Connected Living

KDDI's 4G Empowers Japan's Utilities

Summary

By enabling utilities and their customers to monitor and control electricity and gas usage in real-time, smart meters are transforming the energy industry. Mobile technologies and services can provide cost-effective, reliable and secure connectivity between smart meters and the utility's IT systems. In Japan, mobile operator KDDI is using 4G mobile networks to provide nine leading utilities with advanced metering infrastructure services, designed to ultimately support more than 10 million smart meters and process around half a billion meter reads each day.

Smart metering is transforming utilities

Mobile technologies and services are enabling utilities to gain much greater visibility of how their customers are consuming energy and water. Historically, utilities have either had to send staff to customers' premises to read their electricity, gas or water meter or they have had to rely on the customer reporting the meter reading themselves. While sending out staff is expensive, customer reports can be tardy and unreliable. Now, connected smart meters can send data directly to the utility over a telecoms network, providing it with low cost and reliable meter readings.

Empowered with near real-time information on what is happening across its network, a utility can cost-effectively maximise the use of assets and automate their operation. With a network of smart meters in place, utilities can monitor demand in real-time and redirect resources as necessary or provide customers with incentives to use less energy or water at times of shortage. A utility could also provide customers with home energy management services that enable them to use their smart meter to remotely monitor and control their own usage. A householder could, for example, turn off their home central heating from their office.

4G underpins Japan's advanced metering infrastructure

In Japan, as part of a government-mandated deregulation of the energy sector, utilities are increasingly deploying an "advanced metering infrastructure". This infrastructure makes use of both short-range wireless technologies and conventional cellular networks. While short-range, low power radio technologies transmit the usage information captured by smart meters to nearby access points, the public mobile networks are used to forward aggregated data from the access points to the utility's IT systems.

Serving nine of the ten utilities in Japan, mobile operator KDDI's advanced metering infrastructure services are designed to ultimately support more than 10 million smart meters generating about 500 million meter reads each day. As well as enabling remote meter reading, this new infrastructure also enables the detection of a power outage in a building in near-real time, enabling the utility to respond quickly. It has the capacity to collect data from smart meters every 30 minutes within a 10 minute delivery window (the equivalent of 48 meter reads per day per meter). The advanced metering infrastructure could also help utilities to optimise their networks to harness distributed power supplies, such as that generated by solar panels and wind turbines.

KDDI says it uses 4G (LTE) mobile networks as they offer the most efficient way to provide connectivity in terms of both capital costs and operating costs. For utilities, harnessing the existing LTE infrastructure is more cost effective than constructing and maintaining their own smart grid infrastructure.

Moreover, the mobile networks are secure (protected by 4G LTE cyber security) and tend to be less vulnerable than fixed networks to disruption by natural disasters, such as the earthquakes that can occur on the Pacific Rim. The major Tōhoku earthquake and tsunami in March 2011, for example, caused widespread damage to infrastructure in parts of north east Japan.

Moreover, as LTE networks operate in licensed spectrum, they are protected from radio interference. KDDI says its networks also have a star topology that makes fault identification and isolation relatively simple, while it offers multiple backup capabilities and quality of service guarantees to provide utilities with additional resilience.

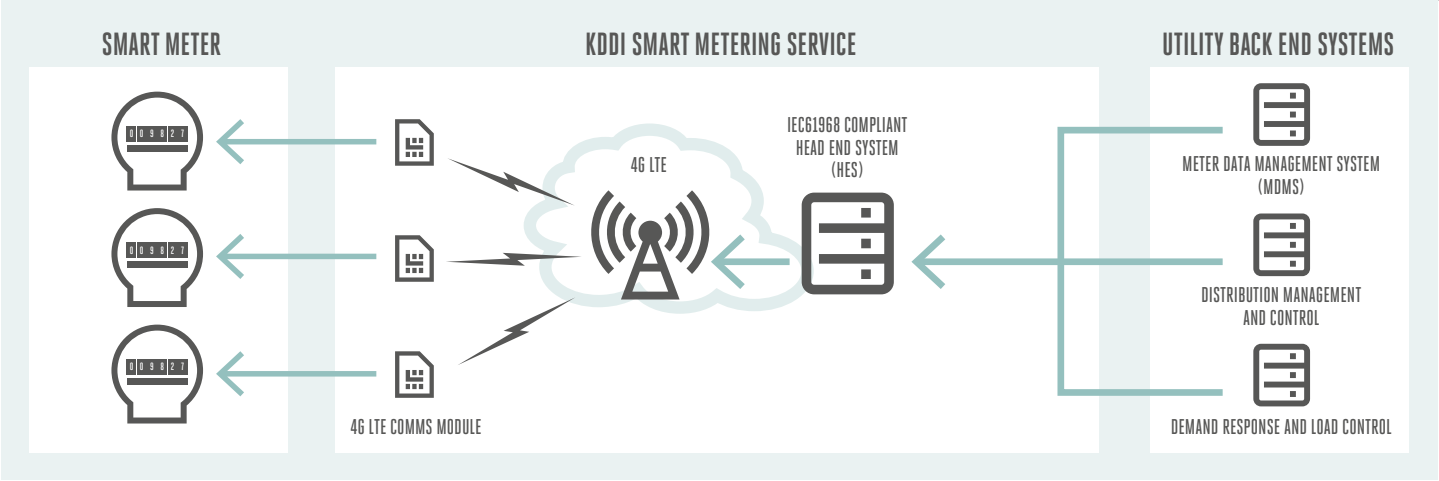
KDDI says its LTE network can support large numbers of devices within each base station cell in urban areas where residential density is very high, while also supporting large cell sizes in rural areas where residential density is relatively low: The LTE network operates in the 800MHz frequency band, which delivers good in-building penetration and geographic propagation, extending coverage to over 99% of the population. If it has poor LTE reception, a smart meter can use a local RF technology, such as 920MHz radio, to transfer data to a nearby smart meter with sufficient LTE connectivity to relay the data to the head end system.

