Networks for the Home

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Home networks will happen!

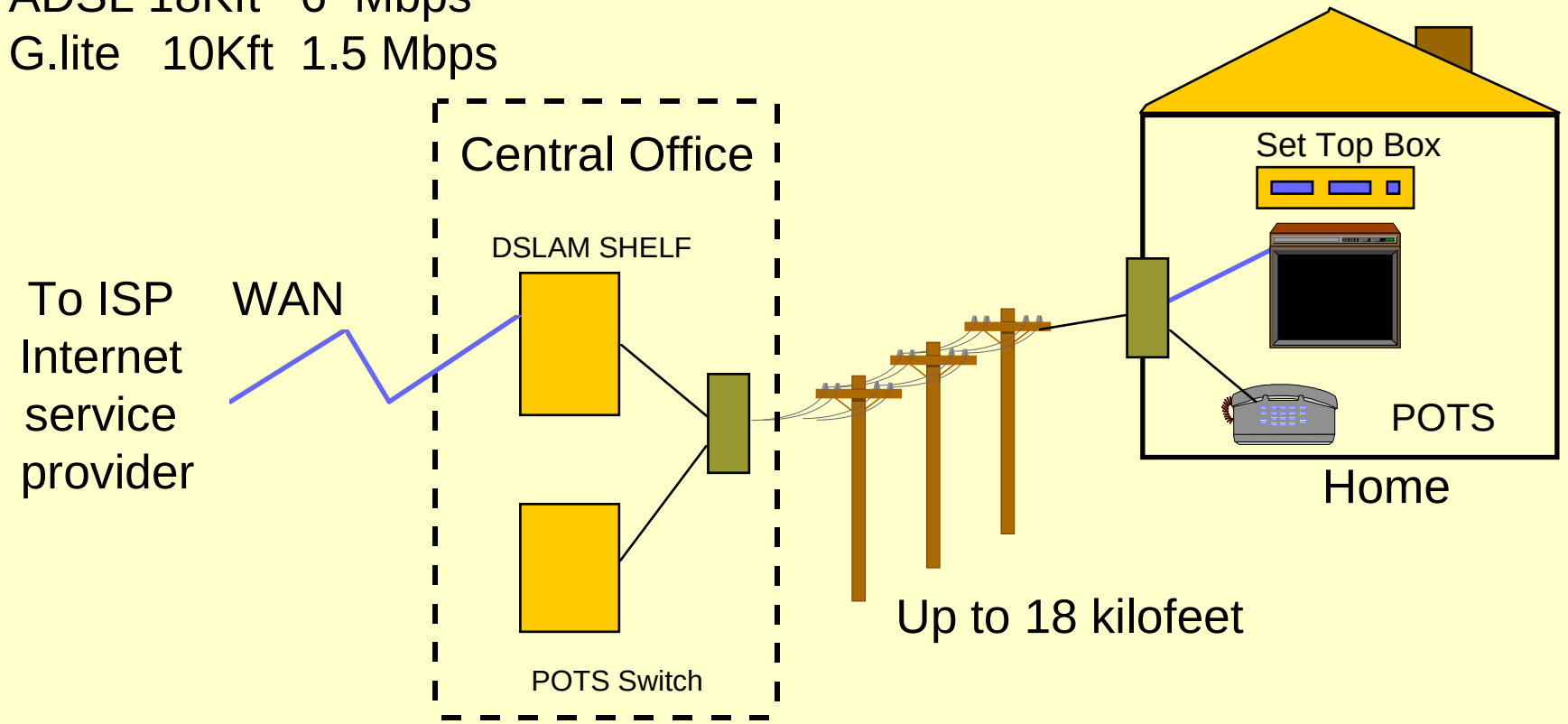
- Technology is advancing and falling in cost.
- Mains power and telephones are the main sockets in the wall today
- A few other wires for HiFi, Alarms, TV, Baby Monitor, Entry system, … exist
- There will be a new data socket on all electronics goods and in the corner of every room.

