Scadoosh: Scaling Down CDN Infrastructure

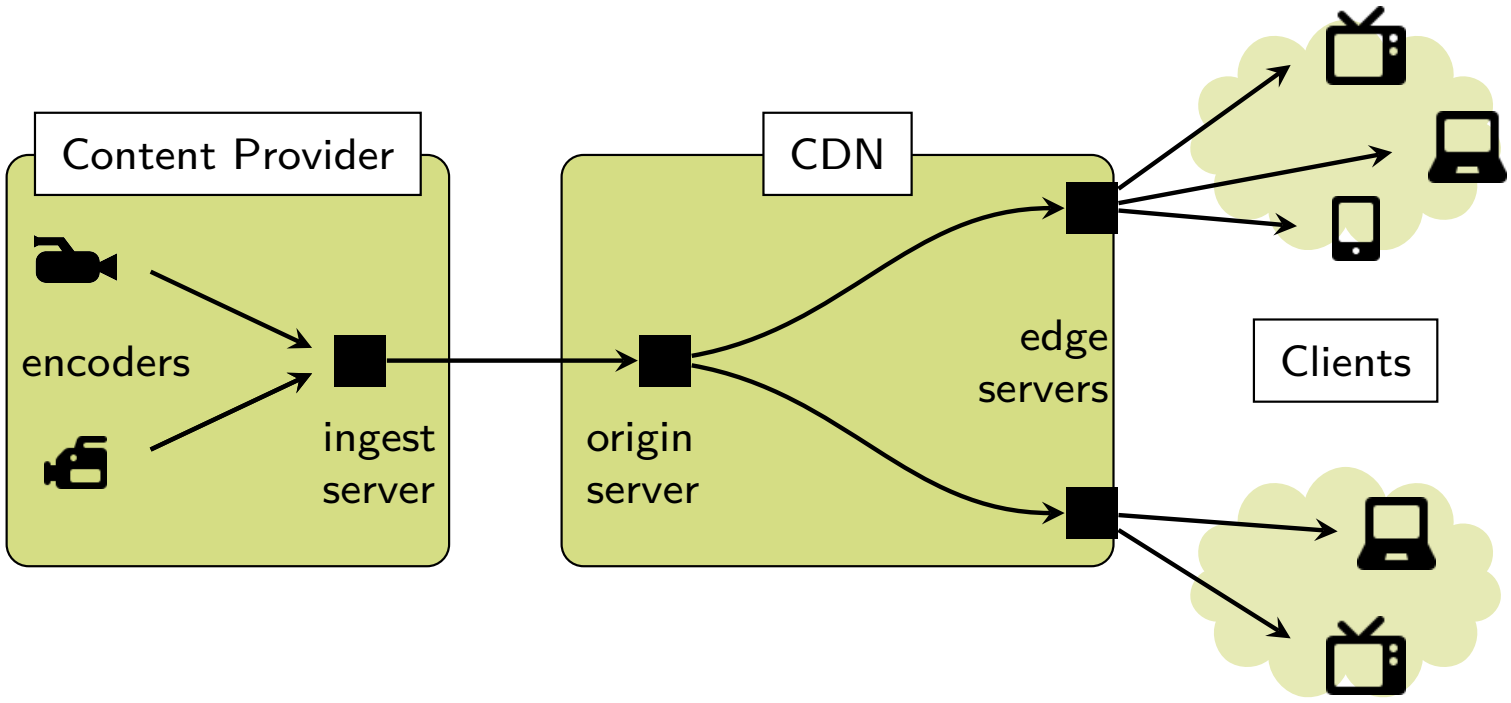
Gwendal Simon

Motivations

Akamai's infrastructure will have to expand by a factor of 100 times in the next five years just to keep up with the demand for real-time video.

