

# Quality-of-Service: An End System Perspective

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# Different shades of QoS

"My application..."

...needs a private circuit, period."

i.e., a specific required bit rate, delay, jitter, packet drop or bit error rate

...is a bit different from other apps."

i.e., would like some sort of preferential or special treatment



# Who needs virtual circuits, anyway?

session-based QoS...

is meaningless to users (flowspec?)

is difficult to manage for ISPs (esp. inter-ISP)

limits multiplexing + needs boxes = more \$/bit

incentives aren't aligned (otherwise we'd have it)

administers scarcity vs. eliminating scarcity

**claim: most of the "killer applications" for QoS don't need it**  
(or actually: *soon* – or at least *eventually* – won't need it)

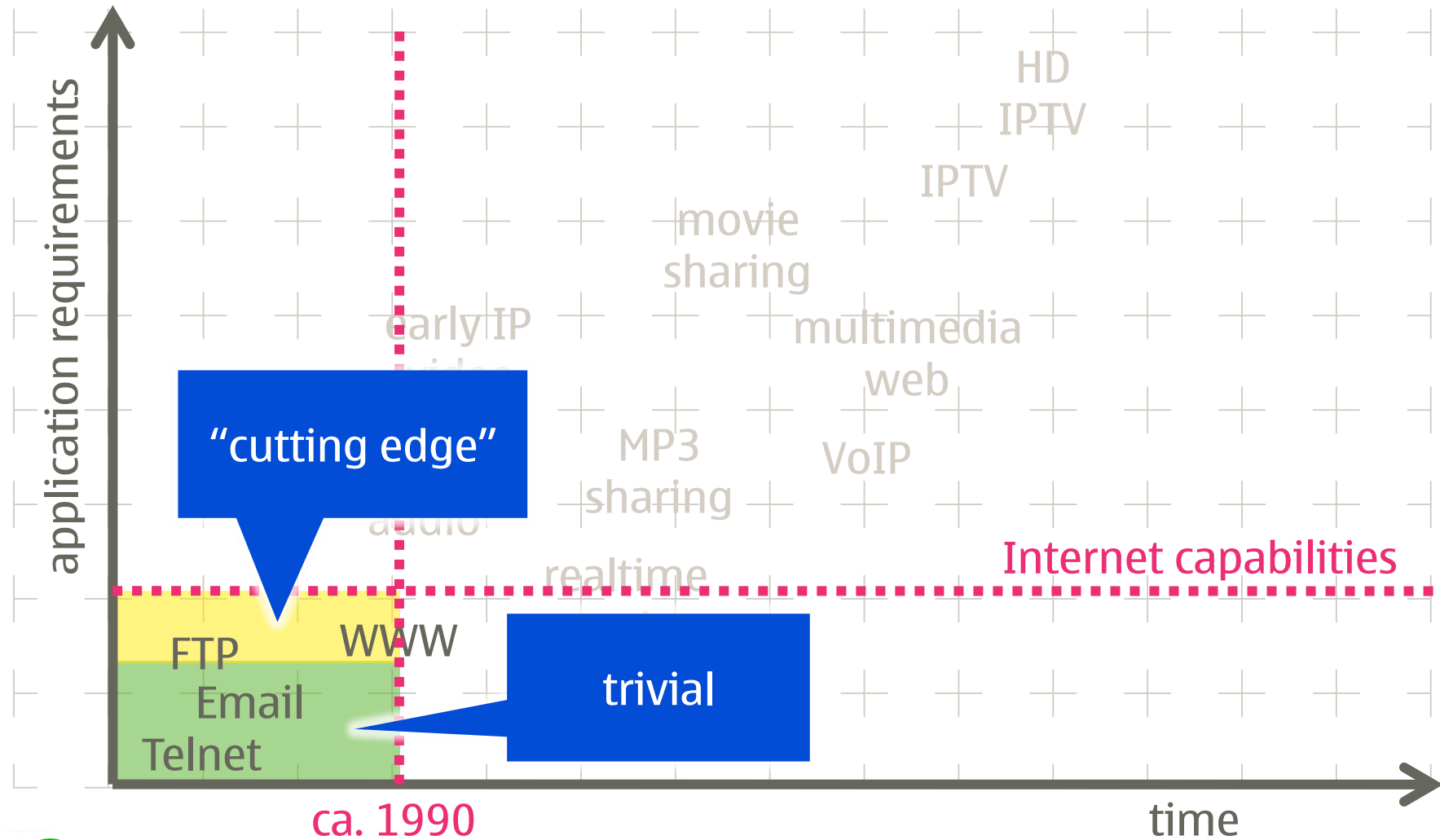
**QoS can be some what helpful for cutting edge apps for a limited time**  
successful apps seem to be able to do without

"My application..."

