

FIBER OPTIC SENSING FOR SMART INFRASTRUCTURES

NEC FIBER OPTIC SMART SENSING (FOSS)

The NEC FOSS solution offers a unique value proposition to network infrastructure operators, enabling them to efficiently manage and operate deployed fiber networks. NEC FOSS solution also enables the addition of new non-transport service offerings.

In the age of the bandwidth-intense metaverse, OpenRAN 5G disaggregation, and residential broadband, the network operator's investment in optical fiber infrastructure is expected to grow exponentially. NEC's industry-first AI-based solution, NEC FOSS provides a way to protect that investment and ensure increased return on investment by opening up new revenue streams.

NEC has 20-plus years of experience in transoceanic optical fiber transmission, combined with machine learning-based artificial intelligence (AI) and advanced distributed fiber optic sensing technologies. We merge our expertise in these areas to create the NEC FOSS solution with unobtrusive, low maintenance, high-precision detection capabilities.

NEC FOSS enables the addition of the following non-transport service offerings, with more applications in the pipeline that can be easily deployed over its extensible, modular platform.



NEC FIBER CABLE MONITORING



FIBER CABLE IDENTIFICATION



FIBER CABLE POSITION LOCATOR



PIGTAIL FINDER



OVERVIEW

NEC FOSS uses a toolset of distributed vibration- and temperature-sensing technologies. Applied to existing fiber optic networks or a dedicated fiber optic sensing network, the NEC FOSS solution monitors environmental conditions and events. A user-friendly and customizable graphical user interface (GUI) denotes the location of events-of-interest and provides actionable data in real-time.

When environmental disturbances such as physical movements, temperature variations, or acoustic vibrations reach the optical fibers, the distributed fiber optic sensing (DFOS) interrogator instantly detects and locates the signal. The solution's AI analytics engine simultaneously analyzes and classifies the events and immediately triggers silent or audible alarms and/or sends actionable alerts. Actionable data, such as date, time, location, and event classification can be stored locally or remotely for future reference and data analysis.

NEC FOSS allows users to continuously monitor conditions on their networks—to detect threats and prevent disruption—reducing the effort and cost of infrastructure operation, monitoring, and repair.

KEY FEATURES:

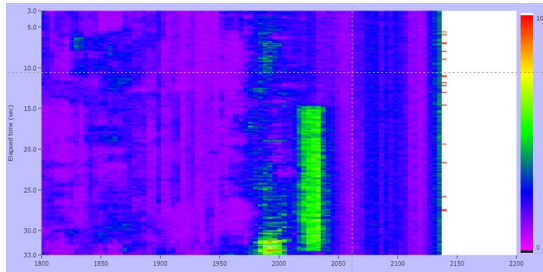
- Long sensing range
- Fine spatial resolution
- Accurate event identification
- CAPEX friendly - compatible with existing deployed fiber infrastructure
- Environmentally friendly - low energy consumption as no additional sensors
- Customizable GUI
- Real-time or offline analysis
- Portable options

AI-based analysis of vibrations, temperature, and sounds sensed by existing optical fiber networks



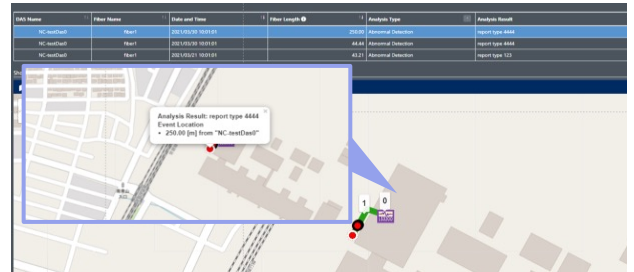
Interrogator senses vibrations from already-laid optical fibers for communication

Measurement range of up to 100km (62mi)*1



Detected vibration displayed in waterfall view

AI ANALYTICS



Waterfall view displayed as an event

NEC's AI technologies enable NEC FOSS users to extract invaluable insights from the large amounts of data sensed by the optical fiber

PRODUCT FEATURES

- Commercial-grade software - Stable, reliable, **QA tested**
- Deployable in compact-portable configuration **at scale**
- Intuitive **smartphone GUI**
- Modular AI-analytics applications platform
- Monitors **up to 16 fibers**
- Based on proven and patented research by NEC Labs America
- **US-based sales and support** and solution customizations



