



Plastfiber som hemmanät

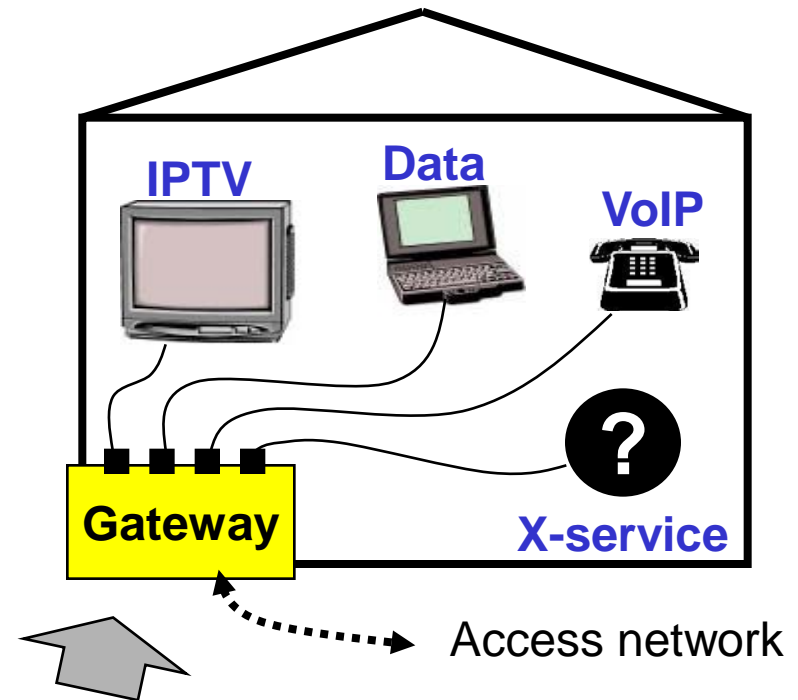
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Claus Popp Larsen, Acreo
claus.popp.larsen@acreo.se

A home network makes the electronic services available throughout the home



- A home network includes
 - ▶ Infrastructure
 - ▶ Gateway
- Important issues
 - ▶ Installation
 - ▶ Ownership and business model
 - ▶ User friendliness
 - ▶ Availability



IP based triple play services – and other services over the broadband connection

IP = Internet protocol

VoIP, internet, IPTV
Telephony, data, TV

- Recommendations from Home Network Project
- Alternative solutions
- Plastic optical fibre (POF) technology
- POF installations
- POF challenges

The "Home network project"

- Main recommendations



One wired infrastructure

Built-in conduits or ducts in the walls.
The conduits should enable re-installation of cables.

All conduits should be connected *directly* between the patch panel and the outlets.

- Double-outlets: Room for two cables per conduit
- Starshaped network

Cat5e (or better) to each room

At least one to three double-outlets with RJ45 connectors depending on room size and type.

- Should be dust protected

Patch panel cabinet

- Should be dust protected



FASTIGHETSÄGARNA



Cat5 cable

- ▶ Low-tech solution to high-tech problem
- ▶ This solution will work until >1 Gbit/s within the home is required
- ▶ Target group: Construction companies, housing companies, end users

- Same basic needs, same basic requirements
- Cat5e to each room may not always be feasible due to cost, practical issues, esthetics, etc
- Alternatives to full Cat5e/6 coverage, considerations
 - ▶ Technical: Bandwidth & interference issues
 - ▶ Business model/responsibilities: Active equipment disliked by housing companies

Alternatives to Cat5/6

- ▶ Telephone cables
- ▶ Coaxial cables (for TV)
- ▶ WIFI
- ▶ PLC
- ▶ Glass fibre
- ▶ Plastic optical fibre, POF
- ▶ WIMAX
- ▶ 3G/LTE



- What are the needs
 - ▶ Point-to-point vs full home coverage
 - ▶ Surfing vs IPTV, gaming
- Ownership and responsibilities
- Future proof vs temporary solution



How is IPTV delivered today?

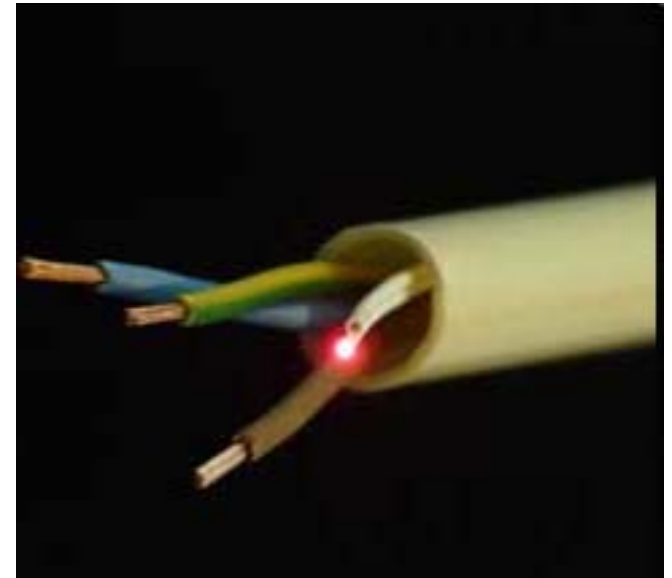
- ▶ Cat5 network in the home
- ▶ Cat5 cable from gateway to set top box
- ▶ Telia: WLAN bridge (Telia Smart)
- ▶ Telekom Austria: Plastic optical fibre bridge
- ▶ France Telecom: PLC bridge
- ▶ And there are probably many more solutions...

