

# Elasticity of Hauls

Leveraging Flexible N/W Architecture for Remote Areas

# The challenges with Remote RAN – Technology to the rescue

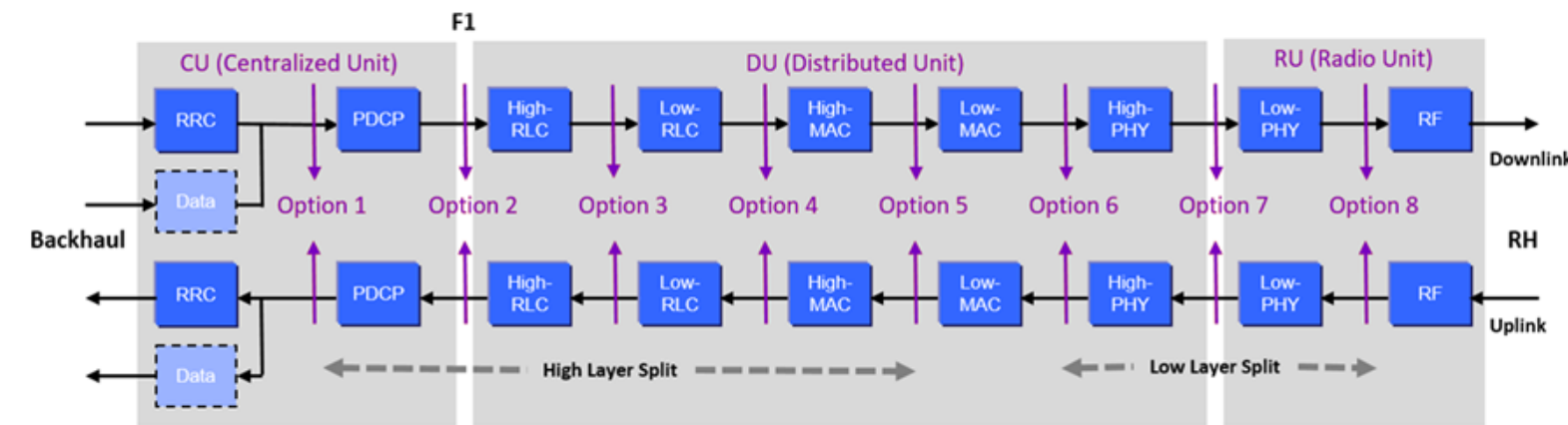
- Investment in spectrum for remote areas
  - Insufficient spectrum
  - Lack of regulations to allow flexible use of spectrum
  - permit operators to trade spectrum as needed,
  - provide a clear roadmap for future releases of spectrum, and
  - auction off spectrum with the aim of boosting connectivity rather than as a technique for maximizing the government's revenue from the sale.
- Investment in infrastructure by operators.

**Return on Investment is poor**

- Evolution of RAN offers an opportunity
- This evolution should be effectively adapted to mitigate this issue

# Evolution of RAN

- Started with just the Air Interface
- Evolved to include static front haul and the mobile radio interface
- The BBU is split into CU and DU, thus introducing the middle haul
- Radio part split into Radio Unit and Antenna unit
- Multiple ways of splitting each unit further



Source: Earlswood Marketing/3GPP

# Leveraging AI/ML

- With increased computing and inferencing capability there is an opportunity to adapt the distributed and virtualized LAN to service the *(commercially) unattractive* and *difficult to access* remote market.
- The multiple hauls have the potential to be designed and deployed flexibly (thus introducing *elasticity in RAN*), thereby
  - mitigating cost and access challenges

# Characteristics of Flexible Haul RANs

- Dynamically programmable high capacity, low latency, point-to-multipoint transceiver
- Software-defined cognitive control plane
- Unified data plane, supporting switching of architectures, as per the latency and jitter demands
- Network component reconfiguration (Reconfigurability)
- Ability to forecast traffic demand, in time and space
- Easy integration of future RAN evolution
- Energy efficiency and joint optimization of RAN resources in terms of dynamic de-activation or decommissioning of scarcely used network portions

