

NOKIA

Site Solutions Brief

Enhancing RAN Site
management through
Digital Site Solutions



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1. Executive Summary

In the dynamic landscape of Radio Access Networks (RAN), characterized by rapid innovation and increasing connectivity demands, informed decision-making is critical for network operators. The complexity of existing infrastructure necessitates comprehensive insights to guide investment choices effectively. The introduction of digital representations of physical objects is a transformative paradigm that offers unparalleled capabilities in network deployment and site evolution.

This brief delves into the potential of Nokia's Digital Site Solutions and explores the impact it can make on RAN site management. It addresses key challenges faced by telecom operators and outlines strategies for harnessing this digital tool set across various stages of the telecom site lifecycle: notably, how the Nokia Digital Site Solutions accelerates time-to-revenue, streamlines site visits and enhances Health & Safety protocols.

2. The challenge

Radio networks serve as the fundamental infrastructure for modern communication systems, facilitating seamless connectivity across diverse geographical regions. However, the deployment, management and optimization of radio sites present significant challenges related to site infrastructure. These challenges encompass various aspects, including comprehensive site acquisition, site design, materials procurement, antenna system selection and site construction.

The complexity of these tasks often results in extended time-to-revenue cycles, necessitating frequent on-site visits. Moreover, on-site crews face health and safety risks during the execution of these critical activities. Compounding these challenges is the reliance on outdated 2D methods, such as schematics, Excel spreadsheets and scattered notes stored in different formats and sources.

To address these limitations, the introduction of digital replicas for RAN sites represents a transformative shift. By transitioning from traditional 2D architectural site design to dynamic 3D models, organizations can enhance efficiency, accuracy and safety in managing radio infrastructure. These digital replicas enable better visualization, streamlined workflows and improved decision-making, ultimately paving the way for a more robust and agile communication network.

3. The benefits

The implementation of Digital Site Solutions has significantly streamlined the construction and engineering processes. In several cases, actual impact was shown to reduce the number of necessary site visits from three to one, resulting in enhanced efficiency.

In a particular project, the deployment of the Digital Site Solution's analytical features enabled customers to identify deviations averaging 45%—surpassing the pre-established limits—when comparing verified items against existing designs. Furthermore, the procedure for gathering digital data proved to be exceptionally efficient, averaging just 1.5 hours to complete once someone was on-site.

Real-world applications of these digital solutions have demonstrated not only a reduction in the time spent performing tasks but also a marked improvement in the overall quality reporting for existing site assets. This underscores the transformative impact that the Digital Site Solutions can have on operational efficiency and output standards in the field.

4. Digital Site Solutions

The advent of digital twin technologies has revolutionized various industries by providing a virtual representation of physical systems, but the mere possession of these platforms is not enough. To harness the full potential of digital twins, companies must have access to a wealth of resources—data, tools and infrastructure—that can feed into and enrich the digital counterpart. Moreover, the complexity of these systems necessitates a depth of expertise and practical experience. It's the synergy between the sophisticated platform, the comprehensive resources and the human insight that transforms digital twin technology from a novel concept into a solution delivering precision, efficiency and innovation.

This triad defines Nokia's Digital Site Solution, with the most precise AI-based Digital Site Twin offering unparalleled accuracy in capturing site specifics. This solution harnesses the expert-created resources and enables Nokia's professional teams to work with customers to deliver site acquisition and site engineering services. The digitalization delivered with Nokia's Digital Site Solutions allows customers to evolve and adapt their network to ever-changing needs, ensuring maximum value and competitive advantage in their marketplace.

4.1 Digital Site Twin

The Nokia Digital Site Twin has the most comprehensive approach to address operational challenges that involves the creation of 3D digital replicas of physical sites. These replicas serve as the foundational framework for Nokia's suite of Digital Site Solution services tailored for RAN sites. These services encompass digital site acquisition, digital site construction, digital site material management and digital enabled antennas system provider.

Here's how it works:

Data capture: During a single site visit, an extensive dataset is meticulously collected to construct a Digital Site Twin. Prearranged drone flights, operated from ground level, eliminate the need for expensive and time-consuming tower climbs, and mitigating associated health and safety risks. For rooftop structures and indoor facilities, handheld LIDAR devices are employed to perform precise scans.

