

Big data and network performance measurement

Enhanced field performance validation

White paper

To deliver an exceptional user experience, network providers must get a lot of things right. Coverage, quality, capacity, and the required functionality of each site in the network are all in the mix. Assessing network field performance is a critical task requiring efficient, timely and comprehensive data.

Drive testing has long been the standard for assessment. However, the method has inherent limitations and inefficiencies, including a substantial carbon footprint.

In this White Paper, we describe how Enhanced Field Performance Validation (EFPV) advances both the efficiency of data collection as well as the quality of analysis and insights in network performance measurement. Using innovations in geo-locating and big data analytics of anonymized subscriber data, EFPV delivers a more comprehensive data set for acceptance testing and optimization while it is safer, more efficient, and more environmentally sustainable than drive tests.

Contents

A more comprehensive view of network performance	3
Detect and address network performance issues quickly	4
Faster path to achieving KPIs and network acceptance	4
How does it work?	5
Visually-rich reports	6
Decrease CO ₂ emissions and increase safety	7
Conclusion	8
Abbreviations	8
References	8

A more comprehensive view of network performance

Physical drive tests have served us well but they don't have the agility that modern networks need. They are carbon-intensive, require advance planning and commitment of resources, and produce a data set that is strictly limited by the drive route and the time it is driven.

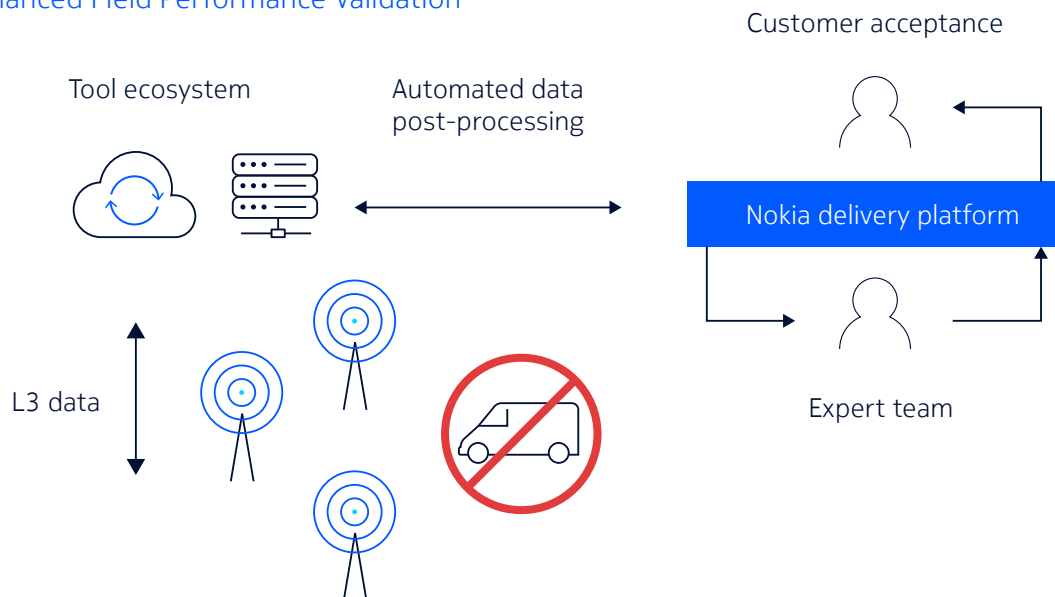
Enhanced Field Performance Validation (EFPV) overcomes these limitations.

EFPV measures network performance through data collected centrally from subscriber equipment such as smartphones wherever they are in the network area — including indoors. While completely anonymous to protect the privacy of end-users, EFPV provides more precise and comprehensive data from the subscriber experience perspective so that network performance decisions can be taken with more accuracy and confidence.