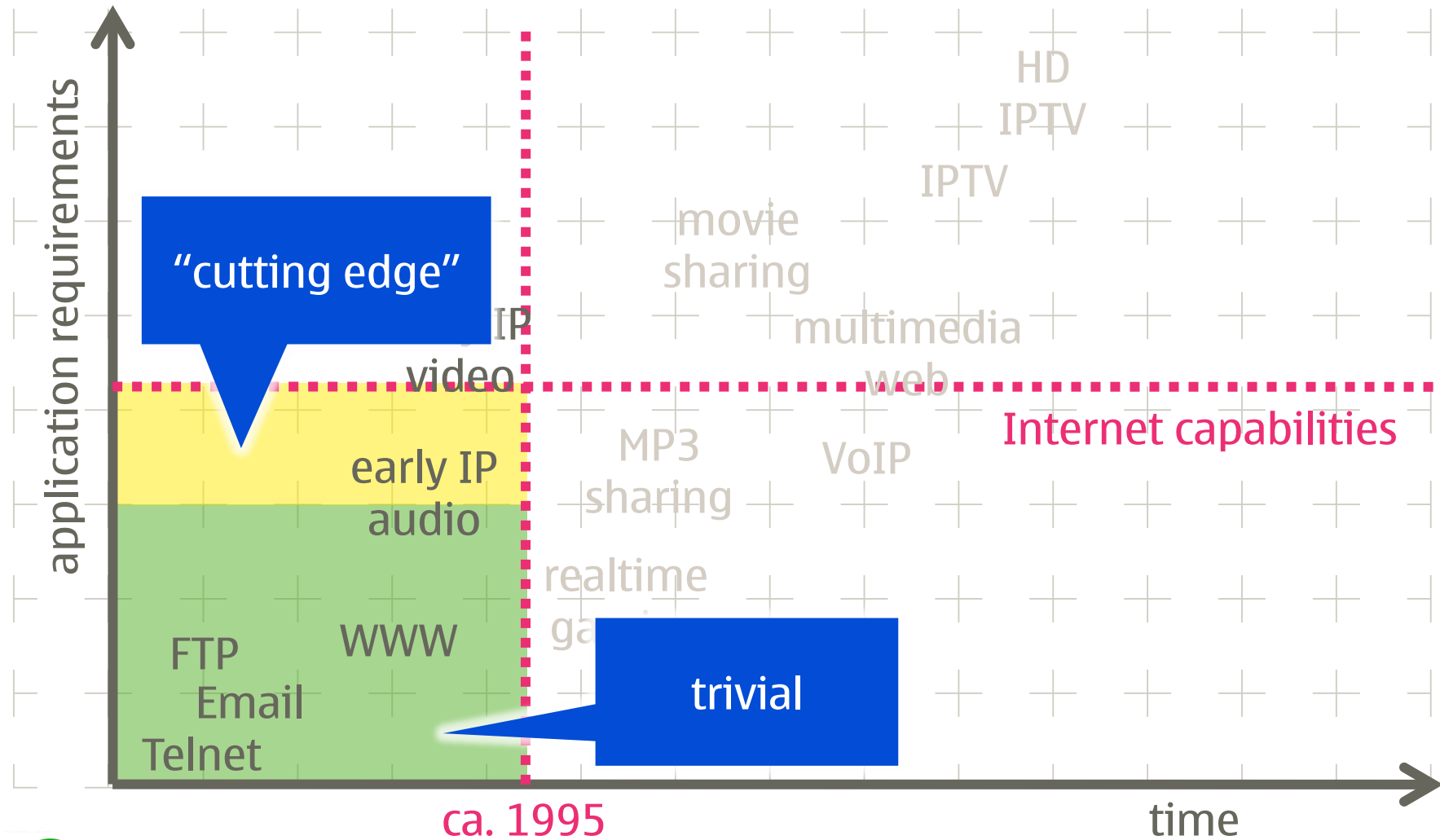
...needs a private circuit, period."



