



# **Setting the standards: HomePlug Powerline Alliance**

**Oleg Logvinov**

**Arkados, Inc., President & CEO**

**HomePlug Powerline Alliance, President**



***A fabless  
semiconductor  
company focused on  
powerline  
communications  
semiconductors***

- Offers an all-in-one highly-integrated ArkTIC platform for high-speed transmission of converged **multimedia, voice,** and **data** traffic over AC electrical wires
- Board of Directors Member and active contributor to the HomePlug Powerline Alliance
- A wholly-owned subsidiary of CDKnet.com (OTC BB: CDKN)

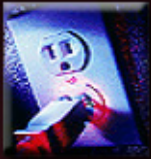
## Standards Spur Growth

### ■ **Proprietary technologies**

- Typically exhibit good performance in one dimension
- Confirm the feasibility (or the lack of it)
- Develop subject matter expertise
- Test the viability of a potential market through field trials and initial deployments

### ■ **Standards based technologies**

- Exhibit good performance in all dimensions
- Typically superior in performance due to collaboration of a significant number of contributors
- Available from multiple vendors
- The competition pushes the envelope in all dimensions, price, performance, etc.
- Interoperable products from multiple vendors accelerate the adoption and remove risks associated with a proprietary source



## Setting the standards: HomePlug Powerline Alliance



# HomePlug Alliance Overview



## SPONSOR MEMBERS



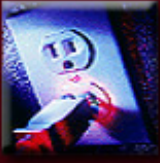
- **March – June 2000:**
  - Alliance founded by 13 industry-leading companies
  - Specification development process is created
  - Baseline technology selected
- **June 2001:**
  - HomePlug 1.0 Specification released
- **February 2003:**
  - HomePlug AV effort is started
- **January 2004**
  - HomePlug BPL effort started
- **Today:**
  - HomePlug Command & Control MRD is completed
  - HomePlug 1.0 based products are sold worldwide
  - HomePlug AV Specification is in its final stages
  - HomePlug BPL MRD is completed, Baseline selected
- **Membership:**
  - Approximately 50 members strong