Hopefully bringing CAPEX and OPEX to to a reasonable return on investment range

# Existing Approaches to Flexible Haul RANs

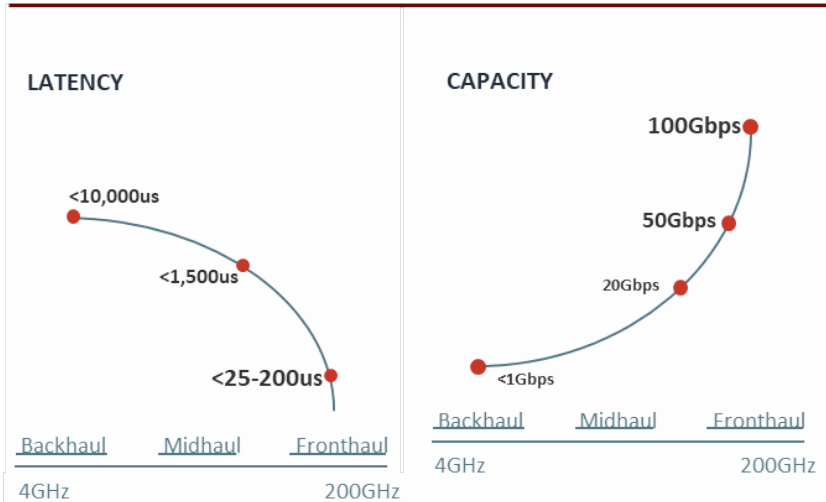
- Most equipment manufacturers are developing their flavours of such RAN architectures
- Open architectures are also being explored and developed
- These efforts
  - should be rationalized,
  - should incorporate requirements of remote connectivity and
  - form contributions for 6G

The approach by Ceragon is discussed as an illustration in the next 3 slides

# FLEXIBLE WIRELESS HAULING

## THE BLUEPRINT FOR IMPLEMENTING SUCCESSFUL 5G STRATEGIES

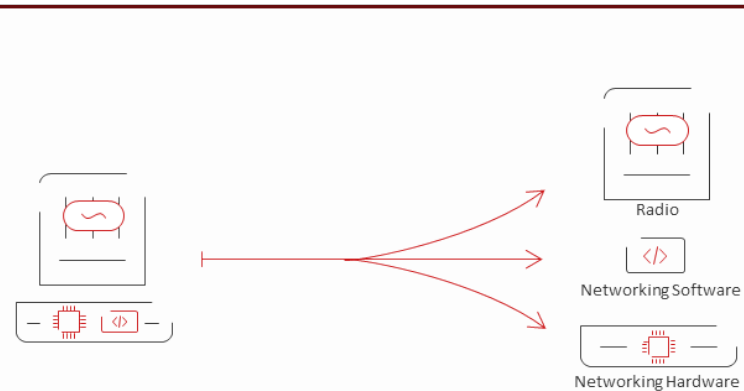
### FLEXIBLE SPECTRUM



- Any hauling scenario (backhaul, midhaul, fronthaul)
- Any capacity
- Low latency, compact nodes
- Flexible site acquisition via all-outdoor radios

Eliminate dependency on fiber  
Save time and money

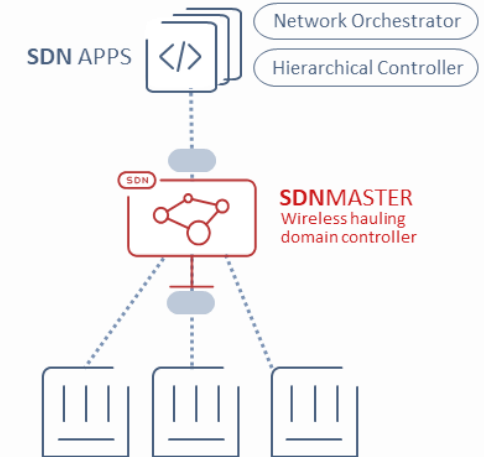
### DISAGGREGATED WIRELESS HAULING



- Low total network investment
- Fast network rollout
- Simpler network evolution
- No vendor lock-in

