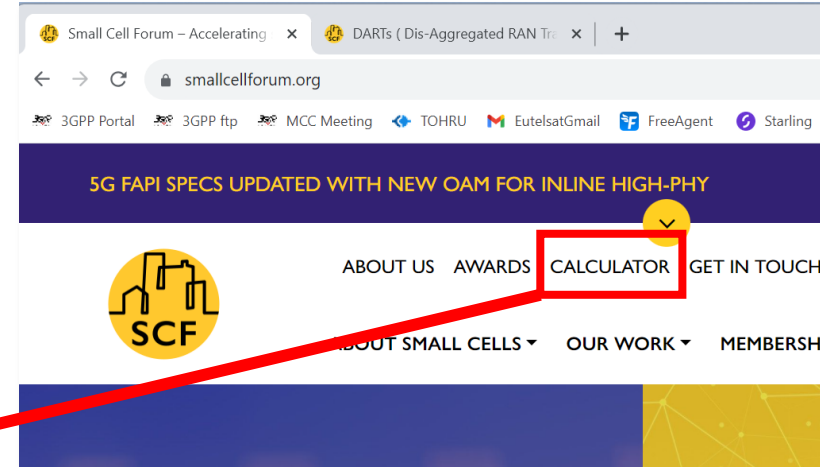


**DARTS provides characteristics of traffic on backhaul, midhaul and fronthaul**  
**Peak rates of dedicated links and typical rates of aggregates drive transport provisioning**

# Web Based DARTS tool at [smallcellforum.org](http://smallcellforum.org)


I) Goto <http://smallcellforum.org/calculator>

## 2) Input air interface configuration



### 3) **Outputs:** transport bandwidth at different split points

# DARTs (Disaggregated RAN Transport study)



## Network infrastructure deployment modelling calculator

The DARTs online tool and its outputs are for informational purposes only and are provided 'as is' with no warranties whatsoever from SCF, including any warranty of merchantability, fitness for any particular purpose, or any warranty otherwise arising out of any proposal, specification, or sample.

Please complete each input field and then press compare. If the inputs aren't visible, or you need to reset your selection, use the reset button.

