PLC Technology

PLC Standardization Tutorial

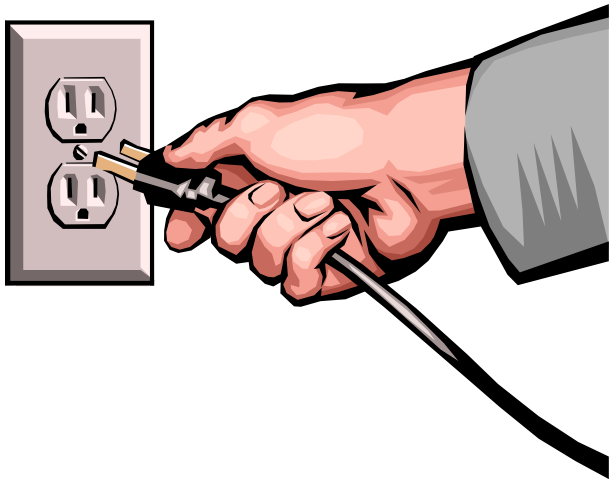
Orlando, March 2004

Contents

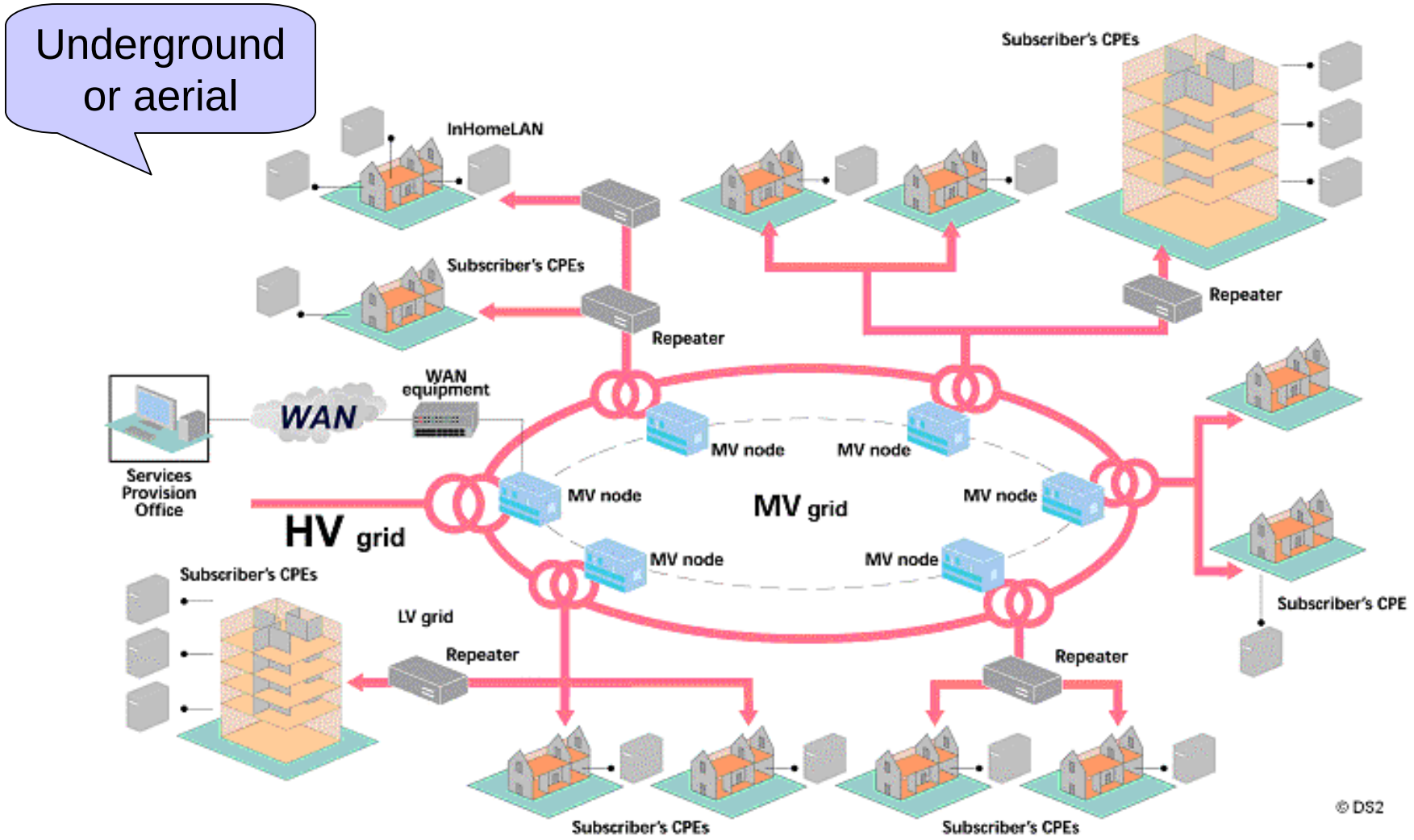
- INTRODUCTION
- ARCHITECTURES
- CHANNEL
- EMC CONTROL
- ROADMAP

Introduction

- Powerline improves consumer experience:
  - Easy to use: just plug it in and it's connected
  - No coverage problems due to walls
  - No need for new wires
  - No antennas (psychological fear)
  - Ubiquitous: works in every plug
  - Low cost
  - High speed: up to **200 Mbps**