Digital Access Networks

- Phone pair based:
  - 56/64 kbps modems and N-ISDN
  - ADSL and xDSL modems
- CATV modems.
- FTH: PON (Passive optical network)
- FTK:
  - VDSL (very digital subscriber line)
  - Radio local loop (fibre to the pole top)
- Power Line Modem.

xDSL Typical System

Name	Reach	T/put
VDSL	1Kft	51 Mbps
ADSL	18Kft	6 Mbps
G.lite	10Kft	1.5 Mbps



Cable Modem Solutions

- 6 MHz channel carries 25 Mbps
- 2 Mbps DVB or MPEG2 stream means 12 digital channels for each old one.
- Also use it for data
- Reverse channel is low bandwidth and does not work in many parts of the world.

Multimedia Requires QoS

- Nearly all current CATV modems are IP.
- Nearly all xDSL deployments are ATM.

This is rather strange ?

What will happen ?

IEEE 802.14 Spec is now complete

Will it be used ?

Media for the Home

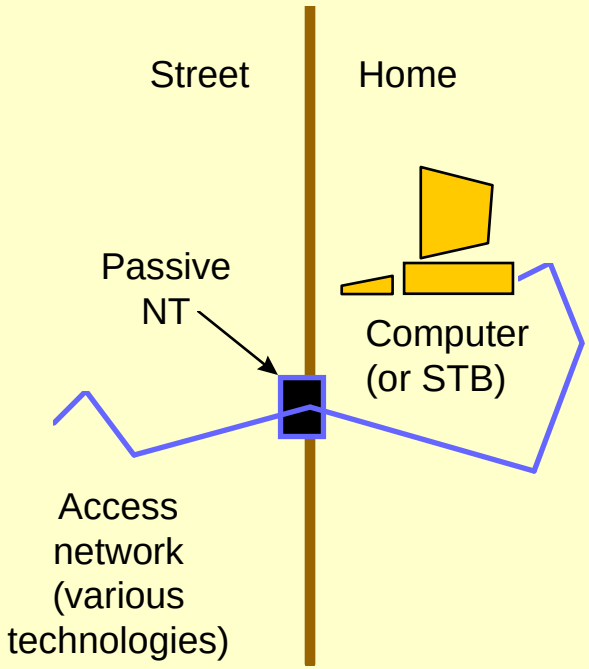
- Installed Telephone Cables
  - Splitterless or With Splitter
- CATV Cables
- Powerline (CE Bus, Echelon, EHS, X.10)
- Radio (DECT or faster)
- Infra-red
- POF (plastic optical fibre)
- New copper media

What will be the seeds ?

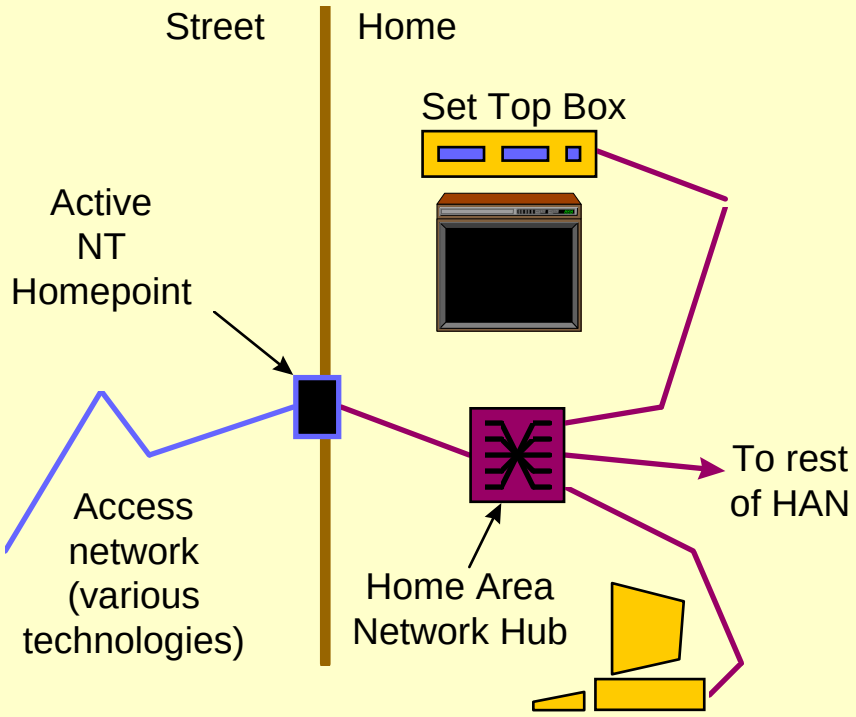
- Perhaps a starter kit of modules ?
- Or perhaps a DV link ?
- Or perhaps the ADSL homepoint ?
  - Home working
  - WWW browsing
  - VOD (video on demand) Pay per view, pay per listen.
  - Home Shopping
- Or maybe hotels, aircraft and other vertical markets ?