DFOS INTERROGATOR



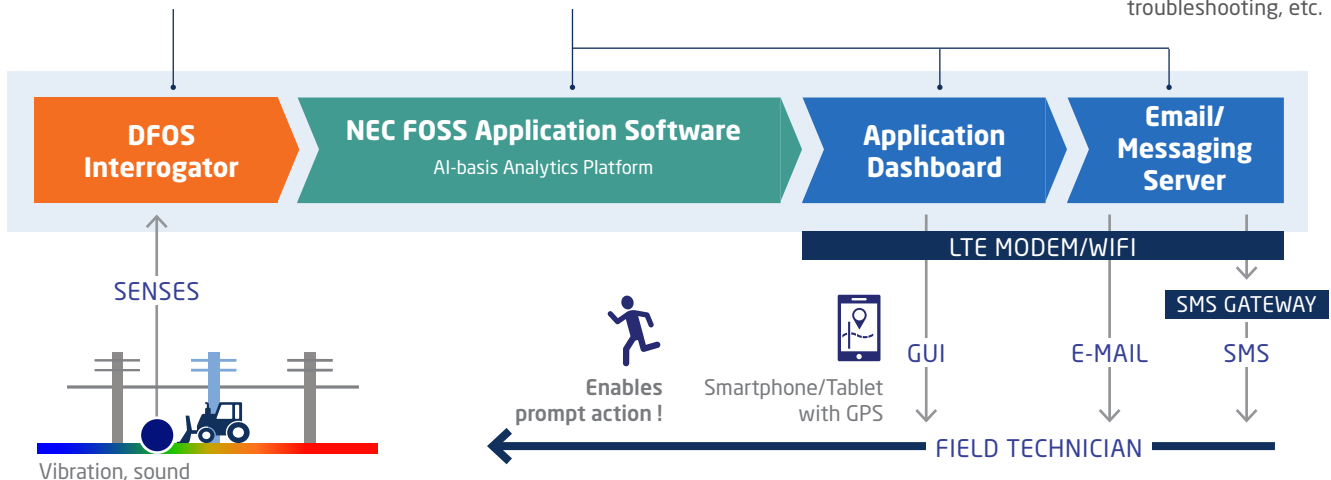
COMPUTER

Deploy suitable AI-based analytics applications to assist in field maintenance

- Use cases can be added and customized.

Simple and compact configuration, which can be easily relocated as needed.

- For planned construction or maintenance, on-demand troubleshooting, etc.



*1: Distance depends on the fiber cable loss

NEC FOSS NON-TRANSPORT SERVICES

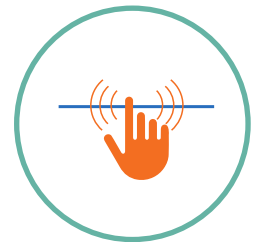
NEC Fiber Cable Position Locator

- Supports the creation of precise maps of the fiber route, including the location of spare spools of excess fiber
- Provides precise, real-time information on fiber cable locations and fiber length, accounting for spare spools of excess fiber in field facilities (manholes, breakout cabinets, other)
- Verifies/disproves old database records; assists in detecting mismatches between deployed fiber and operational records
- Helps with planning for additional field supply equipment at locations where spare cable may not be available



NEC Fiber Cable Identification

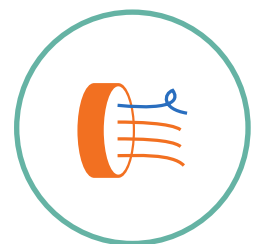
- Central office and field facilities personnel can quickly pinpoint and identify fiber cables in manholes, breakout cabinets, and other locations
- Field engineers can identify the correct cable with tapping/touching while monitoring vibration responses in real-time using a smartphone
- Fewer personnel required for trouble detection—allows troubleshooting without a remote operator in the central office



Preventing a single fiber cut—which can cost tens of thousands of dollars—will cover the cost of the NEC FOSS system

NEC Pigtail Finder

- Determine the total fiber length connected to a specific port.
- Identify the exact fiber within a splice enclosure.
- Improve efficiency in field operations by reducing time spent manually searching for specific fibers.



NEC Fiber Cable Monitoring

- Enables real-time abnormal condition detection and notification on the fiber routes, including construction activities
- Enables operators to take preemptive steps to deter service interruptions
- Enables operators to assess the severity of damage post adverse events (fiber cut, fiber rubbing in conduit, etc.)
- Isolates fiber route faults, with precision, when troubleshooting network alarms
- Identifies landmark locations of concern, such as high-traffic areas and/or other environmental noise
- Helps determine correct number of personnel needed for incident response
- Supports monitoring of multiple fibers using a single NEC FOSS system



KEY PRODUCT FEATURES

Technical Specifications: SpectralWave™ LS3300

Sensing range	Up to 21dB / 100km (62mi)*1
Support optical fiber	Standard single mode fiber
Optical wavelength	1550.12 nm
Laser class	Class 1M
Number of sensing ports	16 (LC/APC connector), with selector switch
Number of management ports	1 (RJ-45, 100/1000 BASE-T)
Power consumption	Typical: 60 W Maximum: 165 W
Input voltage range and frequency	AC: 90 ~ 264 VAC / 47 ~ 63Hz; with AC adaptor DC: -40.5 ~ -57V DC
Dimensions (H x D x W)	82 x 270 x 436 mm / 3.23 x 10.63 x 17.17 in
Weight	9 kg / 19.84 lbs
Certifications	UL62368-1, FCC Class A, VCCI Class A

*1: Distance depends on the fiber cable loss

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Irving, TX
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NEC National Security Solutions, Inc.
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• NEC National Security Solutions, Inc. (NSS), is a leading provider of biometric identity and AI technology for federal government agencies in defense, intelligence, law enforcement, and homeland security agencies. Based in Arlington, Va., NSS deploys proven groundbreaking technology for access control, identity verification, scene processing, advanced analytics, fiber optic sensing, border control and transportation security, among other applications. The company was launched in 2020 as a wholly owned subsidiary of NEC Corporation of America and will operate under a Special Security Agreement (SSA) with the US Government as a FOCl-mitigated entity, free of foreign ownership, control, and influence. It provides full-service solutions for large agencies using the intellectual property and resources of the global NEC brand. The NEC Corporation invests an estimated \$1.01 billion annually in R&D, holds 47,000 patents, and has more than 110,000 employees in 160+ countries. For more information, please visit www.necnss.com.

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