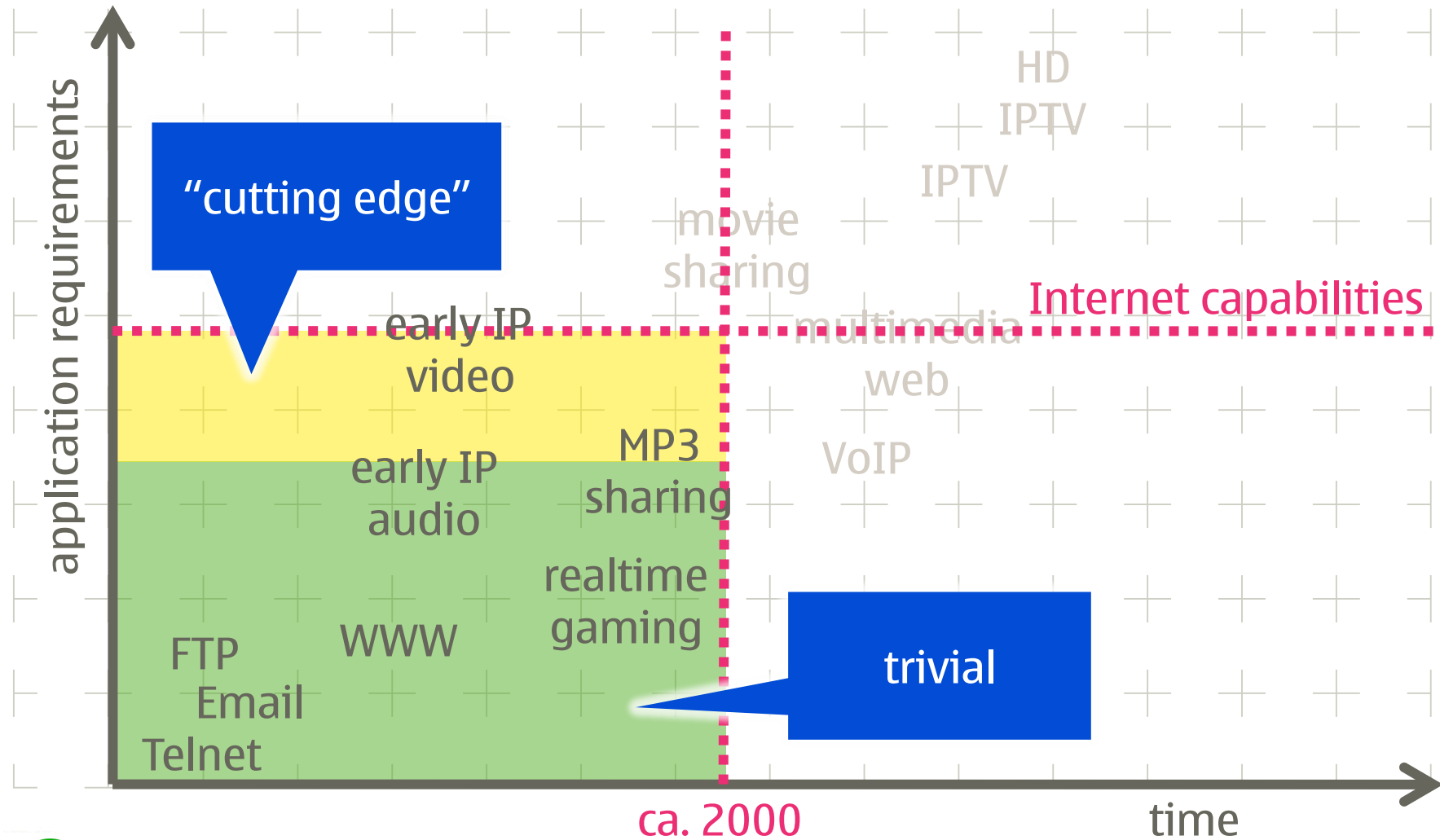
# The cutting edge is a moving target – ca. 1990



