

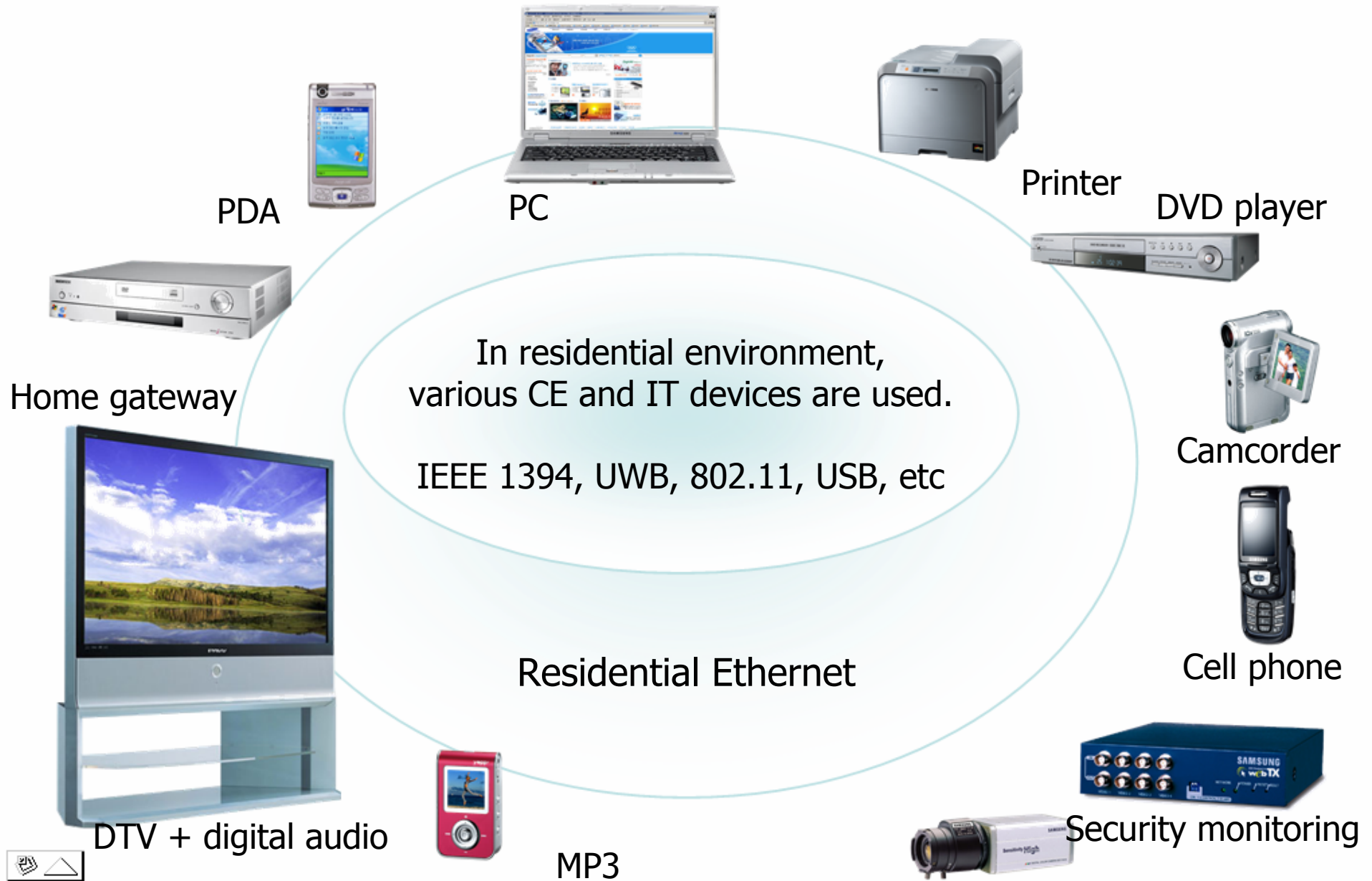
Range of applications for Residential Ethernet

