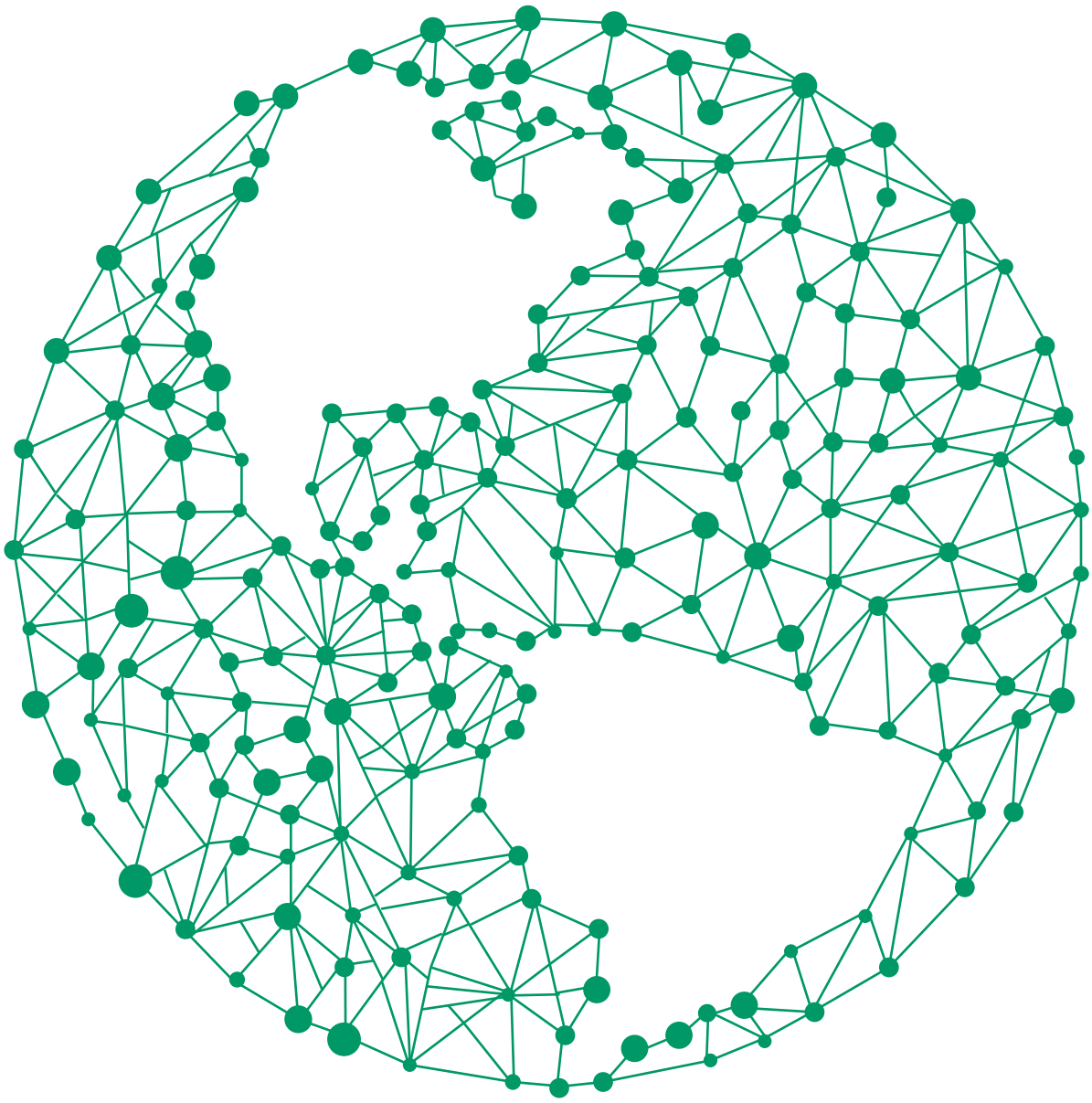
LACE

Billions of people. Trillions of things. One network.



