Improving mmWave Coverage Indoors with Pivot 5G

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5G mmWave deployments are gaining traction in high-density, highly trafficked public venues where there is need for strong coverage and robust capacity inside the facility to support the needs of employees and hundreds to thousands of visitors. Airports are one example of this type of environment for which 5G mmWave is particularly well-suited.

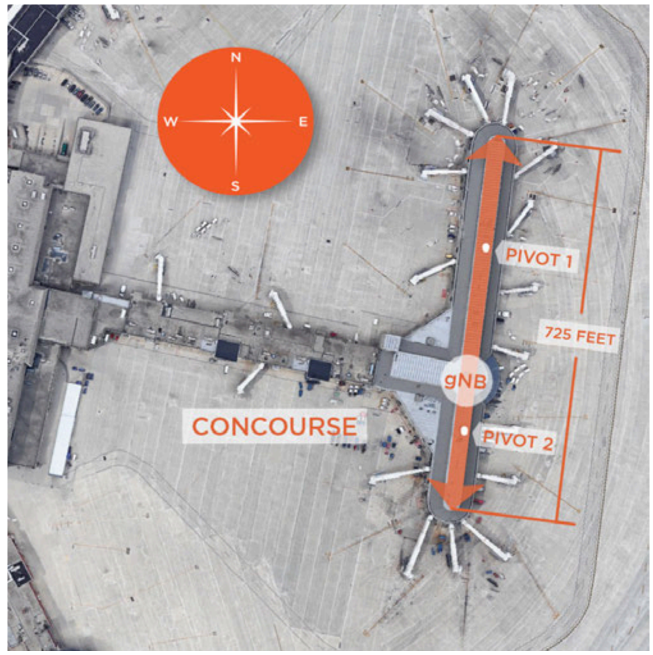

Figure 1

Most airports rely on WiFi to connect their passengers to the internet, and while most carriers also have coverage and in-building systems, in most cases the performance differences between airport WiFi and cellular data are not significant. The reason for the poor performance is related to user density and available spectrum. mmWave spectrum is significantly more plentiful than lower frequency cellular or WiFi spectrum, so if deployed well, mmWave can serve more capacity, and eventually more users. This is particularly important as video calling and downloading video content before boarding the aircraft become more common. Eventually, fast data and low-latency will power A/R and V/R applications.

The star of this use-case is the Pivot 5G™, a 5G network repeater developed by Pivotal Commware to redirect mmWave signals beyond their natural line-of-sight propagation. These signals originate from gNB small cells. Pivots are not small cells, but they improve their coverage by directing it to areas that are shaded or otherwise obscured.

Pivotal partnered with an Internet access provider to steer some of the existing 5G mmWave coverage from the middle of the concourse, where passengers typically walk to their gates, to the sides of concourse where they wait for their flights. Before Pivots, coverage to these waiting areas was obscured by restaurants and shops, causing downlink throughput to fall as low as 23 Mbps. After Pivots were installed, throughput to these areas improved as much as 3,491% to 826 Mbps.

Concourse

Figure 1 shows the north and south wings of the 725-foot-long concourse. At the intersection of these wings, mounted overhead, are two gNBs: gNB 1 points to the north side of the