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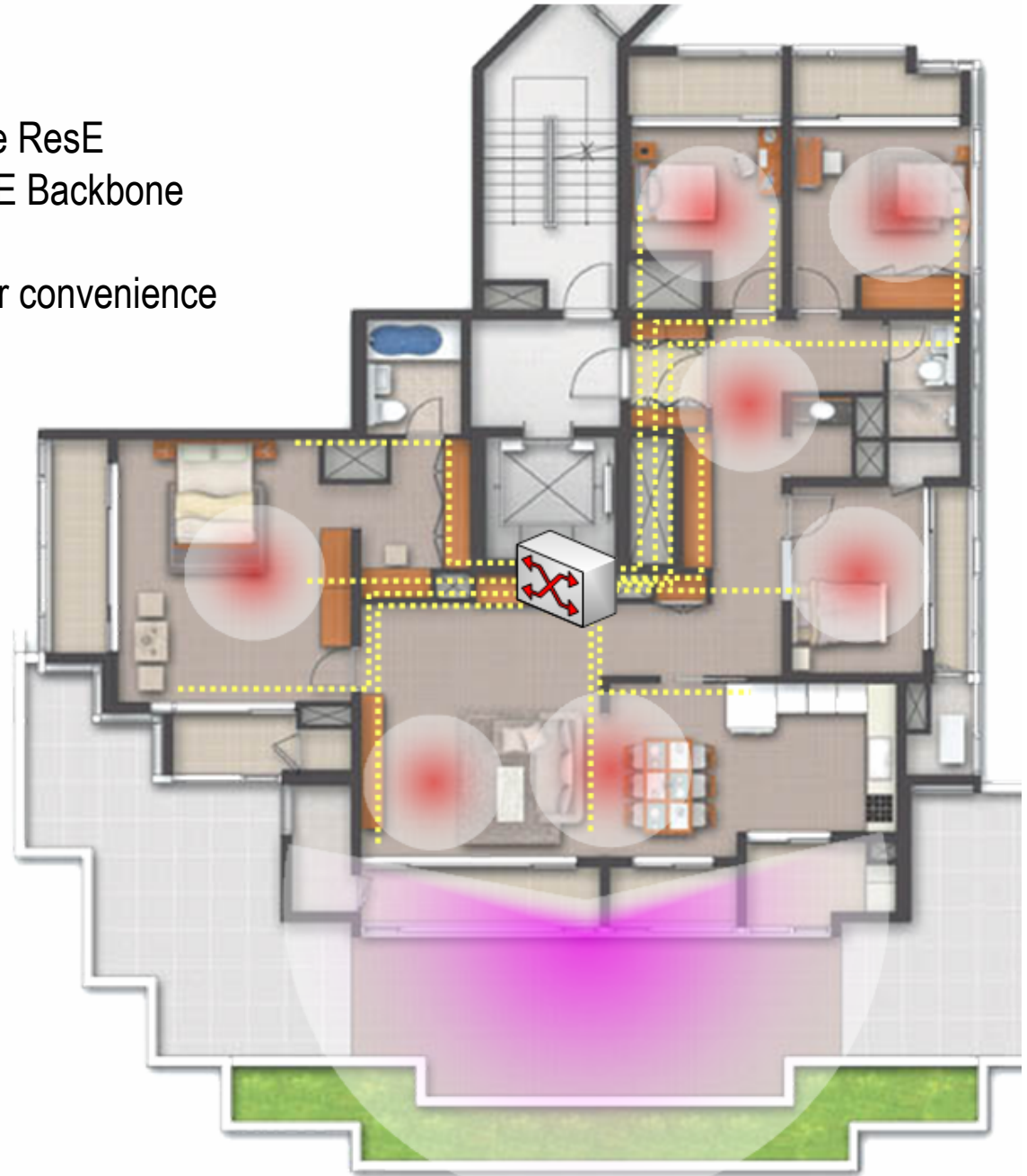
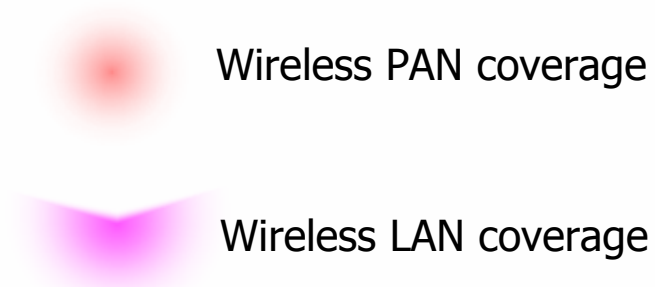
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Basic applications of Residential Ethernet



Backbone applications for Residential Ethernet

- CEs are connected together through the ResE
- Wireless APs are connected to the ResE Backbone
- WPAN devices are connected
- More hybrid connections will be used for convenience



Case for Residential Ethernet Home backbone applications

□ IEEE 1394 has distance limitation, 4.5 meters per hop

- Multi hops can be extended 72 meters but limited capacity by single bus.
- Wire spec was upgraded to CAT5, but it doesn't solve the capacity problem as a backbone.

□ It's difficult to achieve consistent coverage in all areas in a home with pure wireless solutions

- PAN: UWB (802.15.3) is designed for high capacity within a single room
- LAN: 802.11g maximum cell capacity is limited in practice
- LAN: 802.11n will have much higher theoretical capacity, but practical performance in home environment is not clear yet

□ Many homes already have structured CAT5 wiring in place;

- New homes come with structured wiring installed
- 10 million houses at 2008 in US according to Parks association white report, Dec. 2004

The case for hybrid home networks

□ Wireless interfaces are ideal for mobile devices

- Mobile Phone, Camera, Portable Player, PDA, Notebook
- WiFi for data; UWB as alternative for 1394 for A/V,

□ A hybrid network offers both flexibility and reliable coverage

- Wired connections between stationary devices in different rooms
- Wireless connections to mobile devices

In case of hybrid implementation

- ❑ 802.15.3 WPAN is inherently designed for Ad-hoc networking. Its MAC-bridging architecture is not defined.
- ❑ Bridging residential Ethernet with 1394 or 802.15.3 may need address mapping.
- ❑ New protocol adaptation layers are required.
- ❑ There is no isochronous service primitives in 802.11 yet.

