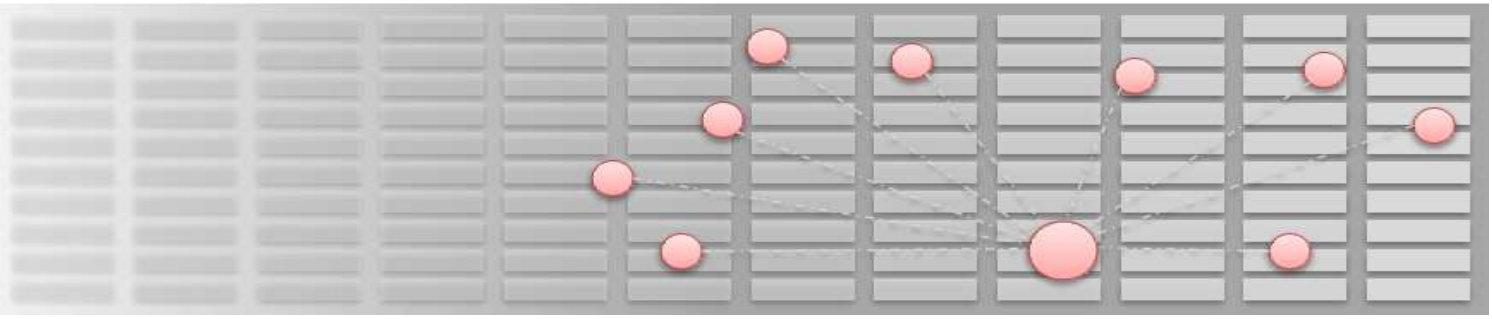
Seamless Wireless Network(SWN)

Remote Data Exchange Platform
2.4GHz Wireless Network Infrastructure



FEATURES

- o Simple and ultra low cost network infrastructure
- o Simple deployment and standard NMS connectivity
- o Industry leading range and capacity for wireless sensor network
- o Up to 15 years battery life
- o 2.4 GHz free ISM-band using Direct-sequence spread spectrum (DSSS) for increased resiliency
- o Dynamic receive sensitivity maximizes data rate and power savings
- o AES 128/256-bit encryption
- o Completely engineered module ready for easy integration by OEMs into existing or planned products

APPLICATIONS

- o Utility/Smart Grid
- o Energy and Environmental Monitor
- o Condition-based Maintenance
- o In-building Automation Systems
- o Wireless Life Sciences
- o Hospital and homecare medical applications
- o Security Monitoring
- o Location Based Services (asset and personnel tracking)
- o Military and Homeland Security

