SPIRE METERING TECHNOLOGY

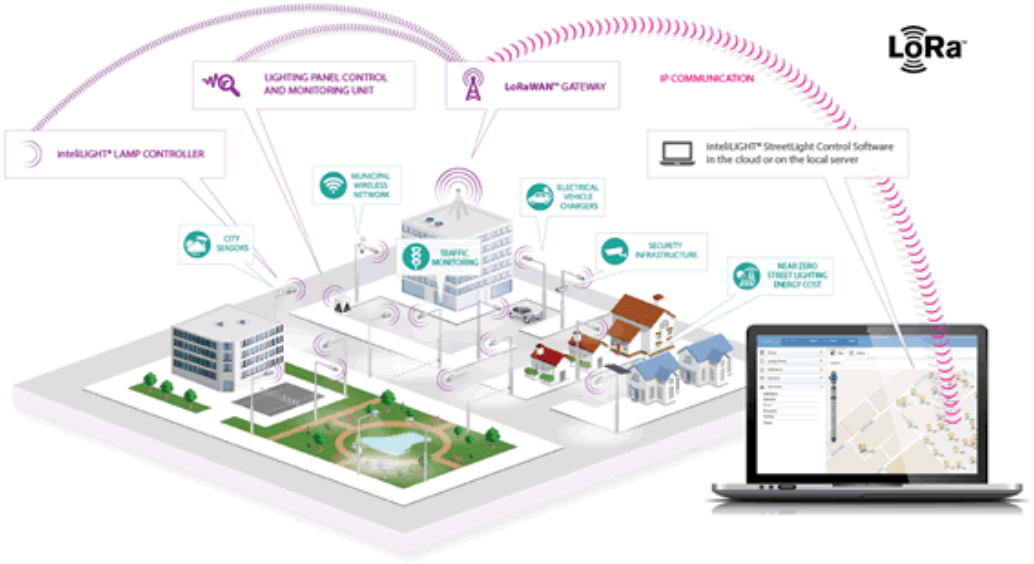
OneDrop Residential Water Meter
https://www.spiremt.com/280W-D-AWWA-residential-water-meter.html

SpiRely Commercial Water Meter
https://www.spiremt.com/280W-D-AWWA-residential-water-meter.html

Spire Smart Water Meters – OneDrop SpiRely LoRaWAN Water Meters Operational Construct, Theory of Operation

Spire OneDrop and SpiRely Water Meters in concert with spire Advanced Metering Infrastructure (AMI) provides our residents with an improved meter read and billing accuracy. This state-of-the-art technology will provide water usage data in real time and detect leaks or issues immediately, leading to a faster response time and an increase in consumer satisfaction.

OneDrop & SpiRely LoRaWAN Technology



Spire OneDrop and SpiRely Water Meters are Smart IoT intelligent meters which include LoRaWAN technology. LoRaWAN technology is Cloud based technology where spire OneDrop and SpiRely Water Meters transmit using LoRaWAN Stack while taking advantage of scalable IoT cloud infrastructure. This infrastructure includes highly available highly secure networks where thousands of Water Meters are sending data to the cloud via Ethernet/LTE Gateways to a service Provider (Comcast) that has a Spire Specific Water Meter Sensor Database. The Spire water Meter Sensor Database stores each water meter reading which are connected to our Spire AMR Cloud Portal software.