Paul Sagan, Akamai CEO, Jun 2012

Live stream delivery



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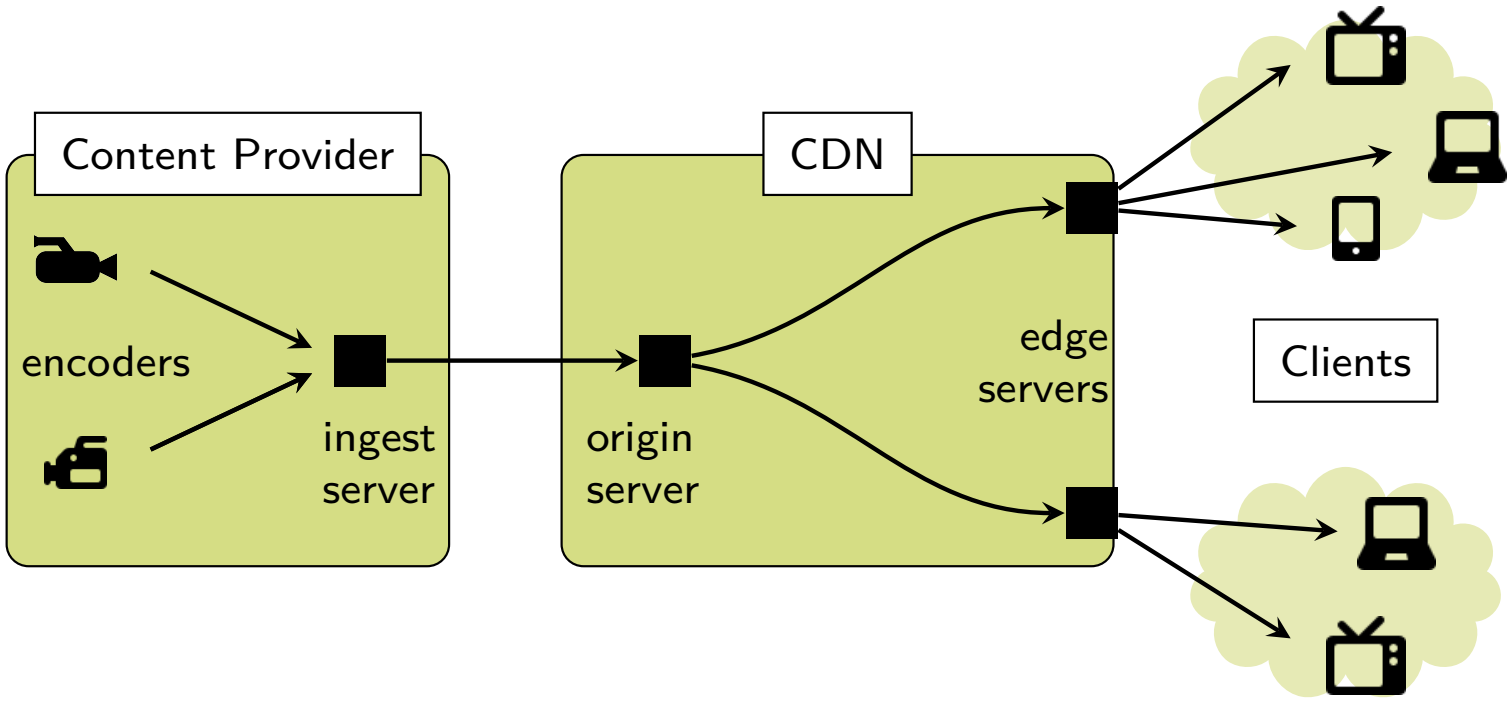
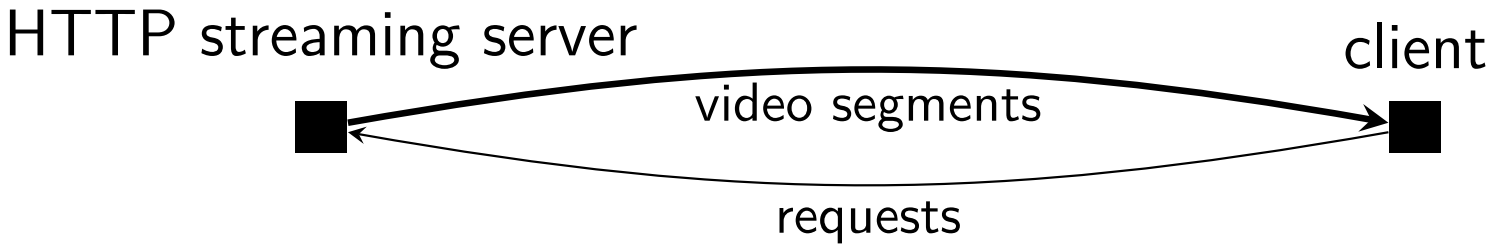