The EFPV advantage:

- No test drives
- 100 percent automated
- Both outdoor and indoor performance measurement
- Complete network view with thousands more samples than drive tests
- Real end-user performance perspective
- No scheduling or location access required
- More detailed insights on network performance
- Possible to analyze past events/faults
- Secure and anonymous so as not to breach privacy
- Detection of performance variations and issues of specific UE types
- Reduced CO₂ emissions

Figure 1: Enhanced Field Performance Validation



Detect and address network performance issues quickly

EFPV captures real end user experience using centrally scheduled tests. With automated end-to-end data collection and post-processing, the lead times for tests may be only a few hours or less, and sampling can be frequent.

Reports can be set up for review at desired intervals. An API connection between other network performance optimization tools automates the process, from data collection to acceptance.

The data collected and analyzed through EFPV makes it easy to detect and pinpoint network performance issues, so corrective actions can be taken quickly. For example:

- Performance in areas with high traffic demand (hot spots) can be improved by implementing new sites or changing antenna orientations.
- Performance degradation caused by issues such as overshooting sites and areas outside the planned coverage zone can be pinpointed and addressed.
- Smartphone model-specific issues in the network can be detected, so that fixes can be offered to end users.
- With measurements available 24/7, unusual network behaviors such as external interference occurring at night can be detected and addressed without the need to wait for them to re-occur.

Faster path to achieving KPIs and network acceptance

A customized set of field validation KPIs can be measured quickly and accurately on a cluster of sites or on a site-by-site basis. This may reduce the time to launch and increase confidence that a new network, or an addition to an existing network, will meet user experience requirements. KPI selections can be customized and performance thresholds can be set across a range of parameters including:

- Coverage
- Quality
- Voice Drop Call Rate
- Voice Call Setup Success Rate
- Data Drop Call Rate
- Data Call Success Rate
- Data Download Throughput
- Data Upload Throughput
- Call Setup Time
- Handover Success Rate

Rolling out a 5G network? Using Minimization of Drive Test (MDT) and fingerprinting, a large variety of KPIs is available, for example:

- Map reports: RSRP coverage, 5G Data Volume, 5G User density (layer, site, cell), Best Server 5G cells, Best Server 4G cells in anchoring with 5G NSA
- Cell Level: Percentage of UE 5G capable, 4G coverage distribution related to 5G calls, SgNB addition success rate – accessibility KPI, time on 5G, and more

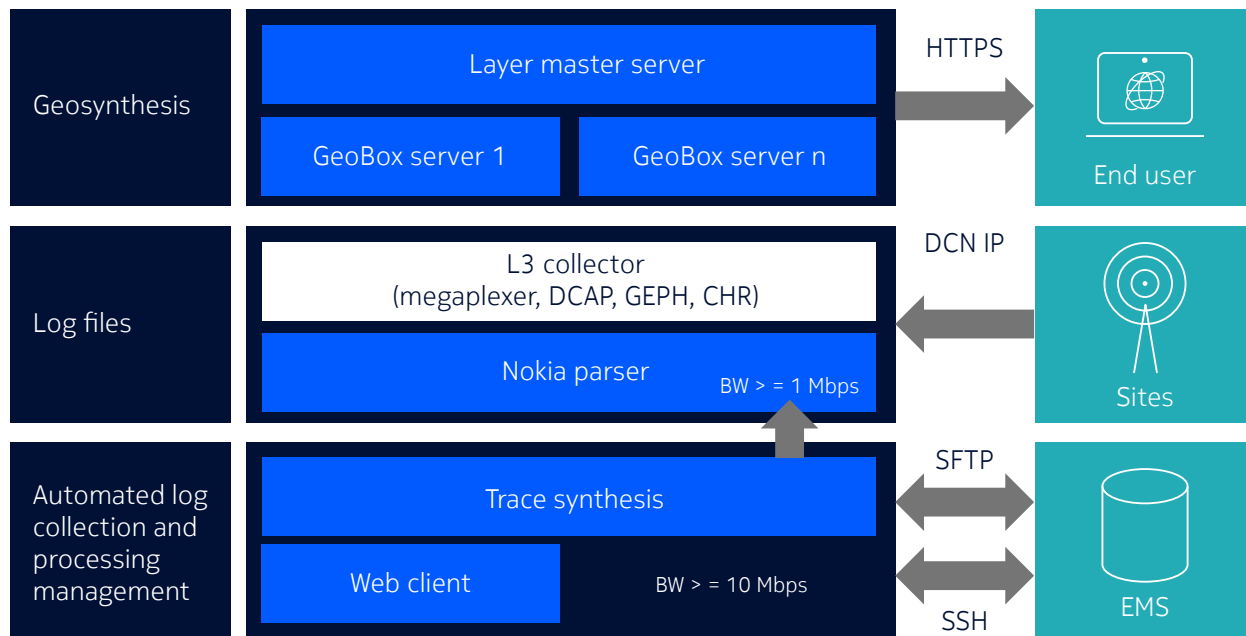
How does it work?

