Olsonet's CollectNet and Smart Meters

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White Paper

1 ABSTRACT

As of 2014, both *smart meters (SM)* and *ad-hoc networks (AHN)* are long pass their 40th anniversaries, if counted from their seminal ideas and papers. The last decade has brought us an explosive growth in industrial deployments of SM, while AHN, although vibrant within R&D, claim no success in industrial applications, having been sidetracked by the various combinations of classical networking and wireless proxy connectivity.

Olsonet Communications has been involved in R&D in the areas of ad-hoc networking and reactive systems from its inception in 2001. We have amassed a portfolio of key patents related to ad-hoc networking technology and its applications in some specific areas, prominently including SM systems.

In this paper, we analyze how the devices and their functionalities, real and hypothesized, destined as SM systems, use the inventions disclosed in Olsonet's patent portfolio.

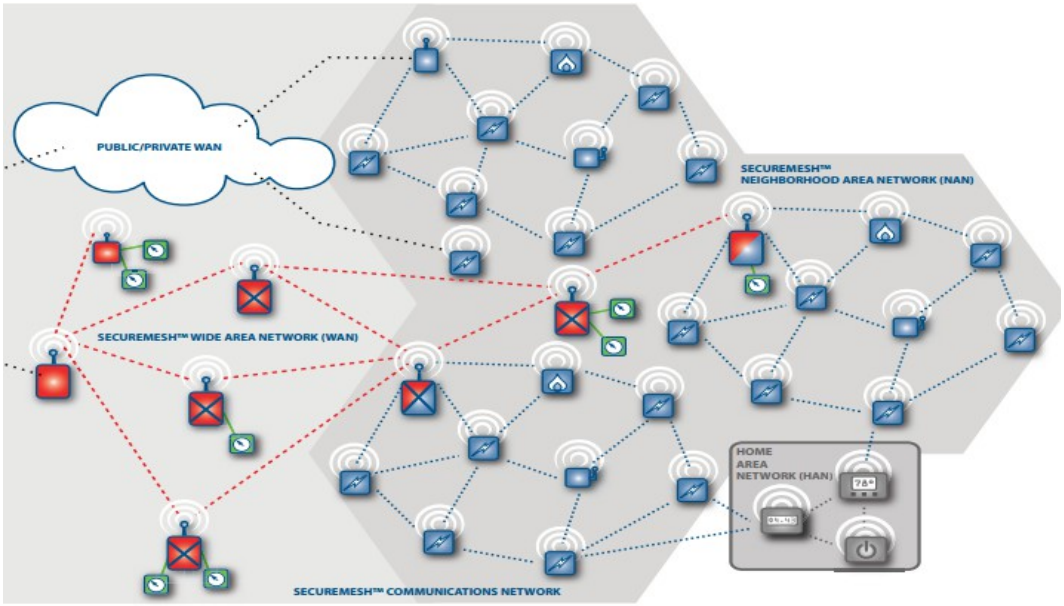
2 INTRODUCTION

We focus on those SM applications that employ wireless ad-hoc communication. In fact, we narrow the scope much further: we pick a single provider, Trilliant (http://trilliantinc.com) and analyze their related technological advancements that either are already included in existing offerings or, doubtlessly, will be embraced very soon. It should be underlined that the choice of Trilliant is incidental, for focus and brevity only. Unrelated to their excellent track record in applied innovations, it is clear that multi-hopping ad-hoc networking is a natural choice for any modern SM solution.

Our ultimate goal is to expose the value of Olsonet's patents to SM industry. However tempting, digressions into broader scope or more detailed and comprehensive analysis are left out.

3 GENERIC SMART METER SYSTEM

We set our generic context with this illustration from [1]:



Abstracted from many necessary and attractive features, the system senses, collects and delivers meter readings interactively and/or for off-line processing. Whenever any of the nodes/meters forward information in an ad-hoc manner, we enter the main area of our presentation.

4 PATENT MAPPING / TECHNOLOGY ANALYSIS

For brevity, we only analyze the main claim of US Patent #7,113,106 "Communication nodes for use with a wireless ad-hoc communication", mostly ignoring the relevant descriptions from the patent, and the other related patents as well. The scope is set by the SM system described above and selected Trilliant materials.