# The cutting edge is a moving target – ca. 1995



# The cutting edge is a moving target – ca. 2000



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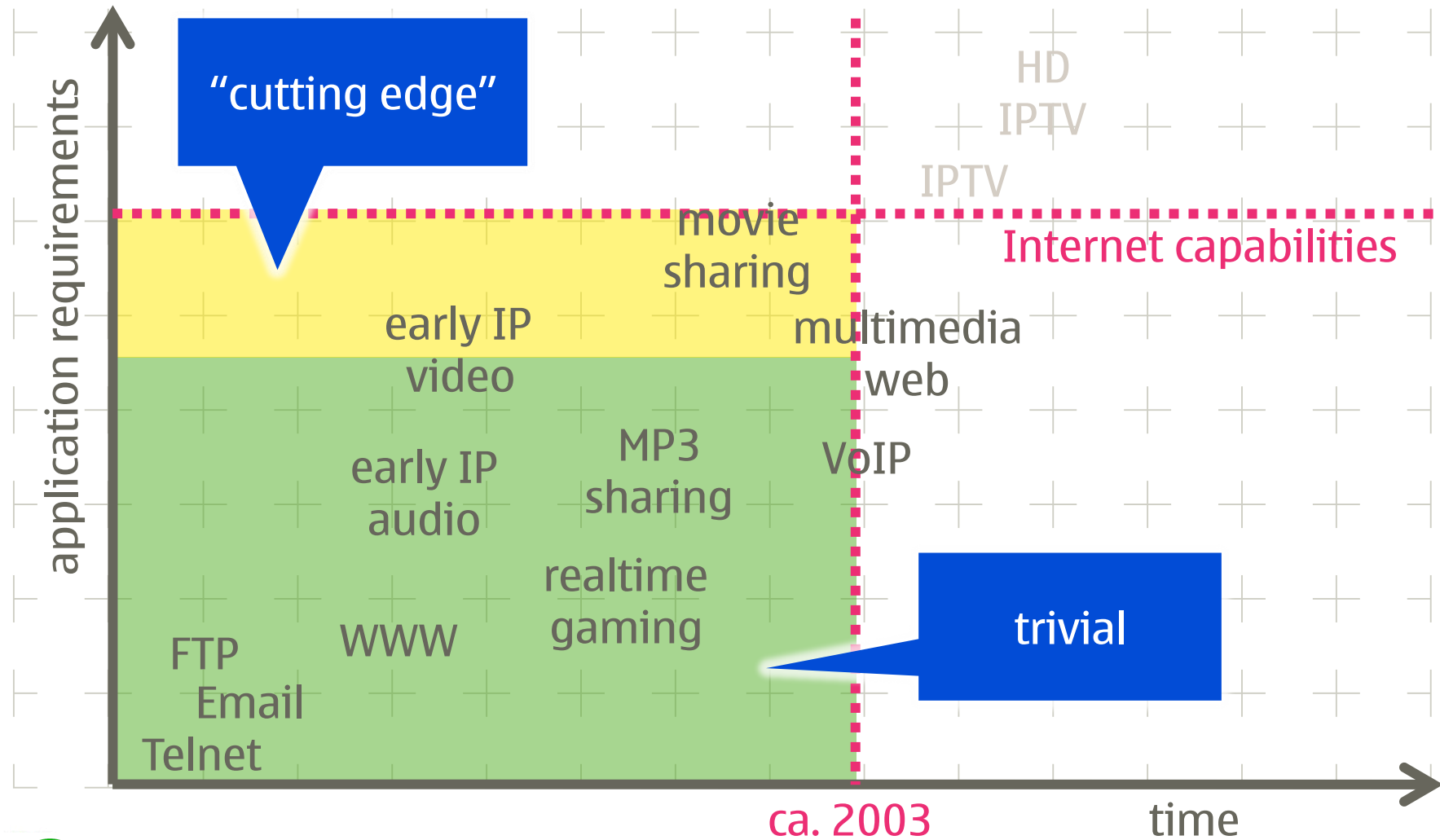
2008-10-22