Internal Modem or '*Homepoint*'

Internal Modem Approach



Homepoint Approach



Copper: what technology ?

- Ethernet ? (1.3 Mbps from TUT/AMD)
- USB ?
- CATV RF modulation
- Firewire (IEEE P1394) ?
- ATM51 ?
- Something new ?

POF Can Carry These Too!

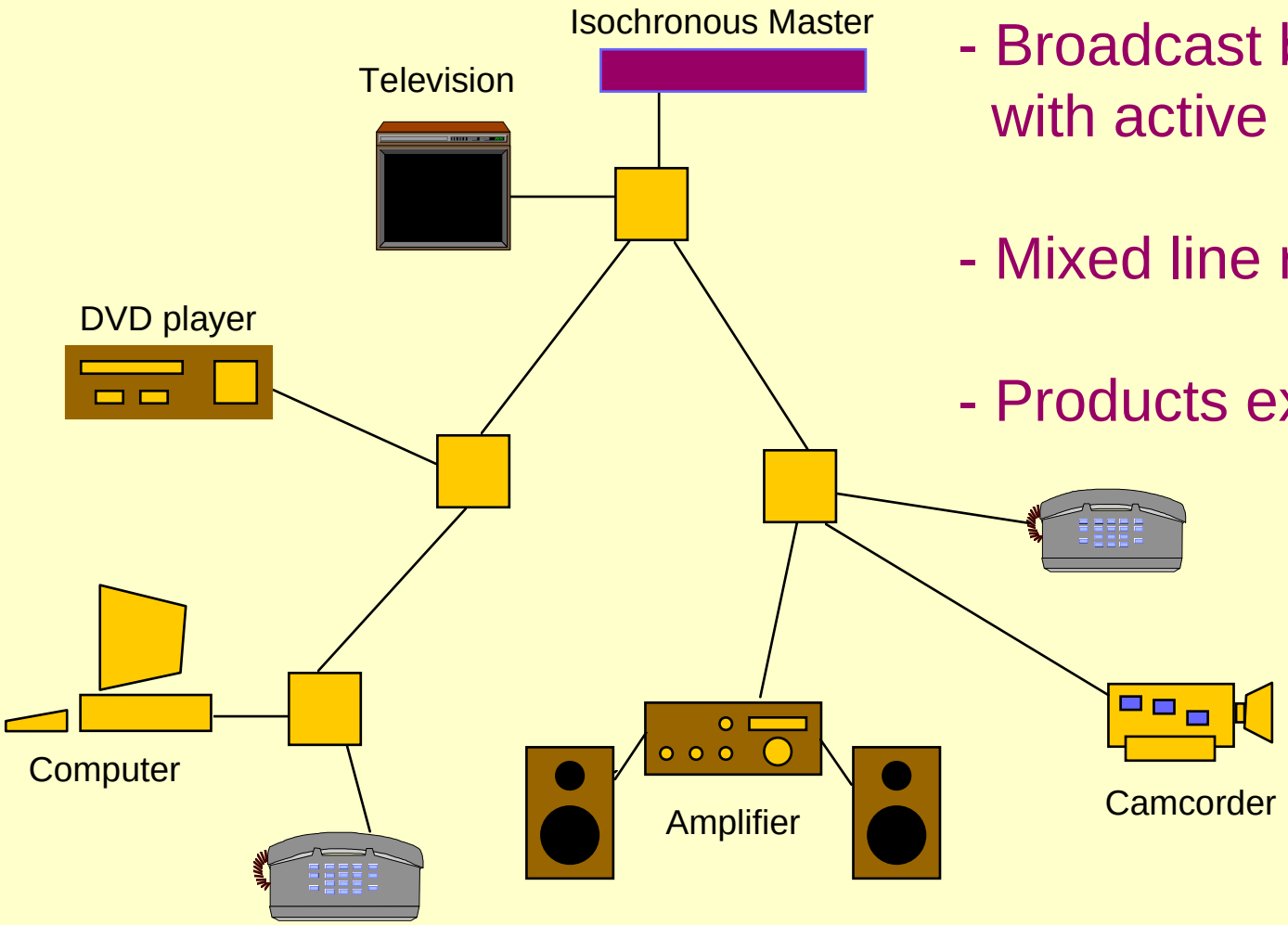
Ethernet

- 10baseT is jolly cheap - but EMC ?
- 1.3 Mbps '*Homerun*' from Tut Systems on home phone wires.
- Poor real-time response for telephony.
- Limited overall bandwidth ?
  - Well just switch it
  - Or let it become a point-to-point link.

Firewire (IEEE P1394)

- 4.5 metre reach on special cables
- Active hubs
- 200 Mbps shared media.
- Token ring performance with Isochronous channels
- Well supported in consumer audio and video fields
- Defined upper-layer architecture.
- Longer reach and POF versions maturing.

Firewire Network Topology



- Broadcast bus with active hubs.
- Mixed line rates.
- Products exist.