LTE is also a future-proof solution. Having been deployed over the past few years, the LTE network will be in service for the entire 10-year lifetime of the smart metering infrastructure.

"We adopted LTE for advanced metering services as it offers utilities major cost savings compared with constructing and maintaining their own smart grid network, such as mesh networks with optical fibers and concentrators."

Keiichi Mori, Executive Officer, General Manager, Convergence Promotion Division Solution Business Sector.

FIGURE 1: KDDI'S ADVANCED METERING SOLUTION



KDDI's advanced metering solution

Figure 1 shows the basic architecture of KDDI's advanced metering solution, which includes:

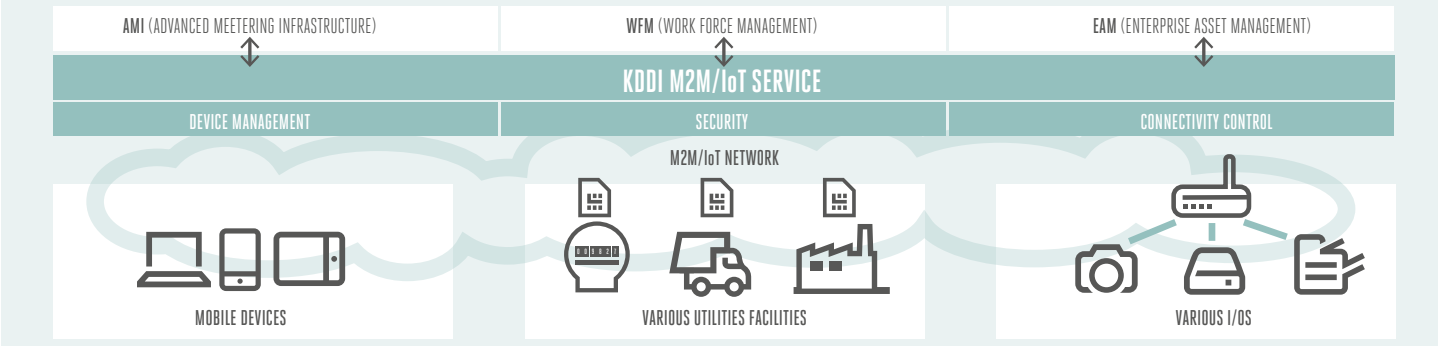
- **4G LTE modules**
- **4G LTE communication services**
- **Hosted and secure IEC 61968-9-compliant Meter Head End System (compliant with the NIST security requirements IR 7628 and segregated from the public Internet to protect against external cyber threats)**
- **Systems integration**
- **Platform operation and maintenance**
- **Cloud services platform supporting data warehousing and big data analytics**

Enabling more than smart metering

Beyond smart metering, mobile connectivity is also yielding other benefits for Japan's utilities. They are using KDDI's Internet of Things solutions to increase workforce safety, improve the management of their field staff and remote assets, as well as cutting costs and delivering a better service to final consumers (please see Figure 2).

As the utility sector embraces the Internet of Things, KDDI also see opportunities to develop further innovative applications that will enable individual utilities to expand their service offerings. Utilities could, for example, use mobile connectivity to offer customers home energy management services, utility sensor networks, and enhanced asset and workforce management.

FIGURE 2: KDDI'S M2M/IoT SERVICE



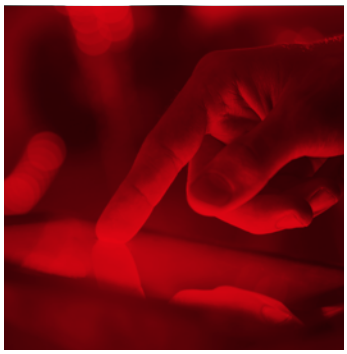
Connected Living

About the Connected Living Programme

The GSMA Connected Living programme is an initiative to help operators add value and accelerate the delivery of new connected devices and services in the M2M market. This is to be achieved by industry collaboration, appropriate regulation, optimising networks as well as developing key enablers to support the growth of M2M in the immediate future and the IoT in the longer term. For more information please visit **www.gsma.com/connectedliving**










Floor 2, The Walbrook Building
25 Walbrook, London EC4N 8AF UK
Tel: +44 (0)207 356 0600

connectedliving@gsma.com
www.gsma.com