# HomePlug Powerline Alliance

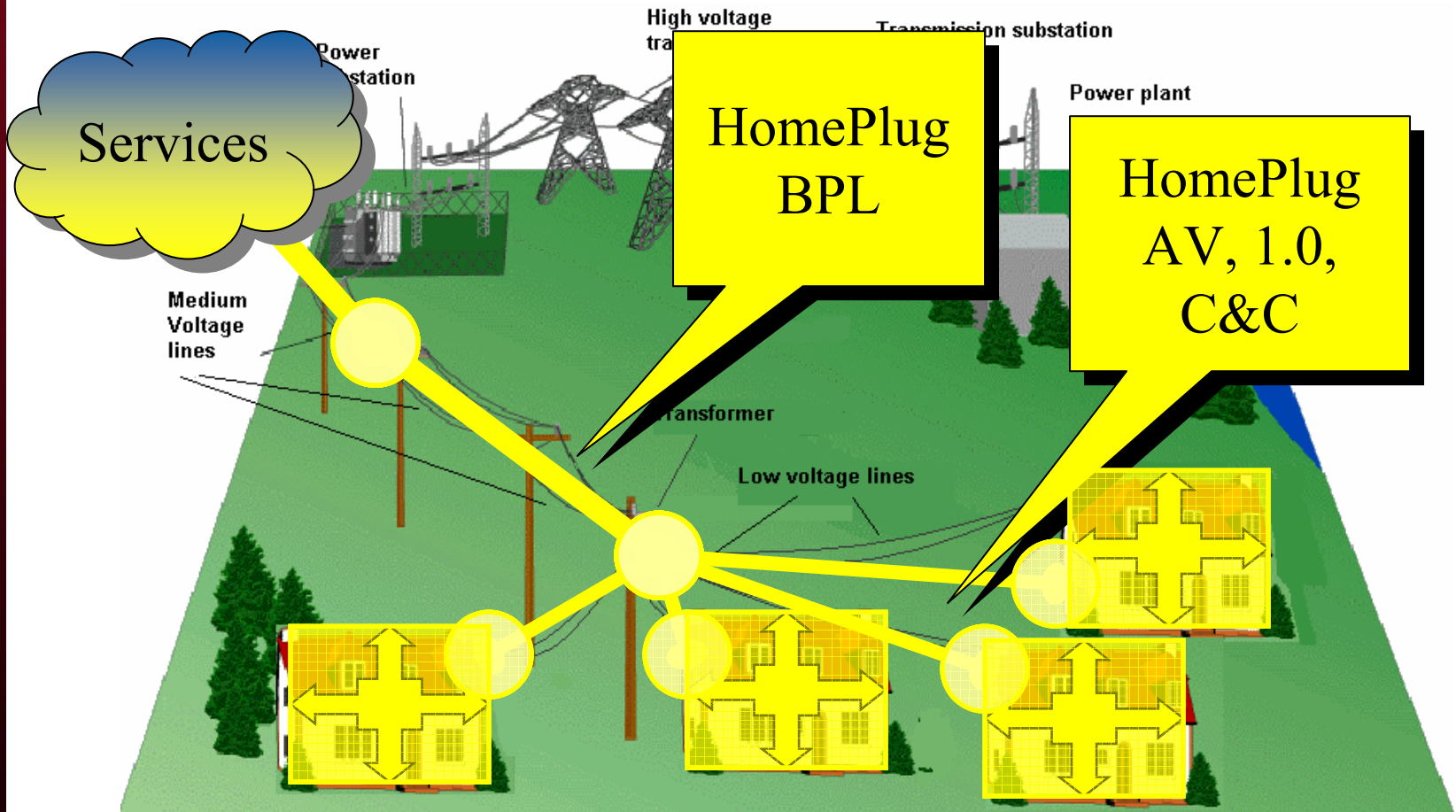
---



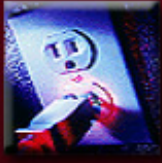
- **The world's only open alliance that develops compatible/interoperable specifications and certification programs for the full spectrum of powerline communication technologies:**
  - HomePlug Command & Control
  - HomePlug 1.0
  - HomePlug AV
  - HomePlug BPL
- **Strict Certification processes ensure multi-company product interoperability**



# The Vision: All Together Now







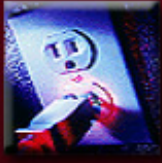
# Benefits of Using HomePlug Technologies

---

- **High number of convenient outlets**
- **Specifically designed for low- to high-bandwidth applications**
  - Reliable bandwidth
  - Whole house coverage
  - Robust QoS with tight control of latency and jitter
- **Cost competitive with other Networking- and AV-class solutions**
- **Created through HomePlug's proven multi-company standards setting process**
- **Backed by multiple vendors**
- **Compatible and interoperable technologies (HomePlug 1.0/AV/BPL)**



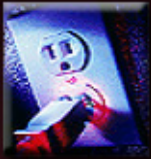
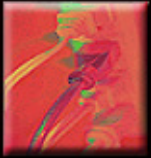




# Specification Status

---

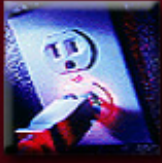
- **HomePlug 1.0**
  - The only globally recognized industry-standard multi-vendor specification for high-speed powerline networking
  - Millions of products sold on six continents
  - “Toaster-easy” to install
- **HomePlug AV**
  - Specification nearing finalization
- **HomePlug BPL**
  - MRD completed with contributions from all members of value chain: service providers, utility companies, technology companies
  - Baseline selected (HomePlug AV)
- **HomePlug Command & Control**
  - MRD Published
  - Proponents currently submitting for technology bake-off



# HOMEPLUG

POWERLINE ALLIANCE

## HomePlug 1.0



# HomePlug Products

- **Millions of HomePlug products have shipped throughout North America, Europe, and Asia.**



- **Certified Products:**

**Routers, Bridges, Adapters**

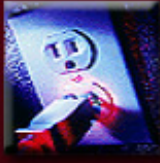
**Wireless Access Points**

**Audio Endpoints and Speakers**

**VoIP Phones**

**Security Cameras**

**PCs with HomePlug Built-in**



# HomePlug Products

- Millions of HomePlug products have shipped throughout North America, Europe, and Asia.



Cable modem installation using Netgear ETH adapters



DSL modem installation using BellSouth ETH adapters WiFi extension using BellSouth ETH adapters (mail out)



Remote room home networking using Linksys ETH adapters



Remote room home networking for desktops using Netgear ETH adapters



Remote room home networking using Linksys ETH adapters (Internet broadband configurator)



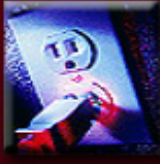
WiMax antenna positioning and VoIP modem installation using Clearwire ETH adapters



DSL modem installation using Sagem ETH adapters







# HomePlug Enabled Companies

NETGEAR®



Packard Bell

SMC®  
Networks

LINKSYS®



SIEMENS

SAGEM

BELKIN

RadioShack

Asoka  
usa

Telkonet

D-Link®  
Building Networks for People

GigaFast

IOGEAR

Corinex Global

ST&T

devolo

deneg

MSI  
MICRO-STAR INTERNATIONAL

comcast.