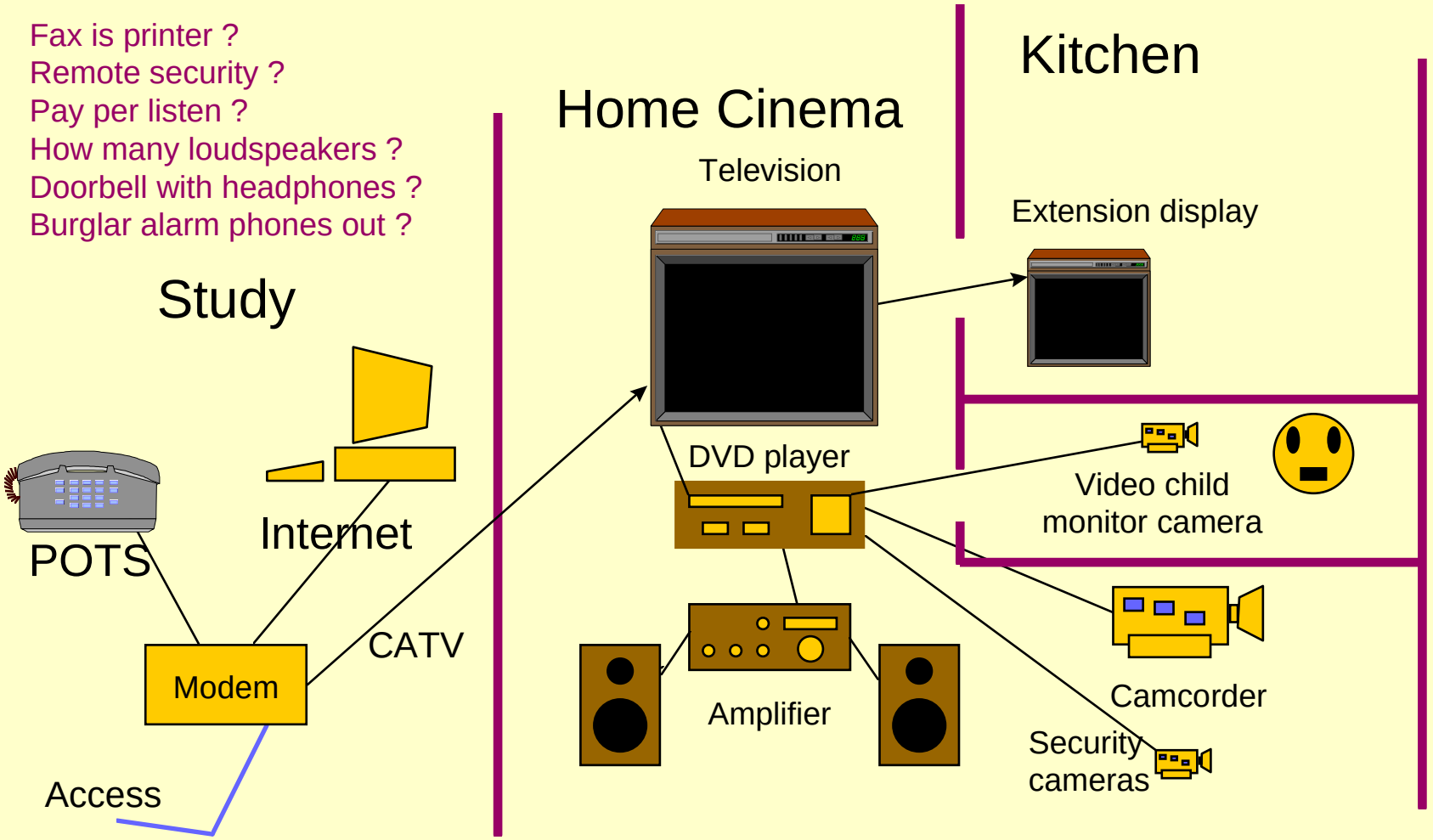
ATM 51

- ATM Forum RBB recommended.
- 51 Mbps in each direction on UTP or POF.
- Special Attention to SW Radio RFI.
- Considerable uptake in the xDSL field.
- Compatible with ATM25 used in Warren prototypes in Cambridge.

