

(SD2022-190) Virtualized User-proportionate MIMO for power-efficient base stations and WiFi routers

Tech ID: 33224 / UC Case 2021-Z08-1

BACKGROUND

Frequency-division multiple access (FDMA) is a channel access method used in some multiple-access protocols. FDMA allows multiple users to send data through a single communication channel, such as a coaxial cable or microwave beam, by dividing the bandwidth of the channel into separate non-overlapping frequency sub-channels and allocating each sub-channel to a separate user. FDMA is highly power-efficient and can work with single antenna base stations. This is because FDMA separates users in spectrum and then samples the net increased bandwidth.

Digital beamforming is highly spectrum efficient, however needs multiple antenna base stations. This is because to resolve the multiple users interfering we need to sample the signals from multiple antennas to cancel out the interferences, which requires a dedicated downconversion chain per antenna. The requirement of multiple downconversion chains makes the solution power hungry, and thus has limited adoption.

TECHNOLOGY DESCRIPTION

Researchers from UC San Diego have developed a patent-pending way to avoid the power-hungry nature of downconversion by making the multiple antenna architecture behave like FDMA with a single downconversion chain. Their invention is a novel multi-antenna architecture which achieves Massive MIMO performance by using only a single RF chain. This technology achieves the above by utilizing RF switches that toggle in sync with a high sampling-rate ADCs, allowing this technology to capture multiple antenna signals interleaved across time, in essence, virtualizing the concept of a physically laid RF chain. As a consequence of the virtualization of these RF chains to the digital domain, this patent-pending invention entails a highly power-efficient, scalable, and flexible multi-user beamforming architecture, which can adapt to the number of users, the channel conditions and provide robust multi-user operation by utilizing scalability in deploying additional antennas for the architecture.

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OTHER INFORMATION

KEYWORDS

Time Interleaved Multiple Outputs,
MIMO, multi-user beamforming
architecture, power efficient WiFi

CATEGORIZED AS

- **Communications**
- Wireless

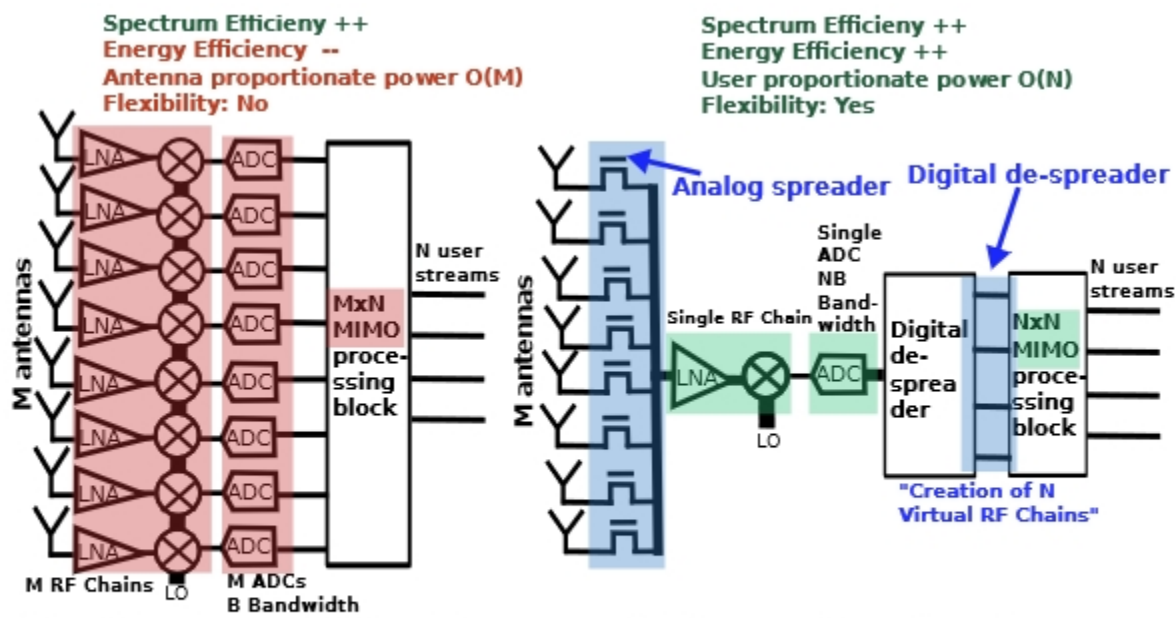
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APPLICATIONS

This can be used by network operators like AT&T/Verizon to create power-efficient base stations. Also, same technology can be used to develop power efficient WiFi routers.

ADVANTAGES



(a) Traditional Massive MIMO architecture (b) Proposed GreenMO architecture
Figure 1: GreenMO solves for energy efficiency by creating a new massive MIMO architecture with flexible user-proportionate power consumption

STATE OF DEVELOPMENT

INTELLECTUAL PROPERTY INFO

UC San Diego has filed patents and is seeking partners to commercialize this technology.

RELATED MATERIALS

- Agrim Gupta and Sajjad Nassirpour and Manideep Dunna and Eamon Patamasing and Alireza Vahid and Dinesh Bharadia. 2022. GreenMO: Virtualized User-proportionate MIMO. - 11/29/2022