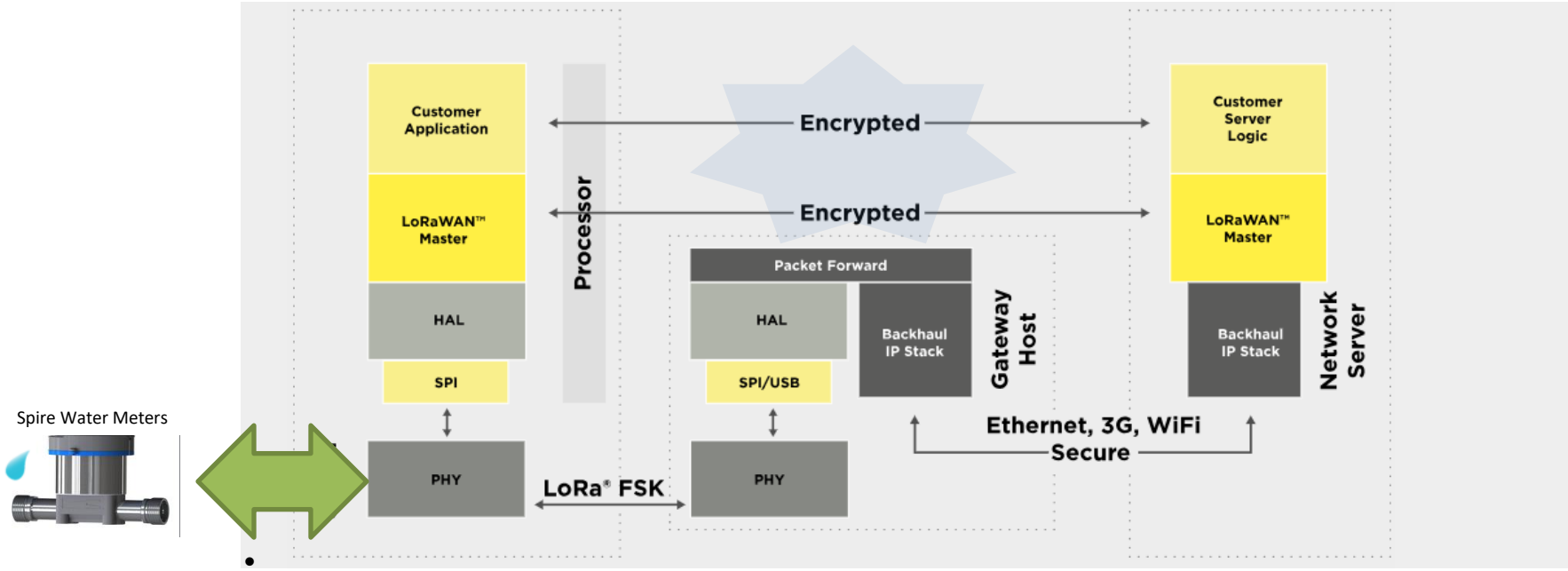
The data is aggregated for post processing that includes; individual meter trending, usage history, alarms for leak detection and many other metrics that can be processed by 3rd Party Billing systems for financial decision making and saving money. With Spire One Drop we make IoT ROI Analytics possible.

The LoRaWAN specification is a Low Power, Wide Area (LPWA) networking protocol designed to wirelessly connect battery operated ‘things’ to the internet in regional, national or global networks, and targets key Internet of Things (IoT) requirements such as bi-directional communication, end-to-end security, mobility and localization services.

Spire Water Meters are Class A LoRaWAN Devices – the Lowest power, bi-directional end-devices:

Spire's default class supported by all LoRaWAN end-devices, are class A communication which is always initiated by the end-device and is fully asynchronous. Each Water Meters uplink transmission can be sent at any time and is followed by two short downlink windows, giving the opportunity for bi-directional communication, or network control commands if needed. Spire's Water Meters are able to enter low-power sleep mode for as long as defined by our own application: there is no network requirement for periodic wake-ups. This makes Spire Compliant as a class A RF device, the lowest power operating mode for our long range wireless 100mW devices, while still allowing uplink communication at any time.
Because downlink communication must always follow an uplink transmission with a schedule defined by our end-device application, the downlink communication is buffered at the network server until the next uplink event.

- Data Rates LoRaWAN baud rates range from 0.3 kbps to 50 kb, Some of Spire Packets are?
- Security Model:



