Comparison of 1 6T bandwidth for base stations using telecom-grade routers

Overview

NADDOD 1.6T Optical Transceiver Differences AnalysisLearn the key differences between 1.6T transceiver models, including InfiniBand vs Ethernet protocols.

Key Takeaways

1. 6 Terabit Ethernet enables next-generation base station backhaul with 200 Gb/s per-lane signaling, PAM4 modulation, and advanced coherent optics, offering high throughput, low latency, and energy-efficient deployment. Key Technical Features1.

Lane Speed and Modulation: 1. 6T Ethernet achieves its high bandwidth using 200 Gb/s per-lane electrical signaling combined with PAM4 modulation, which encodes 2 bits per symbol to increase data throughput without doubling the channel count. This is a significant evolution from 800G Ethernet, which typically uses 100 Gb/s lanes.

Higher-order modulation allows backward compatibility and reduces forward error correction overhead, minimizing latency. 2.

Ser

Des and Switching Chips: Modern telecom-grade routers rely on high-speed SerDes (serializer/deserializer) channels integrated into ASICs. For 1. 6T, 512 SerDes channels at 200 Gb/s are projected, enabling low-latency switching and supporting multiple high-speed ports.

This is critical for base stations handling aggregated traffic from multiple 5G or 6G cells. 3. Optical vs.

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Electrical Transmission: Two main approaches exist for 1. 6T deployment: Coherent optics (e.g., Ciena WaveLogic 6 Extreme) use advanced DSP and 3nm CMOS technology to achieve 1. 6 Tb/s per wavelength, offering long-distance, high spectral efficiency, and reduced power per bit.

IM/DD (Intensity Modulation/Direct Detection) is more cost-effective for short-range links (up to ~5–10 km), suitable for data center interconnects or base station aggregation points. Coherent solutions provide higher performance but at increased complexity and cost. 4.

Power Efficiency and Footprint: Using 3nm CMOS DSP chips and optimized modulation, 1. 6T systems can reduce power consumption by ~50% per bit compared to previous generations, which is crucial for telecom deployments where energy efficiency is a priority. Compact form factors allow integration into existing router chassis without major infrastructure changes.

5. Deployment Considerations: Implementing 1. 6T in base stations requires attention to: Thermal management due to high-density pluggable optics and ASICs.

Signal integrity and connector design, as 200 Gb/s lanes are sensitive to crosstalk and insertion loss. Distance limitations, where IM/DD is suitable for short-range aggregation, while coherent optics are preferred for longer backhaul links.

Practical Implications for Base Stations

High Throughput: Supports aggregated traffic from multiple 5G/6G cells, enabling ultra-low latency and high-capacity backhaul. Scalability: Future-proof for evolving network demands, with the ability to upgrade from 800G to 1. 6T without major hardware changes.

Cost vs. Performance Trade-off: IM/DD offers lower cost for short links, while coherent optics maximize distance and spectral efficiency. Energy Efficiency: Advanced CMOS and DSP designs reduce operational costs and heat dissipation, critical for dense telecom environments.

Conclusion: Deploying 1. 6T bandwidth in telecom-grade routers for base stations provides a high-capacity, low-latency, and energy-efficient solution. The choice between coherent optics and IM/DD depends on link distance, cost constraints, and network architecture, while PAM4 modulation and high-speed SerDes ensure compatibility with next-generation 5G/6G traffic demands.

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