

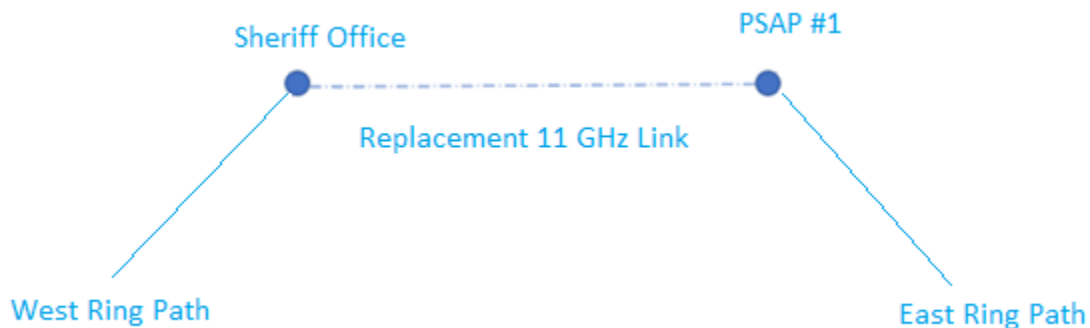
Indoor Unit. Sub-Category 5.5

Nokia has a long Global history in the design and manufacture of telecommunications equipment. Our microwave radio design experience in North America began with Collins Radio in 1951 and continues today not too far from the original location in Richardson Texas. The Texas base of operations continues to include Business Development, Program Management, Network Engineers, Transmission Engineers, Product Management, Customer Technical Support and Research and Development resources. Over the last 69 years we have implemented microwave systems for Service Providers and Mission Critical Operators. Nokia’s current customer list includes the largest US based mobile operators such as AT&T and Verizon Wireless as well as Mission Critical operators such as the State of California, Florida, Michigan, and Mississippi. Utilities such as Southern California Edison, Dominion Energy, Southern Companies, and Duke Energy. Managing these large projects built the practices and processes to effectively and efficiently implement smaller projects.

Nokia’s innovative vision, the dedicated resources and the financial stability of a multi-technology company is a key reason why Nokia has maintained the number one microwave market position in North America for over nine years. Nokia is unique in the industry as we manufacture telecommunications equipment transport your data. As a network solutions supplier, we can supply the microwave transmission, switching, routers, optical, LTE and antenna equipment and their associated services.

Nokia complies to Section 3 of the 00318 AMD4-Exhibit B2-System Solution document and presents a scenario within the Carrier Grade, Native Time Division Multiplex (TDM) category split indoor and outdoor radio hardware configuration. The scenario provides a complete single-hop system that includes all necessary components for the system to function.

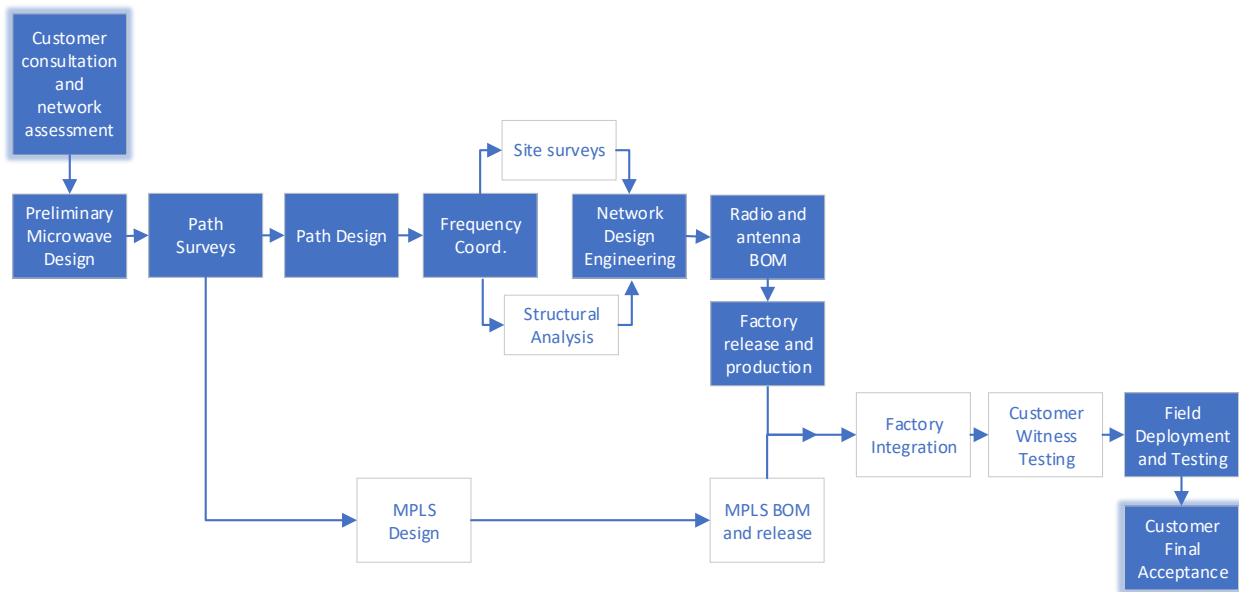
A County Operator is in a difficult situation. The desire is to migrate the Counties TDM network to a Nokia packet based architecture however they have not yet completed the budget and approval process to begin this transition. The Operator has determined that one microwave link in their TDM ring network needs to be replaced immediately.