Internet of Things and telematics:
cost-efficient, easy, quick
and wireless

Lace network – new horizons for your business

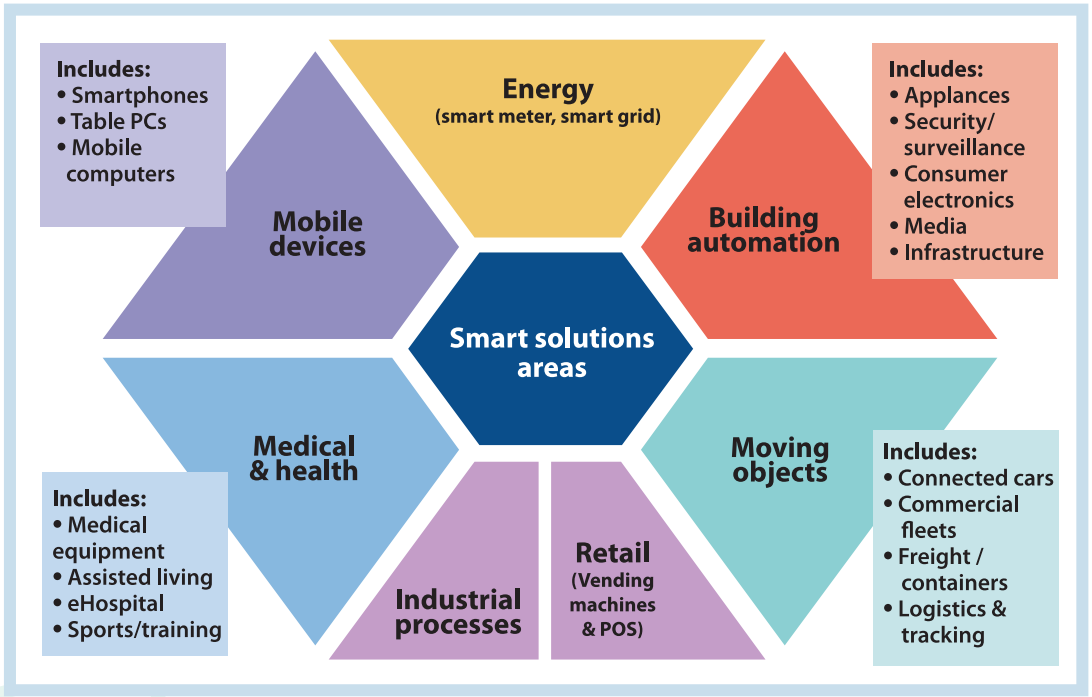
Internet of Things and business

"If you think that the internet has changed your life, think again. The IoT is about to change it all over again!"

Brendan O'Brien, Chief Architect & Co-Founder, Aria Systems

Today, many of those who "at least heard something" about the Internet of Things (IoT), imagine the same situation: a fridge connected to the Internet. On the one hand, this quite square notion of the subject fascinates with its novelty, and on the other – it makes an impression that "all this is still fiction." However, the Internet of Things was introduced to our life long ago. For example, millions of measurement sensors transmit their indications through the Internet. Today, owners of expensive private homes located in modern villa communities are aware that all the sensors installed in their houses regularly transmit information to their community managing company. The concept of a "smart home" is only a few steps away from the common usage of the Internet of Things in housing and utilities infrastructure.

A brief look at the diagram below is sufficient to make us realize: the Internet of Things gives business great opportunities that, until recently, didn't even exist.



If comparing the industry of the Internet of Things with rise of cellular communication in Russia, then now the worldwide Internet of Things is at the level of 1997, when the total number of subscribers was some 300 thousand. Within ten years, this figure went up to 172 million. There are grounds to expect that, in the case of the Internet of Things, the number of "subscribers" (that is, "smart objects" connected into a network) will increase more than a thousand times – not in 10 years, but in 2-3 years.

"The industry predicts that, by 2020, possibly 50 billion devices will be connected, a number that is 10 times that of all current Internet hosts, including connected mobile phones" — Dave Evans, Internet of Things: How the Next Evolution of the Internet Is Changing Everything, Cisco.