COX  
COMMUNICATIONS

dish  
NETWORK

clearwire®

...T...Online

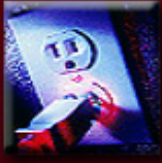
AOL  
FOR BROADBAND

france tele.com

EarthLink

BELLSOUTH®

HOMEPLUG®  
POWERLINE ALLIANCE



## Recent Announcements

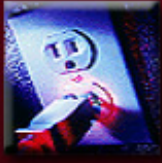
---

- **Cable Labs issues RFP for HomePlug-enabled cable gateways**
- **Packard Bell introduces HomePlug-enabled desktop PCs and Media TV for European market**
- **Radio Shack launches HomePlug-enabled audio player and speakers**
- **Devollo introduces HomePlug-enabled ADSL modem for European market**
- **Comcast, Bell South, Cox, America On-Line, Earthlink, and France Telecom begin deploying HomePlug adapters for broadband installations**



## HomePlug AV





# Video Content is Driving the Trend

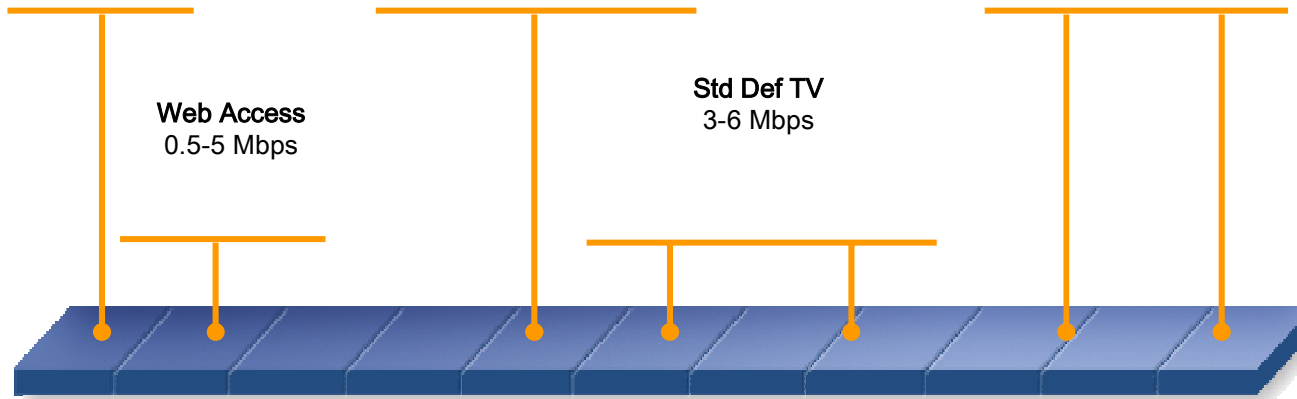
VOIP  
64 kbps

Stereo CD Audio  
1.5 Mbps

HDTV  
19-24 Mbps

Web Access  
0.5-5 Mbps

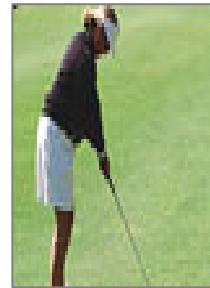
Std Def TV  
3-6 Mbps



Music



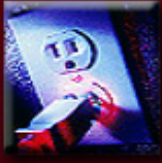
TV Shows



Live Events

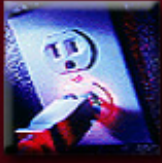


Content on Demand



# HomePlug AV Applications

- **HomePlug AV adds value as a primary or complementary connectivity technology**
  - Sole solution for whole house distribution of AV content
  - Backbone for wireless (802.11x and UWB)
  - Part of a hybrid network
    - Extension of MoCA or Ethernet to areas without wired outlets
    - Wireline network for fixed devices, leaving wireless network free for mobile devices
- **HomePlug AV extends proven performance of HomePlug 1.0 to AV-class bandwidth applications**
  - SD and HD video (including IPTV)
  - Digital video
  - Higher speed Internet sharing (ADSL2/2+ and VDSL)
  - Higher speed in-home and commercial networks