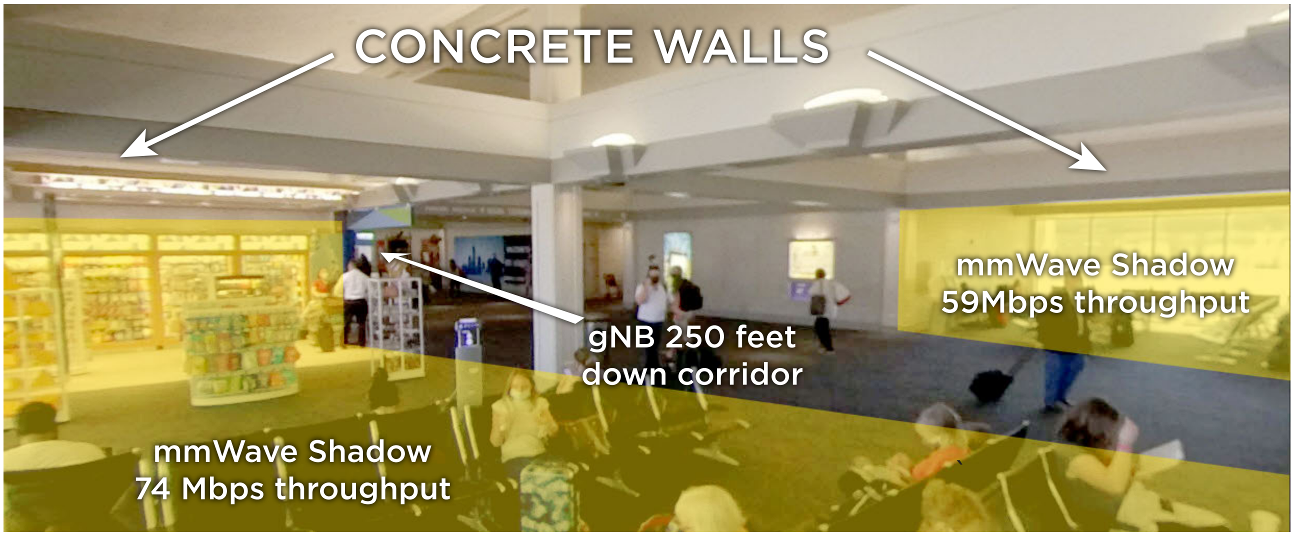

Figure 2

concourse, gNB 2 to the south. Pivot 1 is mounted overhead 250 feet up the north concourse from gNB 1. Pivot 2 is mounted 150 feet from gNB 2 down the south concourse from gNB 2.

North Concourse

Throughput from gNB 1 along the north concourse was weakened by shops and concrete walls, despite occasional reflections. Measured throughput in the waiting areas to the side was significantly reduced relative to what one would expect with mmWave coverage.

A site walk showed good mmWave coverage down the center of the concourse, where passengers traversed to the gates. But the gates themselves were poorly covered and had significantly lower throughput rates, on par with LTE. Even in areas where the mmWave signal was strong, performance was middling.

Pivot 1 units were deployed such that the donor unit (the unit facing the gNB) was on a top ledge within line-of-sight to gNB 1, and the Pivot Service units aimed diagonally toward the gate areas at the mid-point of the concourse. (Figure 3). Initial sample test data was taken initially at four locations at the end of the concourse (Figure 4). Data was taken with the Pivot 5G on and off. (Figure 5)

