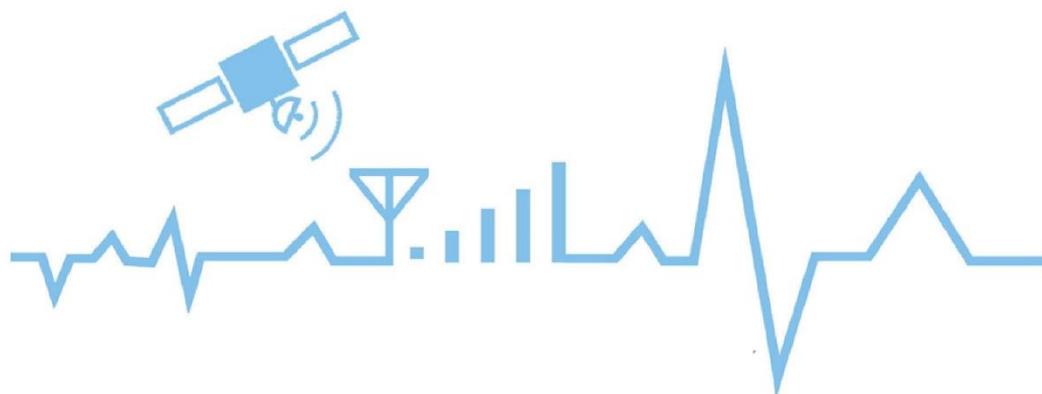# TRANSCOM INSTRUMENTS

Solution

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A Introduction of Internet of Things Standards and Coverage Measurement Solution

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT.

IoT cuts across different application domain verticals ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions.

IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

1. Technologies of Internet of Things

Self-driving cars. Refrigerators that order your groceries. Electricity grids that automatically regulate consumption. It seems that the future has finally arrived – and its powered by the Internet of Things.

The flood of new IoT devices and applications coming onto the market are made possible by the latest advances in connectivity. Unlicensed short-range technologies like ZigBee and long-range technologies like LoRa have allowed anyone with an idea to create IoT apps for mass market deployments. But licensed technologies like narrowband IoT (NB-IoT), enhanced Machine Type Communications (eMTC) and Enhanced Coverage GSM (EC-GSM) are also gaining traction with operators offering IoT services through their existing cellular networks.

For operators who choose licensed technologies to provide IoT access like traditional voice and data service, NB-IoT and eMTC is best choices, for different applications.

NarrowBand IoT (NB-IoT) is a Low Power Wide Area Network (LPWAN) radio technology standard developed to enable a wide range of devices and services to be connected using cellular telecommunications bands. NB-IoT is a narrowband radio technology designed for the Internet of Things (IoT) and is one of a range of Mobile IoT (MIoT) technologies standardized by the 3rd Generation Partnership Project (3GPP).

NB-IoT focuses specifically on indoor coverage, low cost, long battery life, and enabling a large number of connected devices. The NB-IoT technology use 180KHz bandwidth, could be deployed "in-band" in spectrum allocated to Long Term Evolution (LTE) - using resource blocks within a normal LTE carrier, or in the unused resource blocks within a LTE carrier's guard-band - or "standalone" for deployments in dedicated spectrum. It is also suitable for the re-farming of GSM spectrum.

Enhanced Machine Type Communications (eMTC) is another technology standardized by the 3rd Generation Partnership Project (3GPP). IoT LTE-M, that is, LTE-Machine-to-Machine, is an Internet of Things technology based on LTE, Low-Cost MTC in R12, and LTE enhanced MTC in R13, that is, eMTC.

LTE carrier to meet the needs of IoT devices. The eMTC is based on a cellular network and supports peak rates up to 1 Mbps upstream and downstream, much faster than NB-IoT. eMTC user equipment can directly access the existing LTE network by supporting 1.4 MHz radio frequency and baseband bandwidth. Another key capability of eMTC is to support mobility.

In the continuous evolution of LTE, the latest LTE-MTC (eMTC) further optimize the system cost, enhance the battery life and extend the coverage. eMTC features Narrowband LTE one of the most important features. First, the complexity of the system has been greatly reduced, the complexity and cost have been greatly optimized. Second, the power consumption is extremely reduced, battery life increased significantly. Third, the network's coverage is greatly enhanced. Fourth, the density of network coverage is enhanced.

2. Solution for operators to test IoT Network

Transcom provides IoT SCANER covers the test and measurements for narrowband IoT (NB-IoT) and enhanced Machine-Type Communication (eMTC) specified by 3GPP for base stations. It is an integrated platform based on all-standard scanner and LPWAN analysis software. As a third-party test solution, IoT SCANER guaranteed the neutrality of test. IoT SCANER overcomes the disadvantages of conventional test solutions that does not support terminal handover. The instrument can measure and test cells deployed standalone, in-band or in guard band. Support switching to cell with strongest signal coverage in real time. Ultra-fast test speed and very high sensitivity make the instrument suitable for a variety of test environments, including road test.