Pure IPTV providers seldom take responsibility for the home network – unlike the vertical operators – but deliver a 10-25 m Cat5e cable for self installation.

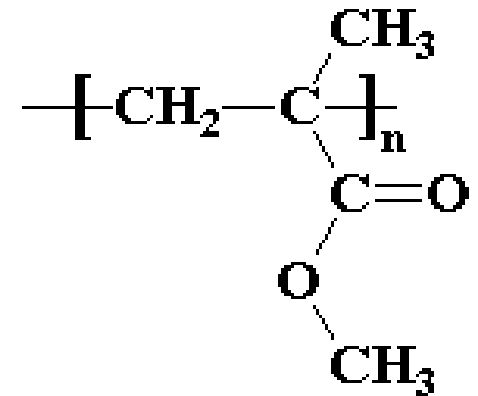
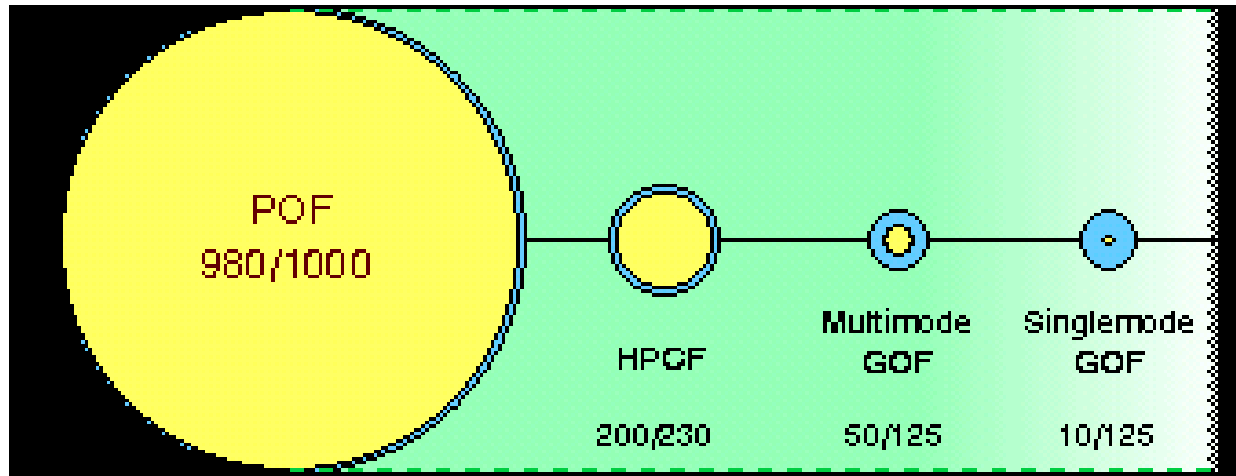


Plastic optical fibre

- Used commercially in some countries for self-installing IPTV connections
- Extremely easy to handle
- Non-conducting: Can be colocated with electrical installations

