



Residential Network Infrastructure

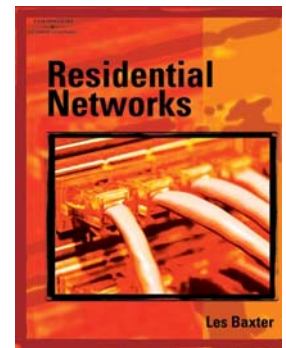
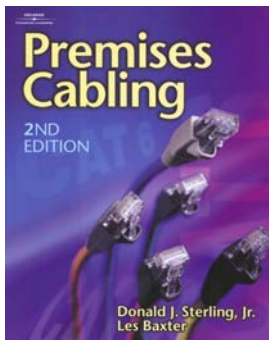
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Les Baxter, P.E.

732-212-1400

les@baxter-enterprises.com

*Consulting on Structured Cabling Systems, LANs,
and Residential Networks*



Outline



- Overview of residential cabling infrastructure
- Residential networking options
- IEEE 1394 in home networks

Installed wiring

- There is lots of wiring installed in homes --
 - ⇒ >70% of homes have coax installed
 - ⇒ Virtually 100% of homes have UTP installed
- But ...
 - ⇒ Quality varies widely (both UTP and coax)
 - ⇒ Often only 1 or 2 runs in older homes.
 - ⇒ Does not always go where you need it.
- About 50% of homes built in the last few years include structured wiring – usually Cat 5 or 5e UTP and coax.
 - ⇒ 56% of new housing starts in 2003 included structured cabling
 - ⇒ >1.9M new housing starts in 2004 in US



Residential Network Options



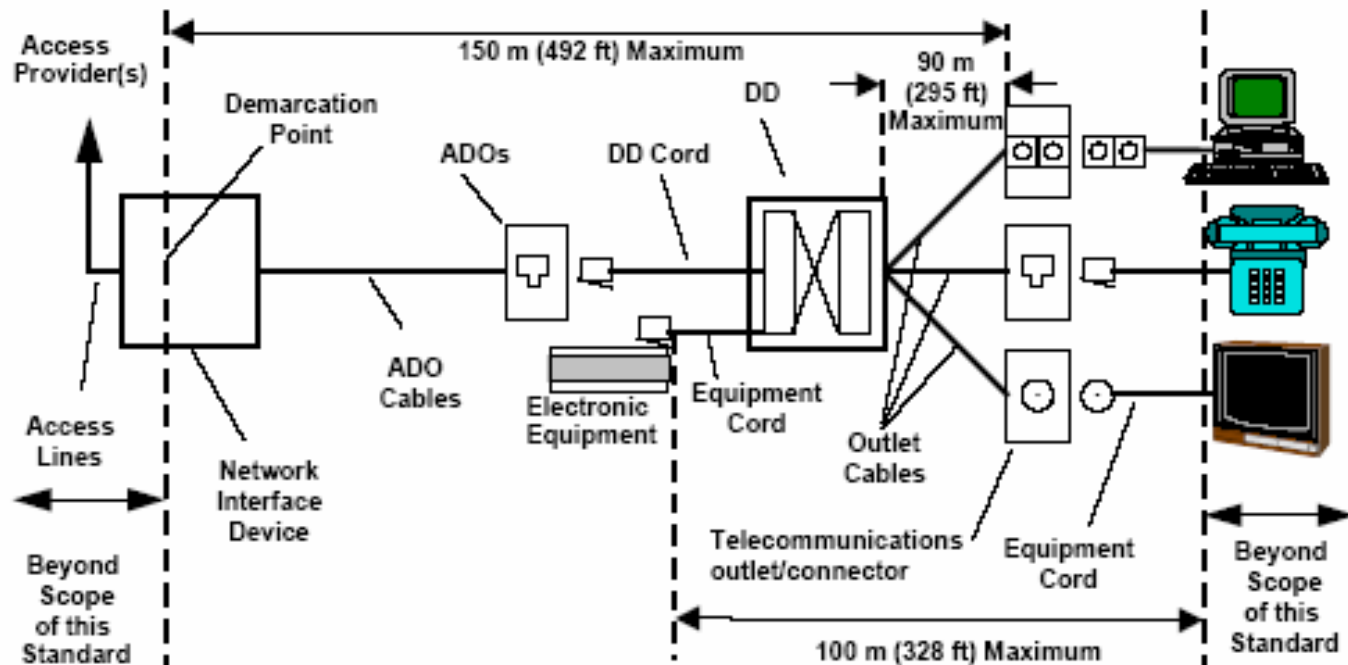
- Media:
 - ⇒ UTP
 - ⇒ Coax
 - ⇒ Wireless
 - ⇒ Powerline
 - ⇒ POF
- Networks
 - ⇒ Ethernet
 - ⇒ FireWire
 - ⇒ *HomePNA*
 - ⇒ *HomePlug*
 - ⇒ *MoCA*
 - ⇒ *Wi-Fi*
 - ⇒ *Residential Ethernet*
- Applications:
 - ⇒ Voice
 - ⇒ Data
 - ⇒ Entertainment
 - ⇒ Home Automation
 - ⇒ Security
- Cabling Standards
 - ⇒ TIA 570-B (Residential Telecom. Infrastructure Standard)
 - ⇒ TIA 568-B (defines UTP performance categories)
 - ⇒ ISO/IEC 15018 (Generic Cabling for Homes)
 - ⇒ ISO/IEC 15045 (HomeGate)