  - Has synergies with other technologies (WLAN, BlueTooth, DSL, Cable)



ACCESS PLC


Underground or aerial
Subscriber's CPEs
InHomeLAN
Subscriber's CPEs
Repeater
Repeater
WAN equipment
WAN
Services Provision Office
MV node
MV node
MV node
MV node
MV node
MV node
MV grid
HV grid
Subscriber's CPEs
LV grid
Repeater
Repeater
Subscriber's CPE
Subscriber's CPEs
Subscriber's CPEs
© DS2

INHOME PLC






Total: 34.6 Mbps ☑

And, in addition to this, you need:

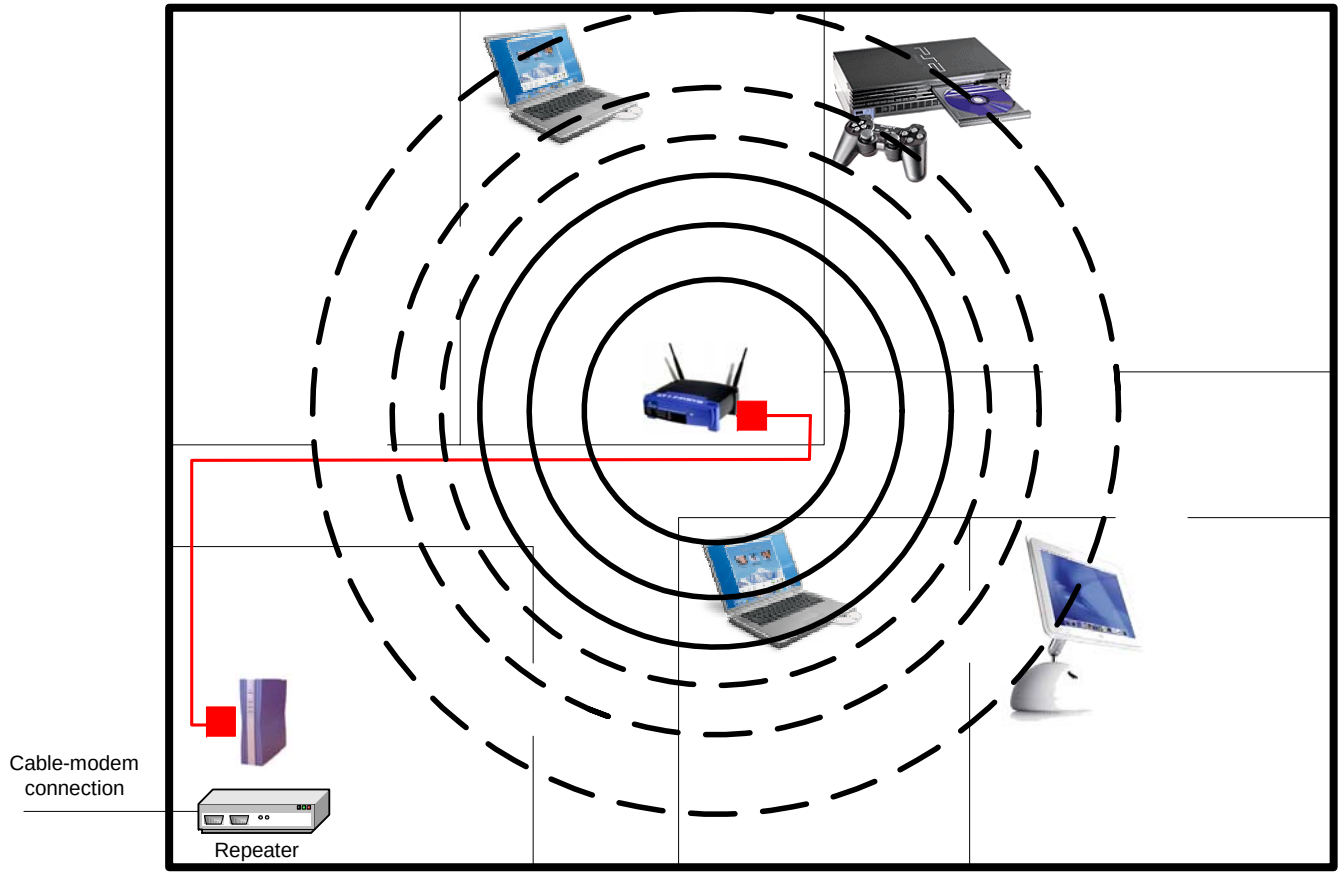
- **full-house coverage** ☑
- **QoS** ☑
- **low cost** ☑
- **easy installation** ☑