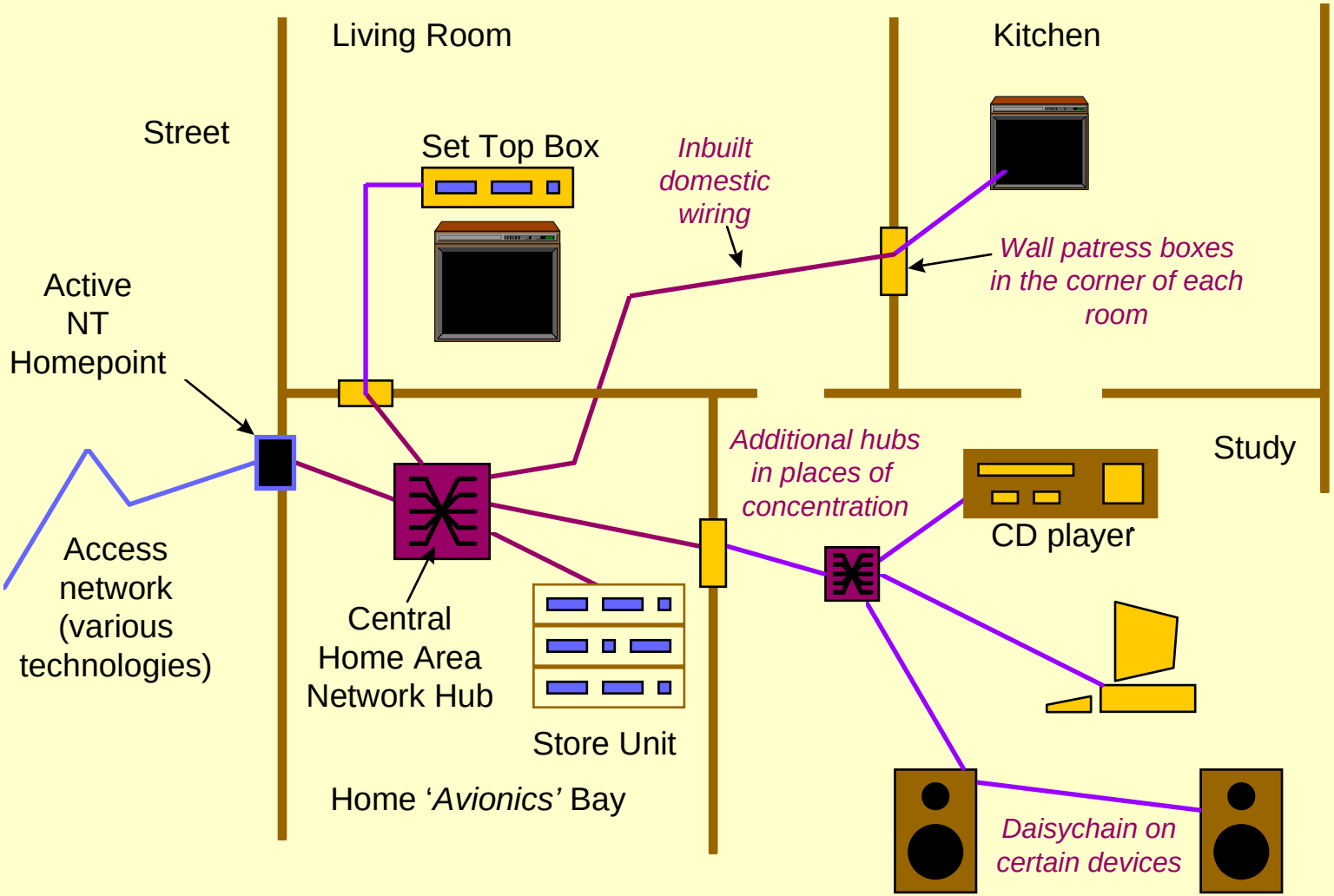
ATM v Firewire

- ATM
  - Fixed length cells
  - Switching hubs but can also make multi-access busses etc.
  - Many different QoS levels
  - CAC ?
  - Warren makes it simple again.
- Firewire
  - Variable length pkts
  - Shared media hubs, but can switch later.
  - Isochronous channels
  - CAC defined
  - Minimum complexity is significant ?