TIA 570-B Requirements

- Star-wiring (i.e., home run, not daisy-chain) to a Distribution Device (DD)
- Media specifications:
 - ⇒ Cat 5e or 6 UTP
 - ⇒ Series 6 coax
- Telecommunications outlets:
 - ⇒ 8-pin RJ-45 for UTP, F connector for coax
 - ⇒ At least one TO in every kitchen, bedroom, family/great room, and den/study.
 - ⇒ Additional TO's recommended on unbroken wall spaces of 12' or more.



Typical voice, data, and video cabling system components for a single-dwelling residence



Source: EIA/TIA-570b, Figure 3

“No New Wires” (NNW) options



HomePNA 3.0

- + Uses existing phone lines
- + Reasonable data rate (128 Mb/s, extension to 240 Mb/s)
- + Deterministic QoS
- Really old phone lines may not be usable
- Phone lines don't usually go everywhere you want them to.

MoCA

- + Uses existing coax
- + Good data rate (270 Mb/s, possibly higher)
- + “High” QoS, HDTV-quality video
- Limited amount of coax in most homes.
- Really old coax may not be usable.

“No New Wires” (NNW) options

HomePlug AV

- + Uses existing AC power wiring
- + Provides 200 Mb/s with QoS
- + Ethernet-like, uses OFDM modulation with CSMA/CD MAC
- + Bridges available to Ethernet and USB
- HomePlug AV spec is in “final stages” (1.0 operates at 100 Mb/s with no QoS)
- Relatively unproven technology

Wi-Fi

- + Defined in IEEE 802.11 series of standards
- + Data rates from 11 Mb/s to 54 Mb/s
- + Widely deployed
- + IEEE 802.11e will provide “QoS”
- + Excellent for mobility and low data-rate activities and for extending other networks
- Limited data rate and wireless QoS are not very good for video
- Potential bandwidth limitations due to interference