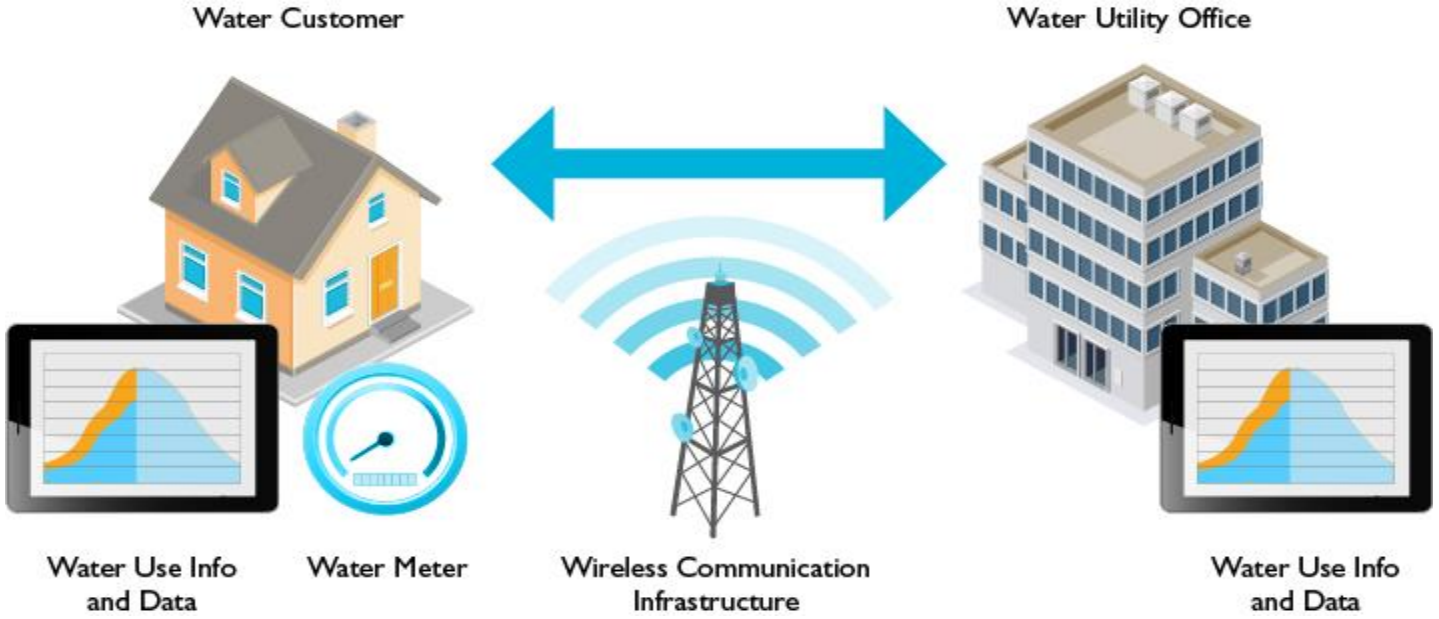
Spire LoRaWAN network architecture is deployed in a star-of-stars topology in which Spire Gateways relay messages between end-devices (Water Meters) and a central network server. The Spire Gateways are connected to the network server via standard IP connections and act as a transparent bridge, simply converting RF packets to IP packets and vice versa.

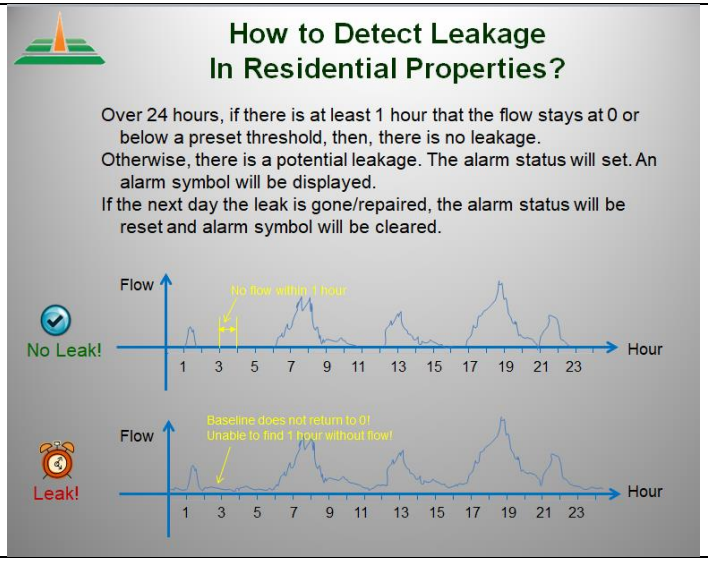
The wireless communication takes advantage of the Long Range characteristics of the LoRa® physical layer, allowing a single-hop link between the end-device and one or many Spire gateways. All modes are capable of bi-directional communication, and there is support for multicast addressing groups to make efficient use of spectrum during tasks such as Firmware Over-The-Air (FOTA) upgrades or other mass distribution messages.