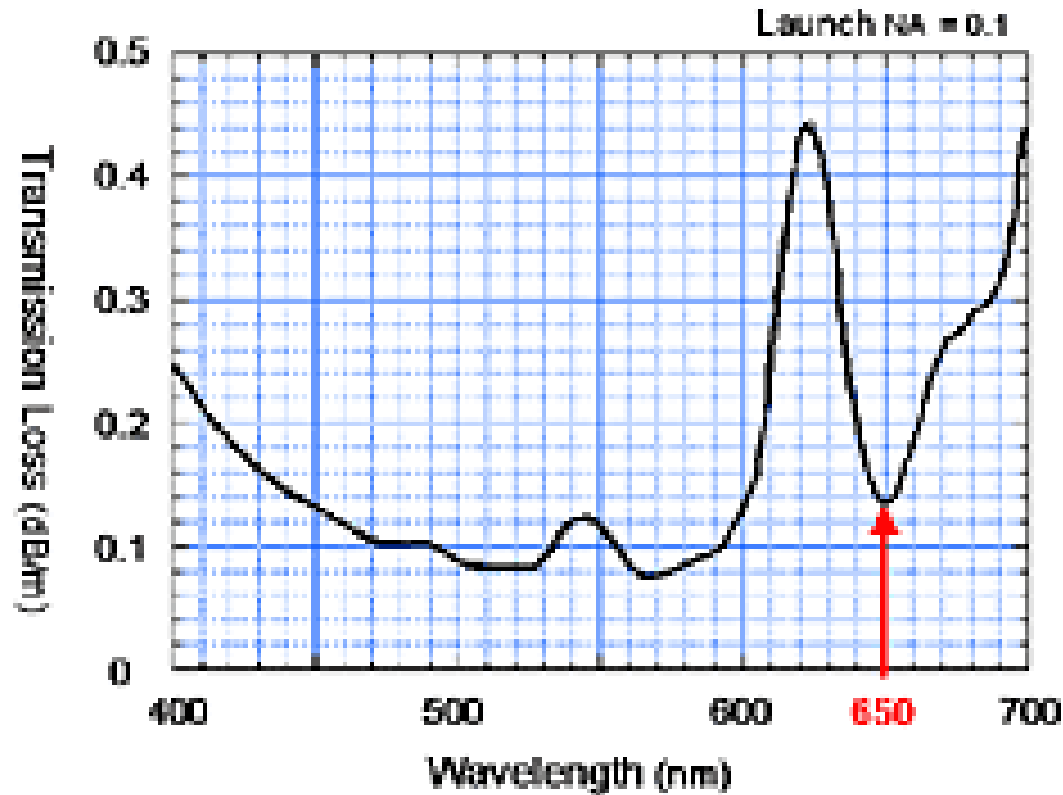


POF basics



- POF used for audio equipment and in "premium cars"
- Material: PMMA, Polymethyl methacrylate
- Step index profile
- Perflourinated GI-POF has been demonstrated in the lab at 50 Gbit/s over 100 m
 - ▶ Expensive and unstable

POF Attenuation



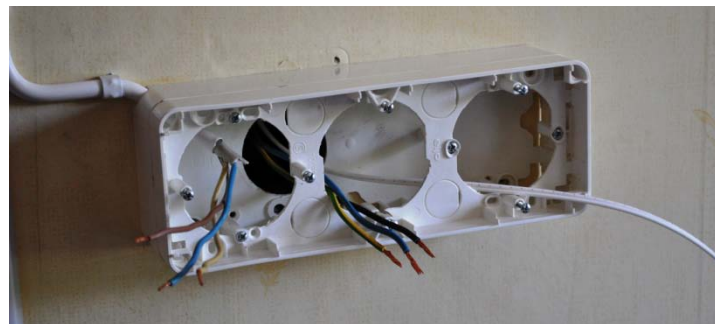
- Around 1000x higher attenuation than glass fibre
- Works at 100 Mbit/s over 150 m straight fibre and around 50 m in a practical installation