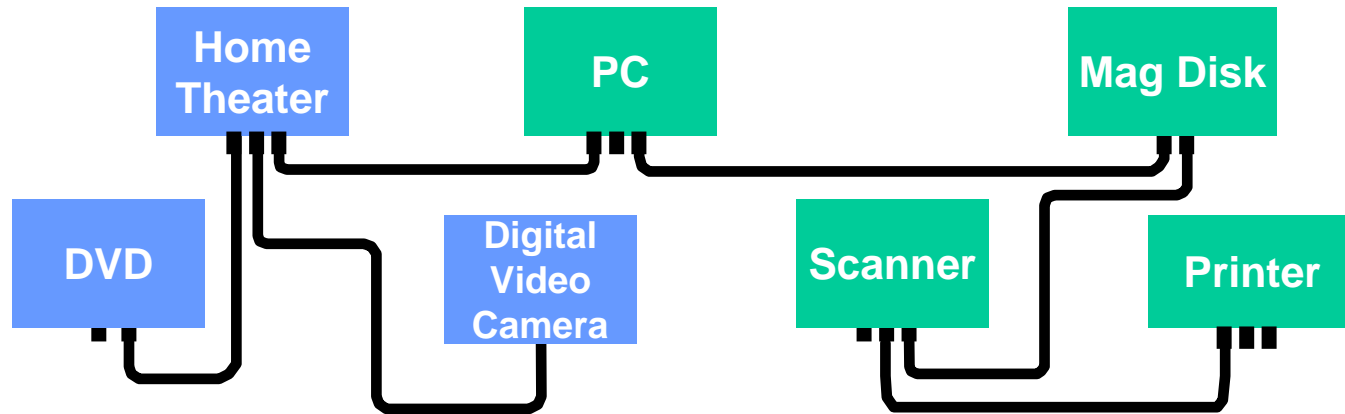
Residential Cabling Recommendations



- For new construction – follow TIA-570B
 - ⇒ Install plenty of TO's
 - ⇒ Use Category 6 UTP
 - ⇒ Provide cabling for wireless access points, security cameras, etc.
- For retrofitting existing homes:
 - ⇒ Use NNW technologies as needed
 - ⇒ Add strategically-placed runs of UTP or coax as needed

What is IEEE 1394?

- A digital network that supports both audio/video AND data processing equipment – provides a bridge between consumer electronics and LAN worlds



- Tree-structured network
- Multiple ports on most equipment
- Very flexible interconnection – just plug into any vacant port

Advantages of IEEE 1394

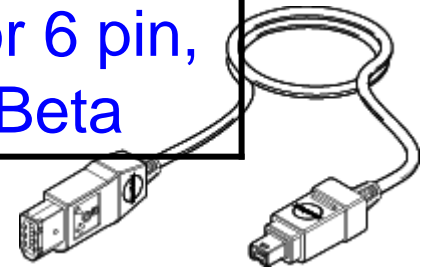
- ***Built-in support for isochronous connections (e.g., digital audio and video)***
- ***Several cabling media options***
 - ⇒ ***Supports both local clustering and long-distance (100m) transmission***
- Hot pluggable – devices are recognized as they are plugged in
- High speed (100 to 1600 Mb/s)
- Large networks – up to 63 devices without a bridge

1394b Physical Layer Media

Media	Reach (m)	Max Speed	Connector
Cat 5e UTP	100	S100	Modular
1000 μ POF (10 MHz-km@650 nm)	50	S200	PN
225 μ HPCF (25 MHz-km@650 nm)	100	S200	PN
50 μ MMF (500 MHz-km@850 nm)	100	S1600	LC
Short-Haul Copper (3-pair shielded cord)	4.5	S1600	4 or 6 pin, Beta

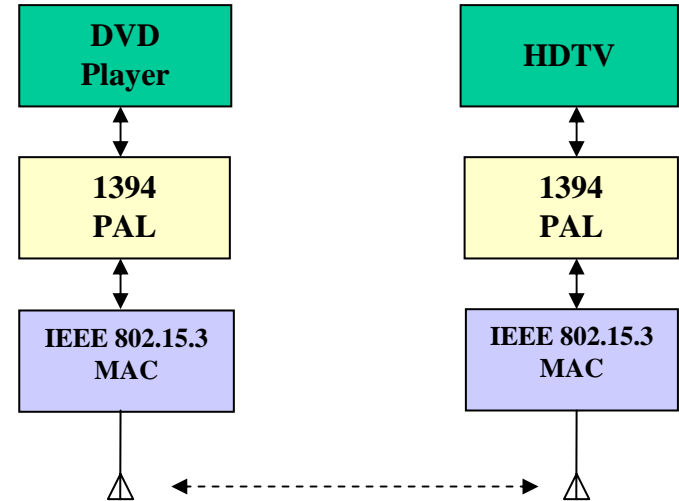
TIA-568B.2

TIA-568B.3



New IEEE 1394 media options

- Wireless IEEE 1394 (a.k.a Wireless FireWire)
 - ⇒ Protocol Adaption Sublayer (PAL) to incorporate IEEE 802.15.3 piconets
 - ⇒ Specified by 1394 TA in document 2003010.



- IEEE P1394c – draft standard that uses GbE PHY to support S800 over UTP
- “1394b S400” – new project to use equalizer technology to support S400 with the existing 1394b S400 interface.

IEEE 1394 home entertainment network