The Internet of Things differs from the common one in that the data in it is generated by things, not by people. Since in the very near future we are going to face universal "internetization," the issue of data transfer becomes of prime importance. We all remember how long it took for the traditional "Internet of People" to win enough hearts, and the reason was obvious – lack of penetration.

This is the problem the Lace network solves today.
Cheap and easy-to-install sensors requiring no recharge and connected into a global network – that's all the "smart" objects need for explosive expansion all over the world. This process has already started, and not without Lace's help.

Lace is not only a global, cost-efficient, wireless network for data transfer.

Lace is a service technology, enabling you to receive data from your sensors located anywhere in the world. Every Lace communication module is several times cheaper than traditional analogues, fully autonomous, and requires no recharge. Lace enables the combination of Things that, on the surface, appear incongruous: MicroData and BigData, miniature devices and a global network, great savings and stable yield, easy installation and high-profile integration projects.

Sounds fantastic? Read on, and see how real it is.

Lace network uniqueness

"The IoT is removing mundane repetitive tasks or creating things that just weren't possible before, enabling more people to do more rewarding tasks and leaving the machines to do the repetitive jobs."

Notman, Head of Sales and Marketing, Wood & Douglas

Easy to use

You need no additional or specific hardware to start transferring data through the Lace system. All you need is communication modules that are compatible with the LoRaWAN protocol. Then, you merely integrate your systems or those of your clients with these modules trough the Lace API.

Broad coverage

Due to use of the LoRaWAN protocol, the Lace radio waves have better penetrative quality than traditional networks, such as GSM, while simultaneously maintaining high reliability and incomparably lower power consumption

Works in every country

The Lace system is not bound to any particular radio frequencies. Our network is adaptable to bands which are in so-called unlicensed areas of industrial, scientific and medical bands (ISM).

Low power consumption

In order to minimize power consumption, the Lace network is activated only when a "smart" object needs to send or receive data. This is the fundamental feature distinguishing Lace from traditional networks. It enables the communication modules to operate on a single 2.5 Ah battery for up to twenty years.

Low cost

Cost of the solutions based on the Lace network is substantially lower than that of analogous solutions using traditional GSM, Wi-Fi, ZigBee or BlueTooth networks. For example, the traditional approach requires such intermediates as a number of concentrators, VPN networks and so on. In case of Lace, none of this is required: any Lace-compatible device can start sending and receiving data right after assembly

Open standard

The Lace network uses an open international data transfer standard – LoRaWAN. It enables you and your clients to be independent from any vendor: even today, the LoRaWAN-supporting communication modules are produced by dozens of vendors on different continents. The LoRaWAN standard was initially developed for creation of cost-efficient data transfer networks.

Two-way communication

The Lace network enables you not only to receive data from your sensors, but also to send outgoing signals, thus exercising full remote administration of your "smart-devices." Besides, it is the two-way communication that enables the maximization of the batteries' durability in terminal devices and the increase in the network "capacity." This is made possible because the Lace network server manages data transmission rates and frequencies sent by **every separate transmitting device according to the adaptive data rate scheme (ADR).**

Security and confidentiality

Security of the data transferred through the Lace network is provided by several protection levels:

- Unique Network key (EUI64);
- Unique Application key (EUI64);
- Device specific key (EUI128).

Lace network components

"One of the myths about the Internet of Things is that companies have all the data they need, but their real challenge is making sense of it. In reality, the cost of collecting some kinds of data remains too high, the quality of the data isn't always good enough, and it remains difficult to integrate multiple data sources".