PowerLine Communications (PLC) is the only technology that satisfies all these requirements:

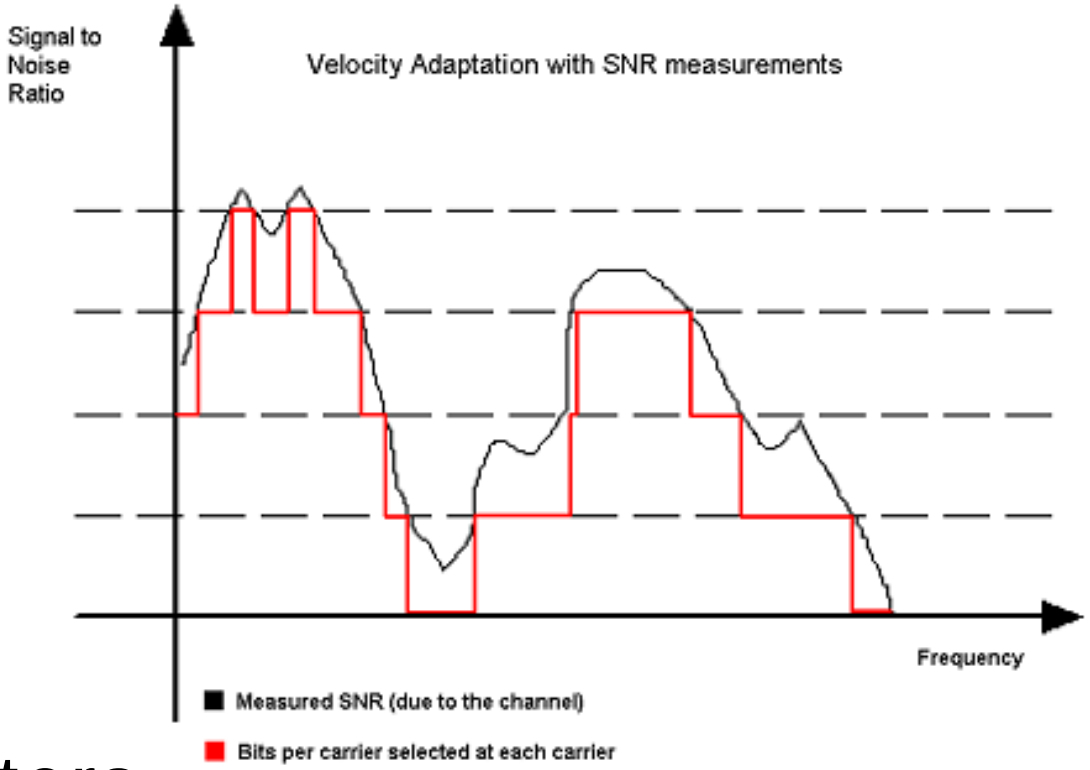
- **Up to 200 Mbps**
- **Not attenuated by walls**
- **Fully supports QoS**
- **no RF components needed**
- **no wiring needed**

