CASE STUDY

T-Mobile and Nokia unlock next-level 5G Advanced performance with Zero Forcing MU-MIMO

- Zero Forcing MU-MIMO delivers gains of up to 60% in throughput and spectral efficiency
- Efficient MU-MIMO pairing supports more users, higher traffic demand, and better economics
- Users enjoy premium experiences on busy cells, which creates monetization opportunities

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At T-Mobile, we never stop working to provide ever-better experiences for our customers. That’s why we value our partnership with Nokia, which continues to help us deploy technologies that deliver measurable improvements in network performance.

Nokia Zero Forcing MU-MIMO lets us elevate 5G and FWA service in the busiest parts of our network. With Zero Forcing, we can cut out interference between user devices that are close to one another in dense urban areas and hotspot-like situations.

Our tests prove that this technology can enable massive gains in downlink throughput and spectral efficiency. These gains will help us provide the premium experiences our customers expect and improve our ability to monetize our network.”

Egil Gronstad

Sr. Director Technology Development & Strategy, T Mobile US

As the supercharged Un-carrier, T Mobile US, Inc. is powered by an award-winning nationwide 5G Advanced network that connects more people, in more places, than ever before. With T Mobile’s unique value proposition of best network, best value and best experiences, the Un-carrier is redefining connectivity and fueling competition while continuing to drive the next wave of innovation in wireless and beyond.

Nokia is a key technology partner to T-Mobile, supporting the evolution of its mobile network with advanced radio access solutions and software innovations. The collaboration between the two companies is bringing 5G Advanced capabilities to life—enhancing capacity, improving spectral efficiency and enabling the high-performance connectivity required for next-generation services.

This case study highlights how T-Mobile has used the Nokia Advanced 5G Zero Forcingg Multi-user MIMO (MU-MIMO) solution to achieve outstanding performance gains.

OBJECTIVE

Boost capacity and keep improving 5G and FWA user experiences

T-Mobile was the first US telecommunication provider to deploy a nationwide 5G Advanced network. The company built the network on 5G Standalone (5G SA) architecture, which is essential for unlocking the full potential and capabilities of 5G Advanced technology and services.

As 5G traffic grows, T-Mobile must increase the capacity of its network to keep delivering the quality and performance users expect. This is especially important for fixed wireless access (FWA) deployments, where demand can rise quickly in specific locations and during peak hours. FWA subscribers typically consume 20–30x more data than mobile subscribers.

T-Mobile's FWA offering has been a major success, attracting 3.5 million new subscribers over the past two years. The company is now preparing to expand its FWA network to support 15 million customers by 2030. To help support this increase, T-Mobile is seeking to improve the spectral efficiency of its existing spectrum and radio access network (RAN) infrastructure assets. The challenge is to determine how to support more traffic while continuing to deliver great user experiences for smartphone and FWA users in the same cell.

