



Delivering Robust Connectivity at Major Events

CloudRAN.AI has demonstrated how its 5G hyper-cell solution can remove the need for cell handovers and increase capacity

Highlights

- Providing reliable connectivity at major events spanning a large area, such as a race track, can be very difficult
- To address the challenges presented by high-speed handovers between cells, CloudRAN.AI has developed a solution that replaces multiple cells with a single hyper-cell
- In tests at a major race track in Brazil, CloudRAN.AI's private 5G network reliably transmitted HD video from up to eight cars simultaneously
- The 360-degree live video feeds from inside the cars can be transmitted to broadcasters to give viewers an immersive experience
- The solution could also be used to boost the cellular network capacity for spectators at major sports events

When tens of thousands of people attend major events, mobile phone networks typically become congested making it hard for spectators to get a connection. At some events, such as motor races, this challenge is compounded by the length of the track and the need to provide continuous connectivity to fast moving cars, which are subject to the Doppler Effect – relative motion

between the source and receiver of radio waves changes the frequency of those waves.

In the summer of 2024, CloudRAN.AI, a start-up based in Singapore, successfully tested a potential solution to these challenges. At the Autódromo Velocitta in Brazil, CloudRAN.AI deployed a private standalone 5G network

that covers the entire track with a single “hyper-cell” created by merging the coverage provided by three base stations. Autódromo Velocitta, which has a capacity of 60,000 people, hosted the Formula 1 Lenovo Grande Prêmio De São Paulo 2024.

CloudRAN.AI’s solution is designed to relay live 360-degree high-definition video feeds from the cars, which can be travelling at 250 km/h, and also supplement the public cellular networks used by the spectators. The live videos from the vehicles are transmitted from the private network’s core to the broadcaster covering the race, so that viewers can see the perspective of the drivers.

Lion Li, Director of Product Management of CloudRAN.AI, says the hyper-cell can reliably connect eight vehicles simultaneously, relaying video from three cameras in each car, as well as key telemetry information, such as the speed of travel and the temperature of various components. To provide continuous coverage to the fast-moving race cars, the CRAI HyperCell solution uses an algorithm to anticipate the frequency shift caused by the Doppler Effect and compensate for it, while also avoiding the need for handovers between base stations.

To merge the coverage provided by the three base stations into one hyper-cell (see graphic), CloudRAN.AI takes advantage of the 5G standards, which allow for multiple base stations to employ a single centralised unit (CU), which then uses the standardised nFAPI interface to coordinate with the distributed units (DUs) and radio units (RUs) in the individual base stations. Although the CU and DU run on a standard cloud platform, the full physical layer functionality is offloaded to the RUs.

This topology removes the connectivity problems caused by hand overs between different base stations, Lion Li explains. These issues can include high levels of latency, which would cause the live video to freeze or stutter, and dropped connections as the car moves from one cell to another.

Integrating private and public networks

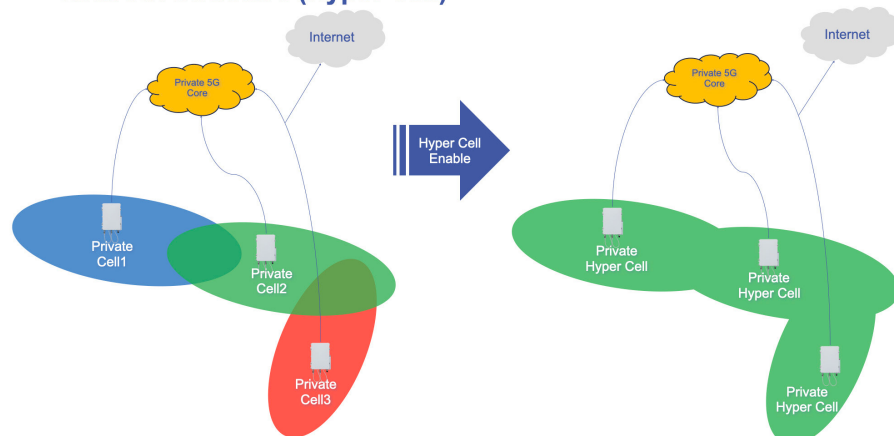
The CRAI HyperCell solution is also designed to help mobile network operators accommodate the surge in demand for connectivity on race days. CloudRAN.AI can integrate the private network into the public cellular networks using a multi-operator core network (MOCN), thereby allowing spectators at the race track to benefit from the additional capacity (see graphic). The pilot solution in Brazil uses the 3300-3800 MHz band, which offers a good balance between coverage and capacity. The network is configured to provide more capacity to the uplink to support the live video feeds from the cars.

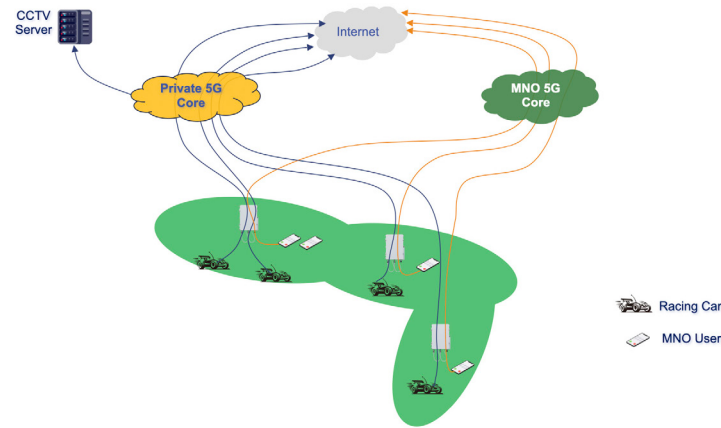
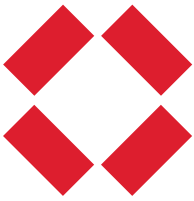
The pilot at the Autódromo Velocitta was the first time CloudRAN.AI has deployed this network topology outside of its labs. The network was able to deliver an average uplink capacity of 230 Mbps, meaning each vehicle could comfortably upload video at 20 Mbps, with a total transmission power of 20 watts.

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Lion Li - Director of Product Management of CloudRAN.AI

Network Structure (Hyper Cell)





To ensure the base stations wouldn't interfere with each other, CloudRAN.AI ran simulations before the actual deployment. These simulations enabled it to optimise the network's throughput across the race track.

Lion Li says its private 5G solution is very cost competitive. "The cloud-native technologies make the private 5G solution very simply for deployment ,just like setting up a traditional Wi-Fi network," he adds. "Without any complicated configuration, the IT engineer only takes an hour to install, and the base station could start to work through plug and play technology."

Following the successful pilot, CloudRAN.AI is aiming to secure two or three partnerships in 2025. To deploy its solution commercially, the start-up is working with both event organisers and mobile network operators (MNO) to deploy its solution commercially in Brazil and elsewhere. While broadcasting live coverage of motor sports present a very specific set of challenges, other major sports events could also benefit from more mobile network capacity.

"From the MNO point of view, they have some pain points at football games when they have some public traffic surge, as there will be a lot of subscribers at the game," explains Lion Li. "The user experience is not that good. We can ask the operators to deploy our network and share it with the football club or some other game owners with a RAN sharing business model."

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Lion Li - Director of Product Management of CloudRAN.AI

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About CloudRAN.AI

CloudRAN.ai is AI-driven private 5G solution provider, aiming to removing the complexity of cellular technology through AI, accelerating the global adoption of private 5G and supporting the digital transformation of enterprises. A subsidiary of CloudNet.ai, an innovative company focused on AI native network and software from Singapore.

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