

OSHAN

Open-Source Home Area Network

Gene Wang

CEO and Chairman

People Power Co.

gene@peoplepowerco.com

David Moss

Director of Device Engineering

People Power Co.

dmoss@peoplepowerco.com



Gene Wang – Lucky Entrepreneur

- CEO, Founder & Chairman, **People Power Co.** Open Source startup focused on home energy efficiency. We help reduce your electricity bills by displaying real-time energy costs, providing simple remote control for power-hungry appliances and allowing you to compete on the internet with friends to see who is most energy efficient.
- CEO, Founder & Chairman, **Bitfone** (Acquired by HP in 2007). Leader in mobile phone OTA device management. Sold to 25 mobile phone manufacturers including world's top 5 and world's largest carrier, China Mobile. Briefly VP Marketing, **HP**, managing marketing, BD and industrial design for calculators, PDAs, phones and software.
- CEO, Founder & Chairman, **Photo Access** (Acquired by Agilent in 2000). Built world's fastest digital camera chip, and Internet photo printing site now American Greetings.
- CEO & President, **Computer Motion** (IPO in 1997). Voice controlled surgical robots for minimally invasive surgery. Acquired by Intuitive Surgical after IPO.
- EVP, **Symantec**. Managed four divisions and helped sales grow from \$172m to \$412m.
- VP & GM, **Borland**. Drove sales of the C++ programming language to over one million copies beating Microsoft.
- VP Marketing and Co-founder, **Gold Hill Computers**, AI on PCs.

Bachelor's degree in Computer Science from UC Berkeley



PAN

Personal Area Network



Short-range

30 – 40 feet indoors

150+ feet line-of-sight

Low Energy Consumption



HAN

Home Area Network



Long-range

100 – 200 feet indoors

700+ feet line-of-sight

Low Energy Consumption

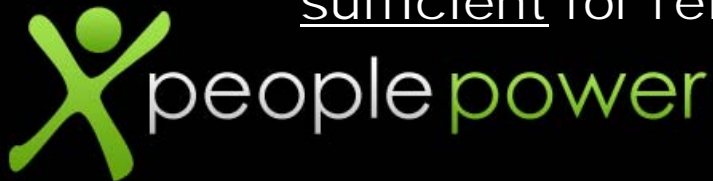


We need a reliable HAN



According to the [National Association of Home Builders](#), the average home size in the United States was 2,330 square feet in 2004.

30 – 40 foot indoor PAN communication range is not sufficient for reliable wireless devices in the home



OSHAN

OSHAN (pronounced "Ocean") is an *open-source* network specification for Home Area Networks with an *open-source* reference implementation available on reliable, low cost, and extremely energy efficient hardware platforms.



Why Open Source?

Many groups are creating proprietary PAN / HAN solutions that you have to buy into.

Proprietary solutions are not conducive to interoperability and inhibit growth and innovation.

Open Source lets anybody view, download, and use the work the others have already created *for free*.

Free access to source code means better and faster interoperability and lowers risk of vendor lock-in.

Open Source success stories include Linux, MySQL, Apache, GCC, Firefox



Technology

- OSHAN is a wireless kernel based on improved, secured, and reliable foundations:
 - Enhanced IEEE 802.15.4
 - IP Addressability (6LoWPAN / IPv6)
 - Smart Energy Profile 2.0
 - Routing over Low-power Lossy Networks (ROLL)
 - Over a decade of mesh networking research on wireless networking and TinyOS, at institutions such as U.C. Berkeley and Stanford
 - Research and deployments utilizing over one million wireless sensors
 - Military grade low power wireless systems



Priorities

- **Highest Reliability**
 - Very long range wireless communications that is wall transparent
 - Avoid typical interference found at other bands such as 2.4 GHz
 - Mesh networking to extend range when point-to-point doesn't cut it
- **Lowest Cost**
 - Must be very affordable based on small memory footprints, smaller chip size, and fewer components
- **Lowest Power**
 - Derived from extremely low power military grade applications
- **Secure**
 - Control channels secured with AES-128 encryption / authentication, and SSL secured internet access
- **IP addressability**
 - Nodes and data accessible directly over the internet
- **Open Source**
 - Anyone should be able to easily download, development, and add new devices to an OSHAN network
 - Promotes interoperability with other systems and solutions