EFPV can be used for Single Site Verification (SSV), cluster tuning and acceptance, as well as network optimization services for 3G/4G/5G technologies. EFPV provides more network insight than pure OSS counter-based acceptance which also collects data without drive tests.

The standard deployment model for EFPV is based on Nokia Enterprise and Services Cloud (NESC) or bare metal installation on customer premises.

EFPV uses GPS-based Layer 3 MDT data for 3G, 4G and 5G technologies. High statistical relevance is achieved with data from 10-20% of UEs in the network, while a parser reduces data transfer requirements. GPS location data provides more accuracy than other approaches reliant on triangulation.

Figure 2: Visualization and analyzer tool for geo-located Layer 3 measurement

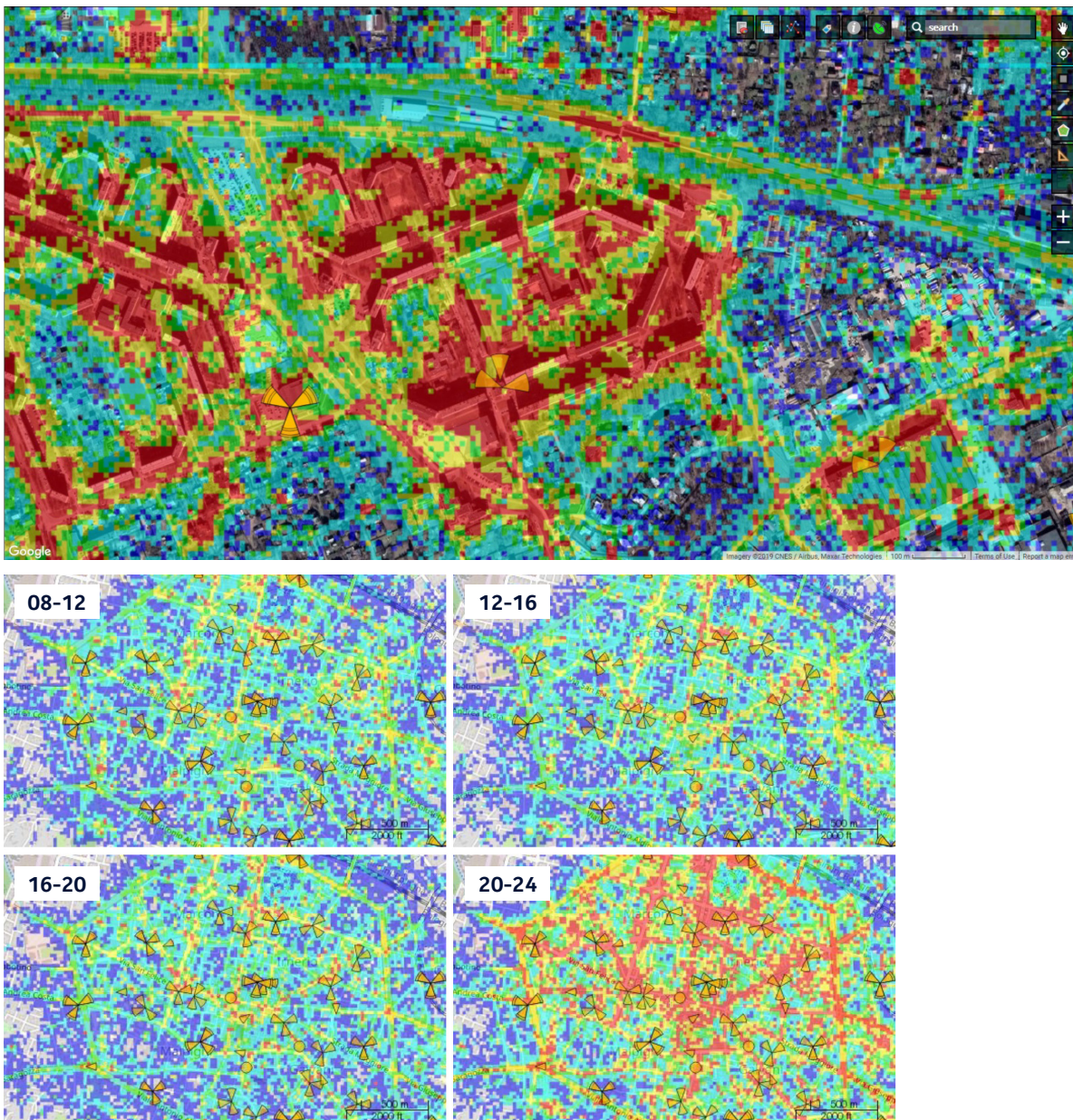


Visually-rich reports

EFPV uses GeoSynthesis, a Cloud visualization and analyzer tool. It interworks with others in the Nokia Network Performance Optimization (NPO) tool ecosystem to process data and create customized and automated acceptance reports in ready-to-use format. The reports feature geo-located KPI data on 2D maps, histograms and tables. Deep dive analysis is possible with a user-friendly graphical user interface.

Because EFPV is not limited to the drive test route or to a single UE type, reports provide far better visibility of the complete sector performance, including issues occurring indoors. Poor performance locations are readily visualized in the reports so they can be followed up and re-tested quickly.

Figure 3: Customized reports of geo-located data for detailed analysis



Decrease CO₂ emissions and increase safety

Nokia is committed to develop and deploy innovations in the area of sustainability, including zero-emission products and services. EFPV is part of that suite of innovations and the results have already been substantial. In just two years (2021-22), our EFPV service avoided approximately 1600 metric tons of CO₂ equivalent emissions for our customers globally.

