The Internet of Things (IoT) provides big opportunities for technologies. The device business will reach $45B in 2024, contributing to a total IoT market of $400B.
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Companies Listed in this Report

Key Features

- The objectives of this report is to provide:

  - Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
  - Technology trends and evolution of IoT device in the coming years
  - Market forecast for IoT devices in Munits and $M for 2014 – 2024, with a focus on sensors
  - IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics
  - The technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
Who Should Be Interested in this Report?

- **R&D, Components Manufacturers Companies**
  - Evaluate market potential of future IoT technologies and products for new applicative markets
  - Spot new opportunities and define diversification strategies
  - Position your company in the ever changing IoT market structure

- **OEMs & Integrator Companies**
  - To evaluate benefits of integrating sensors in IoT devices
  - Get the list of key players and emerging start-ups in this industry

- **Cloud & Telecommunications Companies**
  - Understand the evolution of IoT devices and the market structure
  - Understand the differentiated value of products and services in this market
  - Identify new business opportunities and prospects

- **Financial & Strategic Investors**
  - Understand the potential of incoming Internet of Things revolution
  - Get the list of key players and emerging start-ups in this industry
Report Scope

• Yole’s definition of the Internet of Things is as follows:
  – Internet of Things devices is the aggregation of all the sensing modules that are linked
    to the Cloud – either directly or through a gateway – and which data is processed and
    valorized in any manner (through selling to a third party, through monitoring of a piece
    of equipment, etc.).

• This report looks at the Internet of Things market in general, but with a strong
  focus on sensing modules. We do not detail the cloud computing industry nor
  the data processing services.

• We do not include in our valorizations the benefit brought by IoT solutions
  through productivity gains. The values estimated are from hardware, cloud
  computing processing services and data processing services charging.
IoT Global Market Structure (1/3)
Area Of Application

- Building Automation
- Retail & Logistics
- Consumer & Home automation
- Healthcare & Life Science
- Industrial
- Transportation
- Security & Public Safety
- Environment
• Here are the main applications of IoT devices and sensors associated with.

Legend:

- **Sensor**
- **Level of demand**

### SENSORS OF THE INTERNET OF THINGS

#### Building Automation
- Light (IR, visible)
- Temperature
- Chemical (CO2)
- Accelero
- Contact

#### Healthcare & Life science
- Pressure
- Temperature
- Chemical
- Light (IR, X-Ray)
- Bio Sensors
- Inertial

#### Consumer & Home automation
- Gyroscope
- Temperature
- Chemical
- Pressure
- Accelero
- Magneto

#### Transportation
- Gyroscope
- Temperature
- Pressure
- Accelero
- Magneto
- Chemical

#### Industrial
- Pressure
- Hall Effect
- Chemical
- Light (IR, Optical)
- Accelero

#### Environment
- Chemical
- Temperature
- Light (IR, visible)
- Pressure
- Humidity

#### Security & Public Safety
- Gyro
- Light (IR, X-Ray, THz)
- Accelero
- Magneto
- Chemical

#### Retail & Logistics
- Light (IR/Optical)
- Pressure
- Temperature
- Chemical
- Magneto
IoT Wireless Sensors Map

**Sensing Module**
- Accelerometers
- Magnetometers
- Gyroscopes
- Acoustic Sensors
- Pressure Sensors
- Humidity Sensors
- Temperature Sensors
- Proximity Sensors
- Image Sensors
- Light Sensors
- Gas RFID Sensors
- Micro Flow Sensors

**RF Module**
- Signal Processing Unit
- Radio Transceiver
- Wifi
- ZigBee
- Bluetooth LE

**RF Module**
- Bluetooth
- ZigBee

**Energy Storage Module**
- Li-ion battery
- AAA/AA Batteries
- Energy Harvesting

**Energy Storage Module**
- Ultra-capacitors
- Microbatteries

**Power Management Module**
- PMU
- Ultra-capacitors
- Microbatteries
Solution Price IoT Roadmap

Solution Price per sensor module

- Rosemount 3051C Smart Pressure Transmitter
  Source: Rosemount

- NEST Smart Thermostat
  (current price: $250)
  Source: NEST

- Fitness Activity Tracker
  (current price: $130)
  Source: Jawbone

- Multiple temperature sensors for home automation
  (current price: $75)
  Source: EnOcean

- MEMS-based chemical sensing
  Source: Opto Microelectronics

- Sensors’ swarm - Michigan Micro-Mote
  Source: University of Michigan

- Batch-level RFID Temperature Sensor Tags
  (current price: $ range)
  Source: ThinFilm Electronics

- Item-level RFID sensor tags

Today
2016
2018
2020
2024
2024+
Summary of Technologies of IoT
Forecast: Hardware Market Value by Application Domain

Market Value by Domains of Applications ($M)

- Cloud
- Environment
- Security & Public Safety
- Retail & Logistics
- Industrial
- Healthcare & Life Science
- Consumer & Home Automation
- Building Automation
- Automotive

The global wearable electronics market can be segmented in 5 categories. Head-Wear category includes helmet product and vision aid. There’s also a category of products for neck-wear, with collars and necklace products that cover up electronics with jewels. Arm-Wear category is the most burgeoning category with multiples devices expected wristband, smart watches, ring, armband, etc. Body-Wear products include smart clothing, and devices monitoring back/spine position. And the last category concerns foot-wear.
Wearable Electronic
A new opportunity for sensor fusion / processing

- **Wearable electronics is a new big opportunity for sensors**
  - Fitness / activity monitoring, healthcare, sports applications
  - In many cases the sensor acts as a hub
    - Basic calculations can be done at the device level
    - After transmission (enabled by low energy Bluetooth): advanced software / fusion can be done by the smartphone
  - Below are many examples of such developments:

**I'm watch (2012)**
- Integrates accelerometer + magnetometer

**Moto 360 by Motorola (End 2014)**
- Other connected watches are currently in development by major OEMs
  (LG G Watch, rumors about Apple iWatch...)

**Pebble Watch (0.4 MUnits sold in 2013)**
- Features STMicroelectronics accelerometer
Wearable Electronic / Connected Devices

Examples of new devices (2/4)

BodyMedia (Acquired by Jawbone in 2013)
- Integrates MEMS accelerometer (from Kionix and STMicroelectronics) in its systems for fitness application
- We note that no gyroscopes are used presently. This would enable more precise monitoring and new sport applications, however power consumption would be too high. It could be part of larger systems in the future.

Jawbone Up24

MYO by ThalmicLabs
- Proprietary EMG muscle activity sensors
- Nine-axis IMU containing:
  - three-axis gyroscope
  - three-axis accelerometer
  - three-axis magnetometer

Cell Phone as a Hub

NodeKore from Variable Technologies

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