Facts

- **Lower Frequencies equals Longer Range**
 - 900 MHz is wall-transparent, 2.4 GHz is absorbed by walls and floors
- **Lower Data Rates means Longer Range, Higher Reliability, and Faster Network Throughput**
 - Every 50% decrease in data rate results in a 50% increase in range
 - You can slow the data rate way down and still get data through in milliseconds
- **2.4 GHz devices can have limitations in range and interference.**
 - 802.15.4 at 2.4 GHz use 250 kbps resulting in extremely short range!
 - 2.4 GHz spectrum is also occupied by WiFi, Bluetooth, cordless phones, and microwaves
 - 2.4 GHz solutions typically require range extenders and power amplifiers, resulting in lower throughput, higher costs and more tech support calls

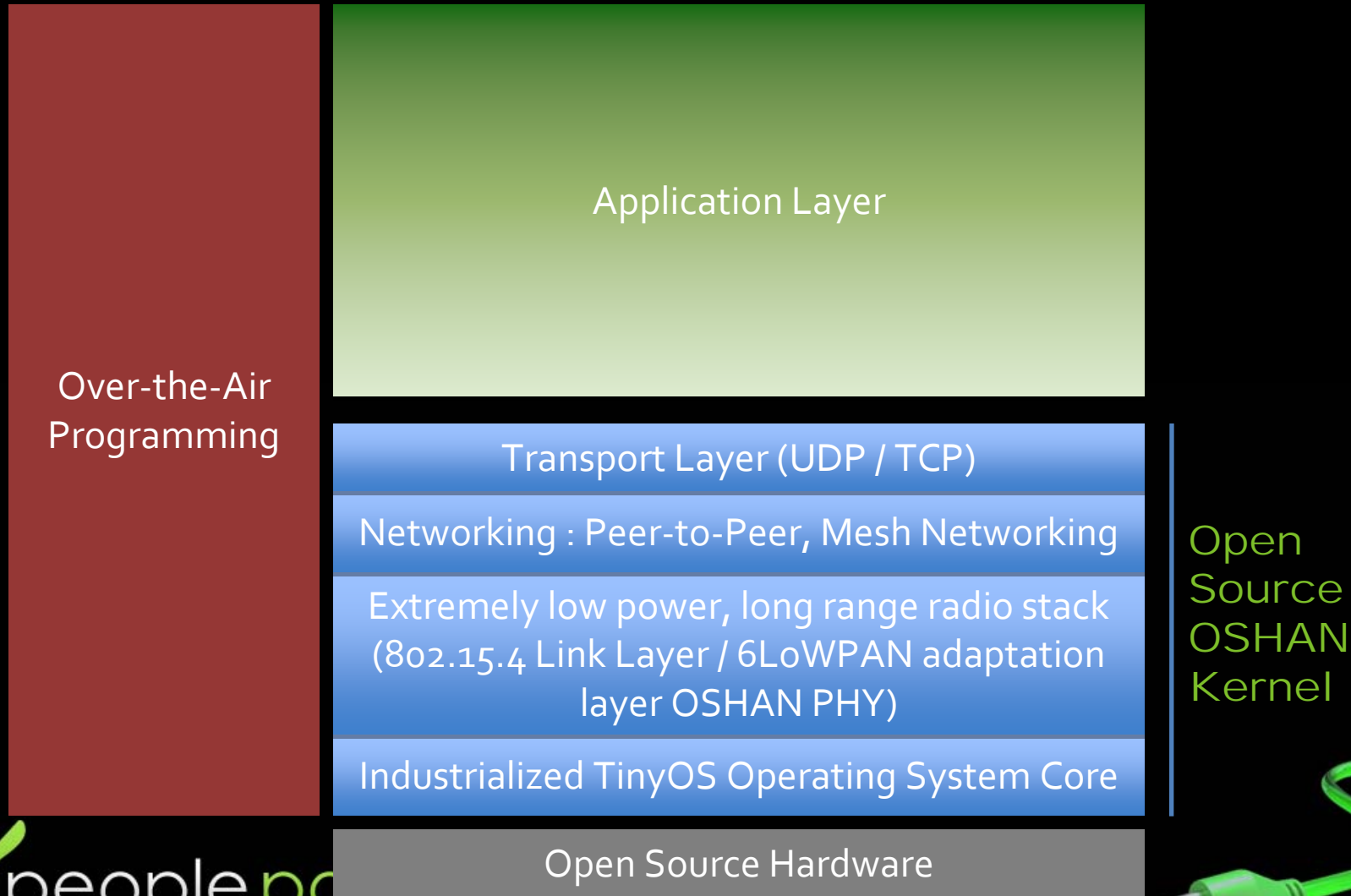


Solutions

- **902 – 928 MHz low data rate operation for long-range, wall transparent operation**
- **Extremely aggressive low power radio duty cycling for long-life battery operated devices**
 - Already deployed in extremely long battery life military applications
- **No external Low Noise Amplifiers (LNA's) or Power Amplifiers (PA's) required**
 - No extra cost for range and reliability

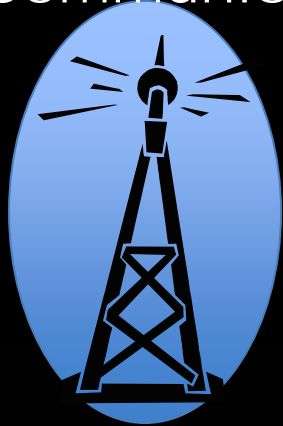


Structure



Getting in the Home

Direct RF Communication



RF / WiFi / WiMax / etc. Direct to:

- Smart Meter
- Thermostat
- Smart Breaker Box
- Direct DR-appliances
- HAN

Cellular



OSHAN: Existing Home Internet Access



Power Line Communications

Smart Energy Profile 2.0



