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Small Cell Networks: Are They Designable

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Lately, whether seen at tradeshows or on industry news sites, there have been a lot of announcements and/or hyped news stories related to small cell networks. This is ongoing even though, to date, there is still very little in the way of outdoor small cell deployments. Why? Because, as of yet, the majority of operators haven't reached the capacity demands where augmentation based on underlying, outdoor small cells ultimately will be required. Taking an introspective view, that's likely more a positive than a negative, as it's currently not clear if the industry fully grasps how best to design outdoor small cell networks. Although vendors have made many announcements and advancements aimed at simplifying deployments, minimizing engineering, and reducing the total cost of ownership, these product introductions, while important, continue to evolve and will likely do so for the foreseeable future.

That said, many of the design challenges faced in the first small cell deployments can't be addressed by product and technology improvements alone. They will require a fundamental rebuild of operators' engineering and deployment processes, with one of the first challenges being varied structure types. Where today operators are accustomed to installing on fairly standard towers and buildings, and having access to accurate engineering diagrams that follow a common template, the scenario differs greatly when moving to metro small cell deployments. Mounting structures will now include traffic lights, street lights, billboards, bus shelters, telephone booths, and sides of buildings, and the challenges from this alone are considerable. Having to rely on such a wide range of structures means

that operators may be dealing with hundreds of landlords and street furniture owners in order to negotiate mounting rights versus one or two tower owners. And, even after successful negotiations, operators will still need to perform engineering studies to ensure equipment can be safely mounted on the structure. Even when mounting on a tower this process takes some time, but it is well defined and structural and engineering diagrams are available for use to perform an assessment. Viable small cell deployments are something altogether different.

For small cells, lamp poles and billboard mounting options will not include structural drawings. In fact, there may not even be a record of the manufacturer of the structure or the date that it was installed. This will make it much more difficult to assess how much weight can be loaded, and where, on any particular structure, and will require a good deal of co-operation with structure owners in order to carry out accurate assessments. The mounting height operators obtain on any given structure will also be very important, as it can determine what safety regulations need to be adhered to and, therefore, what output power can be used on operators' access equipment. The next step will be to perform link engineering should wireless backhaul be a requirement. While new wireless technologies enable lower capacity, yet useful bands, for non-line-of-sight, urban deployments, there will still be a wide range use of line-of-sight links. Initial line-of-sight assessment can be done through mapping tools, although assuring line-of-sight will require a path survey very similar to macro-cellular deployments. The issue with small cells is that the business case cannot support numerous site visits per path. Engineering crews will need to survey entire sub-network regions at a time to minimize engineering costs.

After acquiring a location and overcoming the engineering hurdles, the next challenge will be locating and documenting where the equipment is being deployed. Small cell structures do not come with physical addresses and the onus is upon the deployment team to properly identify sites in order to get equipment installed and commissioned very quickly. Multiple sites will need to be deployed by a crew in a day to meet business objectives and, therefore, new technologies and products that are being developed to minimize installation time will need to be embraced to optimize the deployment process. Additionally, small cell sites will need to meet varied municipal regulations, which are typically much more aesthetically stringent than traditional tower requirements.

The last challenge will be deployment flexibility and adaptiveness. The street level is a very dynamic environment, with ongoing construction, growing vegetation, and changing decorations and fixtures. At street level, there will be many more cases where sites will require modification to adapt to the overall network. It is important that operators build in processes that can handle these inevitable changes and hurdles quickly, and without major cost. For example, an installer may discover a site has no line- of- sight, and may need to change to the next site. Ideally, this could be done in the field, without having to go back to headquarters and restart a completely new site acquisition and engineering process.

Outdoor small cell rollouts will be a critical part of the evolving mobile broadband experience. They are not widely deployed or required yet, but they will be soon. There are clearly many design challenges for operators to address, but they will surely rise to them as they have to those of the past. It will be critical that operators' small cell design teams use a keen eye to the economics of the solution as well.

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