Post-processing and analytics: The collected data and measurements undergo rigorous post-processing. Analytics tools automatically analyze images to identify critical site elements such as radios and antennas. This information is then used to tag photos and generate comprehensive site inventory listings. Leveraging cutting-edge technologies, including AI-driven analytics, alongside telecommunication expertise, Digital Site Twins are created in an intuitive format, that is accessible anytime and anywhere.

Accessibility: These solutions run seamlessly on standard web browsers and do not require supercomputing resources. In fact, users can effortlessly access them using their smartphones, ensuring widespread usability.

Cloud-based and data-driven: These cloud-based and data-driven Digital Site Twins enable online viewing, scenario modeling for site evolution and predictive analytics. Communication service providers can optimize site performance, reduce costs and streamline operations effectively.

Integration with BIM: The Nokia Digital Site Twin concept goes beyond visual aesthetics. It seamlessly integrates with Building Information Modeling (BIM), ensuring compatibility with diverse vendors worldwide. From initial design stages to future constructions, this solution provides comprehensive support for all functions of a RAN site lifecycle.

From the above, it is clear that Nokia AI-powered Digital Site Twins are much more than just visualization tools - they serve as a central reference point for all deployment processes. They can automatically suggest or initiate the appropriate actions at the right time across network design, deployment, optimization and hardware maintenance.

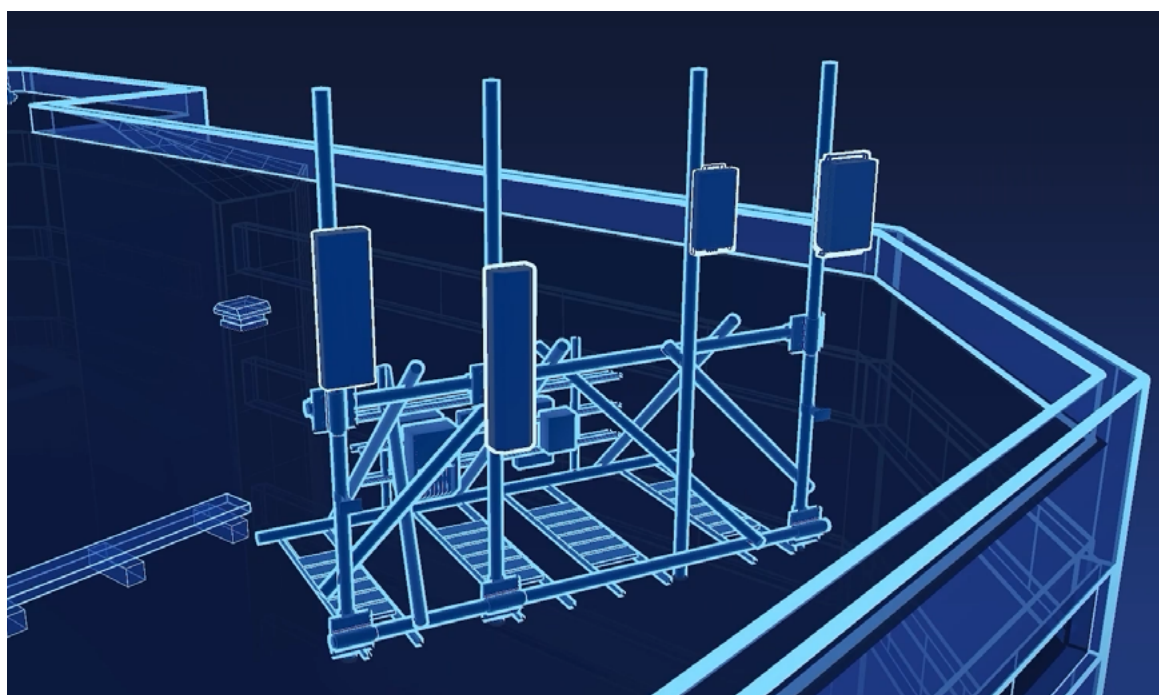


Figure 1: Digital Site Twin mount analysis

4.2 Flexible access to Digital Site Solutions

As a cloud-based service, access to all the features and functionality offered by the Digital Site Solution can be tailored to meet the needs of different customers. Usage provides individual customers with the ability to look at site data anytime, anywhere. From engineering teams that are designing for growth, or a technician getting ready to climb a tower for urgent maintenance, the information needed is available to help them do their work quickly, effectively and safely.