The main claim:

A monitoring node comprising:

- a processor;
- a transceiver in communication with the processor for receiving signals and for transmitting signals, the signals transmitted and received via a wireless communication medium;
- a transducer, in communication with the processor for sensing a first physical parameter and for providing a first signal, including data, relating to the first physical parameter;
- the processor for identifying a received second signal as one destined for the monitoring node and other than destined for the monitoring node, and when the identification is indicative of the second signal being destined for other than the monitoring node, relaying the received second signal via the transceiver, and when the identification is indicative of the second signal being destined for the monitoring node, providing an indication to the receiving party of the received signal;
- the processor for generating a third signal for transmission, wherein the third signal includes at least the first signal including data relating to the first physical parameter; and
- wherein the monitoring node executes an ad-hoc communications protocol to communicate with at least one other monitoring node to form an ad-hoc network.

Monitoring node: SM systems comprise meters that sense water, gas or electricity usage, and also act as communication nodes used to relay data through the network. For example, [1] states on page 1: "*Both electric and gas meters are supported, with each meter acting as a communications node to create a self-forming, self-balancing, and self-healing SecureMesh wireless network.*"

A processor: A processor is needed to support the metering, reporting, and networking functionality of the monitoring node.

A transceiver: A monitoring node needs a transceiver to receive traffic from and send it to other nodes. For example, [2] states on page 9: "*traffic can be passed from node-to-node*".

A transducer: There needs to be a circuitry that allows the node to sense water, gas or elecricity usage, and convert the readings to packets sent through the network to the head end.

The processor for identifying a received second signal as one destined for the monitoring node and other than destined for the monitoring node: Nodes must able to detect, and receive, traffic addressed to them. They also need to be able to detect, and forward, traffic addressed to other nodes. Otherwise, they would not be able to receive requests from the head end, or relay messages to other nodes, which would render the network unusable.

When the identification is indicative of the second signal being destined for other than the monitoring node, relaying the received second signal via the transceiver: Observations made above apply here as well. In a mesh network, the nodes relay packets addressed to other nodes.

The processor for generating a third signal for transmission, wherein the third signal includes at least the first signal including data relating to the first physical parameter: A monitoring node needs a processor to generate data (signal) based on the meter readings of electricity or gas. For example, as [1] states on page 1: "*Each SecureMesh electric meter can report a power outage or restoration event to the head end in real time.*". This data may then include some other data generated by a sensor in the same or a different monitoring node.

The monitoring node executes an ad-hoc communications protocol to communicate with at least one other monitoring node to form an ad-hoc network: [2] says on page 9: "*mesh or multi -hop point-to-multipoint systems, where traffic can be passed from node-to-node. Such systems allow obstacles to be bypassed, permit coverage to be extended beyond the range provided by a single node -to -node pair*". Obviously, a proper protocol needs to run on the monitoring nodes of the multi-hop mesh network to assure that packets are forwarded from node to node bypassing obstacles. Also, [3] states on page 7: "*wireless mesh network solutions are self-forming and self-healing, the latter requiring the presence of alternate paths to reroute around a problematic primary path*", which emphasizes the ad-hoc nature of the required communications protocol.

5 CONCLUSIONS

Our intention was to make a case that multi-hop ad-hoc networking has found its way to smart meter deployments.

In this context, we signal that Olsonet's inventions may play a key role in such developments in this highly inventive and competitive environment.

6 REFERENCES

[1] Trilliant, "Smart Metering. Comprehensive Advanced Metering Solutions", http://trilliantinc.com/wp-content/uploads/2013/06/Smart-Metering-Solution-Brief.pdf

[2] Trilliant, "Telecommunications Considerations for Distribution Automation Applications", http://trilliantinc.com/wp-content/uploads/2013/06/Telecommunications-Considerations-for-Distribution-Automation-Applications-new.pdf

[3] Trilliant, "Wireless WAN for the Smart Grid", http://trilliantinc.com/wp-content/uploads/2013/06/Wireless-WAN-for-the-Smart-Grid-new.pdf

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