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WHITE PAPER

The Environmental Footprint of IoT

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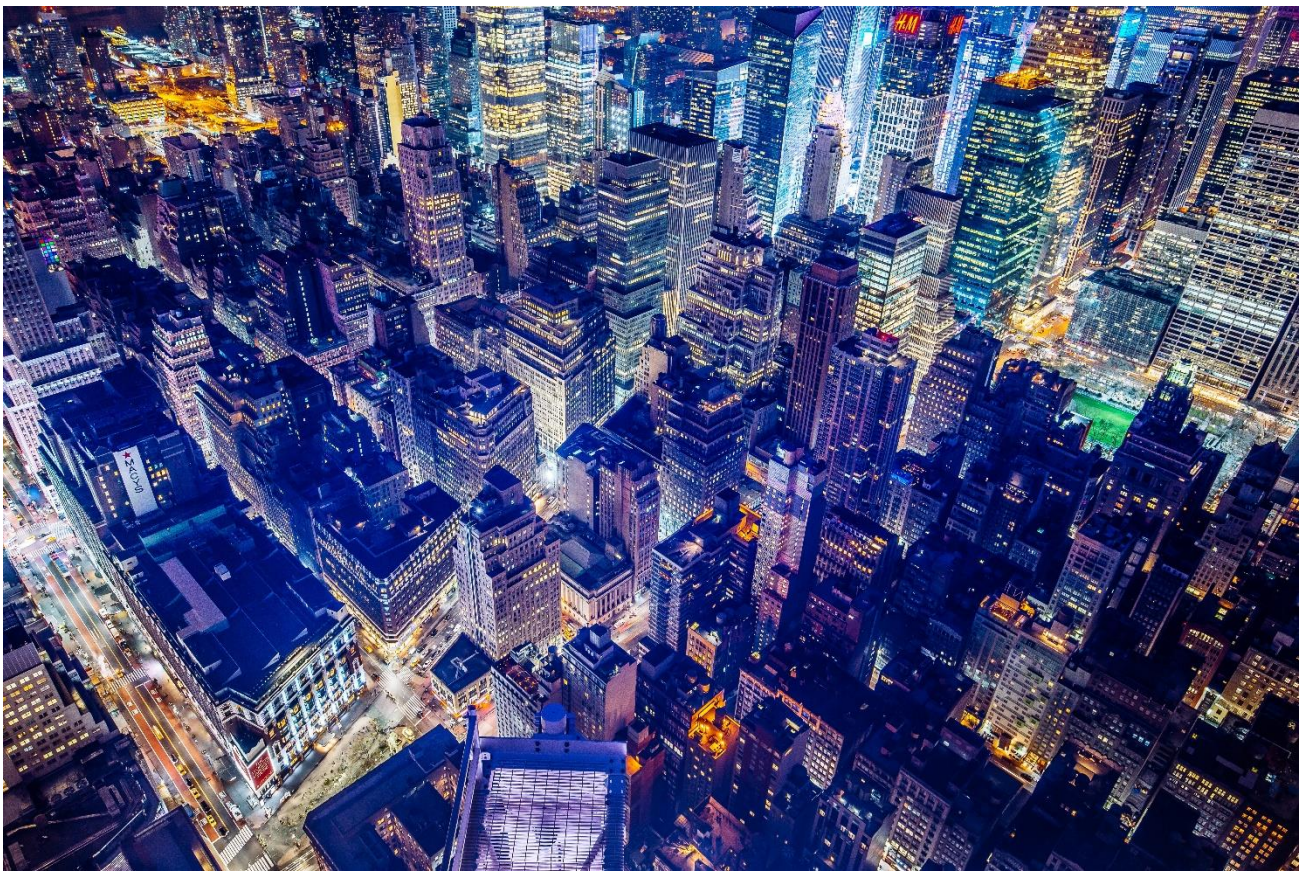

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Have you ever wondered what the environmental footprint of your IoT (Internet of Things) solution is? Significant investments are being made by the lodging industry into IoT for the purpose of enhancing the guest experience, improving staff efficiency and for reducing the energy consumption of buildings. But besides the functional objectives of your IoT initiative, how can one understand the environmental footprint of these systems and how can one compare these footprints as part of a competitive IoT evaluation? Are there greener IoT systems than others? This brief article attempts to provide some thought-provoking insights into this topic.

Over its entire life cycle, an IoT device has a much wider impact on the environmental footprint than its non-IoT device variants. Compare for example a connected light switch with a traditional electro-mechanical light switch. The latter is manufactured with mostly plastics and a few metal parts and the device typically last for upwards of 20 years. Its IoT variant however has a significant amount of electronics that is driven by software and the life expectancy of this device is typically much lower. Often, the electronics contain rare earth materials that can be problematic during the mining process and that are difficult to recycle. Further, an IoT device continuously requires power to operate. Power to operate the device itself, power to operate the associated network equipment, both inside and outside the building. And power to store and make available the massive amount of data that the device sends towards the file servers and that is the basis for data analytics and user-facing applications.

While IoT devices are more complex and have more failure points, the real reason that IoT devices today have a much shorter lifespan is rooted in their software. Inabilities of upgrading the cyber security implementation, or a protocol version that is no longer relevant for a system integration can render a device obsolete overnight. This has the unfortunate consequence that otherwise perfectly good working hardware is discarded to the landfill prematurely. This degrades the environmental footprint of the device.

To improve the environmental footprint for an IoT solution, one can look at the above aspects and engage with the device vendors. Set a goal of how long you expect your IoT solution to be operational and challenge the IoT vendor to meet your expectations. Evaluate the warranty and support duration and the ability to upgrade the software after deployment. Set goals of how you expect the products to be refurbished and recycled as they fail or when they reach the end of their useful life. Review the energy consumption of the total IoT system for the entire expected operational life.

Further, a considerable impact on IoT life expectancy is the system architecture of the selected IoT solution. For example, some devices support multiple communication protocols, such as WiFi, ZigBee, Bluetooth and so on. While supporting multiple protocols by itself can improve the device's usability, the moment multiple protocols are used in a mission critical fashion during a deployment, only one of these protocols needs to become obsolete to render the entire device as obsolete.

Another key aspect governed by the system architecture is the reliance on the selected gateway. The gateway provides connectivity services for an IoT device towards the internet and often performs the orchestration of multiple devices into an application. Should a gateway fail to provide a forward path for maintenance, upgrades or integration, replacing the gateway often forces the upgrade of most if not all attached IoT devices. Such forklift upgrades again significantly degrade the environmental footprint of an IoT solution.

To reduce the risk of obsolescence caused by system architecture, IoT systems benefit if they support long-lived technologies. For example, devices that support internet protocols, such as IPv4 and IPv6, have a much better chance to stand the test of time. IP protocols last for decades and are well understood. Application integration can now be performed at the gateway, at the edge or in the cloud. This greatly lessens the risk of a sudden obsoleteness of an IoT device.

IP protocols do not necessarily have to mean WiFi or Ethernet. IP protocols are largely independent of the physical layer and can also operate over existing low-power network technology, such as ZigBee or Bluetooth. On that front, Amazon, Google and Apple have created an alliance that attempts to create a standard for IP connectivity named CHIP (Connected Home over IP). This standard is expected to become available towards 2021. There are also efforts on the way to create a low-power WiFi standard that would yet provide another means to make IoT devices truly IP capable.

It is in the interest of the IoT buyer and our shared global environment to overcome the mentality of “designed for obsolescence“ and rather strive for IoT devices that have the best possible environmental footprint.

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