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CEPT ECC
Electronic Communications Committee

Asymmetrical Links in Packet-based Mobile Transport Networks

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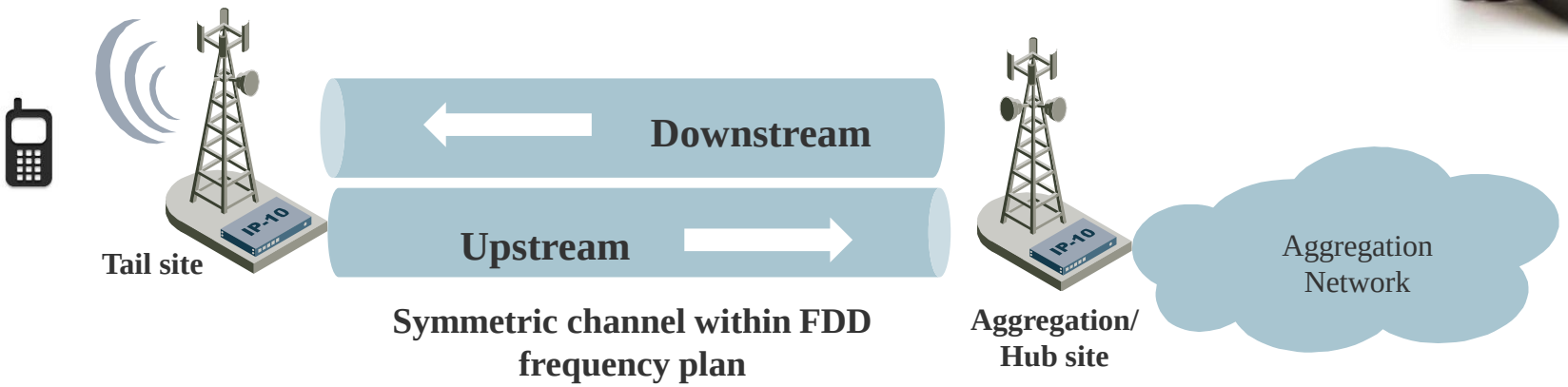
Agenda

- Asymmetrical links concept and benefits
- Review a real life network example
- Summary

Legacy Communication Systems
Voice Oriented Networks



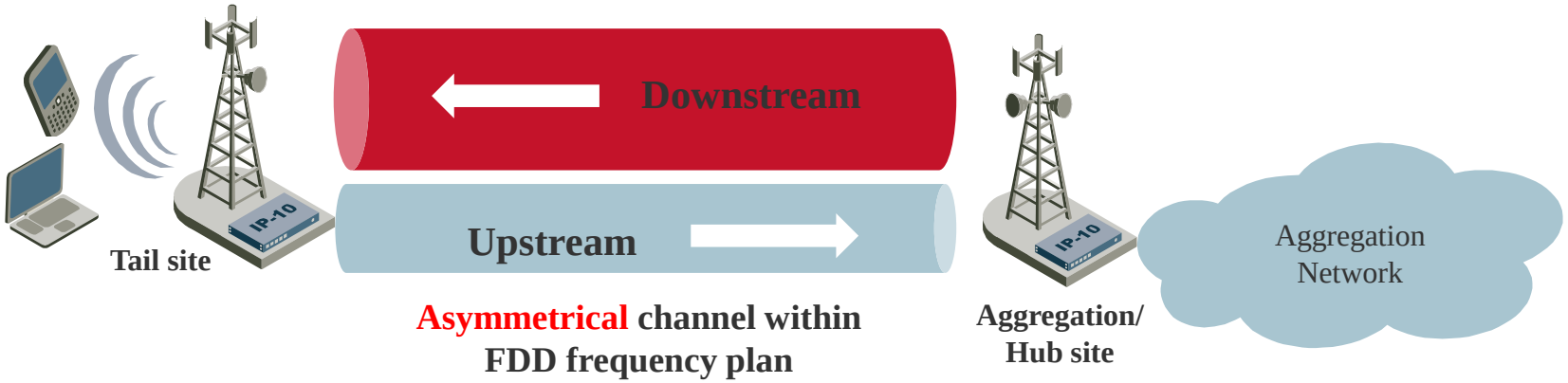
- TDM Voice traffic dominates
- DL and UL bandwidth allocation is equal
- Wireless P2P links are based on voice paradigms (SDH/PDH)
- Regulators provide the same amount of spectrum in both directions