Chris Murphy, Editor, Information Week

The Lace network consists of the following components

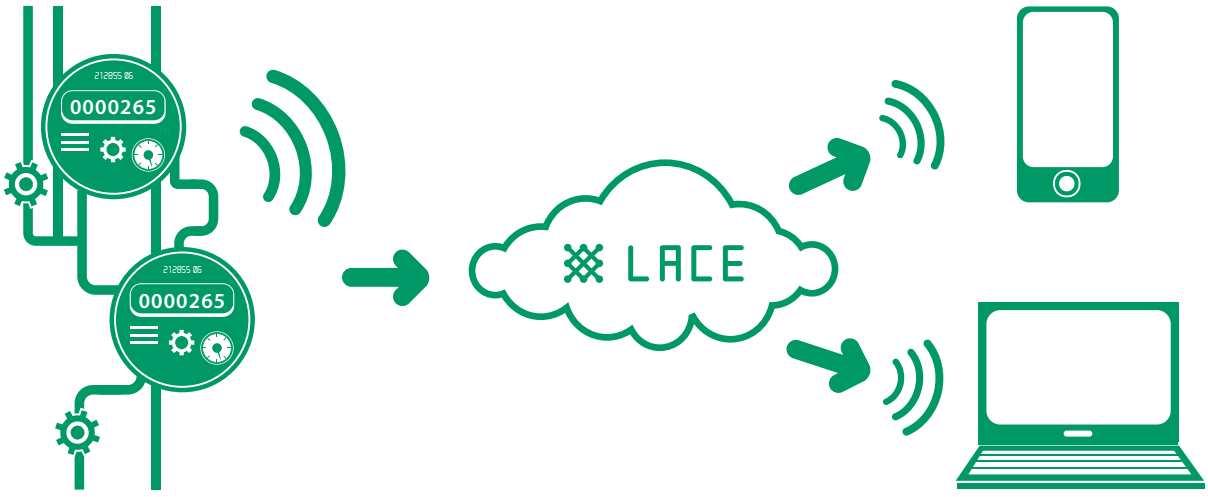
- ***Sensor or "smart device"***

  A terminal device having measuring or managing functions.

- ***Lace network working on the LoRaWAN standard;***

- ***Programming interface (Lace API)***

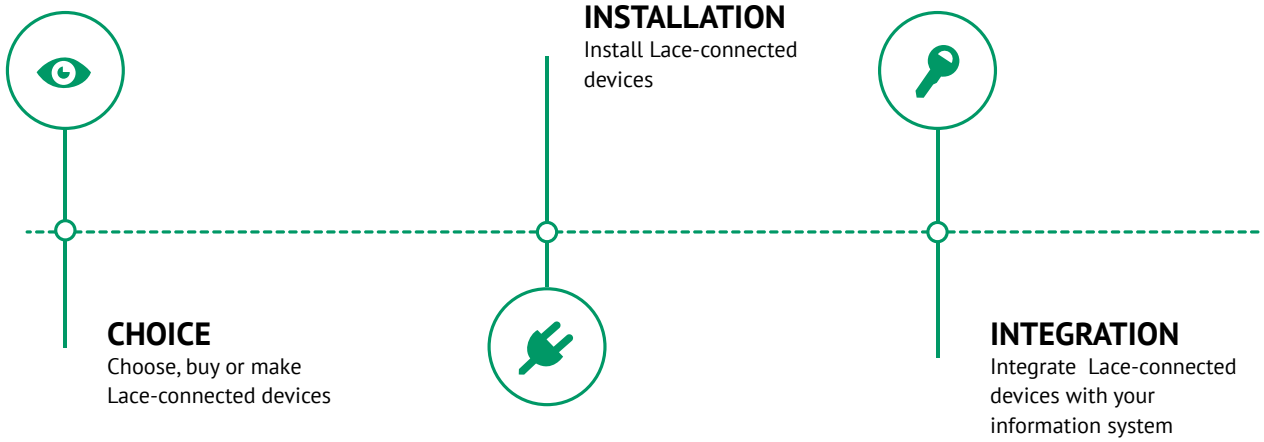
  Used for seamless and secure integration between the Lace network and client's internal ystems.



How to connect?

First, one needs to determine the types of the communication modules required. The range of types is quite wide: Lace-compatible communication modules are produced on all continents. The choice criteria are: form-factor, price, terms of supply, etc. There are variants; you can purchase the production of a communication module especially for your project from an instrument-making company. The Lace company will provide you with all the necessary blueprints, specifications, and source codes. Each module is ready to work right at the moment of assembly. Therefore, all you need to do is to integrate Lace with your information system through a suitable programming interface (Lace API).