3. Solution Highlights

1. Test NB-IoT and eMTC with one equipment
Conventional test solutions have several cons:
- Do not support real-time terminal handover.

- IoT manufacturers' test solution are only for their own products. There is neutral solution that can test the actual coverage of IoT network from different manufacturers in contrast.

- There is a lack of test solutions that supports both NB-IoT and eMTC measurement, cannot

meet the carriers' test requirements.

IoT SCANER Support both NB-IoT and eMTC signal demodulation. Report frequency of TOPN cell, PCI, RSRP, CINR and RSSI parameters. Measurement channels including PSS, SSS and RS. As compared to the previous solution, IoT Scanner supports real time terminal switching in NB-IoT test. Support the test of NB-IoT/eMTC network from all manufacturers. It can be used for manufacturers horizontal test and contrast.

Supporting software also has powerful features test plan can be freely defined, combined and showed in a variety of ways, such as track map, time domain graph, frequency domain graph, list, etc. Support data playback and parameter display, custom test report and automatically generate special test reports. Support the import and export of test data, test data can be generated into * .csv, *.kml and other formats. Instrument has built-in GPS module. The test results can be imported into third-party planning software to do network planning, and use with GoogleEarth for data analysis.

Data analysis with Google Map

2. Ultra-fast test speed and very high sensitivity

NB-IoT technology can enhance the uplink power spectral density, retransmission and codec technology to achieve more than 20dB coverage gain, compared to GSM. Therefore, achieve a coverage of more than 100 times the coverage of GSM, a wide and deep coverage.

The detection level of the NB-IoT device should be less than -125dBm according to the LTE effective coverage level of -105dB. IoT SCANER provided by Transcom provide -130dBm sensitivity which will meet the needs of the test. Besides, data measurement and uploading of single frequency point can be completed in 3s to meet needs of various test environments, including road test.

3. Support cell information measurement with three operation methods

NB-IoT has three operation methods.
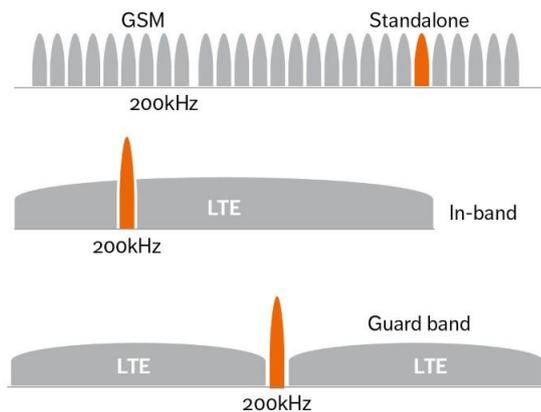
Three NB-IoT deployment scenarios

The standalone operation is suitable for reuse the GSM band. Channel bandwidth of GSM is 200KHz. Just enough to embed the NB-IoT 180KHz bandwidth, and both sides can have a 10KHz guard band.

The guard band operation uses resource blocks of unused 180 kHz bandwidth in the LTE edge guard band.

In-band operation utilizes any resource blocks in the LTE carrier.

With the NB-IoT / eMTC test instrument Transcom provided, you can automatically detect the three deployment methods, rapid measure information of cells with different deployment methods.

Key Facts of IoT Scanner

- Support for testing NB-IoT and eMTC
- Analyze and measure NB-IoT/eMTC base station downlink signal. Report cell frequency point, PCI, RSRP and RSSI. Output cell's signal strength waveform in time domain and frequency domain
- Support cell information measurement with independent deployment, in-band deployment and protect band deployment.
- Measuring speed ≤ 3s (single frequency point)
- Sensitivity: -130dBm (RSRP)
- Data interface: network port
- RF Interface: SMA Female

Keep innovating for excellence!

About Transcom

Shanghai Transcom Instrument Co., Ltd. (NEEQ: 831961), established in 2005, independently research and develop high-end radio frequency communication testing instruments and is a professional provider of overall testing solutions. Starting from 2009, Transcom, titled as National High-Tech Enterprise and the fostered enterprise by Shanghai Little Giant Project, has undertaken the tasks of development for National "New-Generation Broadband Wireless Mobile Communication Network" and the construction of Shanghai Engineering Research Center for Wireless Communication Testing Instruments.

In 2015, Transcom officially announced its new five-year development strategy "1+3". In detail, Transcom will continue to enhance its potential to be the national team for domestic wireless communication instruments, and develop security software for mobile communication network (network communication/data mining), wireless signal (spectrum monitoring/situation analysis) and Beidou navigation (signal monitoring for satellite navigation/mobile anti-jam verification platform). The strategy has now been implemented systematically with progressive achievements in Shanghai, Guangdong and other cities.

Keep innovating for excellence!

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