Modern Communications

Asymmetrical by Nature

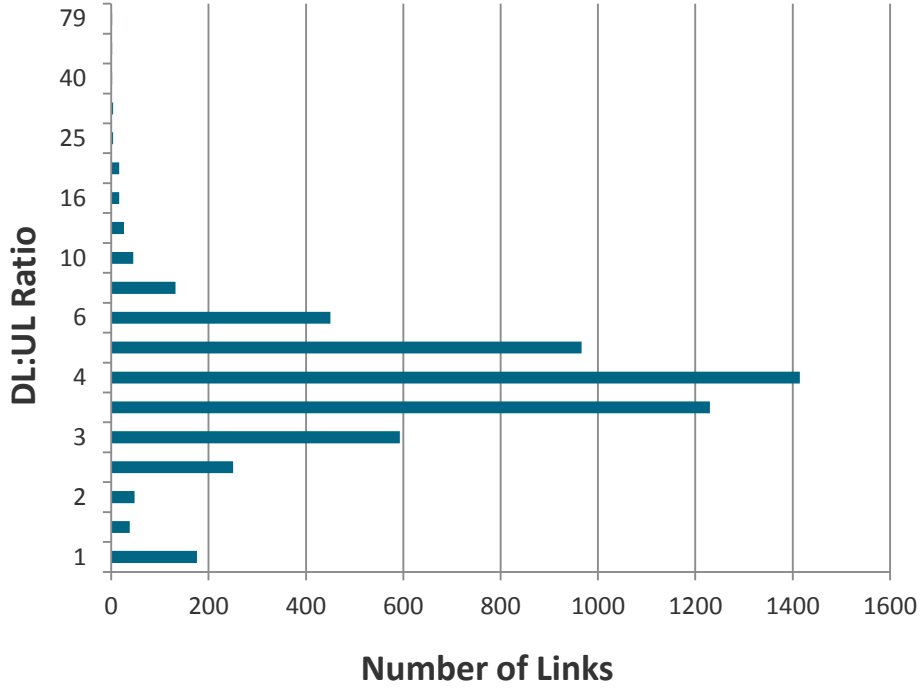
- **Modern communication is asymmetrical by nature**
  - Browsing
  - Video streaming…
- **The Base station - Handheld channel will always be asymmetrical**
  - ~10dB difference, BTS to handset TX power → half the capacity in the uplink.
  - Capacity increasing techniques on the UL (MIMO, Channel aggregation) requires TX amplifiers addition → Quickly draining the handheld battery – Not practical.
- **Cloud computing:**
  - May cause more UL capacity – storing work on the web
  - But, will also cause more DL capacity – Downloading this info to several devices.
  - Many of the cloud computing applications are DL oriented – sending only the differences on the UL.

Benefits of Asymmetrical Spectrum Usage
Tuned to the needs of 3G/4G networks



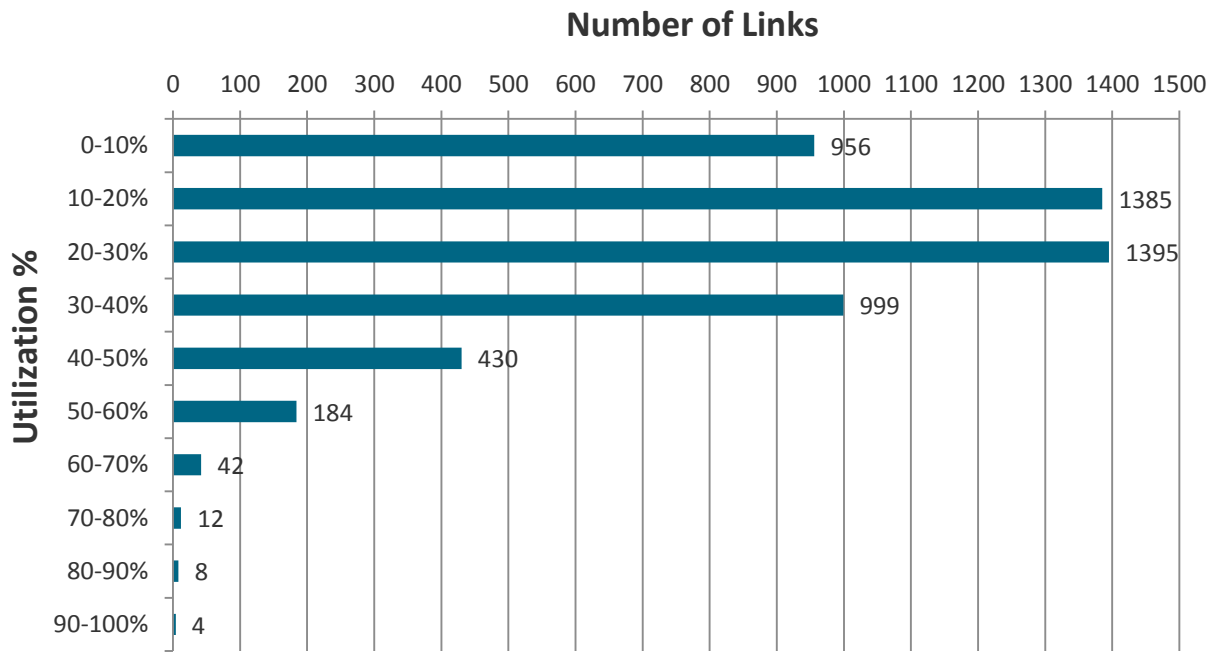
- **Dramatically increase backhaul spectrum utilization**
  - Less spectrum for services - avoid spectrum congestion
  - More capacity-per-site using same spectrum allocation
  - Support more links in a given geographical area
  - Increase spectrum channel reuse
  - Better Operator TCO - promotes services growth for public benefit