Technology

NR

Duplex mode

FDD

Enable Massive MIMO

NO

Bandwidth

10

Antenna Configuration

2T\*2R

Number of DL MIMO Layer

1

Number of UL MIMO Layer

1


Traffic Dimensioning

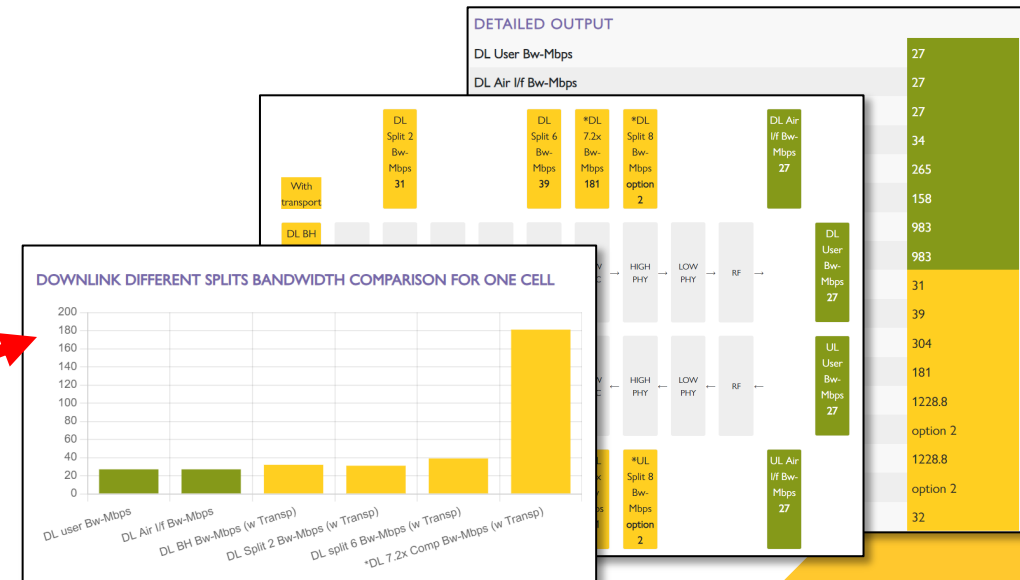
CELL AVERAGE

RESET

COMPARE

### Quick view



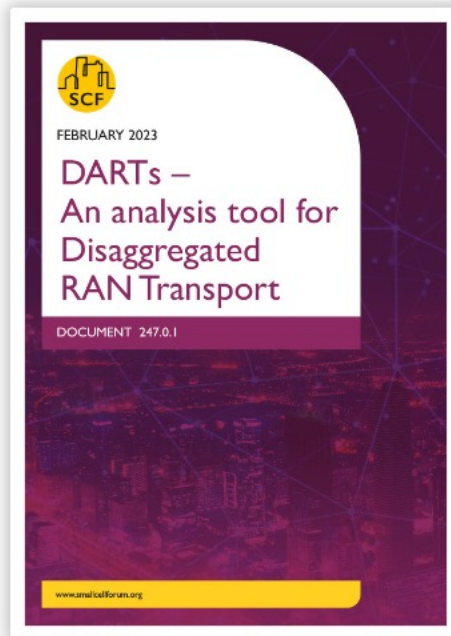




# DARTS Paper at [smallcellforum.org](https://smallcellforum.org)



1) Goto <https://scf.io/en/documents/247> DARTs - An analysis tool for Disaggregated RAN Transport.php



## DARTs - An analysis tool for Disaggregated RAN Transport

Document number: SCF247

The aim of this paper is to help deployers plan, design and budget for transport networks in different deployment scenarios. In the paper we discuss the details of the interfaces of different splits and their transport bandwidth requirements. We also discuss parameters which affect transport bandwidth calculations and their default values.

[DOWNLOAD PDF →](#)



## DARTs Tool Input: *Web based*

Technology <div>NR/LTE</div>	Duplex mode <div>TDD/FDD</div>	Enable Massive MIMO <div>YES/NO</div>	Bandwidth <div>≤100 MHz</div>
Antenna Configuration <div>≤ 8T</div>	Number of DL MIMO Layer <div>≤ 4</div>	Number of UL MIMO Layer <div>≤ 2</div>	Traffic Dimensioning <div>cell peak/average</div>