POF equipment

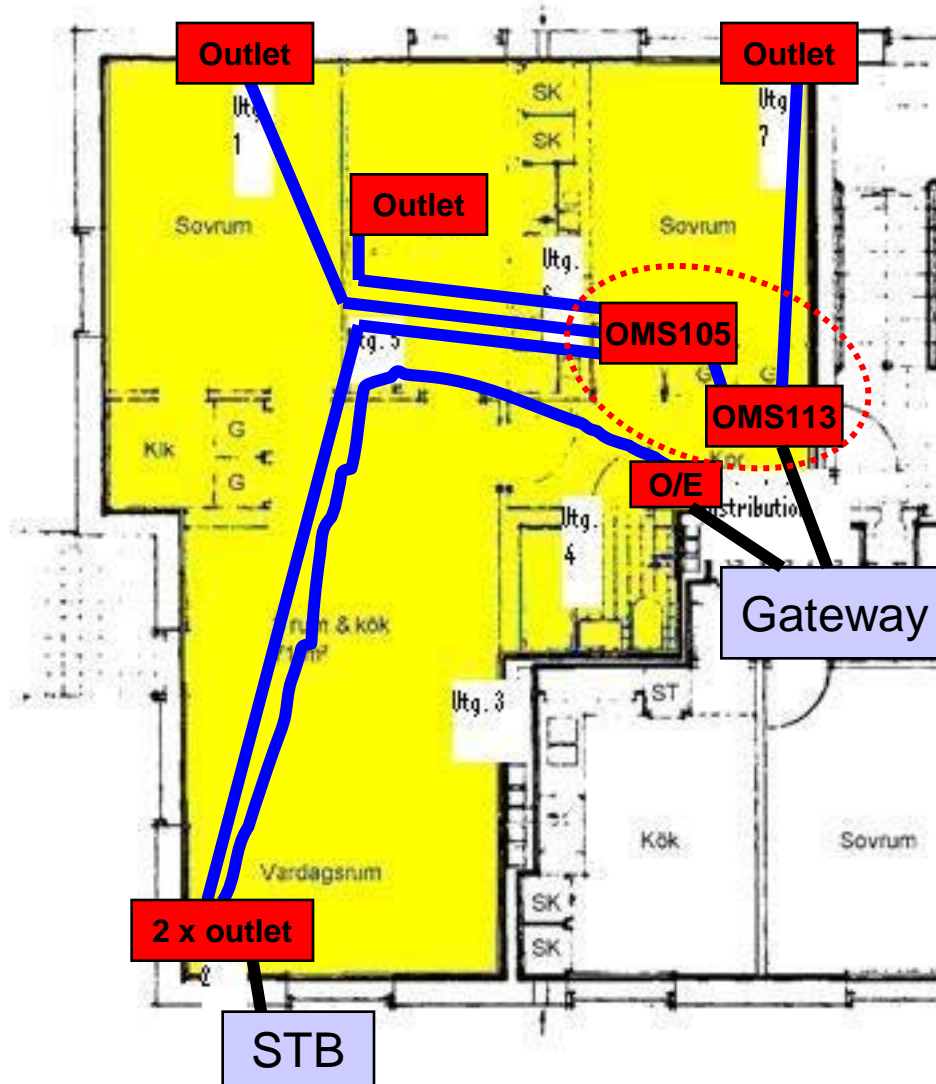


POF practical installations

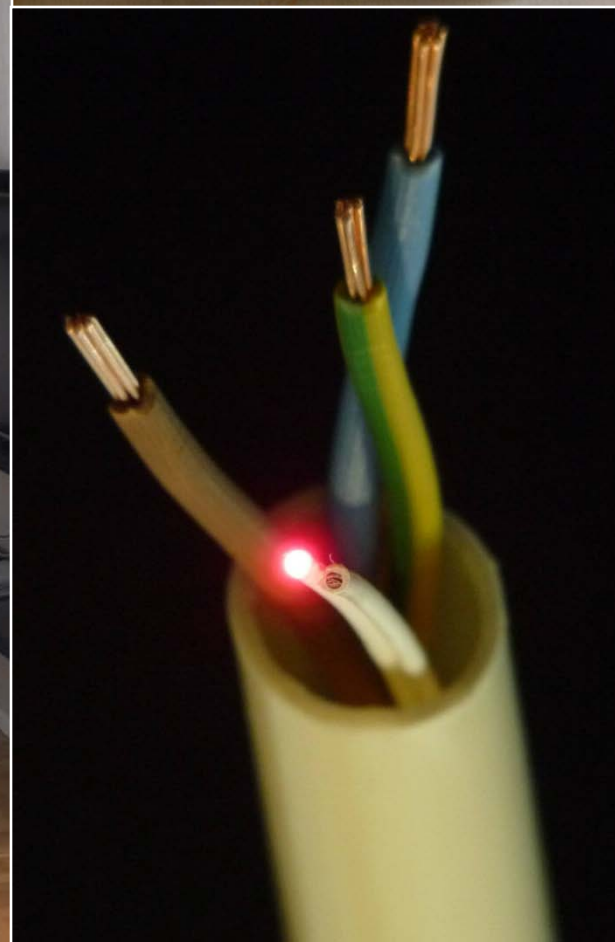
- Two apartments in Hudiksvall
- Installation in existing tubes for electricity
- Star/tree architecture from gateway
- Professional installers (15 min of "education")
- RJ45 outlet at each power outlet
 - ▶ Apartment 1 with 5 single outlets
 - ▶ Apartment 2 with 6 double outlets (incl switch at outlets)



POF installation in Hudiksvall

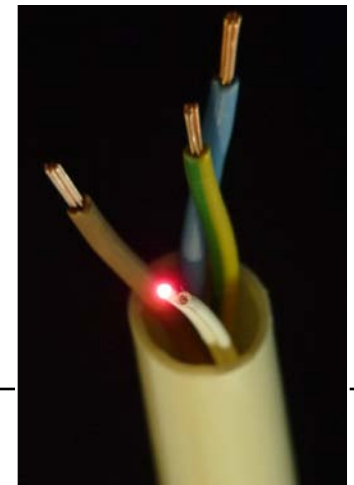


POF installation in Hudiksvall



Installation experiences

- Pulling wire needed in most but not all cases
- Enhancement wire from Ericsson cables used as pulling wire, attached to fibre with duct tape
- It was necessary to break a hole in the walls a few times
- Only twice the electrical wiring had to be removed and reinserted together with POF
- Lots of vaseline applied
- Installer comments: Total cost would equal a Cat5e installation with plastic ducts on the walls
 - ▶ Equipment more expensive
 - ▶ Less time consuming



Issues with POF

- Plastic details for the outlets for the Swedish market not available
 - ▶ Chicken & egg problem
- Housing companies reluctant to active equipment
 - ▶ Stable Ethernet electronics
- Bandwidth today: 100 Mbit/s
 - ▶ 1 Gbit/s near, but no commercial demand yet

BUT

- Technically almost as good as Cat5e
- Hidden installation major esthetic advantage at retrofit installations



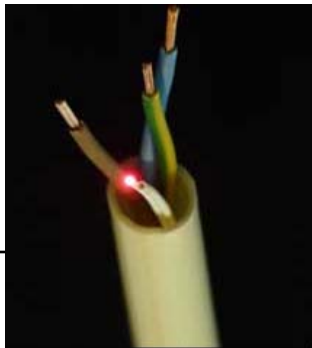
What is needed for commercial rollout?



- A pilot installation by a housing company/BRF
 - ▶ Get business model settled
- A company making the plastic parts for the outlets
- Consumer market
 - ▶ Connection between gateway and set top box for IPTV – or other internet devices
 - ▶ Online gaming
 - ▶ Clas Ohlson next...