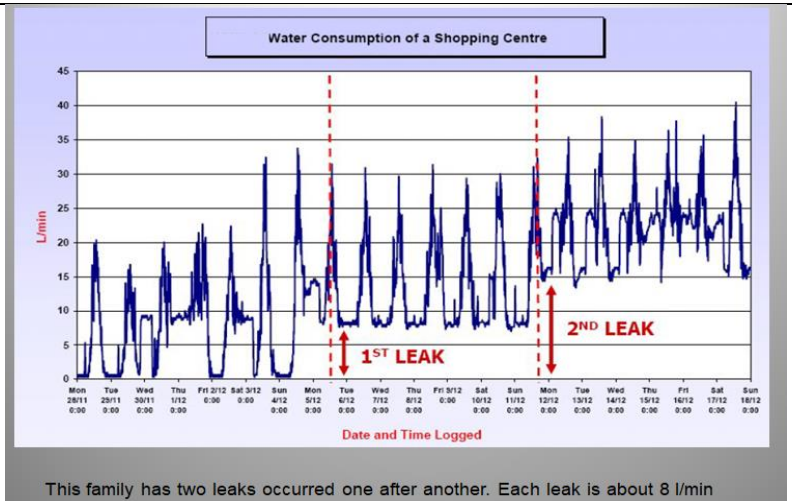
The specification defines the device-to-infrastructure (LoRa®) physical layer parameters & (LoRaWAN) protocol and so provides seamless interoperability that has created Spire's Smart Water Meter innovation and differentiates us from the Encoder type of Water Meters where the Radio technology is not integrated into the water Meters.

Spire has embedded the LoRaWAN stack that is developed and maintained by the LoRa Alliance: an open association of collaborating members.

Automated Meter Infrastructure and Smart Water Metering







This family has two leaks occurred one after another. Each leak is about 8 l/min

SpireCapture™ & AMR/AMI System for SpiRely & OneDrop Family of Water Meters

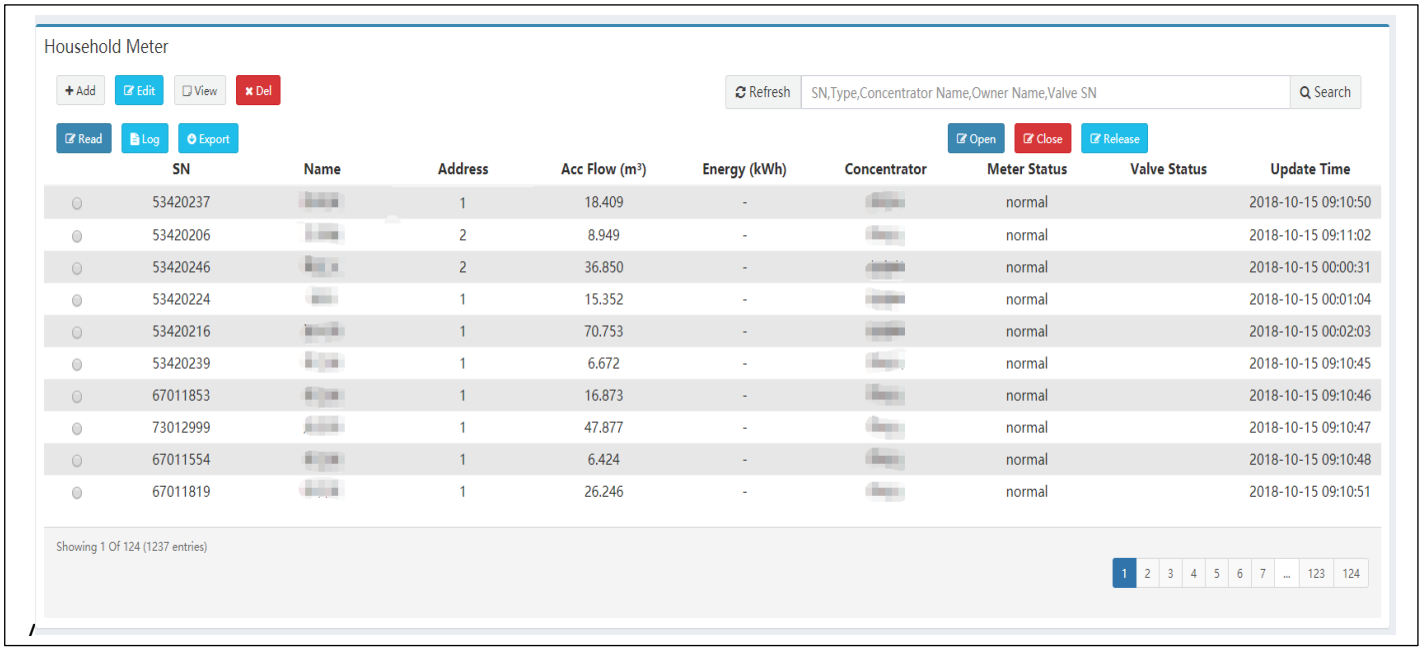
Spire Metering offers specialized software solutions designed to deliver critical data necessary for analytic review.