RESET

COMPARE

**Output:** Three different formats for all the splits

**Members based tool provides more options & capability**

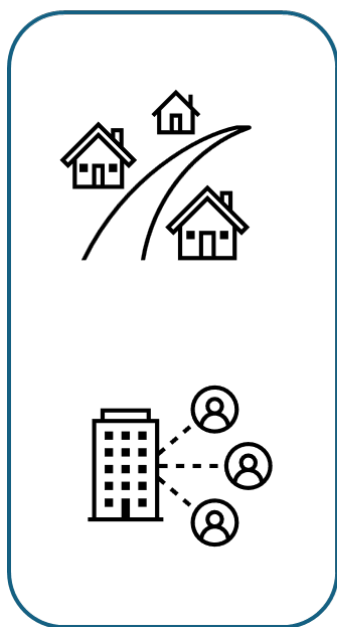


# Deployment Scenarios & Architectures

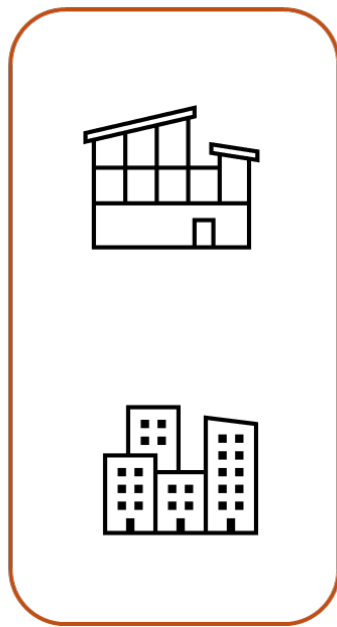


# Example Deployment Scenarios

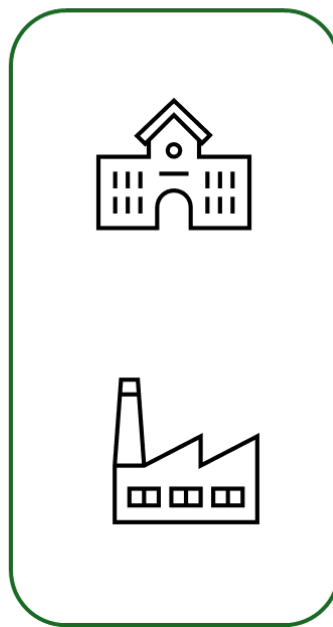
Residential



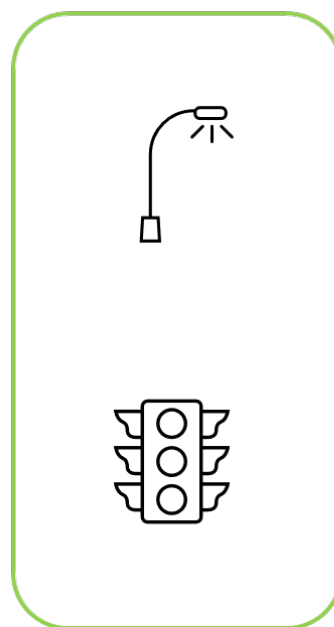
Enterprise



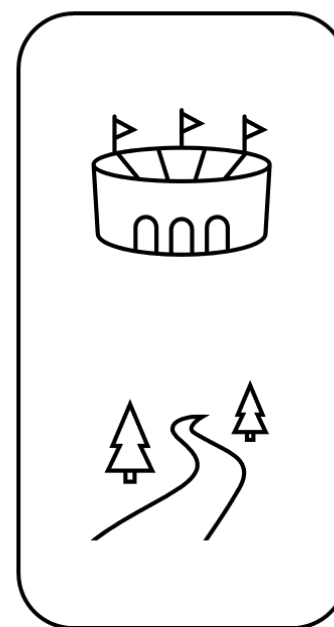
Campus/Industry



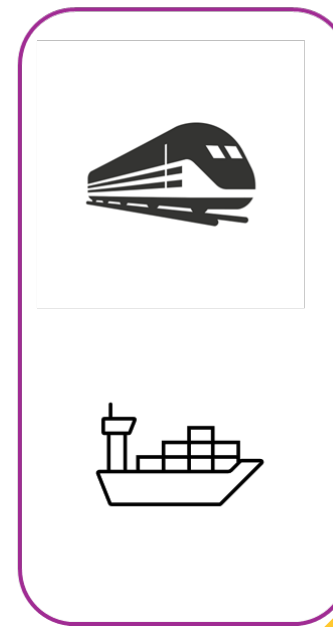
Outdoor



Other



Transit/Cargo

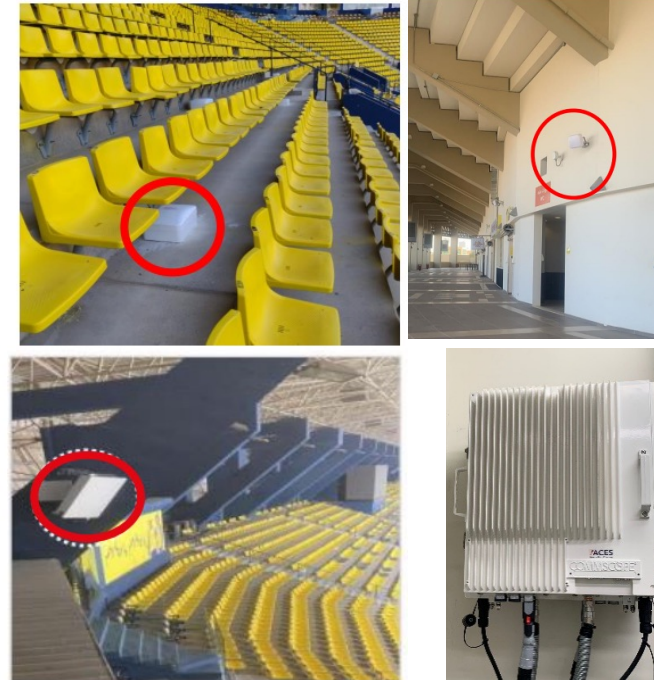




# Evaluating Real World Use Cases:



**Riyadh Metro**



**KSU  
Stadium**





# Summary

## ➤ Positioning Summary

- Leveraging of the DARTS tool for the anticipated fronthaul data rate requirements for example common cell configurations in this work item.
- Future network requirements of simplified, modular, and/or dynamic reconfigurability.
- Consider requirements for uplink performance improvement (ULPI).

## ➤ Key takeaway

- Service providers should consider these trade-offs and their specific use cases when selecting the split option that will best meet their requirements for their nG RAN deployments.



## **DARTs usecase paper coming soon...**

- DARTs usecases paper is getting prepared in the Forum
- Details about different types of the transport technologies
- Identifying requirements related to different transport technologies
- Considerations of future deployment scenarios e.g. NTN, Neutral hosts
- Having practical usecases and their transport requirements
  - Small cell deployment
  - Stadium deployment (mix of LTE and NR cells)



Thank You!