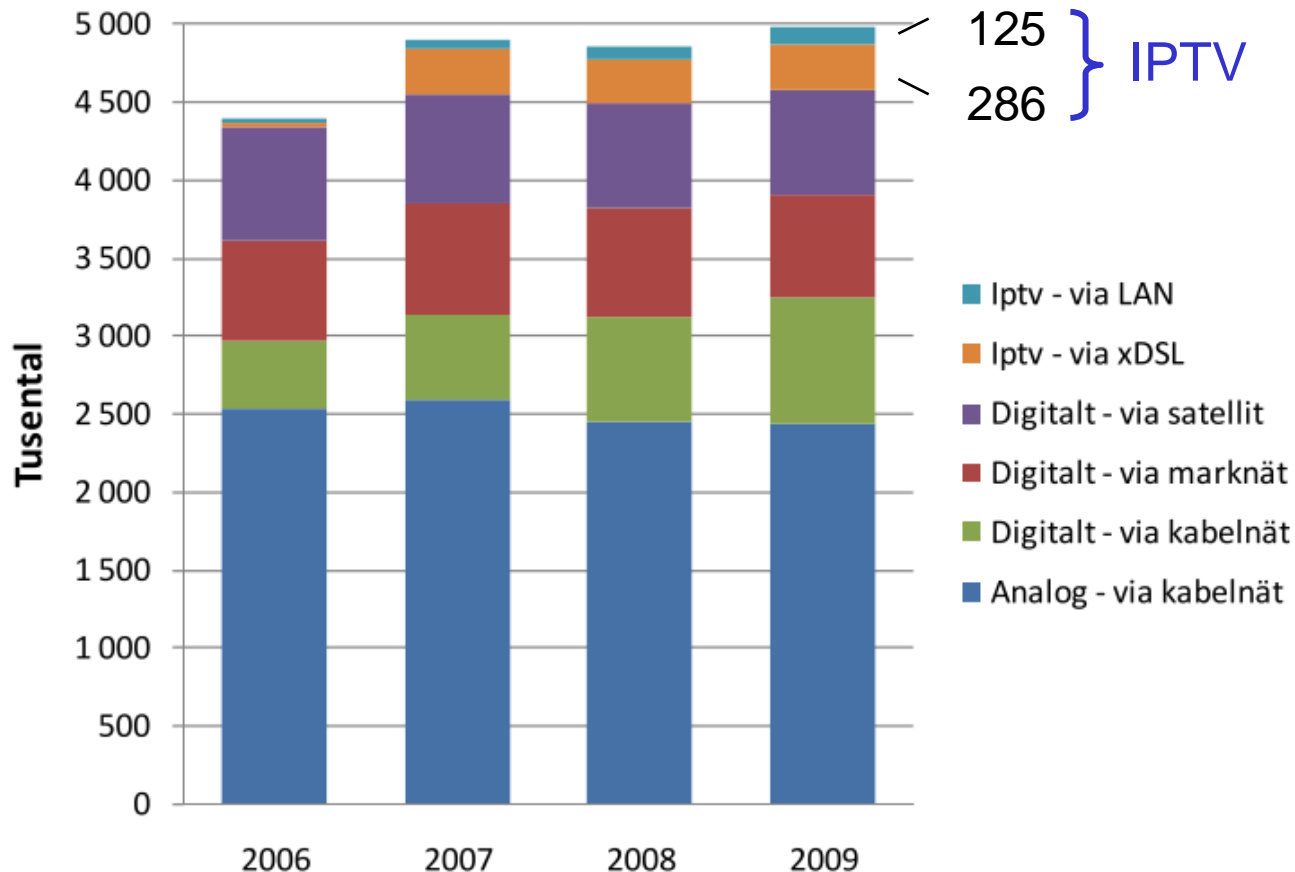


- Plastic fibre an alternative to Cat5/6 for home networks
 - ▶ The *only* wired alternative today
 - ▶ Especially for retrofit installations collocated with electrical wiring or point-to-point to get IPTV
 - ▶ Extremely easy handling
 - ▶ Installation invisible for the end user
- Two full apartment installations in Hudiksvall proof the concept