Home Wiring - First the seeds



Home Wiring Vision 2



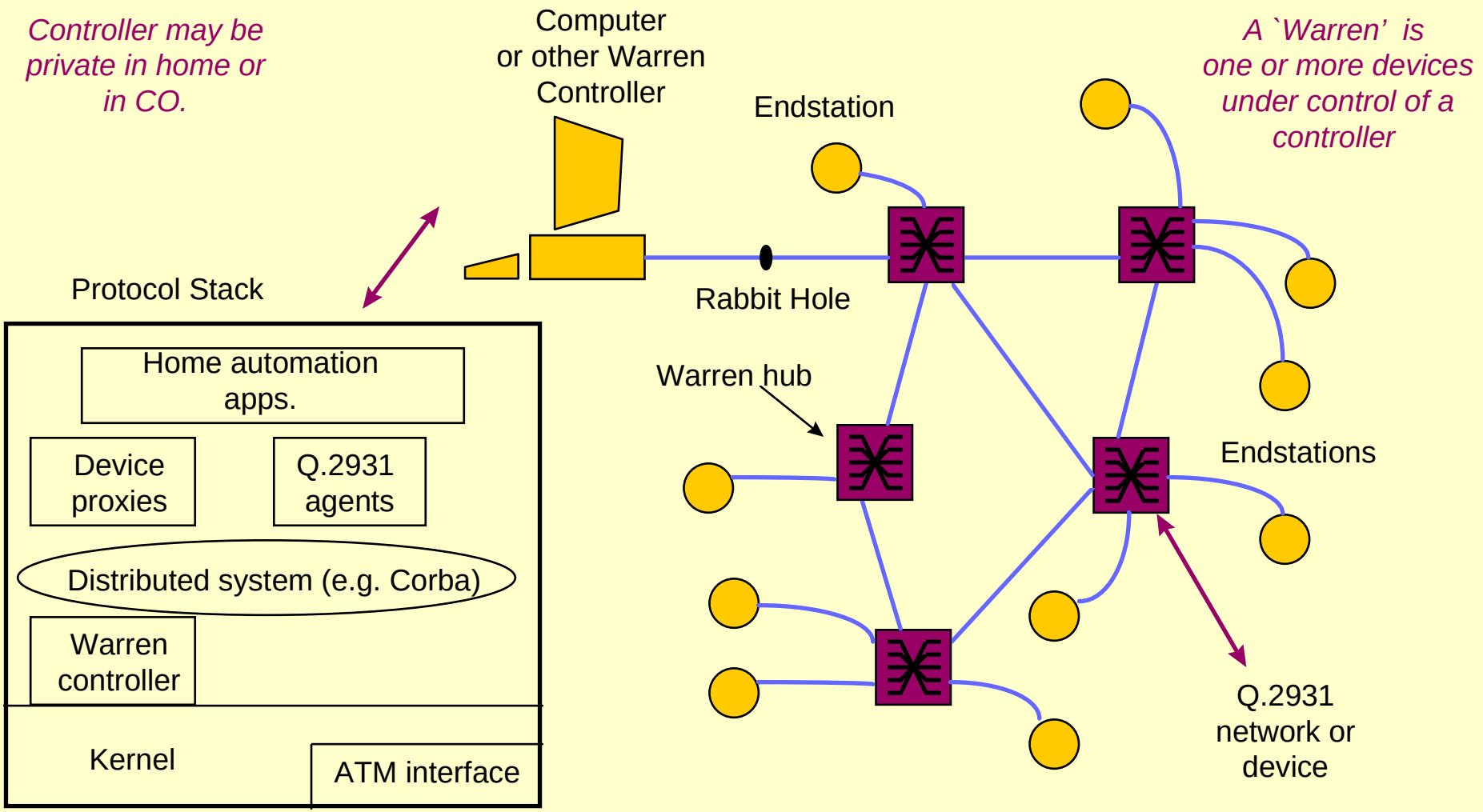
What about the redecorating ?

- Installation and redecoration cost is a series obstacle to *short-term* acceptance
- Start with a TV or Hifi Focus.
- Add one or two remote stations.
- Use some pieces of wire already present.
- Finally do the whole house.

ATM is expensive ?

- ‘Low cost ATM and the ATM Warren’
  - Don’t put 2 MByte of software in every node
  - No unique serial numbers in each device
  - Allow direct connection
  - License as macrocells
  - Rediscover envisaged benefits of out-of band control.

Warren Generic Structure



Single Cell Working Group

- 8 Companies backing the proposal
- Warren concepts are embodied
  - Can also be used ‘more simply’
- Likely to become ATMF ‘standard’
- Silicon vendors can build with confidence.

Upper Layer Stuff

- Need an idiot-proof user interface
  - Maintenance
  - Auto configuration
- ROM and IR handsets actually go a long way.
- ‘Cal’ from CE.org: home P’n’P
- Autohan project here at CL.