Open network approach adopted  
by major Tier 1 operators

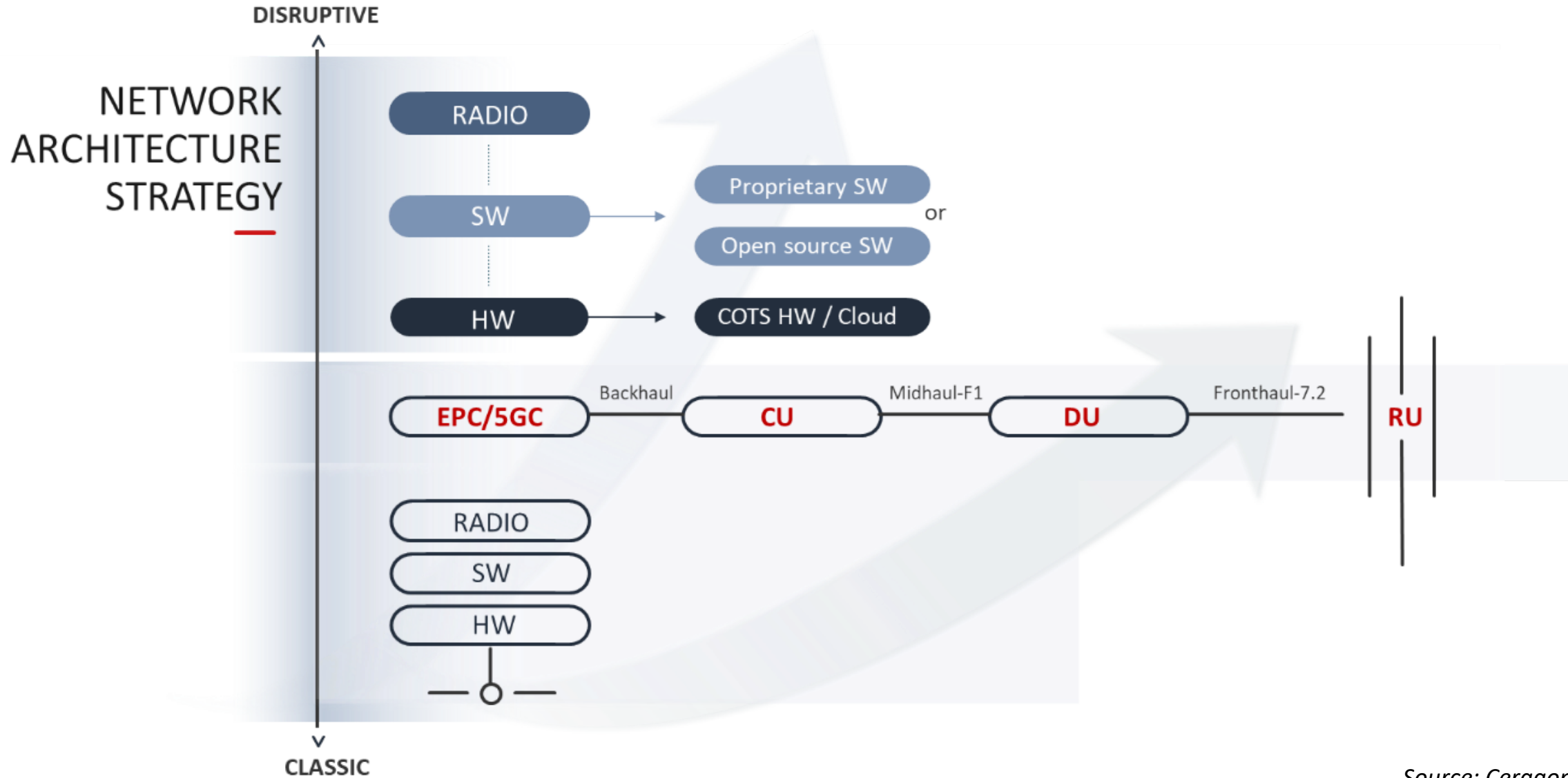
### SOFTWARE-DEFINED NETWORKING



- Faster time to market for new 5G services
- Simple network slicing
- Network optimization

Network & operations  
simplification

# 5G DISRUPTION QUADRANTS - NETWORK ARCHITECTURE STRATEGIES AXIS







Cloud-native core is a done deal



Disaggregated hauling gains traction



Cloud RAN is the current battleground

EPC/5GC

HAULING

CU

DU

RU

DISRUPTIVE

NETWORK ARCHITECTURE STRATEGY

**COST-DRIVEN**

Reduce expenses

Create leverage over current vendors

**HIGHLY DISRUPTIVE**

Enter new markets by broadening services portfolio

CLASSIC

DISRUPTIVE

SERVICES EVOLUTION STRATEGY

**CONSERVATIVE**

Maintain operating model and cost structure, focus on current markets

**NICHE DISRUPTIVE**

Focus on specific markets via specialized services

CLASSIC

# Potential Contributions Opportunities

- Supporting ultra low mobility in some of the hauls
- Some of the hauls should have physical layer specification for optimal use of spectrum resources
- Software defined network specifications to ensure that remote area requirements are addressed
- Reconfigurable Back/Front Hauling
- Hierarchical architecture of RAN hauls

Thank You