



PowerStream™ FAQs

As of 6/26/02

1. Modulation

Q: What modulation technology is used on PowerStream™?

A: Wideband, "spread-spectrum-like", BPSK with digital adaptive equalization for noise and distortion done "on-the-fly"

Q: Is the technology approved for use in the US (FCC regulation)?

A: Yes, our prototype has been tested and is FCC compliant. Final silicon has not been tested. Our AN Pro-Line™ products are FCC compliant and have been in use since 1987.

Q: Is the technology approved for use in Europe (CENELEC regulation)?

A: European regulations are in a state of flux and it is unclear at present how they will be defined. We have built into our technology the flexibility to null out spectral bands. This means that our technology is very spectrum-friendly and can be easily modified to meet different national requirements.

Q: What other countries is the technology approved in?

A: We have not submitted our technology for approval to any other country other than USA. We comply with FCC Part 15, the Additionaly, we have been registered to participate in ARIB regulatory discussions in Japan. Based on our experiences with CENELEC in Europe, we do not envisage any difficulties arising in obtaining approval's for the vast majority of countries.

2. Quality of Service

Q: Is quality of service supported?

A: Yes, it's integrated into the PHY, MAC & Link Layers.

**PHY--Digital Adaptive Equalization on-the-fly allowing for multicast & broadcast
MAC--deterministic access with inherent QoS support via a token passing protocol
Link--provides a SAR with multiple priority levels**

Q: Is this to any known standards?

A: It will comply with CableLabs CableHome QoS standards when they have completed their work. It also complies with Universal Plug And Play (UPnP) standards for QoS.

3. Data Rates

Our technology delivers 20Mbps to the physical layer, and 5 Mbps to the application layer. We have a robust adaptive equalized physical layer that ensures that this throughput is attained in at least 95% of the outlets in your typical family home. At the other outlets the data rates could be somewhat less.

Payload: Rate available to your application

Q: What data rates are supported?

A:

a) Minimum	Depends on power-line conditions
b) Expected	5 Mbps

Raw: Physical layer rate : 20Mbps

Q: Under what conditions were these data rate figures obtained.

A: In different types of homes under all kinds of conditions.

4. Security

Q: What provisions have been made to encrypt the signals?

A: Multi-home MAC, powerline optimized Token Bus Protocol. We also provide an encryption layer in software that is encryption method agnostic (i.e., it is designed as a module that can be customized to a specific need.) It is our belief that data encryption is most appropriately performed at or above layer 3 (i.e., using Ipsec) to ensure end to end security.

Q: If used within an MTU, or equivalent, does the technology limit the transmission to a single dwelling or will it spread throughout the MTU?

A: The MAC layer isolates individual dwellings using a virtual LAN for each dwelling. Only the units within a single dwelling will be capable of communicating with each other.

Q: What techniques can be used to limit the spread through an MTU?

A: A simple clip-on filter at the breaker box.

Q: What other techniques can be used to reduce interference between powerline connected houses?

A: In addition to our multi-home MAC (and physical isolation), at the PHY layer we can maintain multiple networks under weak coupling

5. Addressing

Q: What addressing scheme is used by the nodes in the system?

A: Unique MAC addresses. We use Ethernet MAC addresses (48 bits). From a PC point of view our product looks just like a regular Ethernet NIC.

6. Standards

Q: Is the technology compatible with any standards? If so which ones?

A: IEC and ISO (we wrote them) for industrial and commercial lower-speed products

7. Reduction to practice

Q: Has the technology been deployed in the field?

A: Yes, in commercial and industrial products (up to 100 Kbps)

Q: What field trials have been conducted?

A: high-speed internal; lower-speed in commercial deployment in department stores, factories, homes, ships and shipyards, trains, mines

Q: Has it been commercially deployed?

A: Only in commercial and industrial powerline products.

Q: What is the estimated BOM cost for a basic system in 100K+ and 1M+ quantities?

A: Less than \$20. Silicon priced to meet consumer electronics manufacturers cost targets.

9. Error rates

Q: What corrected error rate is expected for the technology?

A: less than 1×10^{-9}

Q: Does the technology include any error detection or correction? What level of protection do they offer?

A: Yes, a Reliable Low Level Link Protocol with rigorous Forward Error Correction and Error Detection & Retransmission

Q: What latency does the technology introduce to data?

A: Token Bus Token Rotation Time (TRT) is 10ms. Worst case latency will be 10ms. As long as there is bandwidth we can guarantee this because of the token passing architecture.

10. Interfaces

Q: What is the interface to the technology?

A: ***USB 1.0 and micro-processor interface (via a dual-port RAM in our product)***

11. Spectral allocation

Q: What frequencies does the technology use?

A: ***5 – 35 Mhz***

12. Data transport mechanism

Q: What data transports are available/have been designed for use with the technology?

A: ***TCP / UDP. Our product will work with any data transport that can be encapsulated in Ethernet packets (802.3). We accept frame sizes up to 1500 bytes of data plus the standard 14 byte Ethernet header (two 6-byte MAC addresses plus the 2 byte type field).***