SOLUTION

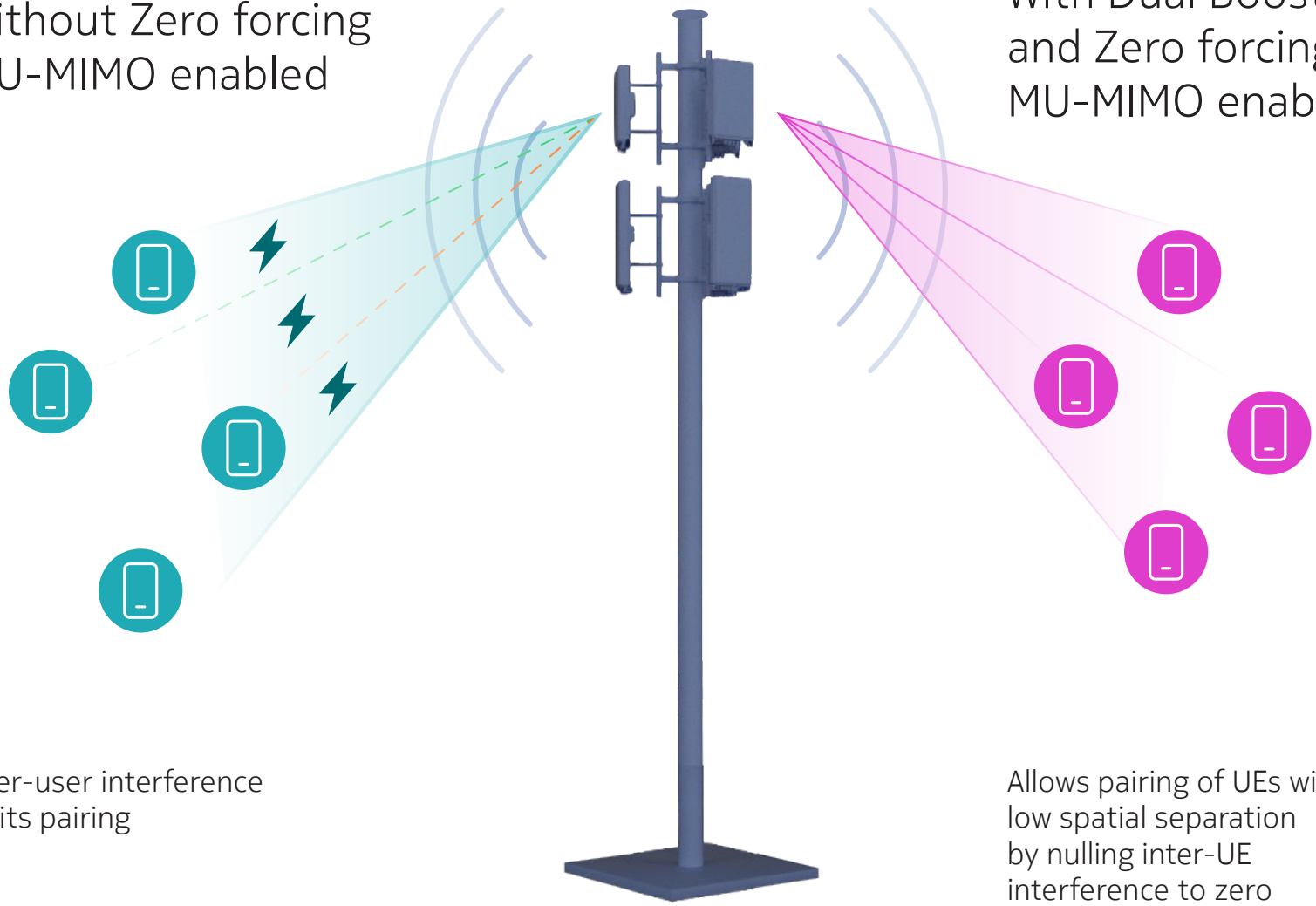
Unlock more downlink capacity with Zero Forcing MU-MIMO

T-Mobile is deploying the Nokia Zero Forcing MU-MIMO solution in the downlink to maximize network efficiency and deliver superior user experiences. This 5G Advanced capability runs on Massive MIMO radios and improves the way multiple users are simultaneously served by the network. Powered by Nokia Dual Boost technology, Zero Forcing MU-MIMO boosts the performance, capacity and monetization potential of 5G TDD networks in busy areas where devices are relatively close to one another and congestion can sometimes limit capacity.

To achieve these improvements, Zero Forcing MU-MIMO uses an advanced pairing algorithm that efficiently groups user devices. Pairing minimizes interference between devices by nulling, or "Zero Forcing," the radio frequency signal directed toward other users in the cell. This results in better spectral efficiency, a consequential increase in average cell downlink capacity and more capacity headroom in busy cells. The technology is supported by Nokia Habrok Massive MIMO radios.