The County and Nokia meet to gather the requirements for the project and ensure that the scope of work is well defined. From this meeting the data and scope of responsibilities were documented. It is from this starting point that the preliminary design and quote can be assembled and submitted to the County for approval. Below were the key points from the meeting.

- The existing path is four miles long and operates at 11 GHz in an all indoor microwave radio configuration.
- The County requires 160 Mbps of traffic across the link at a two-way availability of 99.9995%.
- The sites have existing 100' self-supporting towers with the antennas at both sites mounted at the 70' center line. The horizontal run from the tower to top of the rack is 30'. The County provides the tower latitude and longitude locations required for the preliminary path calculation. The County prefers to reuse the existing antenna system.
- The sites have available rack space and DC power for the new equipment. After completing the installation of the Wavence microwave radio, ring traffic will be switched to its alternate route while the new Wavence equipment is cutover to the existing antenna system and link testing completed.
- The County takes on the responsibility of physically connecting the existing M13 DS3 connections to the new Microwave Service Switch (MSS) and ensuring connectivity around the ring is achieved once Nokia has successfully tested the link. The County will also configure their existing SNMP Network Management System to recognize the new equipment.
- The Nokia Scope of Work is to provide a Turnkey solution for the one microwave radio link connecting the Sheriff Office site to PSAP #1 site. This scope to include the path design, path survey, frequency coordination, delivery of the equipment to the site, installation of the new Microwave Service Switch (MSS) and Ultra Broadband Transceiver (UBT) and perform a standard test plan to confirm operation.
- The County request the inclusion of spare units into the quotation.
- The County confirms tax exempt status and prevailing wage requirements do not apply

With this information in hand the Nokia representative begins the process of providing the County a Nokia Wavence microwave radio solution. Providing a full turnkey microwave radio solution involves so much more than just providing hardware. The company entrusted to provide a full turnkey Mission Critical solution must have established policies, processes, quality standards, accreditations, and the proper mindset as to the importance of the network reliability. A full turnkey Mission Critical solutions provider understands and accepts that they will be held accountable from the beginning of the project to end. Nokia excels in all these categories as presented throughout our RFP response. The below explanation highlights the Nokia process when providing a full turnkey Mission Critical solution.



Preliminary Design and Quote

The path is 4 miles and design places the antenna center line at 70’ and there is a 30’ horizontal run from the tower into the shelter and equipment rack location. The path design confirms the existing 11 GHz 3’ Category A antenna and antenna center line supports the availability objective. The scope of the installation and test effort will consist of mounting the new MSS shelf and UBT RF unit into the existing equipment rack, ensure alignment of the antennas, sweep the installed waveguide to ensure compliance to manufacturer specifications, provision the MSS shelf for the new service and SNMP address and test the link. Below is a high-level summary of the Hardware, Software and Services pricing required to implement the new link