Besides, anyone can purchase a Lace Demonstrator kit including: a communication module, source codes to connect to external systems, and one-year service within the Lace network. This kit is mostly designed for engineers developing monitoring and metering instruments, but is also available for anyone who wants to try the Lace technology in order to work out their own business-solutions. Please, feel free to contact the Lace company to obtain a kit for yourself.



Examples of projects

"If the last 10 years of technology development were about making it easier for companies and people to exchange information with one another – Google, Skype, Dropbox, and so on – the next 10 years will be about making it possible, cost effective and easy for the physical world to transmit data to the Internet".

«The Executive's Guide to the Internet of Things », Jason Hiner, CBS Interactive Inc.

For system integrators, Lace is not just a global wireless network for data transfer. Lace is a set of useful services and an "ecosystem" of partners developing the Internet of Things all over the world. Here we can see some further examples of how the Internet of Things can be used for business purposes.

▫ Healthcare

"Smart devices" can be used in remote health monitoring and in systems that provide information about vital signs' emergency changes. Such devices can vary from comparatively simple blood pressure and pulse trackers to advanced sensors monitoring implants, prostheses, cardiostimulators and hearing aids.

Special autonomous multifunction sensors can be installed in the rooms designed for monitoring the health of elderly persons or recovering patients. Devices such as "connected" thermometers and portable heart-rate monitors not only facilitate the development of the Internet of Things, but also encourage people in the pursuit of a healthy lifestyle.

▫ Agriculture

Since the Lace system can transfer data over dozens of kilometers, use of autonomous measuring instruments can find wide agricultural applications, for example:

- soil acidity control
- hydrographic data collection.
- monitoring of agricultural products' quality during storage and transportation

Today in China, the implementation of the Internet of Things is going, so to speak, in full throttle.

Companies such as China Telecom and Nunyi develop solutions on different stages of production, distribution and realization of agricultural products.

Historically and technologically, agriculture is in perfect step with environmental protection tasks. Therefore, today, the topic of the Internet of Things is more and more closely interweaved with the topic of human-to-nature interaction. Monitoring of water quality, changes in atmospheric effects, sun intensity – these are only the most evident and universal uses of "smart sensors."

Form-factors of the sensors compatible with the Lace system have become so small that they can already be used in the monitoring of flora and fauna migration.

Durability (the ability to work without recharge for more than a decade), resistance to environmental impact, and ability to transfer data for dozens and even hundreds of kilometers make the Lace-compatible sensors indispensable in such areas as earthquake and tsunami early warning systems.

▫ Transport

The Internet of Things helps to integrate different functions of control and communications in transport systems. "Smart modules" are used in all transport systems' components: in the very vehicles, within the infrastructure, and are applied by users and drivers. Intensive interaction between such modules enables the carrying out of internal and external communications, creates systems of road traffic control, "smart parking," road toll systems, logistics systems, safety control and road assistance systems.

Tires vendor Michelin installs "smart" sensors, not only in the manufacturing equipment, but also in the product itself.

Michelin "implants" IoT-sensors into their tires, thus helping drivers (truck drivers, for one) learn to save fuel.

Smart devices" are also widely used in transport telematics:

- flexible vehicle insurance (pay-as-you-go);
- emergency accident response (ERA-GLONASS and eCall);
- charging road tolls for heavy vehicles

If the task of precise geo-location of moveable objects (for example, cars) was solved comparatively long ago by development of satellites, then the task of the cost-effective sending of outgoing information from a car anywhere in the world becomes solvable only with the creation of the LoRaWAN protocol and Lace system. Now that such a burning technical need has been satisfied, it becomes possible to realize a great range of projects, potentially profitable and useful both to system integrators and users of transport systems.