Asymmetrical Links Test Case
Real Life Network Analysis – DL:UL Ratio



- Large mobile operator in western Europe
- Study encompassing 5415 links – Entire network; access and aggregation
- 96% with DL:UL ratio higher than 2:1

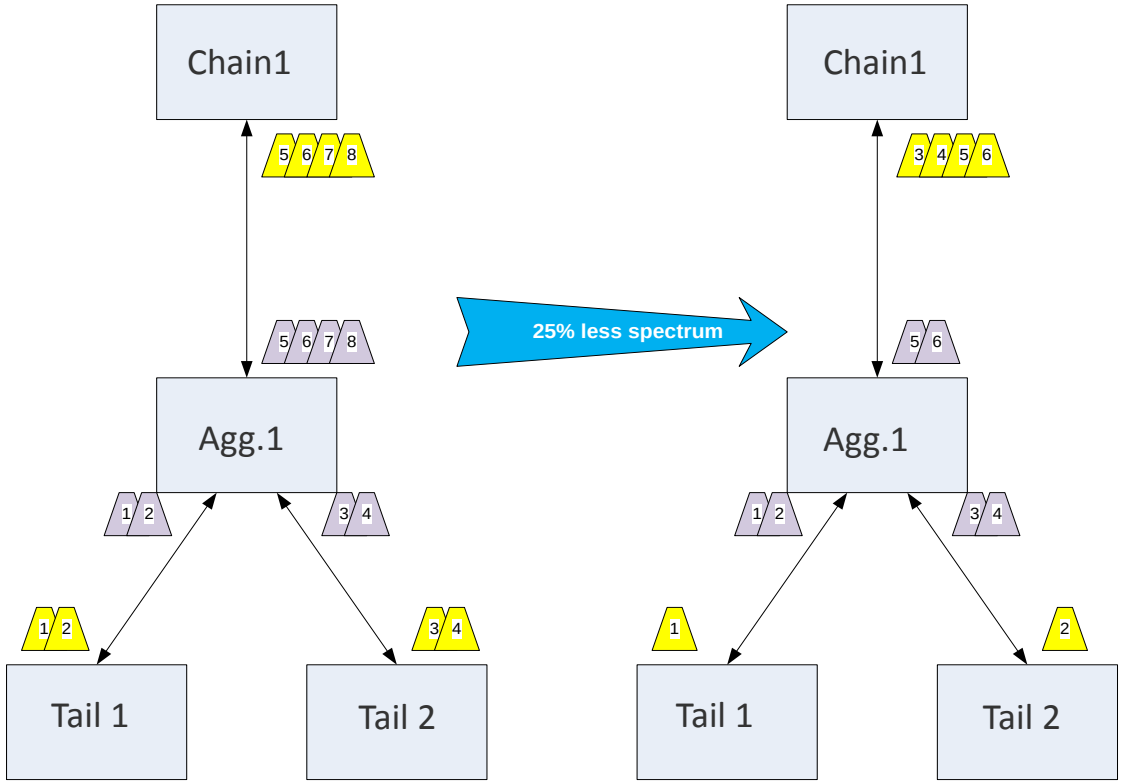
Asymmetrical Links Test Case
Real Life Network Analysis - Utilization