Figure 3

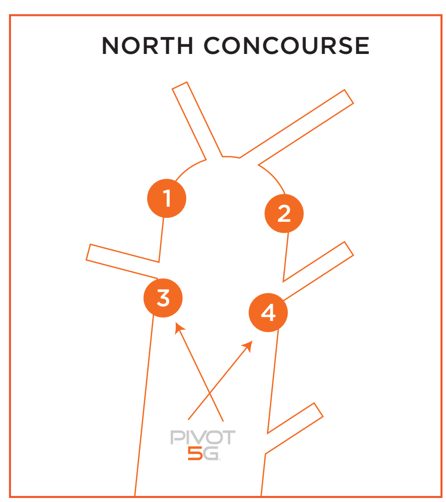

Figure 4

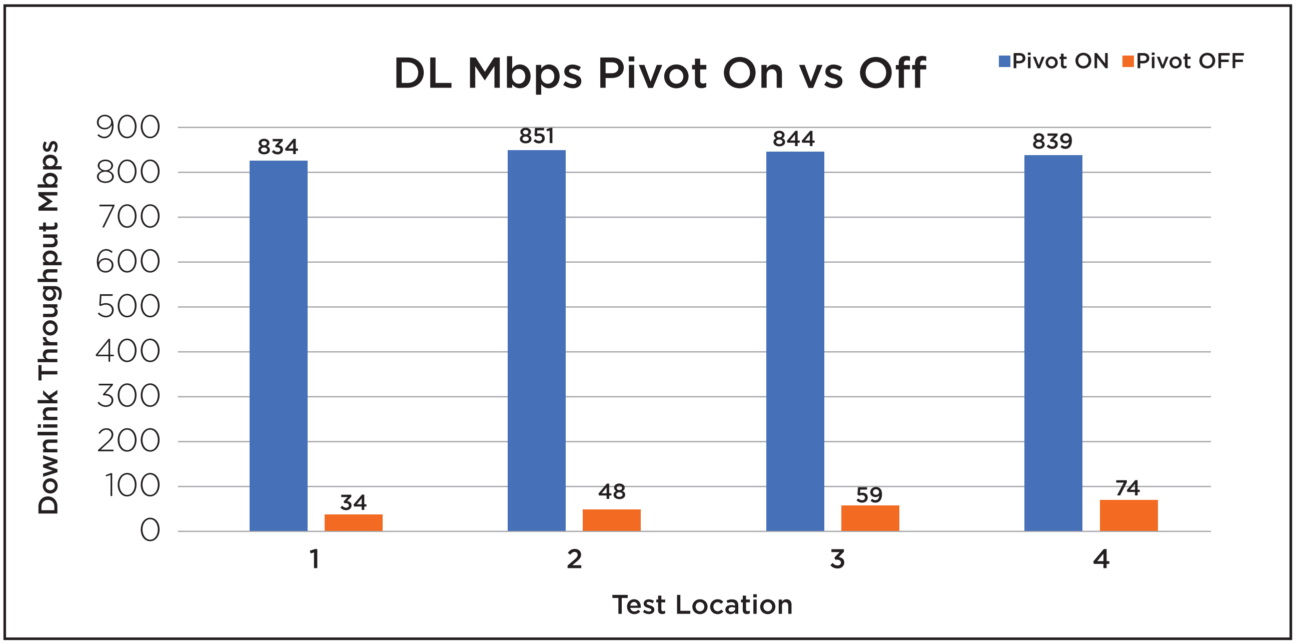

Figure 5

South Concourse

A site-walk in the south concourse revealed the same abbreviated coverage as the north, for the same reasons. Two Pivot units were deployed above, with the donor facing gNB 2, and the service units aimed diagonally toward the gate areas (Figure 6). Likewise, sample test data was taken at four locations within the concourse at the end of the terminal (Figure 7). Data was taken with the Pivot on and off (Figure 8). And like those in the north concourse, the results in the south were just as stunning.