The SpireCaptureTM system is a cutting edge fixed automatic meter reading system which integrates both wired and wireless AMR/AMI technologies. SpireCaptureTM provides a unified platform for meter reading and data management through LoRaWAN, M-Bus networks, RF wireless networks, GSM networks, GPRS networks as well as TCP/IP networks. In addition, it works seamlessly with Spire Metering's billing software to make data exchange easy, fast and reliable.

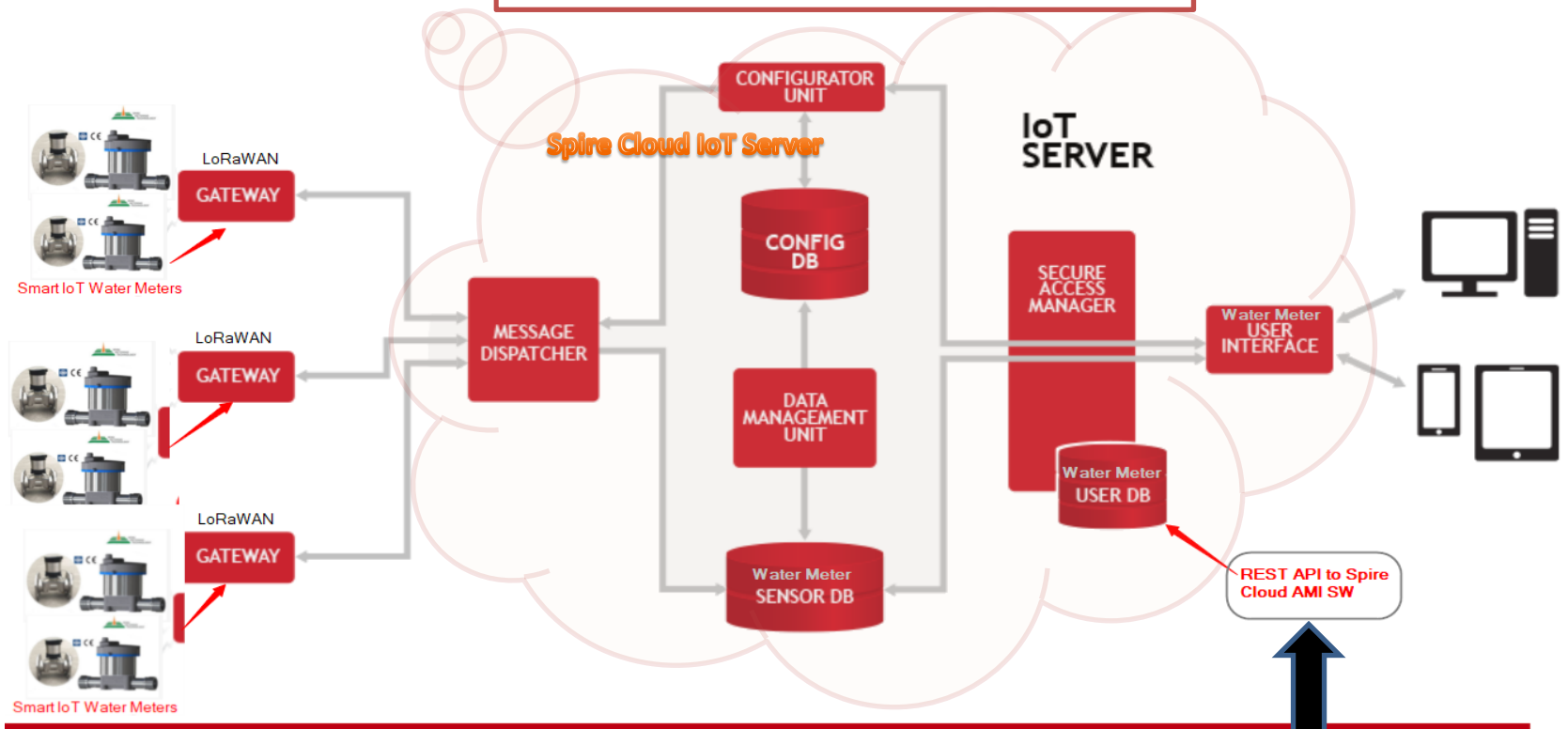
SpireCaptureTM is an advanced, highly robust meter reading solution that delivers comprehensive usage information as well as timely, high-resolution meter reading. This data enables gas, water, heat and electric utilities to eliminate on-site visits and estimated reads, reduce theft and loss, implement time-of-use billing, and profit from all of the financial and operational benefits of fixed-network AMR/AMI.