Digital TV subscriptions in Sweden

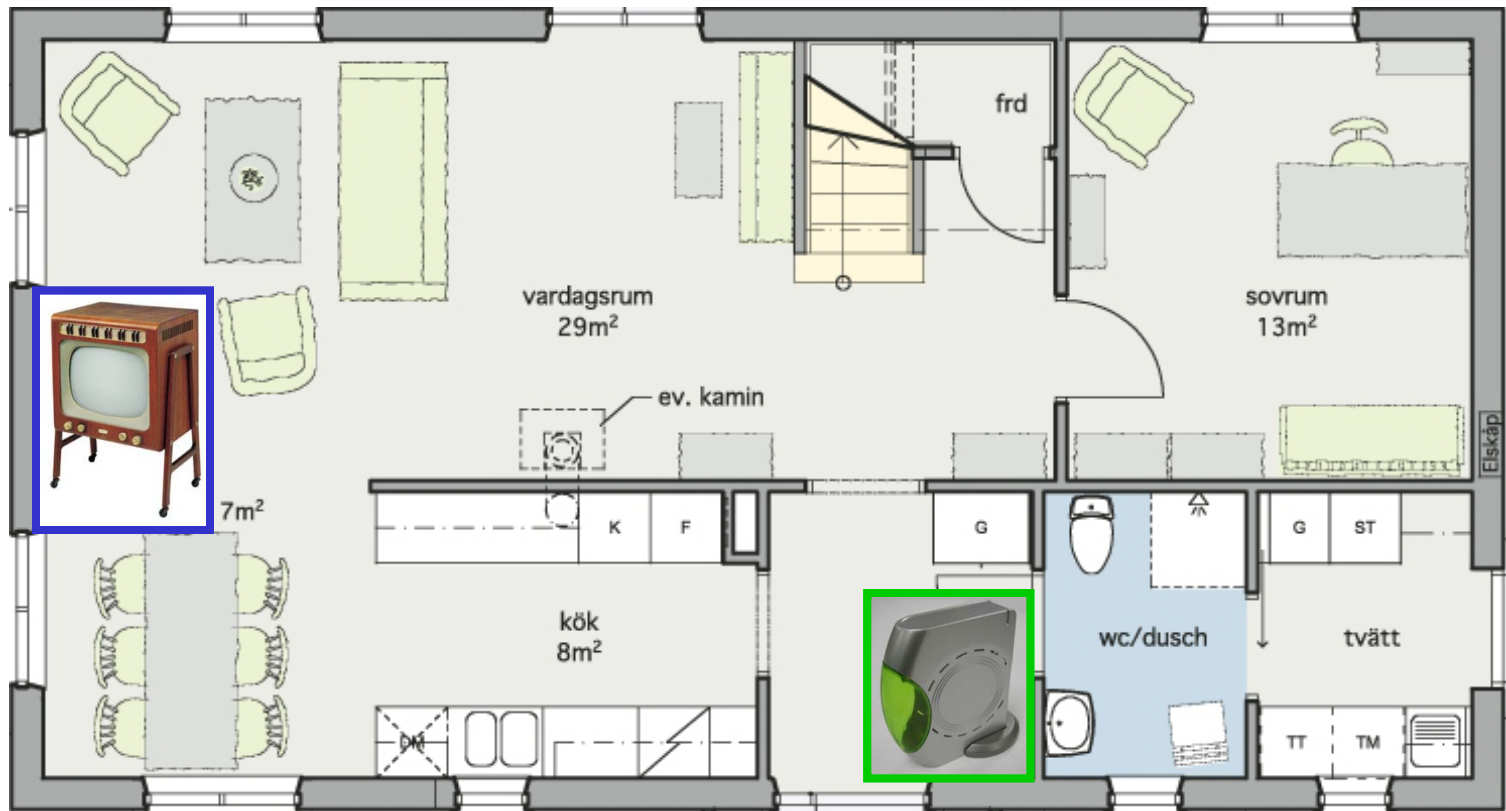


- ▶ IPTV over xDSL dominated by Telia Sonera
- ▶ IPTV worldwide growing enormously from low numbers

Why are home networks so important?