In addition to carbon reduction, the EFPV service helps carriers eliminate the health and safety risks and inconveniences inherent to drive testing for employees and communities in the network coverage area. This includes road accidents and other issues along high-risk drive routes, as well as dangers from weather impacts and traffic obstructions.

Big data insights in action

As early as 2019, 3 Indonesia was pioneering the replacement of drive tests with centralized data collection for network acceptance and optimization.

Real world benefits of EFPV:

- Up to 5m location accuracy (GPS)
- 75% reduced time to reach performance
- Automated data processing
- Data samples from 300k UEs instead of only 1 UE
- Detailed performance analysis based on dimensions including time, location, indoor, outdoor, device type
- Avoidance of CO₂ emissions associated with drive testing
- Improved health and safety

Conclusion

Network performance and user experience go hand-in-hand. To fulfill subscriber expectations and to achieve performance standards, carriers worldwide need the advanced insights of comprehensive network performance data sets, collected cost-effectively and safely, with minimal CO₂ emissions. Nokia delivers innovative no-drive-test solutions to help carriers meet these goals.

Abbreviations

EFPV	Enhanced Field Performance Validation
MDT	Minimization of Drive Test
NESC	Nokia Enterprise and Services Cloud
NPO	Network Performance Optimization
SSV	Single Site Verification
UE	User Equipment

References

1. Press release: Nokia and 3 Indonesia develop Zero Drive Test assessment solution to enhance network quality and user experience. 19 August 2020
<https://www.nokia.com/about-us/news/releases/2020/08/19/nokia-and-3-indonesia-develop-zero-drive-test-assessment-solution-to-enhance-network-quality-and-user-experience/>

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