

# JABIL

## Energy Harvesting

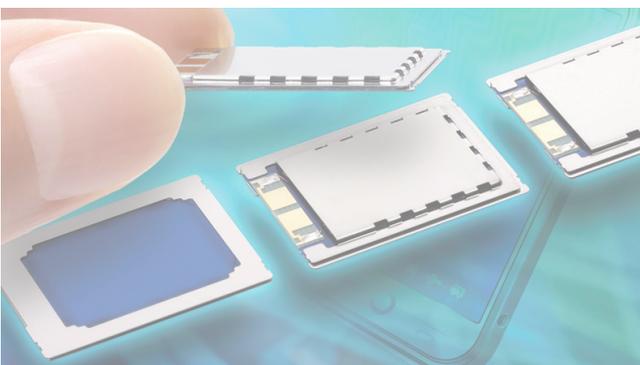
### Powering Smart Devices for the Internet of Things

The number of IoT devices — from toys to industrial equipment — equipped for connectivity, sensing, and computing is skyrocketing. Sophisticated materials science, precision engineering, and advanced manufacturing techniques have enabled product designers to include smart capabilities, cost effectively, in an amazing diversity of applications.

However, for all the technological advancements in electronics, materials, and production processes, one component lags: the power source. Unless recharged, batteries stop working. Fortunately, small wireless sensor components, such as those used with many medical implants or e-textiles, require only micro- to milliwatts of current.

### Comprehensive Jabil Expertise

The answer is energy harvesting: using the properties of piezoelectrics, thermoelectrics, and photovoltaics to generate the tiny currents needed to power smart IoT components. And Jabil, with its expertise in all the disciplines and capabilities needed to design, engineer, and cost-effectively manufacture connected, sensor-equipped products, is the partner of choice for leading brands and their OEMs worldwide.



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## Energy Harvesting

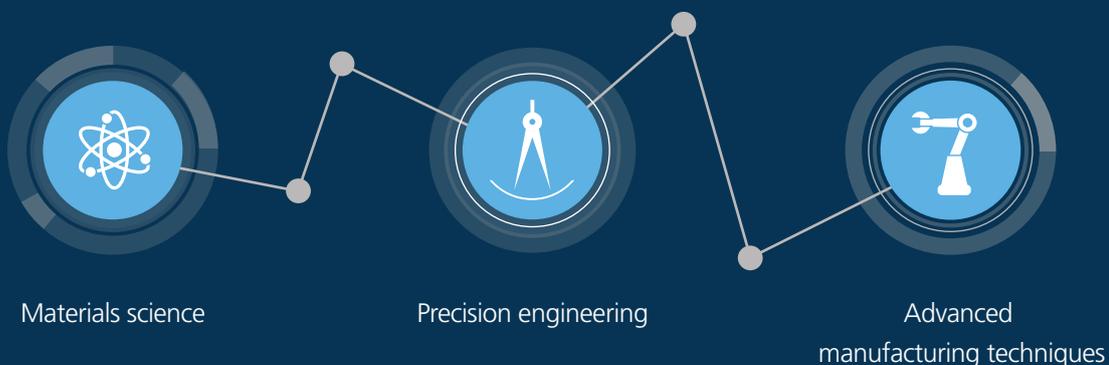
### Energy Harvesting Technologies

Motion, temperature differentials, and light are all power sources:

- Piezoelectrics — when piezoelectric materials, typically quartz and other crystals, undergo mechanical stress, their electrical charge shifts, generating current. In a microphone, sound waves apply pressure to a crystal, and the crystal emits a signal. The principle enables harnessing many types of motion (stress), from foot traffic on special floor tiles to blood flow in an artery.
- Thermoelectrics — thermoelectric generators convert temperature differences between two different materials into electric voltage. For example, if two surfaces are sandwiched together and connected, and one side is heated, current will flow from the connection. Typical thermoelectric materials include rare-metal alloys and silicon germanium.
- Photovoltaics — advances in harnessing light for electricity have enabled capturing up to several hundreds of  $\mu\text{W}/\text{cm}^2$  from ambient indoor light. This is enough power to enable wireless sensors in even the lowest-light conditions, without the need to wire a circuit or repeatedly change batteries.

Even radio frequency energy from TV signals, wireless radio networks, and cell phone towers can be harvested.

The accelerated growth of the IoT means that almost everything we can imagine will be connected and aware. And Jabil builds literally everything in the IoT ecosystem — from hyperscale data center servers that host IoT communications to the wearable devices we use to stay connected and healthy.



Learn about all Jabil design, engineering, manufacturing, packaging, and supply chain capabilities at [www.Jabil.com](http://www.Jabil.com).