As a subscription offering, this service offers a host of advantages tailored to enhance efficiency and adaptability. First and foremost, it eliminates the need for hefty upfront costs associated with owning a platform. This financial flexibility allows businesses to allocate resources strategically without significant initial investments. Moreover, the subscription is scalable, designed to evolve seamlessly alongside the growth of the network.

5. Leveraging Nokia Digital Site Twin Solutions across various stages of RAN site lifecycle

5.1 Site acquisition

Leveraging Digital Site Twins, telecom companies can conduct comprehensive assessments of the actual physical situation at a RAN site, coverage requirements, environmental factors and site conditions. This meticulous evaluation minimizes delays and optimizes site placements or growth.

Digital Site Twin can also prove invaluable for tower owners seeking insights into the available physical space for each mount and the potential to accommodate additional equipment within specified limits. Given that many sites are shared among multiple operators, the Digital Site Twin ensures proper allocation of space to each tenant and identifies any issues such as overlaps or improper spacing between equipment or antennas.

5.2 Digital Site Construction

Digital Site Twins significantly enhance site construction processes by enabling accurate planning, safety risk identification, better resource and time management, and overall quality control. Digital Site Twins enable seamless collaboration between different teams involved in engineering and building a site, by providing a shared platform for data visualization and analysis.

With the Nokia Digital Site Twin, customers can utilize the available Lean Tower catalogue to evaluate different options for both rooftop and ground-based deployment scenarios. The catalogue features an array of tower designs, including lattice, guyed, monopole and braced types, covering. These designs are meticulously created, considering optimal geometry, member sizing and member utilization.

Similarly, and more importantly, construction work on existing infrastructure can be thoroughly evaluated for feasibility and effectiveness for any planned changes before any physical work takes place. By using the Digital Site Twin, the optimal design can be engineered, and the specific bill of material can be produced to speed up the planning and site preparation processes.

5.3 Digital Site Materials Management

The Digital Site Twin Solution provides online simulations of site infrastructure, facilitating the precise selection and quantity of the best items that align with site requirements. This approach not only reduces waste but also makes a substantial contribution to overall sustainability efforts. By integrating the Digital Site Solution with inventory systems, Nokia can streamline material procurement through regional vendors or direct deliveries from manufacturers, resulting in minimized waste, cost overruns and ensuring timely availability of site materials.

5.4 Antennas System Selection

With the Digital Site Twin, antenna and RF accessories, selection can be fine-tuned for specific physical site requirements. With access to thousands of antenna models, by the top global antenna manufacturers, the Digital Site Twin can be used as a single interface to select the right antenna that will deliver an optimal performance. It empowers users to simulate various deployment scenarios, whether it involves establishing a new site, conducting a swap or implementing an upgrade.

With the selection of antennas and location in place, deployment teams can use the information from the Digital Site Twin to plan the safest installation method in the most effective way. Cable connections and runs can be clearly defined ahead of time, allowing the crews to focus on quality and safety, saving time on site.



Figure 2: Digital Site Twin for design

6. Conclusion

Nokia Digital Site Solutions provide the most precise and comprehensive approach to address the challenges associated with Radio Access Network (RAN) site management. These solutions encompass various aspects, including site acquisition, design, materials management, antenna system deployment, logistics and construction. By leveraging precise accuracy, artificial intelligence, advanced analytics and simulation techniques, Digital Site Twins empower operators to optimize site performance, reduce operational costs and streamline processes throughout the entire lifecycle of RAN sites. As telecommunications networks continue to evolve and expand, the adoption of Digital Site Solutions becomes increasingly crucial for operators aiming to deliver superior connectivity experiences and meet the demands of our interconnected world.

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About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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