INHOME PLC

- The PowerLine backbone improves the coverage of the WLAN



Channel

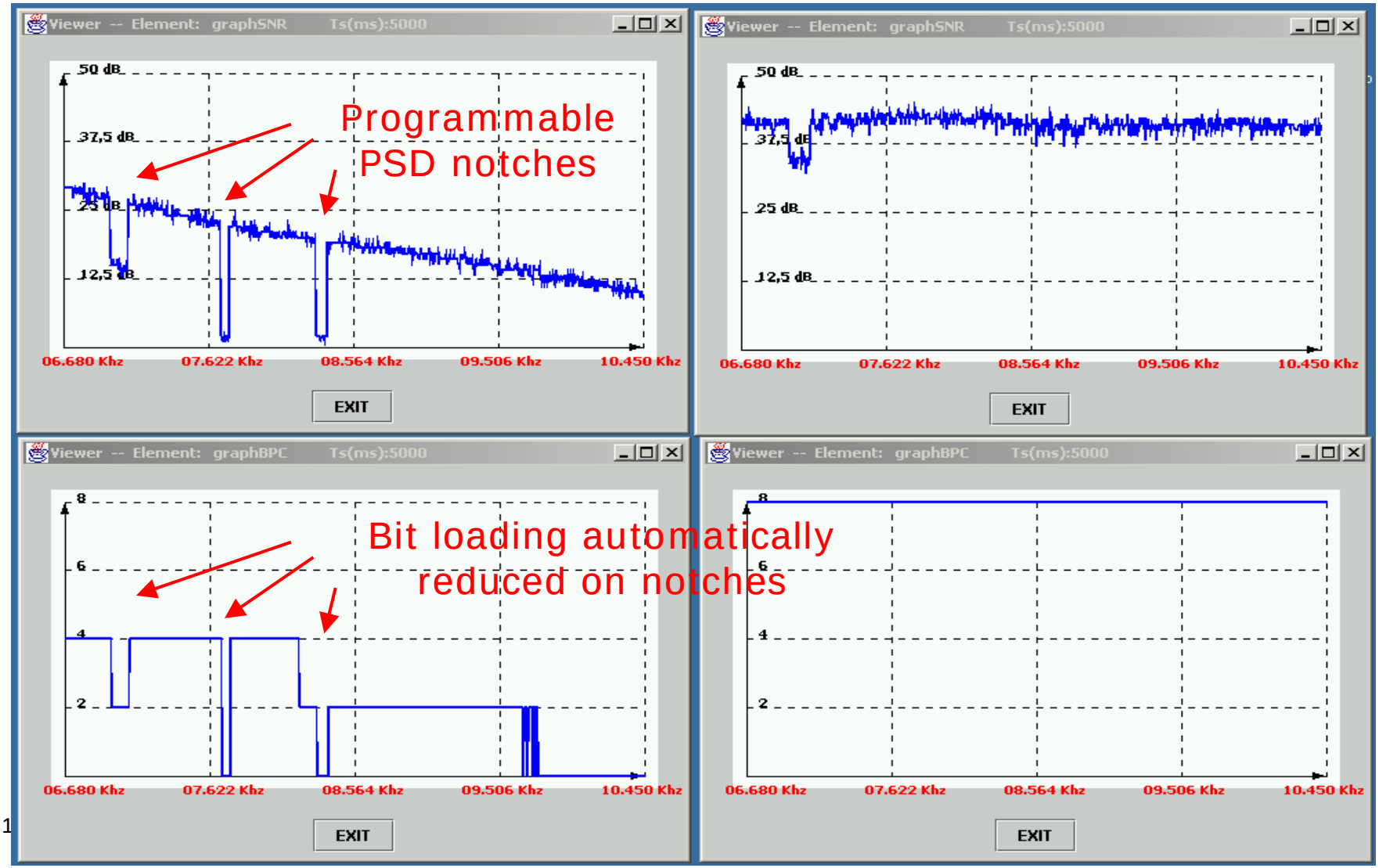


- 1.7 to 30 MHz
- Few hundred meters
- Multi-path (strong fadings)
- Noisy: background, ingress, impulsive