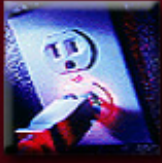


# HomePlug AV Features

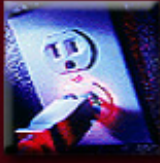
- **200-Mbps class networking**
- **Robust, near-capacity Physical Layer for reliable communications over noisy power line channels**
- **Highly-efficient MAC layer**
- **TDMA and CSMA based access with AC line cycle synchronization**
- **Quality of Service (QoS) guarantees**
  - guaranteed bandwidth reservation
  - tight control of latency and jitter
  - high reliability
- **Advanced Network Management functions and facilities capable of supporting plug-and-play, user and service provider set-up and configuration**
- **Tight security based on 128-bit AES**
- **Backward compatibility with HomePlug 1.0**
- **Co-existence modes enabling Broadband over Powerline (BPL) co-existence, multi-network operation and hidden node service**



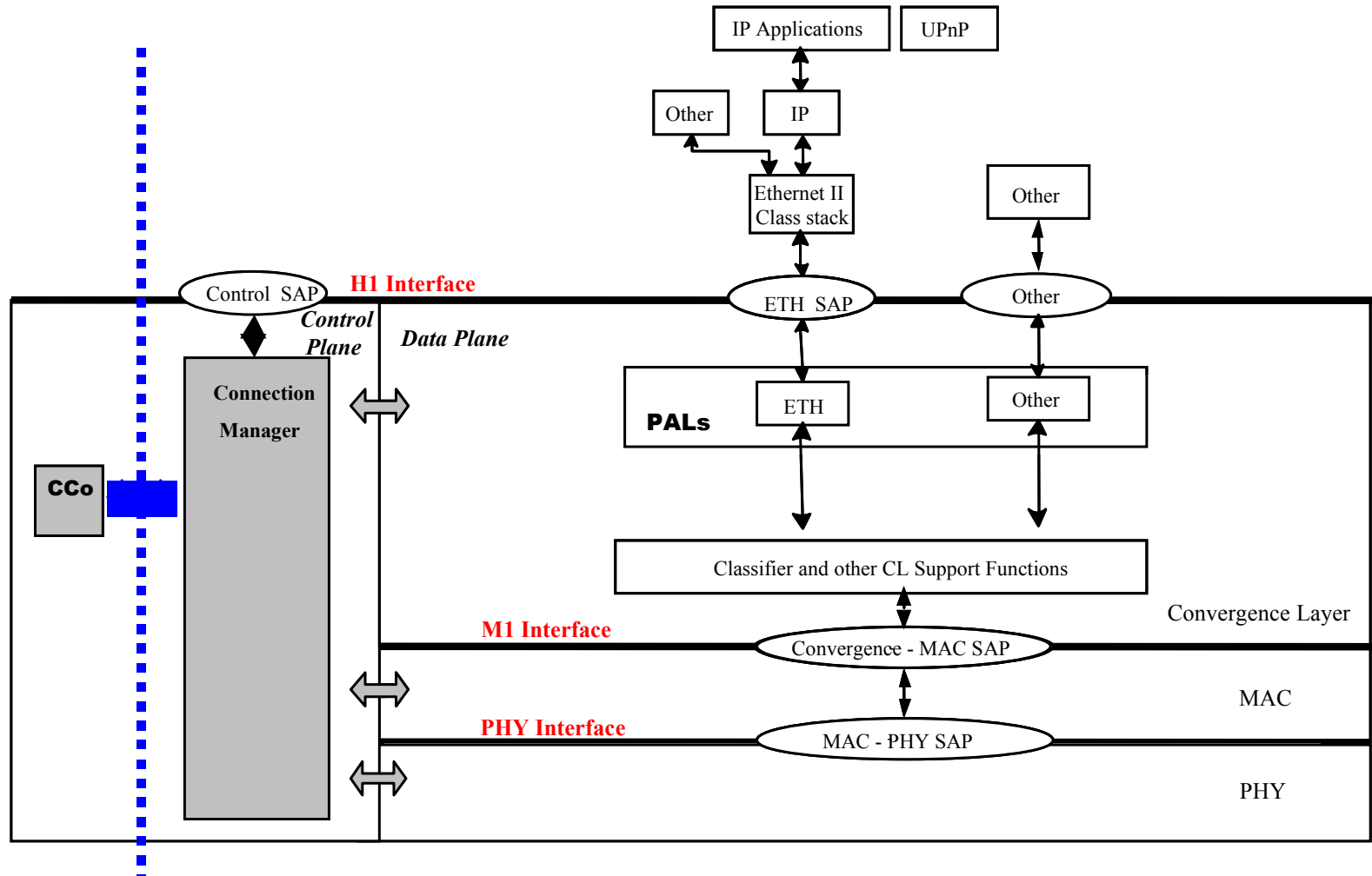
# HomePlug AV Status



- **Integrated technology components from several companies**
- **Technology components have already been tested in real-world environments**
- **Fully-licensable**
  - Designed to enable multiple IC vendors
  - Technology contributors and SWG participants participate in an IP licensing pool
- **Specification (currently over 300 pages) contains the detail required for vendors to bring AV ICs to market quickly**
- **All interested companies are invited to contribute**
- **SWG process underway to complete specification process by June**