Telemetry Options:

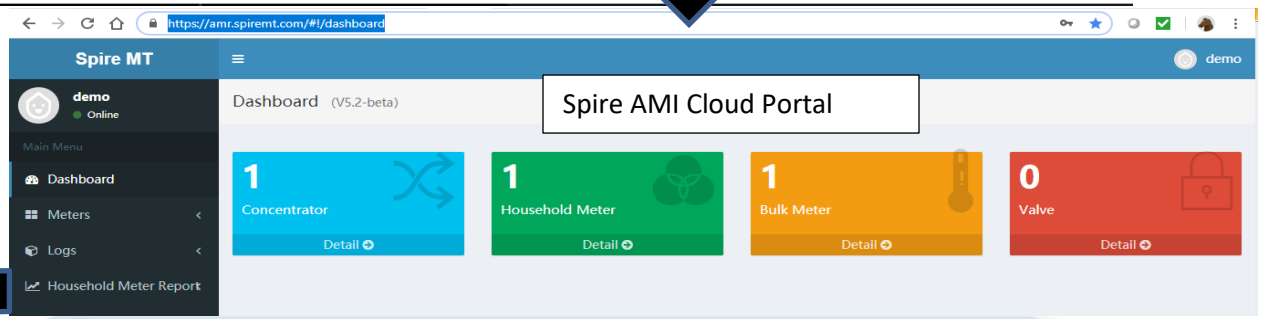
- LoRaWAN 915MHZ
- M-Bus AMR/AMI System
- Wireless AMR/AMI System
- BACnet network
- GSM/GPRS network
- MODBUS
- Ethernet



Spire OneDrop Water Meter IoT



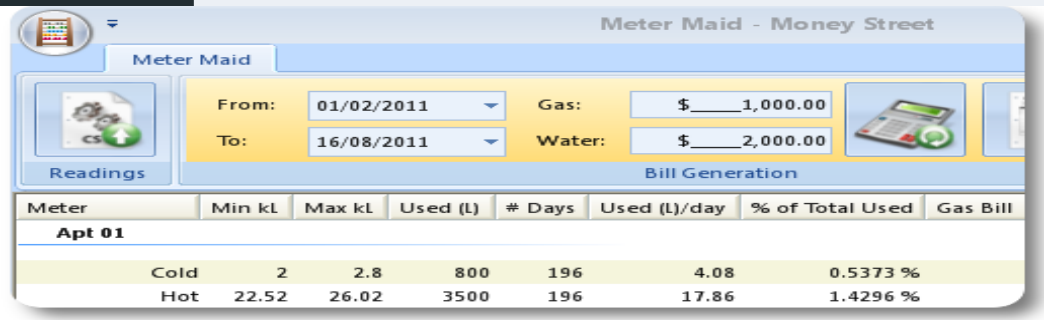
Current Spire AMI Dashboard
https://amr.spiremt.com/#!/dashboard



Spire AMI Cloud Portal

3rd Party Billing SW

Water Billing SW



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