- 99% of the links, with less than 80% utilization
- Combined with the previous picture we understand why…

Benefits of Asymmetrical Spectrum Usage

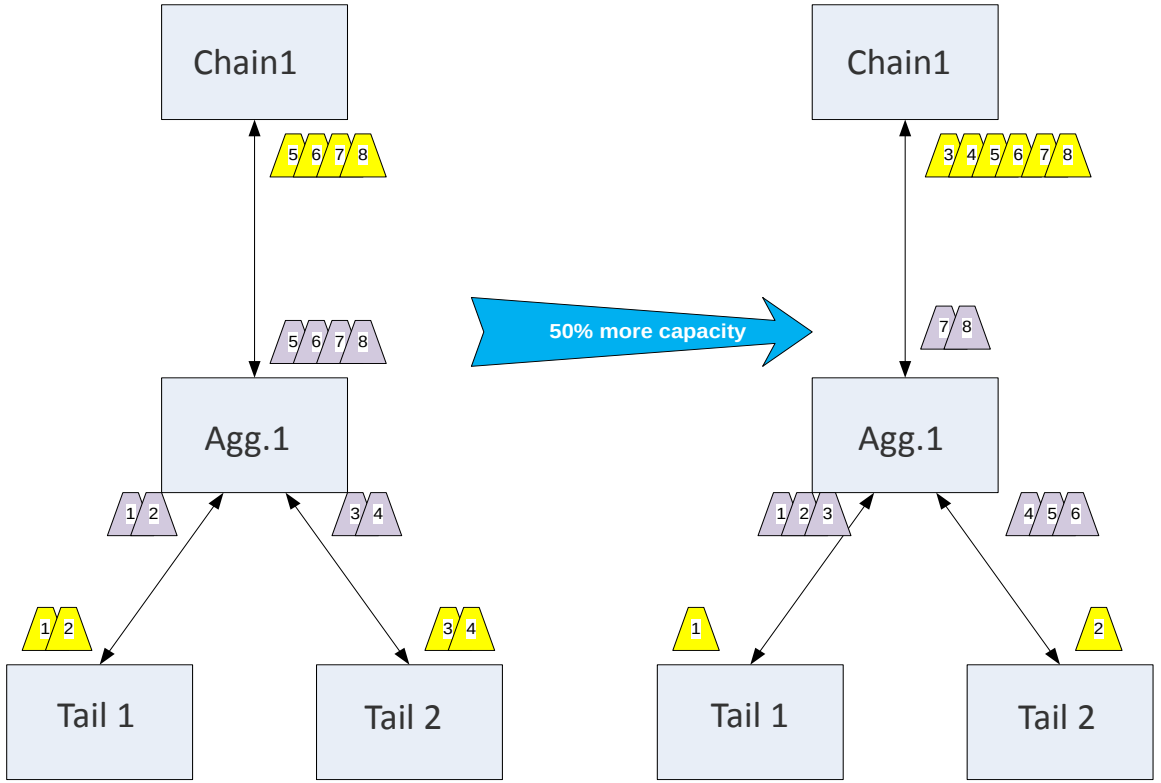
Theoretical Example 1:



- **Assuming you can't reuse the frequencies**
- **Saving 25% of spectral resources**