With more efficient MU-MIMO, T-Mobile can support more users, high traffic demand and better network economics in locations where radio resources are already under pressure. This will enable the company to expand FWA or introduce premium 5G performance tiers by creating a practical path that can scale, which makes it highly relevant for dense urban traffic, hotspots and FWA-heavy traffic peaks.

Without Zero forcing MU-MIMO enabled



Inter-user interference limits pairing

With Dual Boost and Zero forcing MU-MIMO enabled

Allows pairing of UEs with low spatial separation by nulling inter-UE interference to zero

Result

Higher average cell throughput

More users served

Higher spectral efficiency

More capacity from the same spectrum

RESULT

Live tests produce major throughput and spectral efficiency gains

T-Mobile and Nokia tested Zero Forcing MU-MIMO on Nokia radio access infrastructure at T-Mobile headquarters in Bellevue, Washington. The test team used two scenarios involving four user devices.

For the first scenario, testing took place in an area close to the headquarters building, with users spread across the area. In this case, implementing Zero Forcing MU-MIMO led to more consistent, higher-quality device pairing. This resulted in a 60% cell downlink throughput gain compared to the legacy MU-MIMO solution.

For the second scenario, users were located close together. The legacy MU-MIMO solution did not pair devices because of the close spatial proximity of the users. By contrast, when Zero Forcing MU-MIMO was enabled and pairing took place, the resultant cell throughput again showed a 60% improvement.

Overall, the use of Zero Forcing MU-MIMO resulted in a 60% spectral efficiency gain compared to legacy MU-MIMO.

It should be noted that these results were achieved in near-ideal conditions. In practice, Zero Forcing MU-MIMO gains are closely tied to pairing opportunities and will vary based on parameters such as radio conditions, traffic load and user distribution within the cell. In real-world deployments, the most significant gains are typically realized at heavily loaded sites, where increased pairing opportunities translate into higher cell throughput, improved spectrum efficiency, and enhanced user experience.

Up to 60%

Increase in cell downlink throughput verse legacy MU-MIMO

Up to 60%

Increase in spectral efficiency verse legacy MU-MIMO

CONCLUSION

Zero Forcing MU-MIMO sets new performance standards

As operators scale 5G Advanced services and address growing FWA and mobile broadband demands, Zero Forcing MU-MIMO offers a practical way to increase downlink capacity and spectral efficiency using existing spectrum and radio assets. For T-Mobile, the collaboration with Nokia highlights how advanced RAN innovation can support premium user experiences, improve network efficiency and strengthen the foundation for future service monetization.

Read about new opportunities with Advanced 5G

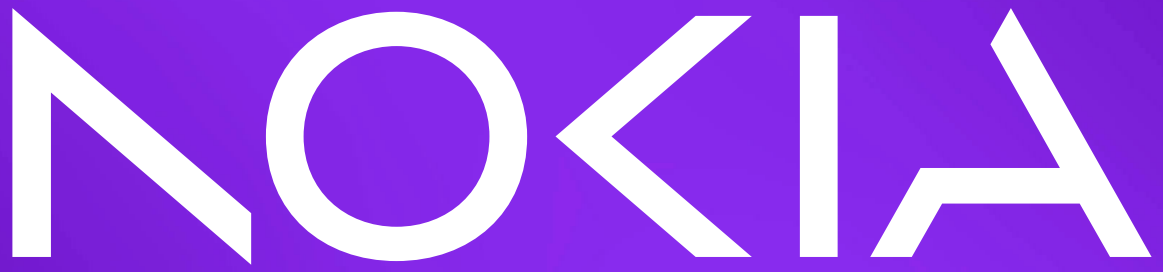
Explore our Advanced 5G solutions

Nokia OYJ
Karakaari 7
02610 Espoo
Finland

Tel. +358 (0) 10 44 88 000

CID: 215509 (August)

nokia.com



About Nokia

Nokia is a global leader in connectivity for the AI era. With expertise across fixed, mobile and transport networks, we're advancing connectivity to secure a brighter world.