# AV System Overview





# Physical Layer Highlights

---



- **Windowed OFDM – 917 usable carriers**

- 1.8 – 30 MHz frequency band

- **Channel Interleaver, Turbo Convolution Code, Data Scrambler**

- **Robo Mode**

- Broadcast communications, 5 & 10 Mbps

- **Bit Loaded Payload Mode**

- 200 Mbps channel rate / 150 Mbps information rate
- Tone Maps – synchronized with the AC line cycle

- **Point-to-point Channel Adaptation**

- Modulation density BPSK to 1024-QAM per tone
- FEC Rate
- Multiple Cyclic Prefix Lengths

- **Power Line Cycle Adaptation**

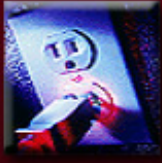
- Allows adaptation to time-variant line cycle noise







## AV Medium Access Control



- **TDMA channel access with Contention-Free and Contention-Based (CSMA/CA) periods**
- **Beacon-based design**
- **BSS architecture with Central Coordinator (CCo)**
  - Authentication of new stations joining the BSS
  - Association of new stations joining the BSS
  - AC line cycle synchronized Beacon Generation
  - Admission control for CF sessions
  - Scheduling CF and CSMA allocations during each Beacon period
- **Highly efficient**
  - Efficiently supports simultaneous VoIP and HDTV traffic





# QoS Control

---



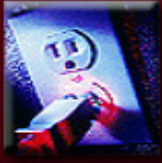
- **Extensive control to provide QoS through Convergence Layer**

- Interfaces through Ethernet Service Access Point (SAP) to higher layers
- Control SAP allows tight application control for explicitly establishing connections for traffic requiring QoS.



- **Packet Classifier**

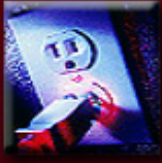
- Inspects incoming traffic from Ethernet SAP
- Identifies traffic as belonging to established connections, or not
- Inspects payload for connection identifying information such as a TCP header



- **Auto Connect**

- Used to autonomously establish connections for traffic
- Uses classifier and traffic profiling to identify QoS streams.





# Interoperability and Coexistence Features

## ■ HomePlug v1.0

- Preamble similar to HomePlug 1.0
- HomePlug 1.0 coexistence mode adds 1.0 Frame Control
- Provided through CSMA period which uses 1.0 channel access
- AV devices can also interoperate

## ■ Access BPL

- HomePlug BPL baseline is natively interoperable
- Highly efficient coexistence through TDM or through FDM
- Fully flexible sharing in time
- Access and in-home networks can negotiate any slice of time within frame
- Provides for maximum spectral diversity
- Proprietary BPL co-existence using 1.0 TDM or FDM mechanisms

## ■ Neighbor Networks

- Allows for cooperation between neighboring networks to avoid interference

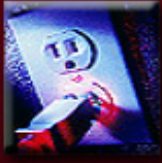




# HOMEPLUG

POWERLINE ALLIANCE

## Conclusions

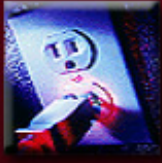


# HomePlug Alliance: Created to Lead

---

- Brings together some of the PLC industry's top technical engineers
- Already enabled successful powerline products around the world in an organized and timely manner
- Developed relationships with leading industry alliances, standards organizations, and regulatory organizations
- Natural fit for any near-term standardization efforts in the powerline space
- World's only organization that certifies interoperability of high-speed powerline products from multiple vendors





## June 16 & 17: SAVE THE DATE!



- Get all the latest information on HOMEPLUG AV -- the world's only industry-standard 200 mbps powerline communications technology
- Network with Industry Leaders in Powerline Communications
- Meet and learn from analysts, venture capitalists, market specialists, and business leaders

**HOMEPLUG**™

Powerline Technology Conference

The Palms Hotel, Miami Florida

June 16-17, 2005





# Thank You!



Oleg Logvinov  
President & CEO  
oleg@arkados.com

Arkados, Inc.  
948 US Highway 22  
North Plainfield, NJ 07060  
Voice: 908 769 3232  
Fax: 908 769 0206