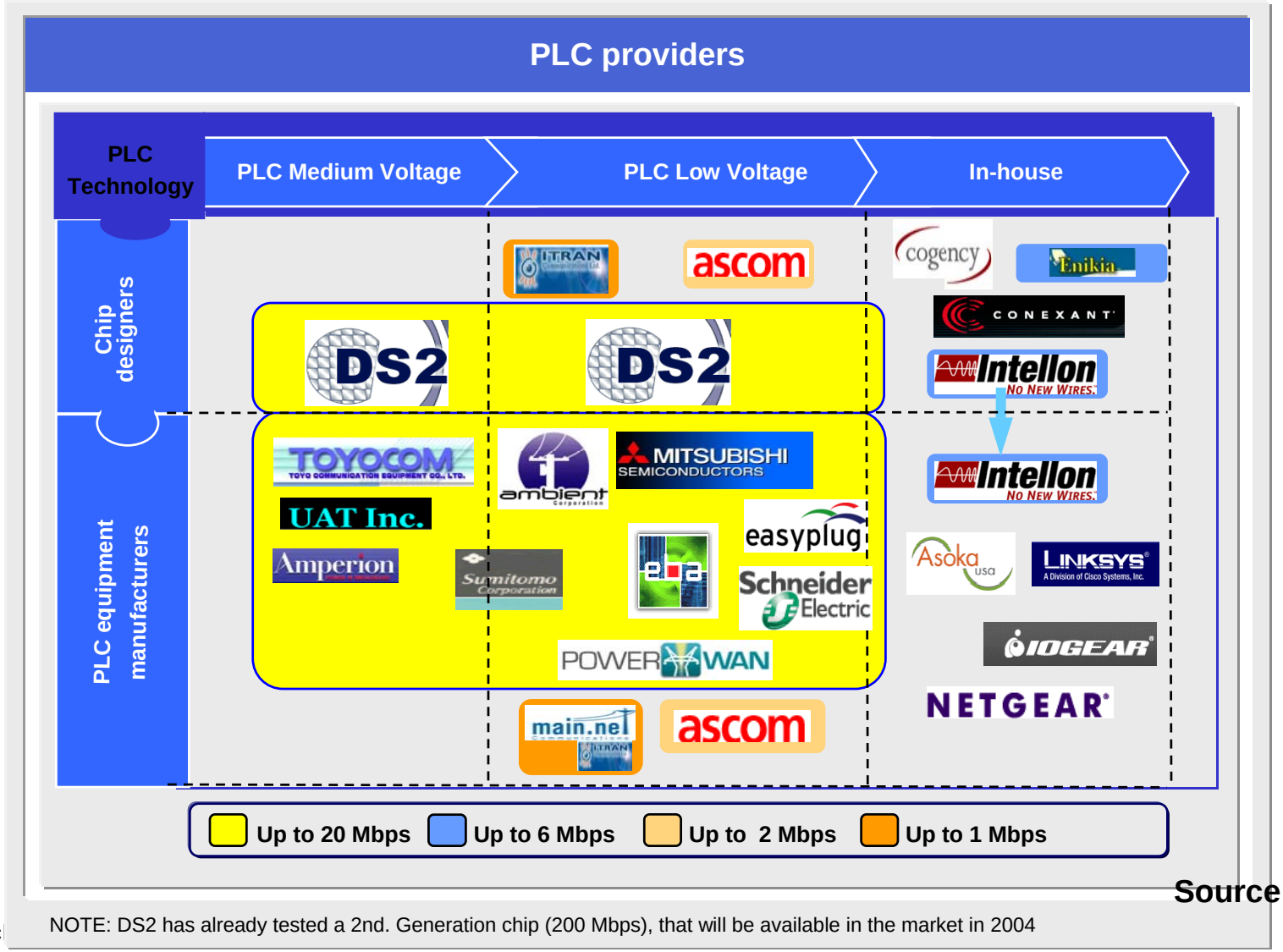
EMC Control

- Wide-band modulations:
  - The signal is spread over a wide bandwidth, instead of being concentrated at a single strong carrier
  - This means that power spectral density is lower than with single-carrier modulation, reducing the possibility of interfering other users of the spectrum
- Adaptive transmission power
  - PLC technology can have an **adaptive transmission power**, so that the system **only** injects the **minimum signal level required** to achieve the desired performance level.
  - Equipment is typically transmitting with **much less power** than nominal level, thus reducing any potential emissions to a minimum
- Differential-mode signals (no ground reference)

Spectrum Friendly Notches



Leading manufacturers ensure the availability and development of PLC equipment. 2nd generation chipset will increase performance and competitiveness