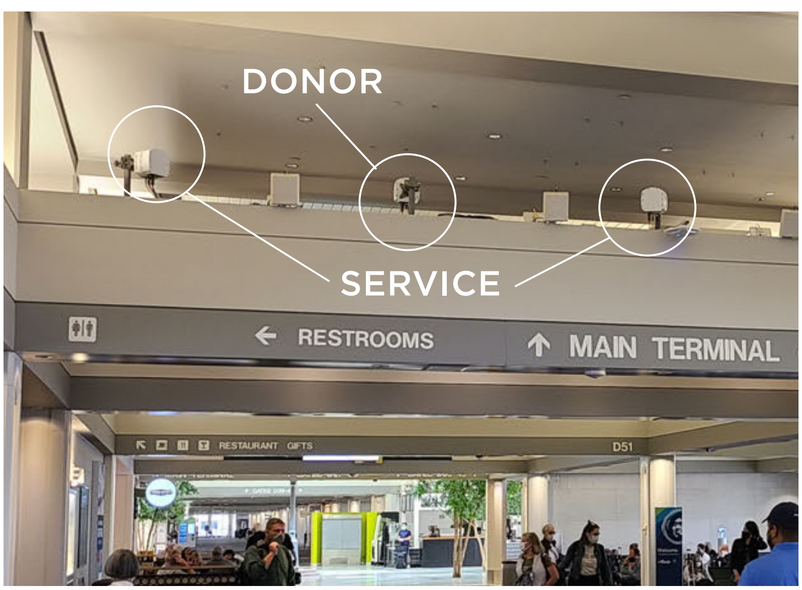

Figure 6

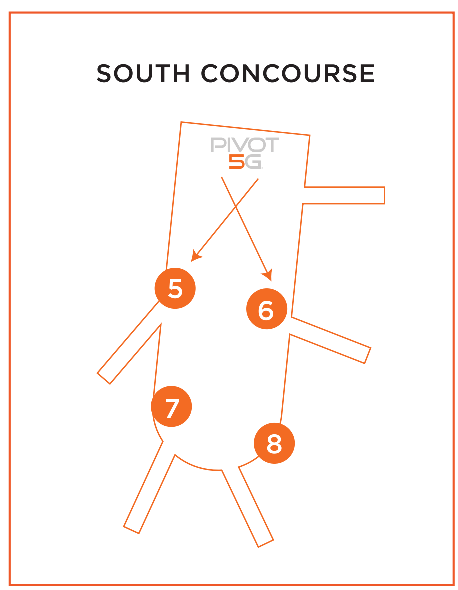

Figure 7

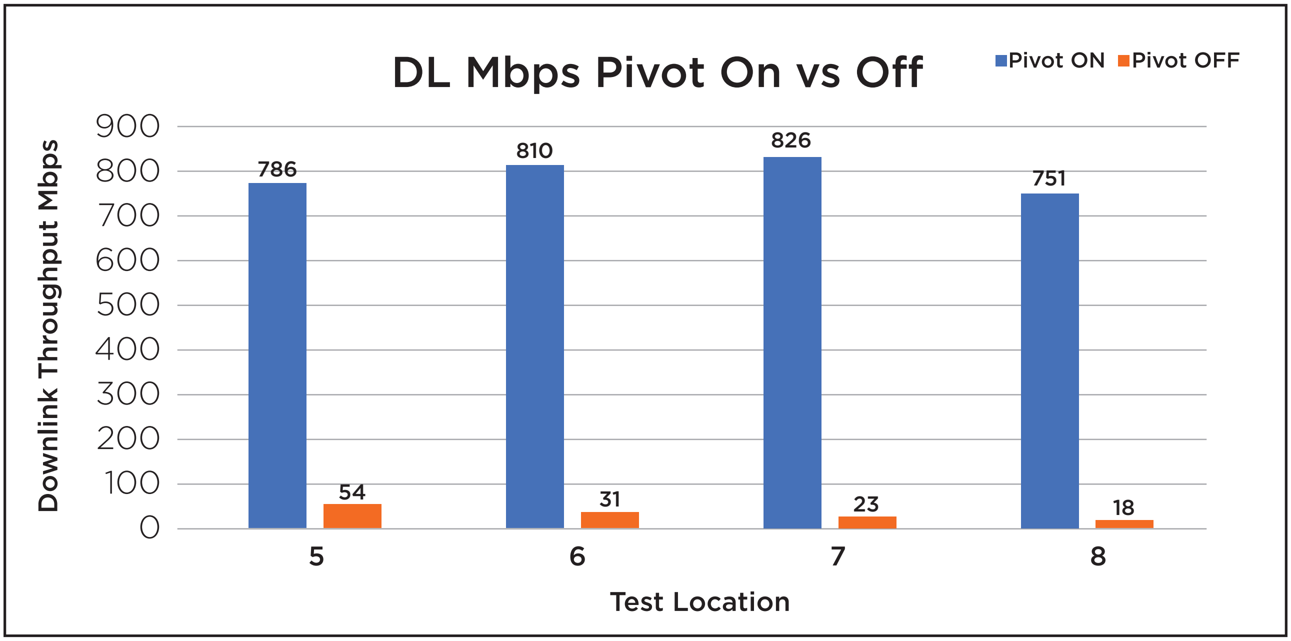

Figure 8

Conclusion

High density airports like this one are attracting mmWave to address wireless connectivity needs beyond the capabilities of LTE or Wi-Fi 6 . Successful gNB small cell deployments along with network repeaters like the Pivot 5G can play a critical supporting role by placing coverage where passengers need it most, in waiting areas that are typically shadowed by shops and walls. Airports need mmWave, and mmWave needs Pivots. To learn more about Pivotal's mmWave ecosystem, please visit https://pivotalcommware.com/products/.