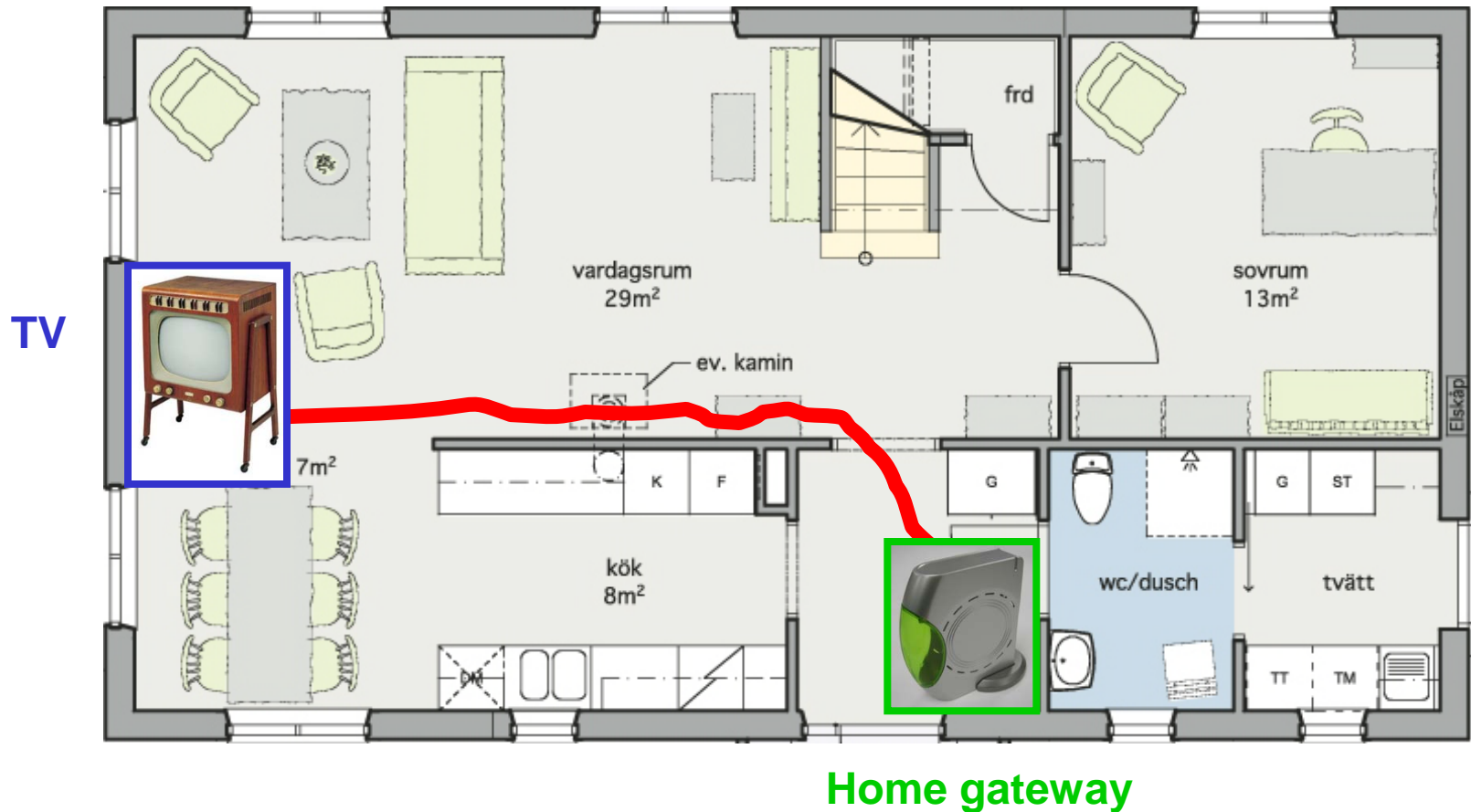


TV + set
top-box

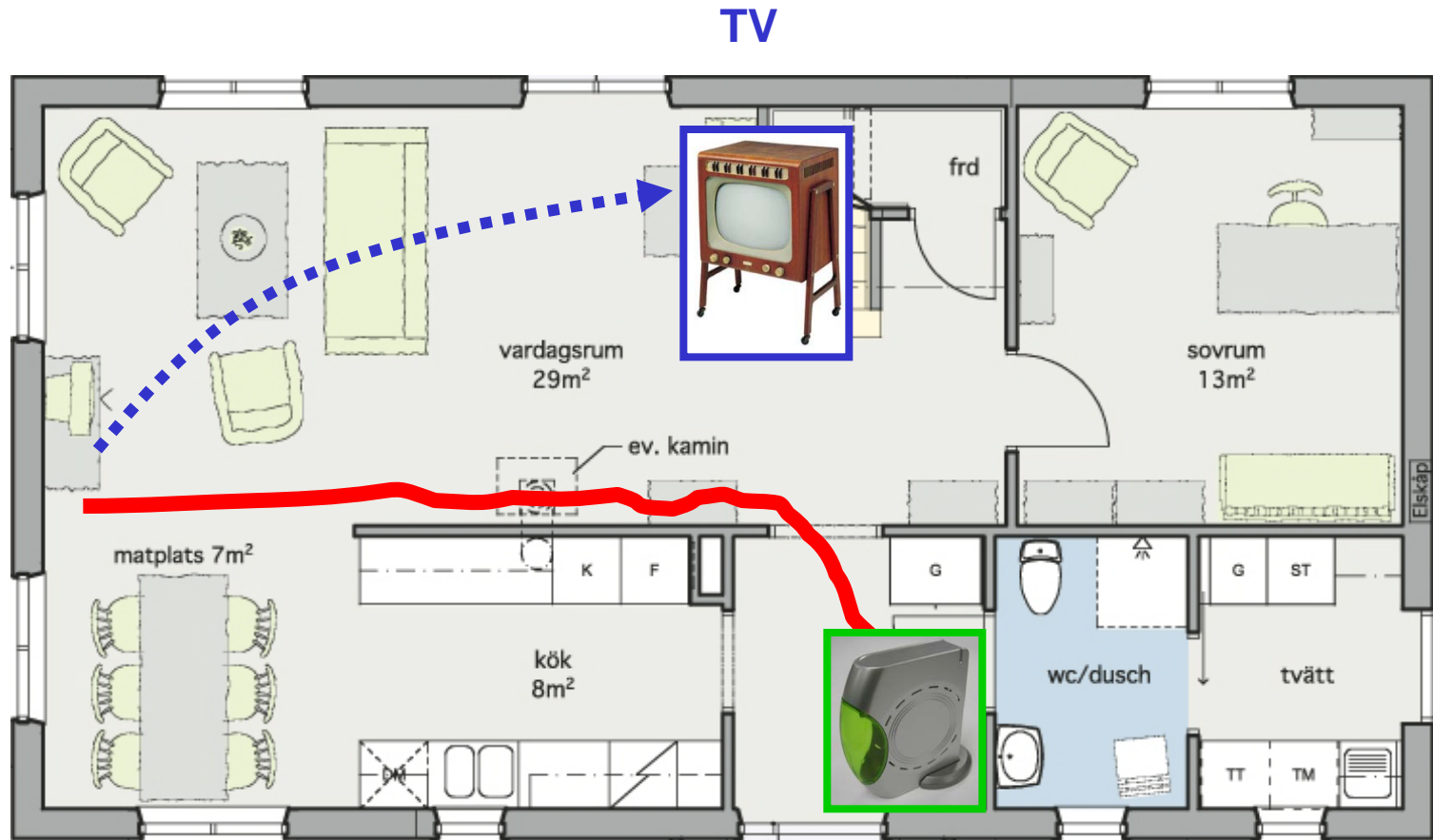


Home gateway
(modem for xDSL,
cable, or fibre)

