Hybrid vs traditional discrete cabling for FTTA deployments

Independent study commissioned by CommScope

Surging demand for mobile data has made network modernisation a priority for network operators. To meet the demand while lowering costs, more operators are now deploying remote radio units (RRU) at the top of the tower. The debate over the best way to connect the RRUs to the dc power supply and baseband unit, however, is still up in the air.

For years, the common practice has been to use a separate "home run" of fibre and power cables for each RRU. The design is familiar for installers and uses standardised components, but the time and expertise required to prep, pull and connect two runs of cable for each RRU is considerable. Cabling a three-sector site, with two RRUs per sector, can take a full working day.

An alternative solution combines power and fibre in a single hybrid cable. Individual hybrid cables are deployed directly from the baseband unit to the RRUs. Using half as many cable runs should provide significant savings in deployment time. But, until recently, this assumption had yet to be verified or quantified.

Putting assumptions to the test

In December 2015, CommScope Inc. commissioned Scott-Grant Ltd., an independent provider of productivity analysis and industrial engineering services, to conduct a time study under controlled conditions, comparing the hybrid cabling to traditional discrete cabling. Completed over two days, the independent study measured the time required to cable a typical three-sector cell site.

The site selected was an existing tower located approximately 28 miles east of London. The tower had three sectors and was 27 metres tall with one passive antenna and two RRUs per sector. The ground run between the base of the tower and the base station enclosure was six metres.

Specifically, the study looked at the time required to prep, pull and connect all required power and fibre to the six RRUs using three cabling methods:

- **Traditional Discrete:** As described above, this method required 12 total runs of cable—six for power and six for fibre.
- **Hybrid Sector:** This method uses a single run of hybrid cable from the base station enclosure to each RRU—for a total of six runs. At the RRU, the cable's power and fibre components separate for connection to the appropriate ports in the RRU.
- **Hybrid Direct:** This second hybrid model has a plug-and-play breakout system that uses one trunk cable to connect the baseband unit and RRUs. The trunk cable has pre-installed connectors for six fibre jumpers and six blunt-cut power cords.

The installation work was performed by a two-person team managed by a supervisor. All times represented in this report are calculated to British Standards BSI 0-100 rating scale. The team were briefed with a good understanding of each of the products and methods being evaluated for a sensible comparison. They approached each cabling method with similar effort and application; rated at BS 80 (100 is standard performance) by the Scott-Grant Industrial Engineer.

In comparing the three methods, the team looked at each phase of the cabling process.

1. **Ground preparation:** This includes preparing the studs and clamps as well as measuring, cutting and preparing all cables.
2. **Tower preparation:** This step includes attaching all pulleys and ropes needed to hoist the cables, as well as installing the studs.
3. **Cable installation:** The final step involves hoisting, connecting and securing all cables to the RRUs and connecting the bottom end of the cables to the BBU.

The objective of the study was to quantify the time required to complete each step as well as the total installation for each solution.