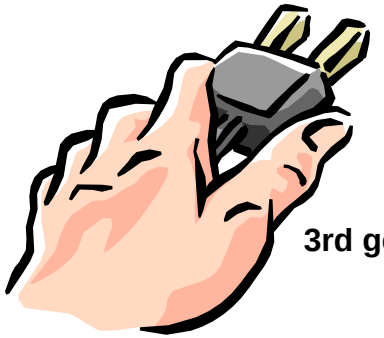


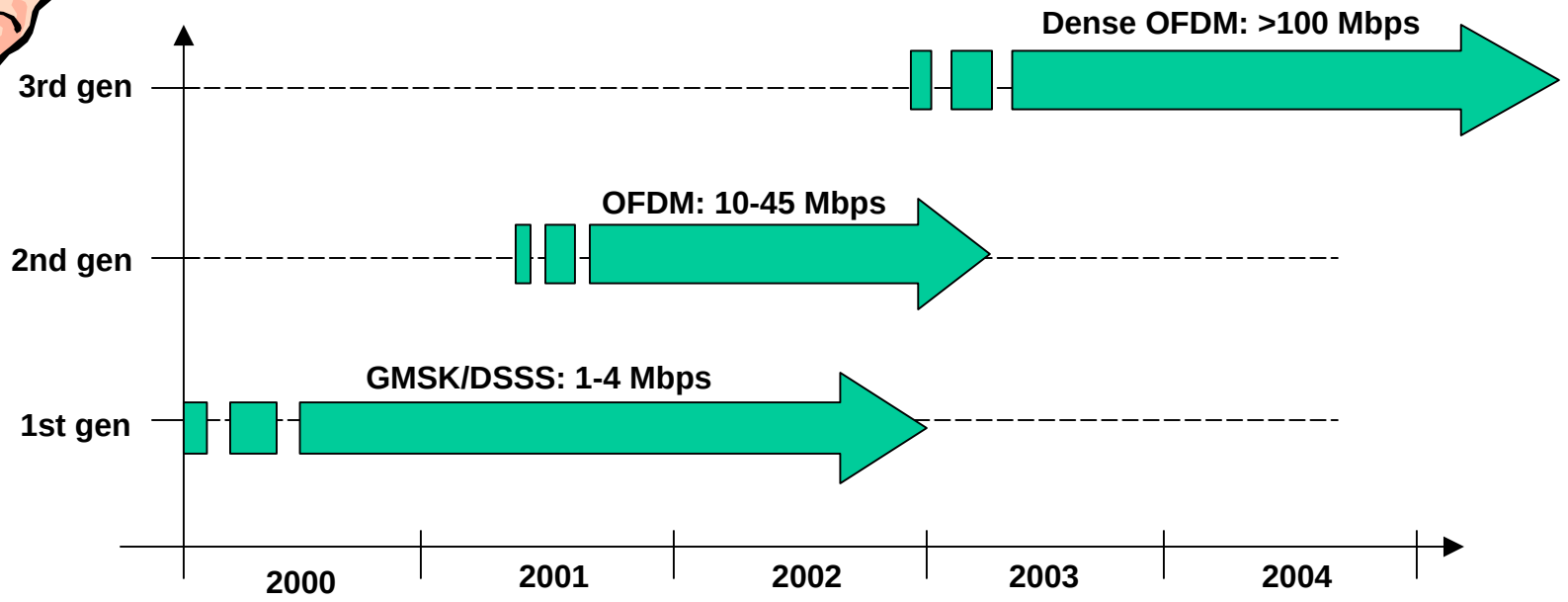
Source: PUA

NOTE: DS2 has already tested a 2nd. Generation chip (200 Mbps), that will be available in the market in 2004

Roadmap

- PLC Access technology roadmap:





Example 2nd gen

- 1280 OFDM carriers
- Data rate :
  - Up to 27 Mbps in downstream channel
  - Up to 18 Mbps in upstream channel
- Data rate per subcarrier adaptable according SNR detected
  - Nº bits per carrier : up to 8
  - Different carriers transmit at different data rates
- Modulation efficiency up to 7,25 bps/Hz
- Overlapped subchannels: efficient use of the spectrum saving bandwidth

Example 2nd gen

- MAC
  - FDD or TDD
  - MASTER-BASED or PEER-to-PEER
- QoS
  - THROUGHPUT, LATENCY and JITTER CONTROL
- Security
  - CODING
  - ENCRYPTION
- Bridging
  - ETHERNET, USB, VoIP, WLAN, etc

3rd generation PLC products

- Speeds higher than 100 Mbps...
- ...achieved thanks to high-density, high-efficiency multi-carrier modulations
- Advanced features (multicast, QoS, integrated VoIP) and built-in high-speed interfaces)
- Cost equal or lower than DSL/Cable
- Easier installation, higher coverage and better diagnostic mechanisms that will reduce operational costs for running a large-scale network