Benefits of Asymmetrical Spectrum Usage

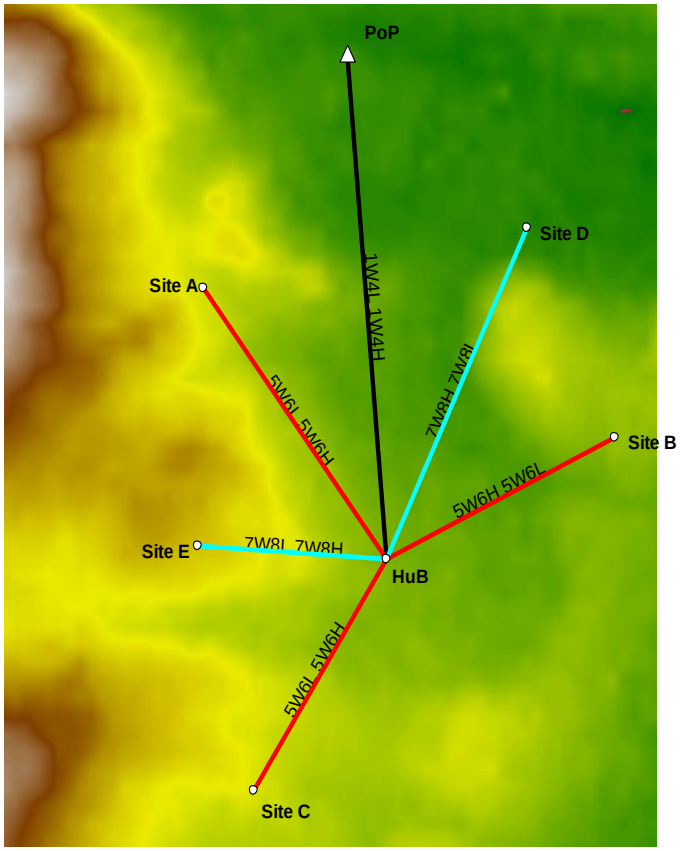
Theoretical Example 2:

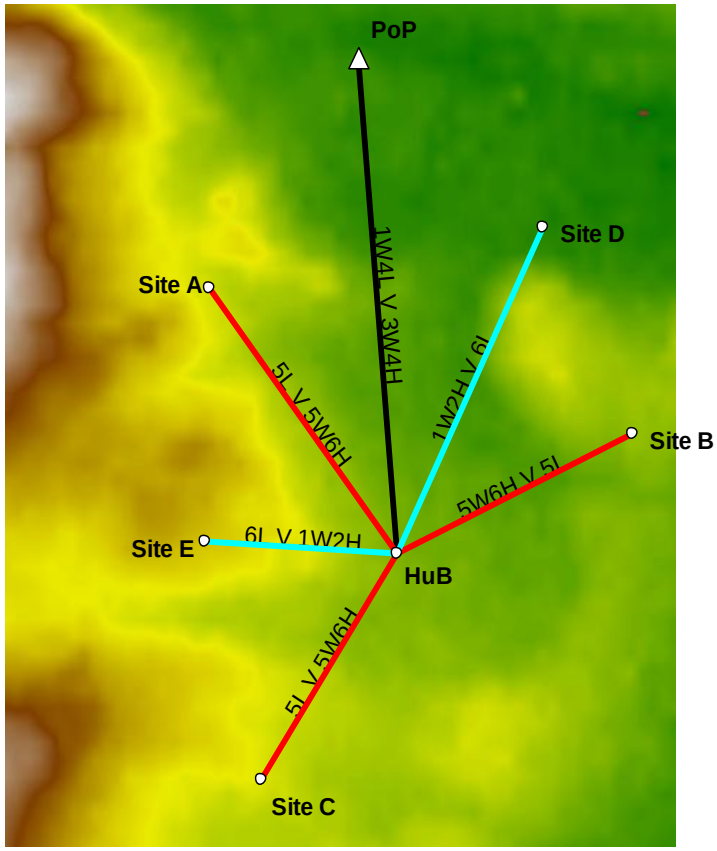


- **Assuming you can't reuse the frequencies**
- **Getting 50% more capacity**

Benefits of Asymmetrical Spectrum Usage

Real life Example (XPIC links) 3:





- Adding sites D and E requires additional channels - 7,8

- Adding sites D and E reusing channels 1,2 from the aggregation link.

Technology is Available for All

- **Radio Technology – MODEMs can be SW configured to control system spectral utilization.**
  - All MW vendors are already doing so - ACM.

- **Planning Tools – Same process as for symmetrical link planning.**
  - **Propagation** – Symmetrical and Asymmetrical links behave the same.
  - **Planning SW** – Asymmetrical planning requires different parameters within the same inputs framework (C/I, NFD…).
  - **Frequency coordination** – Already performing bi-directional links coordination

    (Both stations independently assessed in terms of interference causing and generating)

Pathloss

Asymmetrical Links – NOT a Paradigm Change

Summary

- **Asymmetrical planning shows definite spectrum saving – In any scenario.**
- **Another tool in the planning tool box – not a mandatory requirement.**
- **Based on available standardisation, channel plans and working process – Not a paradigm change!**

Ceragon recommends:

- Adopting unidirectional allocation of spectrum for P-P links.
- Allowing concatenation of Nx7MHz channels

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