Cellular IoT Success Story

Altair
A Sony Group Company

Altair Enables IoT's Lowest Power Consumption Solving Japanese Smart Gas Metering Challenges



Situation

Smart gas metering in Japan began in 1983, with the introduction of gas meters that had built-in microcomputers. The Japanese market has continued to evolve, with the rollout of communication interfaces in 1988, and the 2005 introduction of residential ultrasonic gas meters. It is expected to continue growing to over 37% market share by 2024. The government-initiated program, involving all Japanese telecoms operators, is for smart meters to help create an energy-efficient and low carbon society, by providing customers with information on their energy consumption and encouraging more efficient usage. The 2011 Great East Japan Earthquake and resulting nuclear disaster at Fukushima also contributed to the need for smart meters to improve energy security. Following the disaster, the Japanese government mandated that up to 100 million buildings and households be connected with smart utility meters by 2020.

Challenge

The primary challenge was to enable continuous network availability and real-time remote access, while maintaining battery life of 10 years or more in the field. Traditional gas meters were able to conserve battery life through a sleep mode setting, turning on once per day to send data to the cloud. But such systems are not able to handle more than one update a day and sustain a long battery life. Of course, the issue in Japan is that it is unclear when a disaster may strike. Therefore, the device must always have network accessibility – and be "on" to some degree, so that it can be remotely shut down in case of a tsunami or earthquake.
Telemetering and robust communications were identified as key requirements for smart gas metering in Japan, due to a growing number of sites that were difficult for metering personnel to access. Other requirements included reverse-flow measurements, bi-directional information supply and enhanced security protocols.

The key undertaking, therefore, was to develop a solution capable of eDRX (extended discontinuous reception) paging mode, which would enable constant network accessibility, enable data transfers a few times per day, and provide firmware upgrades every couple of years – without compromising on battery life. Simply adding more batteries to existing devices was not an option, due to the prohibitive cost of batteries used in smart utility meters.

At a Glance

Situation

Following the 2011 Great East Japan Earthquake, the Japanese government has mandated that 100 million buildings and households be fitted with smart meters by 2020.

Challenge

To develop a Cellular IoT solution that enables continuous network availability and remote access, while allowing smart gas meters to maintain over 10 years of battery life in the field.

Solution

The Sierra Wireless AirPrime® HL78 module, featuring Altair's highly integrated LTE CAT-M & NB-IoT chipset, was selected to provide CAT-M connectivity for LP gas meters in Japan.

Results

Altair chipsets now provide connectivity for all cellular-connected gas meters in Japan with continuous cellular connectivity.

Solution

The Japanese smart gas metering market consists of two parallel projects – Metropolitan gas meters and LP gas meters. Metropolitan gas meters, serving gas pipelines in urban areas and covering 29 million households, are supported by 198 gas suppliers. LP gas meters, servicing gas tanks, consist of 24 million units. A supply chain formed in which each network operator targeted one or more meter vendors who, in turn, selected the module makers and chipset developers.

One of Asia's leading telecommunications providers approached Altair Semiconductor after recognizing that alternative vendors were unable to meet the power numbers needed to provide over 10 years of battery life. Altair teamed up with Sierra Wireless, a leading provider of integrated IoT solutions, to develop a cellular solution capable of meeting the strict performance demands and timelines. The AirPrime® HL78, featuring Altair's integrated LTE CAT-M & NB-IoT chipset, ALT1250, was subsequently selected to provide CAT-M connectivity for LP gas meters.

There followed an intensive testing and selection process, involving setting device parameters and optimizing network configuration. Proving that the battery would be capable of lasting for 10 or more years posed a significant challenge, as there are major costs in recalling devices after deployment if they are found not to work, or if the battery drains too quickly. Therefore, a gradual testing process was required, starting with just a few devices and graduating to hundreds of thousands of systems by the end of the assessment period.

Environmental changes also had to be considered, to ensure that devices would still operate, even in adverse weather conditions. Thus, a year of testing was required, as lab testing quickly progressed to active field tests. Network fluctuations were also taken into account, to ensure devices were sufficiently robust, so that batteries did not drain in instances of exceptionally high or low network coverage.

Due to the unique situation in Japan, regulations require the ability to not just read, but also remotely control gas meters. Therefore, each meter includes a valve that can be remotely controlled via the cellular connection to shut down the gas supply in case of an earthquake. This adds further complexity to maintaining long battery life. Altair's cellular IoT chipsets were consistently proven capable of meeting the requirements of 10-plus years of battery life for gas meters in Japan, thanks to the ALT1250's ultra-low power consumption enabling extended battery life. Additionally, only Altair's chipsets possessed the necessary reliability and maturity.



Results

As the only solution capable of meeting the ultra-low power requirements of these deployments, Altair chipsets now provide cellular connectivity for all the cellular-connected smart gas metering projects in Japan. Earlier Metropolitan gas meters are utilizing Altair's ALT1160 CAT-1 chipset, while the dual-mode CAT-M & NB-IoT ALT1250 will continue providing connectivity for the next-generation LP meters.