Link Pricing Summary

Item	Description	Price
1.00	ENGINEERING	SubTotal: \$3,200.00
2.00	MATERIAL	SubTotal: \$15,235.73
3.00	IMPLEMENTATION SERVICES	SubTotal: \$19,593.18
Project Total:		\$38,028.91

Wavence Link Bill of Material

Part Number	Manufacturer	Description	Quantity
3EM24463AB	Nokia	9500 MPR Shelf Kit (MSS-4 10G)	2
3DB19318BA	Nokia	CorEvo-1G	3
3DB19417AA	Nokia	Ethernet Access Card 1G (EAC-1G)	3
1AB380750004	RAD Data	DS3 SFP	6
3DB18163AB	Nokia	MSS Slot Cover - Blank Plate 1/2H	4
3DB17020DEAA	Nokia	Wavence 20 uSD Card	2

3MU00180	Nokia	RTU 160 Mbps UBT-S Capacity	2
3DB29110AA	Nokia	UTB-S 10-11 GHz	3
3MU00085AD	Nokia	6 ft RJ45 Cat5e Cable	2
3CC50318AA	Nokia	Nose adapter UBT 11GHz	2
3CC50351AA	OMP Mechtron	10.5/11 GHz E-Bend Kit WR90 R100	2
3CC50345AA	Nokia	Rack Mount Kit (for UBT-S, UBT-T)	2
1AF02957ABAA	Commscope	1 meter Twistflex	2

Preliminary Microwave Design

Path feasibility studies are prepared by Nokia’s Transmission Engineering Group using preliminary microwave path information provided by the customer, U.S. Geological maps, Nokia US Tree height database, or other sources. Feasibility studies are created using the industry recognized PathLoss design tool and form the baseline for equipment and radio frequency system design. This baseline can then be used for budgetary estimates.

Path Surveys

Microwave path surveys are conducted to determine or verify site coordinates, ground elevation, on-path obstructions (location and height), tower information, and other parameters required to develop the final design of a radio link. The present and anticipated future effect of on-path obstructions, such as tree growth, is evaluated by Nokia and incorporated into the path design where applicable. The results of the path survey are documented and presented in a formal survey report. Nokia warrants the path survey the geodetic coordinates to be accurate to within +/- 1- second of latitude, +/- 1-second of longitude, ground elevations are accurate to within +/- 1 meter, and that heights of identified on-path obstructions at critical points are accurate to within 5-feet.

Path Design

Path design services conducted by Nokia are based on formal field survey data gathered as described above. Path designs are considered final. The project can move to the deployment stage based on the recommendations within the final design report.

Frequency Coordination

Frequency planning Services include frequency selection, prior coordination, interference case resolution, and FCC license application documentation preparation. Interference studies will be conducted utilizing industry accepted methods, hardware, and software to build a database that is as accurate as possible at the time of the study.

Site Surveys (available service but not included in the proposed scenario)

Site Surveys cover visual inspection of the equipment location, review of customer provided documentation, and collection of information or data relevant to the preparations for the subsequent installation tasks included in the project.

Structural Analysis (available service but not included in the proposed scenario)

Structural and tower loading analysis is performed to determine if the tower is structurally sound to accommodate new radio and antenna equipment loading, determination of reinforcements or modifications that are required in existing towers are made.

Radio and antenna Bill of Materials

Radio and antenna BOMs from the preliminary design are revised and validated against the final design.

Factory Release and production

Once the BOM is updated, the Nokia Network Design Engineer releases the material in the supply chain system for manufacturing, allocation and shipment scheduling.

MPLS Design (available service but not included in the proposed scenario)

Nokia works with the Customer to produce a network detailed design which reflects the Customer objectives and requirements. The design work is done at a Nokia R&D center where design options can be verified in a lab and discussed among the Nokia team of architects. This Service could also include a network migration strategy. The migration strategy is developed in accordance with the network design and aims at preserving the capability and services offered to existing customers.

The network design documentation addresses networking aspects, such as:

- *Physical architecture*
- *IGP topology and IP addressing scheme of the IP/MPLS network*
- *MPLS topology and LSP infrastructure*
- *Element and network security requirements*
- *QoS configuration requirements*
- *Service definition*
- *Resilience model*
- *Synchronization design*
- *Failover mechanisms*

Nokia utilizes the approved Network Design to develop the per-network element configurations, including system, routing, interface and network services needed. Nokia tests the configurations and verify successful integration and conformance with the Network Design.