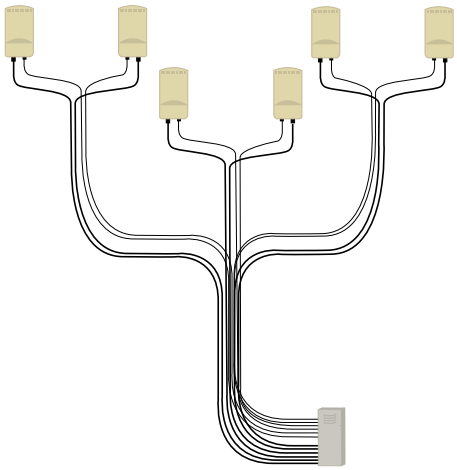

Figure 1: Traditional Discrete connectivity

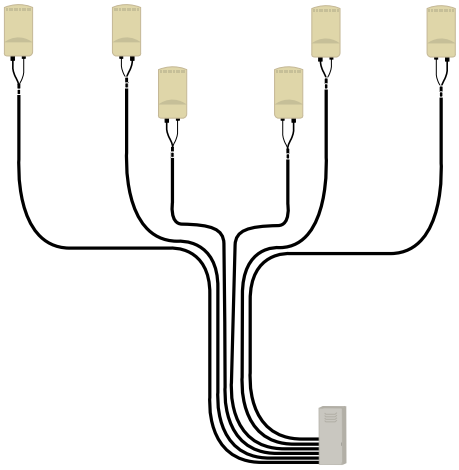

Figure 2: Hybrid Sector connectivity

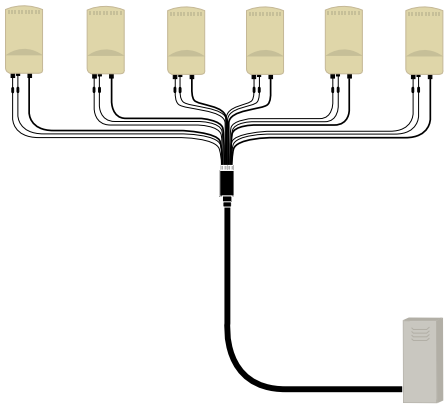

Figure 3: Hybrid Direct connectivity

Results of the study

Phase 1: Ground preparation

As indicated in Table 1, the job of preparing the studs and clamps—then measuring, cutting and preparing the cables—took three times as long for the traditional discrete method versus the hybrid direct method. When compared to the hybrid sector method, Phase 1 using the discrete method took nearly twice as long. As noted earlier, the discrete method involved preparing 12 individual runs, while the hybrid sector method needed only six individual runs. The hybrid direct method involved a single trunk cable containing six hybrid fibre cables. At the top of the tower, the trunk cable terminated in a breakout canister that split the trunk cable into six fibre jumpers and six blunt-cut power cables.

Phase 2: Tower preparation

The tower preparation time needed for the three models is nearly the same. This is primarily because the greatest portion of time during this phase is spent attaching the pulleys to the tower. The number of pulleys required is based on the number of RRUs, which remains constant across all three methods.

Phase 3: Cable installation

As in Phase 1, the time required to install the cables is proportional to the number of cables. The discrete solution required more than twice the time to install cables, compared to the hybrid solutions.

Total time required

Table 4 reflects the aggregate time required to prep, install and connect the site using each of the three methods. Based on these results, the hybrid direct method is approximately 55 percent faster—from start to finish, compared to the discrete model—while the hybrid sector method is about 48 percent faster than the discrete method.

Conclusion

Though installation conditions will vary throughout a network, this study provides an excellent benchmark on the relative labour intensity of each solution. By extrapolating this information across hundreds or thousands of sites, the financial impact can be quite significant. In the UK, for example, using the hybrid direct model instead of the traditional discrete model to cable a 500-site expansion project could save 1,442 hours—equal to 180 eight-hour days.

Factoring in the local labour rates and availability of qualified installers, switching to the hybrid-based model results in a lower overall cost of installation. In deciding which method to use, operators and tower companies should weigh this total cost of installation versus material cost during project planning and vendor selection.

Phase 1 (Ground Preparation) results

Solution	Installation time
Discrete	92.50 minutes
Hybrid Sector	48.47 minutes
Hybrid Direct	30.25 minutes

Phase 2 (Tower Preparation) results

Solution	Installation time
Discrete	69.56 minutes
Hybrid Sector	66.38 minutes
Hybrid Direct	66.38 minutes

Phase 3 (Cable Installation) results

Solution	Installation time
Discrete	285.60 minutes
Hybrid Sector	117.03 minutes
Hybrid Direct	108.66 minutes

Aggregate Results

Solution	Installation time
Discrete	447.69 minutes
Hybrid Sector	231.88 minutes
Hybrid Direct	205.28 minutes

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