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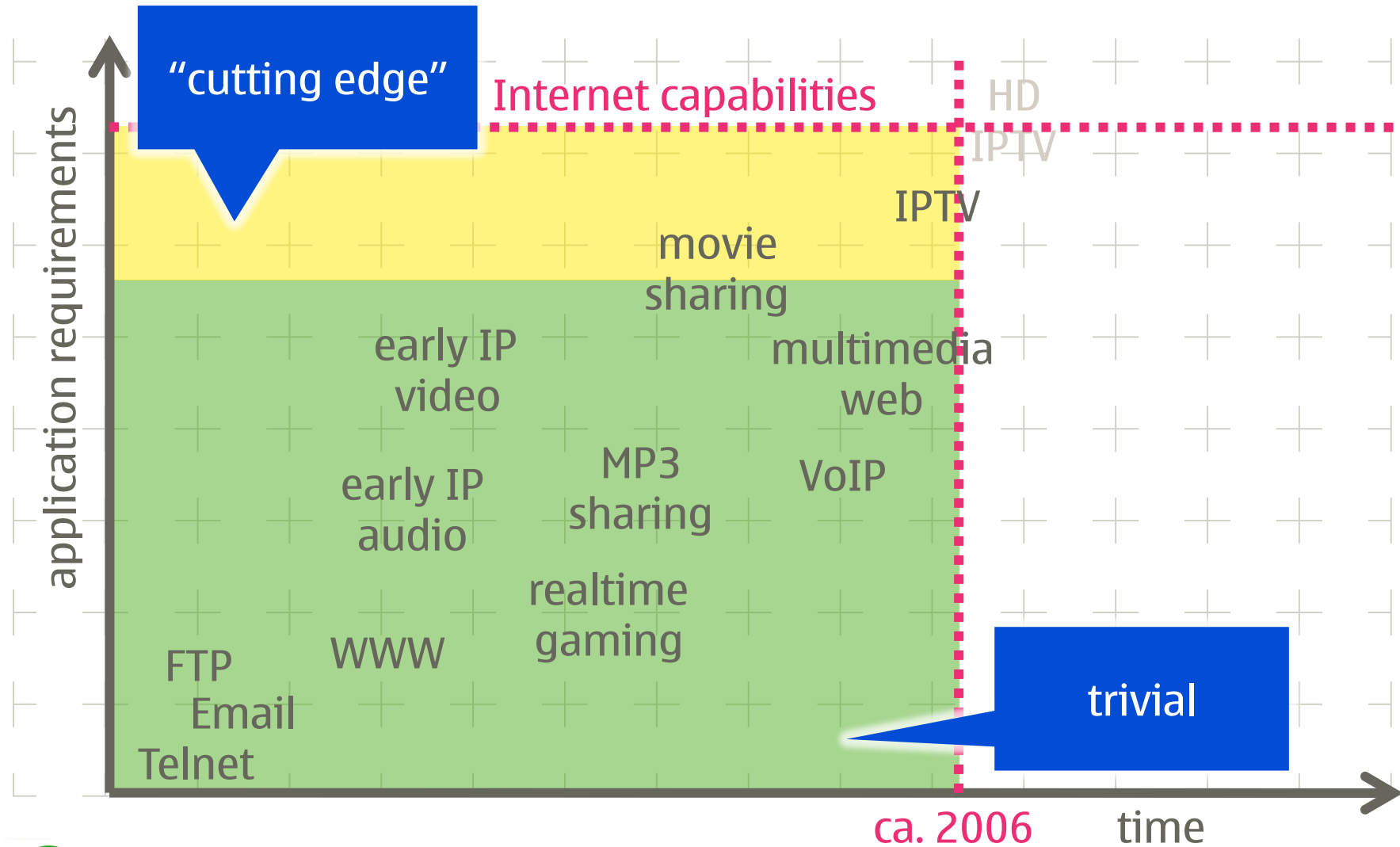
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5