▫ Smart city

The Internet of Things as a brand seems to have become widely known to consumers exactly for its use in common living houses. Television sets appropriately became the first "connected" household appliance. But use of miniature and fully autonomous transmitting devices that require no recharge will surely grant the Internet of Things real consumer popularity.

"Smart devices" can monitor mechanic, electrical and electronic systems used in new buildings. Though the state-of-art home automation systems are excitingly multifunctional, they still fully depend on uninterrupted power. That's another reason for maintaining such systems "smart sensors," – they are absolutely independent from power supply systems or communications. In other words, Lace-compatible sensors can work in your home even when it "runs out" of power, landline phone, mobile communication and Internet. The Internet of Things in "smart houses" (living, office or industrial – it doesn't matter) is capable of saving costly energy and warning of danger in sufficient time. In particular, use of "smart sensors" in fire alarm systems is but one very important example of how the whole fire protection system can be quickly and cheaply arranged in a single apartment house or office center.

Another example: a small, button-battery-sized sensor can be easily set on your apartment's front door, at once becoming a security system. Therefore, if you activated this sensor upon leaving your home (for instance, by using your mobile phone), then every time the door opened you would be informed about it.

Today, in different countries, several projects are being conducted on the implementation of the Internet of Things at a municipal level in an effort to enhance control over municipal systems and show the entire world how much more interesting and safe life has become in such cities. South Korean Songdo and Spanish Santander have realized the ideology that "all the city devices are interconnected." In these cities, you won't have a hard time looking for parking or a common Wi-Fi connection.

In one of the Singapore districts and in San Jose, systems of automatic traffic management are being built.

▫ Power engineering

Integration of measuring sensors and executive devices connected to the Internet is capable of optimizing power consumption itself. "Smart communicators" are expected to be integrated shortly into all types of power-consuming devices (lamps, switches, TV sets, etc.) and will be able to communicate with power suppliers in order to organize optimal energy balance. Even now, such devices can be controlled remotely via cloud servers, using such functions as the scheduled startup and shutdown of this or that light or heating complex, for example.

The Thames Water company, which invested 5 billion pounds sterling into the development of the water supply of Great Britain, uses remote sensors (set on water mains) for online monitoring of pipes and water-purification mechanisms' condition. It enables the company to carry out preventive replacements and repair in good time, preventing major failures. According to Thames Water, expenditures for repair work decreased by 30% and the number of sudden breakdowns – by 70%.

Today the Internet of Things finds its most logical use in the arrangement of so-called "smart grids," since it enables the automation of a lot of operations in a single power supply, thus achieving efficiency and stability within it.

▫ Housing and utilities infrastructure

What should be done so that house occupants wouldn't overpay utilities, water and power suppliers could plan their loads, and cease to suffer losses over errors in accounts?

You can connect wireless communication modules, compatible with the LoRaWAN protocol, to water, electricity, heating and gas meters at the building and/or apartment levels. Further, you connect a tour metering computer system to the Lace system API and that's it. Such a technology can function without the need for preventive measures for years.

How can controlling organizations and consumers benefit from it?

Let's consider the example of water metering. In addition to metering precision we get: leakage alarm, misuse prevention, exclusion of the human-error factor when taking meter readings, etc.

With the Lace system, one can easily arrange automated energy audits of apartments, townhouses and office buildings. Most likely, one of our industry solutions in housing and utilities infrastructure can be made applicable to your tasks. Please feel free to contact us, and we will discuss your project with interest.

About Lace company

The Lace company ("Lace" LLC) develops and operates a self-named, wireless, global, energy-efficient network. Our talented engineers take an active role in the work of LoRa Alliance committees. Other members include such trustworthy companies as IBM, Semtech and other companies in the field of telecommunication, microelectronics, program development, and system integration – from start-ups to multinational corporations. Thus, Lace makes a significant contribution to the development of the Internet of Things all over the world.

The LoRa Alliance develops the network LoRaWAN standard, which enables the sending and receiving of small amounts of data from "smart things," for example, measuring sensors, alarm triggers, transport traffic trackers, etc. This standard enables the arrangement of wireless energy-efficient networks.

LACE

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