MPLS Bill of Materials (available service but not included in the proposed scenario)

MPLS BOM from the preliminary design is revised and validated against the final design, the Nokia Engineer releases the material in the supply chain system for allocation and shipment scheduling.

Factory Integration (available service but not included in the proposed scenario)

Nokia radio equipment is staged in the microwave factory and any non-radio (e.g. Nokia routers, NSP server, TSM 8000, etc.) equipment is integrated into the racks per network design. The customer system is provisioned, integrated and tested until is running traffic end to end. The network is tested using a Network Acceptance Test Plan that is specified by the Customer and Nokia. Test Results are provided to the Customer prior to shipment. Staging and Integration testing in a control environment such as the factory provides network performance assurance and reduces installation issues and potential field troubleshooting delays.

Customer Witness Testing (available service but not included in the proposed scenario)

Performed for Customers requesting to observe how the overall network performs prior to shipment.

This process is identical to Integration Testing, with the addition of an onsite witness of the Network Acceptance Test Plan execution, on a network sample, by Nokia and the Customer or the Customer's representative. CWTs are traditionally performed over a 3-day testing interval. Nokia partners with Sanmina to provide an efficient factory staging and CWT experience. Conveniently located in Carrollton, Texas, the microwave factory is within 10-15 miles of the DFW and Dallas Love airports.

Field Deployment and Testing

Nokia has a dedicated team of professionally trained and factory certified installers that efficiently and accurately perform field installation and testing. Upon shipment, the Nokia Project Manager will engage Nokia's expert field installation team, based on the mutually agreed project

schedule, to inventory the equipment and begin field installation. The Nokia field installation force will install the equipment according to Nokia's certified field installation practices that ensures the highest quality installation as possible.

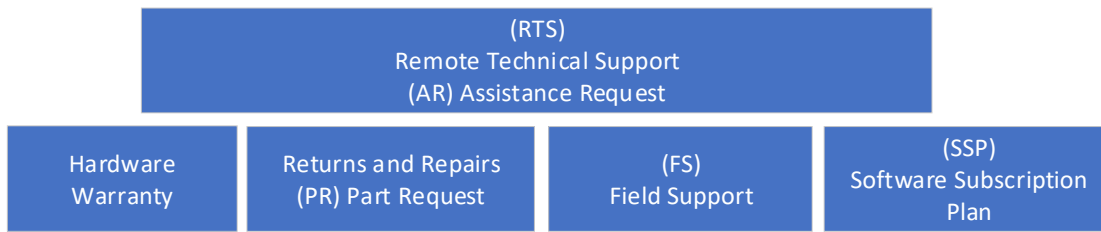
Nokia's Certified Installation Technicians follow all industry guidelines as well as Federal and State Occupational Security, Safety and Health Administration regulations. Their complete design and task execution approach utilize detailed planning and reporting which enables many aspects of the project to be worked in parallel to streamline the process and eliminate delays. Constant oversight and communication by the Program Management Office (PMO) and Deploy Project Manager (DPM) teams ensure all equipment design, manufacturing, and delivery align with civil construction and equipment installation timelines. Onsite project supervision by Construction and Installation Managers enable Nokia to ensure all designs and services meet high quality standards and an availability required.

In the event factory integration is not included in the project scope, all materials will ship to a Nokia Customer designated storage facility and moved to the field for assembly, installation and testing post integration.

Customer Final Acceptance

Once the equipment is installed and inspected, final field acceptance testing is executed with documented test results provided to the customer. The assigned Deploy Project Manager (DPM) manages the creation of closeout packages which include as built drawings and test records and ensures all deployment activities are completed before any necessary resources are released. The assigned Project Manager (PM) verifies that all activities within the scope of Nokia's responsibility have been completed to the customer's satisfaction.

Post Implementation Services



The dedication to our customers extends past the final acceptance with support options available ensuring NASPO Partners know we have a vested interest in your network performance. These services include preventative and emergency maintenance/repair supported by our CTAC (Customer Technical Assistance Center) as well as network monitoring options from our Network Operations Center (NOC). To ensure constant transfer of product knowledge and simplifying the process Nokia maintains the OLCS (Online Customer Support) website to support downloading manuals, software, release information, technical notes and product alerts for any revision of any product 24 hours a day, seven days a week. Diagnostic tools, white papers and remote license upgrades are also available and accessible through OLCS.