Timing requirement

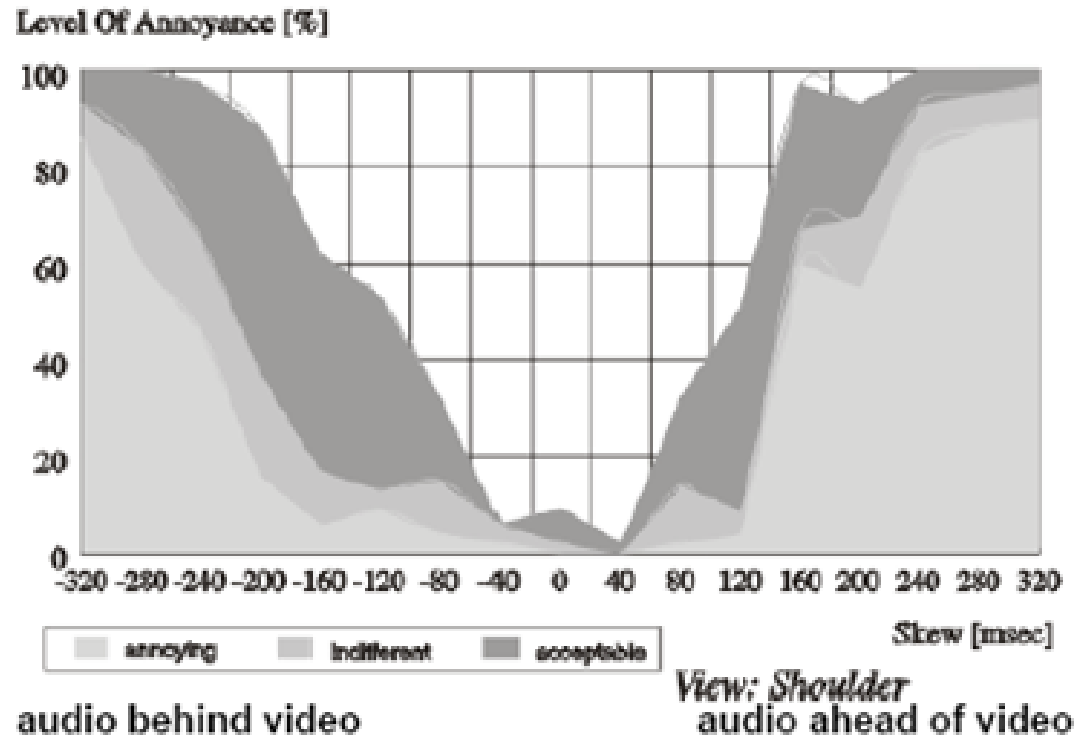
- Phase alignment is critical in audio

Media	Mode, Application	QoS	
Video	Animation	correlated	+/- 120 ms
	Audio	lip synchronization	+/- 80 ms
	Image	overlay	+/- 240 ms
		non-overlay	+/-500 ms
	Text	overlay	+/- 240 ms
		non-overlay	+/-500 ms
Audio	Animation	event correlation (e.g., dancing)	+/- 80 ms
	Audio	tightly coupled (stereo)	+/- 11 μ s
		loosely coupled (dialogue mode with various participants)	+/- 120 ms
		loosely coupled (e.g., background music)	+/- 500 ms
	Image	tightly coupled (e.g., music with notes)	+/- 5 ms
		loosely coupled (e.g., slide show)	+/- 500 ms
	Text	Anmerkungen zu Text	+/- 240 ms
	Pointer	Audio Related to the Item	-500ms +750 ms



Source: Ralf Steinmetz, Clemens Engler, "*Human perception of Media Synchronization*", Technical Report, No. 43.9310, IBM European Networking Center, Heidelberg, Germany, 1993

Lip Synchronization



Some observations:

- Asymmetry
- Additional tests with long movie
 - +/- 80ms: no distraction
 - -240ms, +160ms: disturbing

Source: Ralf Steinmetz, Clemens Engler, "*Human perception of Media Synchronization*", Technical Report, No. 43.9310, IBM European Networking Center, Heidelberg, Germany, 1993

Summary

- ❑ More specific use cases and requirements study in home network are needed.
- ❑ Architecture definition and use cases of wide hybrid applications are needed.
- ❑ Liaison with 802.1 for MAC/bridge aspects are needed.
- ❑ Timing requirement for Residential Ethernet should be driven by Lip sync and phase synch.

Thank you