Evaluation

Careful evaluation of any HAN technology is critical.

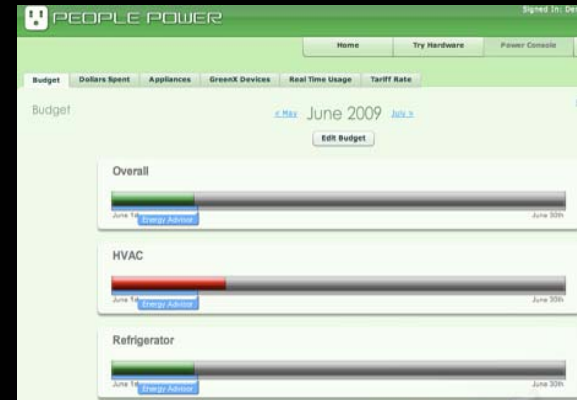
"However beautiful the strategy, you should occasionally look at the results." -Winston Churchill

EPRI's Wireless Evaluation Tools provide empirical data to determine the reliability of any communication protocol in real home environments.



About People Power

- **People Power Co:** People Power enables consumers to control energy consumption at the appliance level and compare their usage with others, while reducing their carbon footprint.
- **GreenX™ Home:** A family of low cost devices that monitor and control energy usage in the home.
- **GreenX™ Portal:** A Web based control and monitoring service that enables households to meet their energy budget and share their savings.
- **Open Source Home Area Network (OSHAN):** An open source, cost-effective, ultra-long range protocol to encourage widespread adoption.



Working Together

- **Electric Power Research Institute**

- HAN Research Project - Dr. Erfan Ibrahim



- **UC Berkeley**

- Berkeley LoCal Project - Prof. David Culler



- **Stanford**

- TinyOS Open Source Group - Prof. Phil Levis



Summary

- OSHAN is designed for the Home, to help the world save energy
- OSHAN is reliable, low power and *FREE!*
- People Power is working with utilities on OSHAN energy efficiency pilots



For info visit www.peoplepowerco.com

“Interoperability is important, but Operability is critical”

Dr. Erfan Ibrahim, EPRI