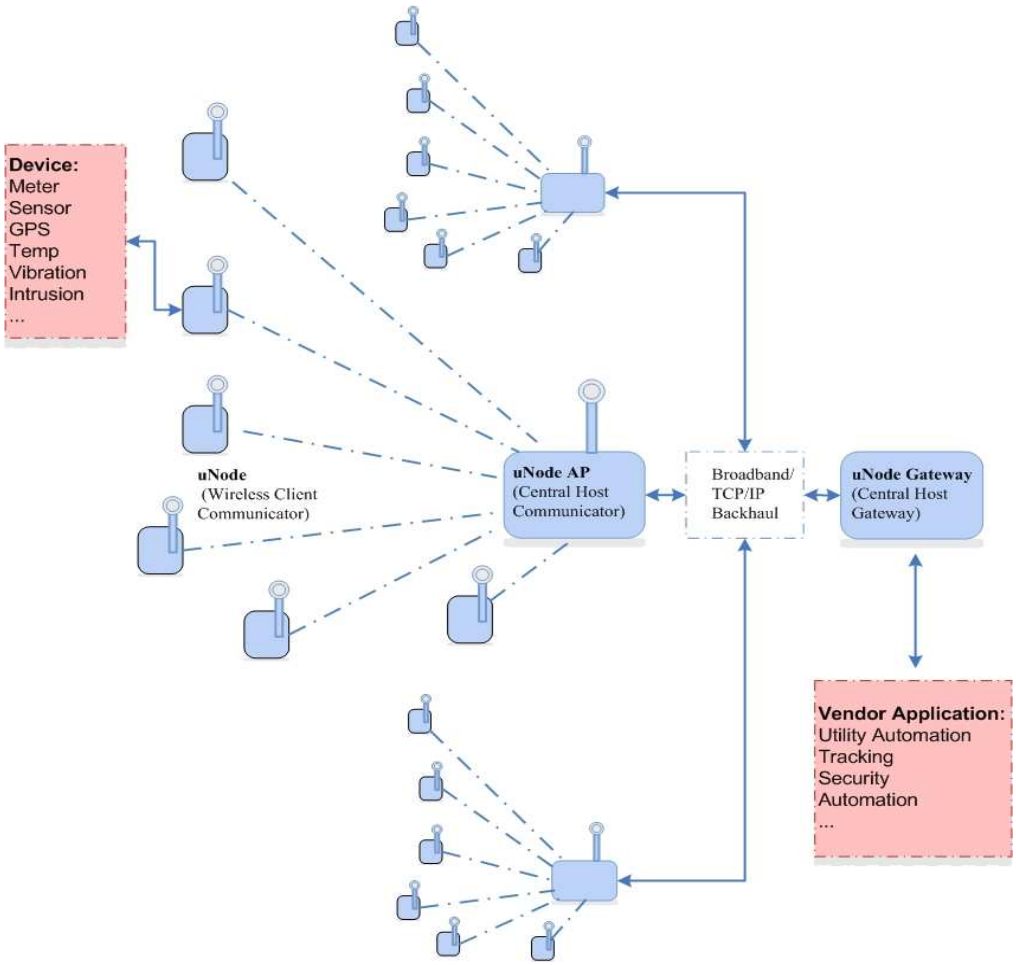
Network Infrastructure

Seamless Wireless Network (SWN) is a wireless packet data network system, purpose-built for utility automation, remote sensing and real-time location tracking applications, resulting in superior performance as well as deployment and operational costs that are several orders of magnitude lower than competing systems for systems operating in large metropolitan areas. The basis for the advantage is a new physical layer (Layer 1 of the OSI model) built from the ground up to provide a 600× coverage and a 25× to 100× capacity advantage (application throughput/MHz of spectrum). The ULP system's ability to offer customers thousands of square miles of robust, low-power coverage in free spectrum, with minimal network infrastructure, is unique in the industry. Prior to the arrival of Ultra-Link Processing™ the industry was required to add complex and capacity inefficient repeater or mesh systems with licensed spectrum (e.g., cellular backhaul) to stitch together coverage, or accept that communication only took place in designated chokepoints.

Networking Components

The SWN network operates in a simple star topology. Remote Nodes, connected to end-point devices, such as electric meters or fault indicators, communicated directly with one or more SWN Access Points. A SWN Node is a small module designed for easy integration and operation.

A network of Access Points can provide coverage for a wide area (such as a city or even a county), or can provide overlapping coverage to increase network capacity in a given location, or both. The ULP Access Point is a small hardware component, designed for indoor or outdoor operation.



Parameters	eNode	eNode AP
Wireless Frequency	2.402GHz - 2.476GHz(FCC) 2.400GHz - 2.483GHz(ETSI)	
Bandwidth	1MHz	
Modulation	Dynamic-Direct Sequence Spread Spectrum (D-DSSS)	
Multiple access Scheme	Random Phase Multiple Access (RPMA)	
Transmit Power	+20dBm/+10dBm(EU@1MHz)	+30dBm/+10dBm(EU@1MHz)
Receive Sensitivity	-135dBm(@1MHz)	-142dBm(@1MHz)
Data Rate	31kbps(-115dBm) 60kbps(-142dBm)	60kbps(-115dBm) 60kbps(-142dBm)
Indoor Range	1000Meter	
Outdoor Range	64KM / 3200KM(free space range)	
Maximum Allowable Path Loss	Uplink:172dB / Downlink: 172dB	
uNode AP Capacity	Each uNode AP can support 10,000 uNodes in a star topology	
Power Scenarios	30dBm PA -172dB total loss	-

Average Power Scenario (Utility): -132dBm receive sensitivity, 500 bytes, once per day	326µW	-
Average Power Scenario (Wireless Life Sciences): -132dBm receive sensitivity, 100 bits, 5 times per day	138µW	-
Average Power Scenario (Condition Monitoring): -112dBm receive sensitivity, 40Bytes, update every 15 minutes	107µW	-
Average Power(Sleep)	50µW	-
Peak Power(Rx)	750mW	-
Peak Power(Tx)	1400mW	-
Operating Voltage	2.4-6.0VDC	5VDC
Dimensions(W x L x D)	26mmx 57mm x 9mm	152mmx 178mm x 17mm
Operating Temperature	-40 °C to 85 °C	
Interface	SPI	Ethernet
Security	AES 128/256-bit encryption	
Network Management	HTML, Standard NMS	
Certifications	FCC/IC/ETSI Other certifications are currently in the process	

eNode(V1.1)	eNode AP(V1.1)