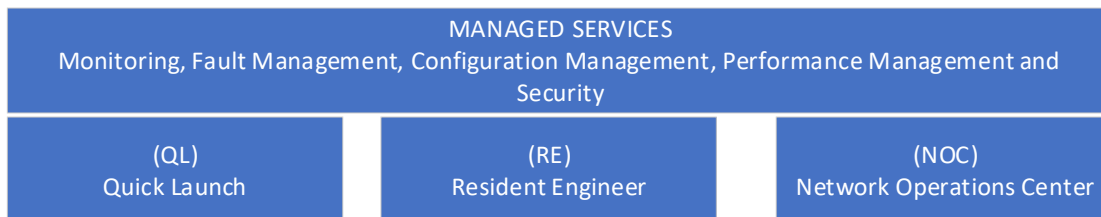
These Services consist of providing support within the agreed response times for the Nokia supplied products. Support, by way of example: Answering product-related questions, troubleshooting assistance, providing diagnostic procedures, investigating suspected software defects and remedying errors and malfunctions providing access to Patch- and / Maintenance-Releases as may become available. For situations where part or all the network’s functionalities are not available, the Service offers fast restoration of Customer’s end-user services or network equipment for Supported Products, including investigation, troubleshooting and continuous remote support by Nokia’s experts until the functionality is restored. Services are offered for repair or replacement of Field replaceable units (FRUs). Customer will return a reported FRU to Nokia who’ll repair or replace the FRU. Nokia offers multiple SLA options (advanced replacement, 30 - 90 days options) for the repair or replacement services.

Nokia has industry leading defined response time KPI benchmarks that may be chosen based on Service hours and service access with hours that best fit the Customer’s needs. All requests for assistance are considered as Ticket Requests and classified as Critical, Major, Minor and Information Requests. Nokia provides several easily accessible options to Customers (via phone on 24*7, email and web access) and tracked against the services defined KPI’s.

Software Subscription Plan or Software release subscription service will make available all Feature Releases of software for network/node elements, management systems for specific network elements or families of network elements, and other network-related applications for Customers network. Feature Releases may also include provision of third-party software

upgrades, as may be made available by the third-party software manufacturer, if the third-party software is supported by Nokia and was licensed by Nokia.

Managed Services



Nokia Managed Services has been operating communications networks for over 20 years. Business and organizations across industries (enterprise, energy, government, and telecom sectors) leverage our capabilities to realize any combination of OPEX reduction, operations expertise, and/or reduction of risk when introducing new/unfamiliar technologies into their network. Today, Nokia operates over 1 million network elements (of which 70% are non-Nokia products) which over 700 million users communicate every day.

The Managed Services solution assumes operational fault management responsibility over all or a subset of an enterprise or Microwave IP/MPLS network through a central NOC (Network Operation Center), applying state-of-the-art operations processes and tools. We provide 24*7 network surveillance and trouble resolution via our Network Operation Centers (NOCs) that have the capability to cover every fault detection and resolution aspect of running your network operations. The Managed Network Operations solution offers enterprise, energy, government and telecom sectors targeted fault management operational support when needing to:

- Migrate from legacy to next- generation operations
- Reduce time to market
- Minimize risk involved in new deployment projects
- Improve network key performance indicators and service level agreements
- Ensure optimum service availability, without increasing internal staff and associated costs
- Introduce new technologies in existing environments
- Launch new services

Nokia’s Managed Services can be delivered from its onshore Delivery Center in Texas or from its Global Delivery Center in India. As part of our solutions we offer a comprehensive OSS platform that introduces advanced and sophisticated levels of automation, intelligence, correlation, and filtering driving quality and efficiency. Our services are provided against committed Service Level Agreements to which we hold ourselves accountable. Additionally, our onshore organization also helps our customers with consultative services including Operations maturity assessments, on the job operations knowledge transfer, and NOC Resident Engineering services for staff augmentation.