# The cutting edge is a moving target – ca. 2003



# The cutting edge is a moving target – ca. 2005



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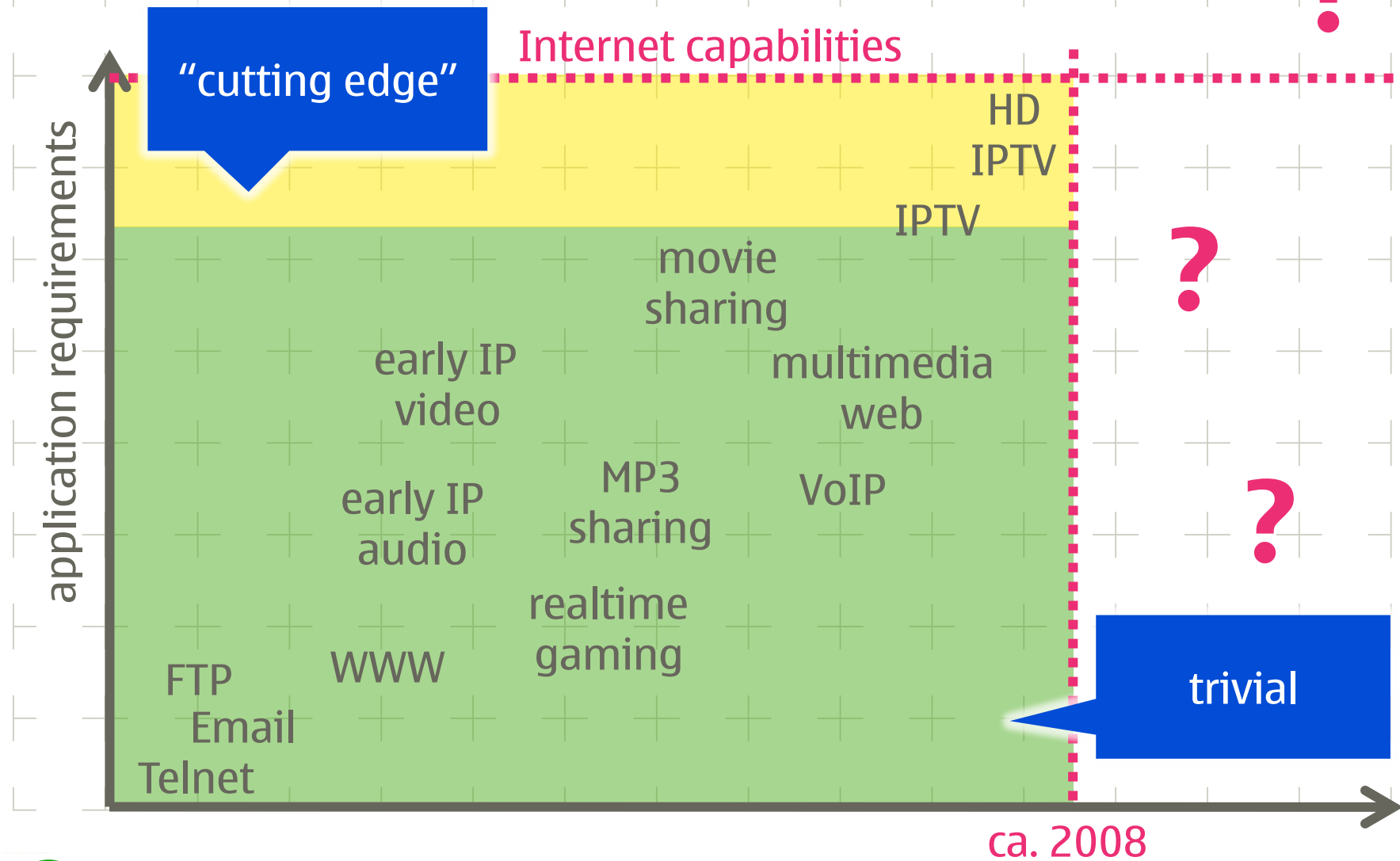
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7



# The cutting edge is a moving target – ca. 2008



# Dead-obvious observations

## the cutting edge moves

apps that were impossible become feasible, then commonplace  
(watch what your bleeding edge users are doing!)

## yesterday's cutting edge becomes today's bread-and-butter

adequately supported by the residual capacity of regular best-effort  
Internet paths without special QoS (or with app-level approaches)

## QoS is the perpetual panacea for the demanding Internet app *du jour*

without ever managing to really get deployed  
c.f. multicast, IPv6, IPsec, MobileIP, ...



## So what?

session-based QoS is a red herring

what's an "app that's a bit different" to do?

straightforward: app-level approaches

or end-system-level approaches (however: deployment)

pain → change → gain incentives align

plenty of examples

coding, prefetching, caching, parallel sessions

detect and limit/control self-interference

"My  
application..."

...is a bit  
different from  
other apps."



## So, nothing left to be done on the network side?

well, no – there are many things that'd benefit apps  
(that aren't session-based QoS)

many all-time favorites, including

- turn on ECN

- use some AQM (avoid FIFO drop-tail)

- use reasonable buffer sizes (more ≠ better)

- consider “lower effort” PDB (RFC3662) & give incentives for use  
don't interfere with the apps ability to probe the path

- provide CE equipment that doesn't limit evolvability



## Finally: a plug for related IETF work



### TANA – Techniques for Advanced Networking Applications

1. an end-to-end congestion control algorithm that approximates less-than-best-effort “scavenger” service
2. a document discussing the tradeoffs surrounding the use of some or many parallel connections

next meeting (1<sup>st</sup> WG or 2<sup>nd</sup> BOF) to happen at IETF-73 (Nov 16-21, MSP)

### Adding Acknowledgement Congestion Control to TCP

draft-floyd-tcpm-ackcc-04.txt proposed to the TCPM WG

(we’re always all ears for other neat ideas – talk to us!)