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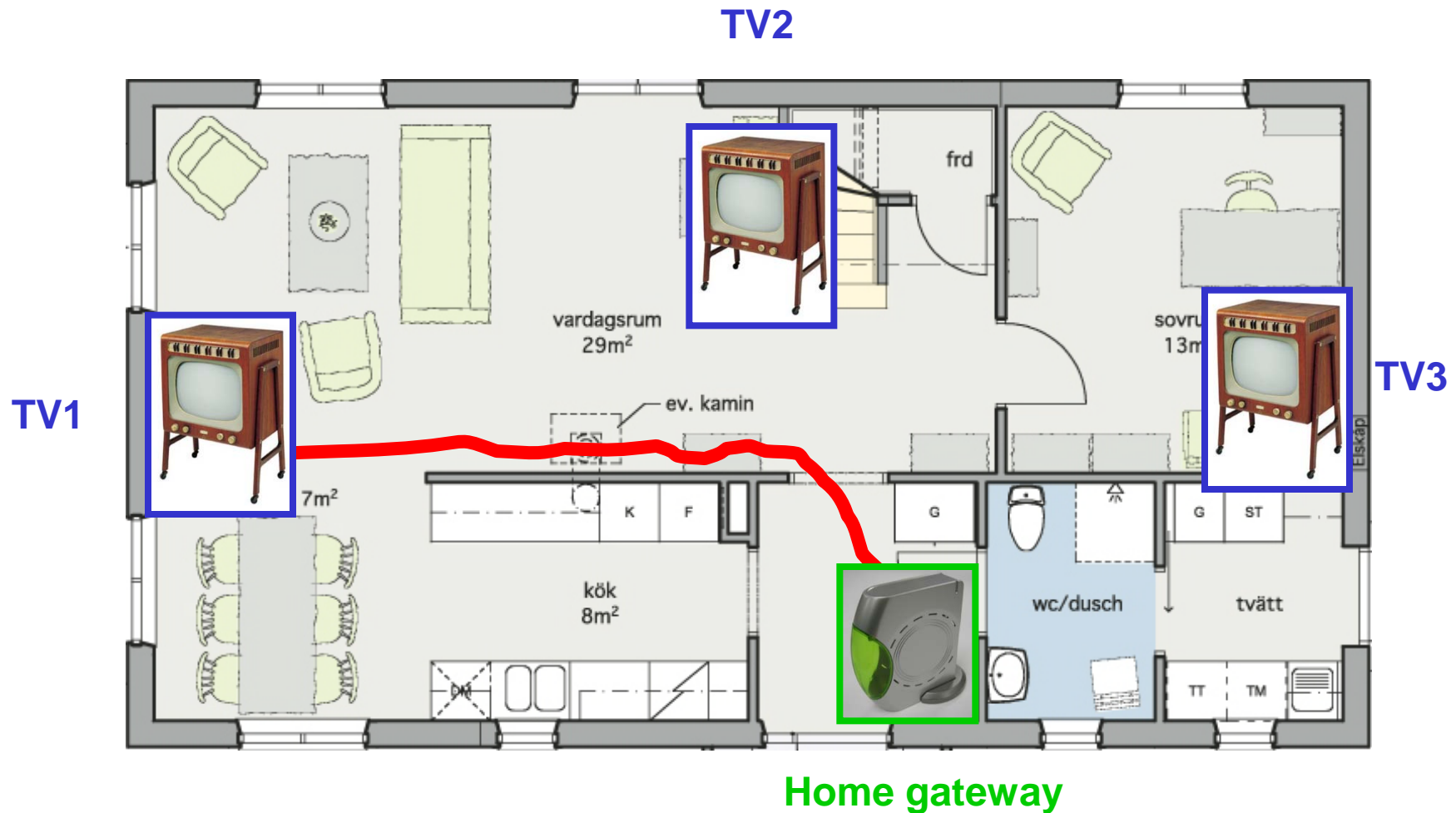


Of you move the TVn...



Home gateway

If you want to watch TV more than one place...



Much more of the same – and new stuff

- High quality video
- Video conferencing
- Peer-to-peer networking ("file-sharing")



Bandwidth
greedy across
the home
gateway

- Sensors and telemetry



Limited
bandwidth

- e-health
- e-government



Requires
high reliability

Basic assumption: All services will eventually become IP-based
and the home networks should be dimensioned for that

TV bandwidth development



SD, 576i
10 Mbit/s in Mpeg2



HD, 1080p
15 Mbit/s in Mpeg4



“4k”, 4000p
> 200 Mb/s in Mpeg4

- ▶ 3D TV requires 50-100% higher bandwidth
- ▶ 4k used in some cinemas today and is becoming available on the consumer market
- ▶ 8k is another factor of 4
- ▶ Holographic TV, ...

Encoding techniques cannot keep up with bandwidth demands

Common *wired* home networks today

- ▶ Telephone cables
- ▶ Coaxial cables (for TV)
- ▶ In some cases a data network



- ▶ Do all these networks handle the services of tomorrow?
- ▶ Is it a good idea to have three parallel wired infrastructures in the home?

Home installation



Hidden under the floor