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Mobile Devices Can Solve IoT Connectivity Challenges

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As the Internet of Things grows by leaps and bounds over the next decade, it is very likely that there will be viable use cases for sensor networks located in areas that pose challenges to connectivity. This presents a problem because it's difficult to have the Internet of Things (IoT) if you do not have the Internet to connect the things to. One very viable solution is to use mobile devices in an opportunistic manner to serve as the IoT gateway.

Today, we live in a world where more people have access to a mobile phone than to a toilet. That not only speaks to the impact that mobile technology has on our planet, but also to the extent to which mobile technology can affect the future. It also highlights just one reason why mobile devices hold a great potential as the opportunistic gateways for wireless sensor networks.

Many of us already use our mobile devices as a gateway for sensors and devices in our Personal Area Network (PAN), connecting various devices to our phone and many of them to the Internet. Some devices are simple and perhaps connect just to the mobile device to interact with an app like headphones or a microphone. Wearable devices like smartphones and fitness trackers are far more likely to use your phone as a gateway to communicate out to the Internet and get information back.

But the mobile device as a gateway doesn't have to be limited to use in a PAN. The mobile device has the functionality and connectivity to bridge the gap for sensor networks that might happen to be located to remote regions. Mobiles can thus be useful in areas where other types of connectivity or resource constraints might otherwise hinder direct communication with the Internet.

In a more traditional deployment of a wireless sensor network, the devices might talk directly to the Internet through a hub or router. They may alternatively have a fixed gateway that relays between the sensor's network and the Internet. In the event that neither is possible, one where there is no reliable Internet connectivity or where the sensors are under a power constraint and must minimize wireless communication, a mobile device could be utilized as the gateway when it becomes available to the network.

The mobile devices of today seem almost designed for such a task. They have multiple radios that can communicate to sensors using different technologies, they can run software to manage authentication and messaging, and they have vast amounts of storage as well as considerable battery life. All of these features point to the mobile device platform as an ideal opportunistic gateway for wireless sensor nodes.

The architecture here would involve having one or several mobile devices that are trusted as a gateway by the wireless sensor network. When one of these mobile gateways comes into range...
it can send out a periodic beacon to the sensor nodes, letting them know that they can now transmit their sensor data via the gateway. When the mobile gateway is turning off or moving out of range it would send out another beacon letting the sensor nodes know to stop transmitting. In more simple deployments this activation and deactivation of the gateway could be done manually by a user. In more sophisticated versions of such networks the activation and deactivation could be automated through the use of drones or by using geo-location technology so the gateway knows when to send out beacons.

Utilization of mobile devices as the gateway for wireless sensor networks can extend the Internet of Things to reach far beyond what the current physical infrastructure would allow. Being able to deploy sensor networks in remote areas and periodically have the data transmitted through a mobile device as the gateway might not fit every use case, but it offers a solution to sensor network deployments that face significant resource challenges. Where extending a fixed network might not be a viable option, opportunistic mobile gateways can push the Internet of Things that much further into the physical world.