disclaimer : ISP strategy is out of the scope of this talk

Rate-adaptive video streaming



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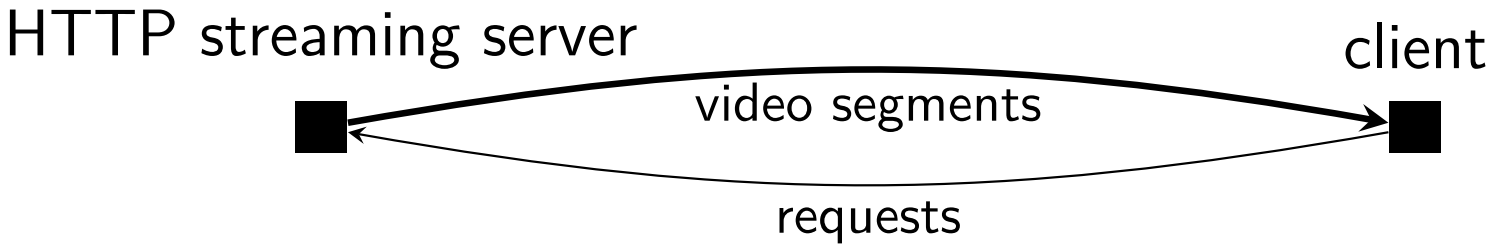

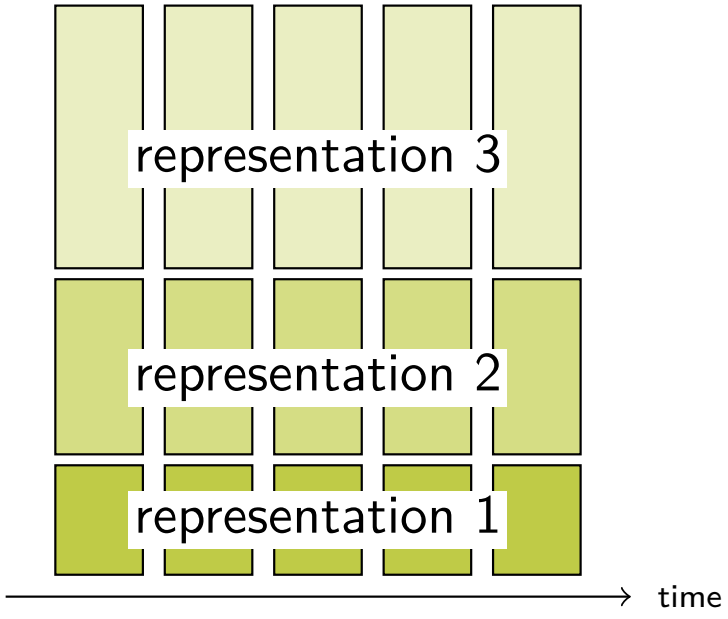

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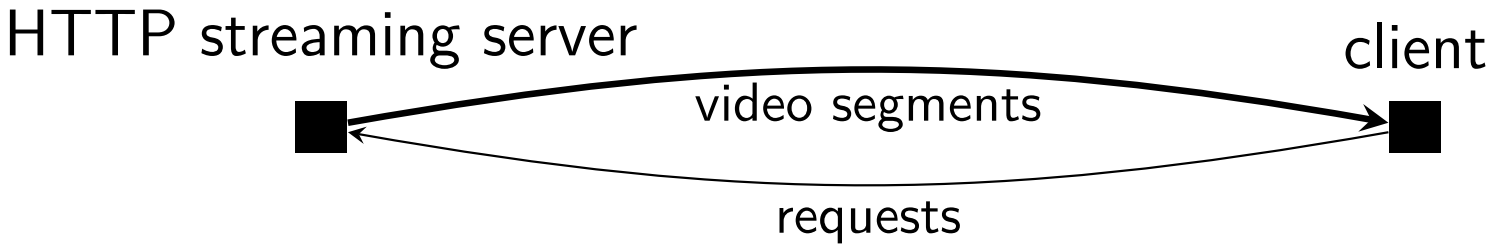

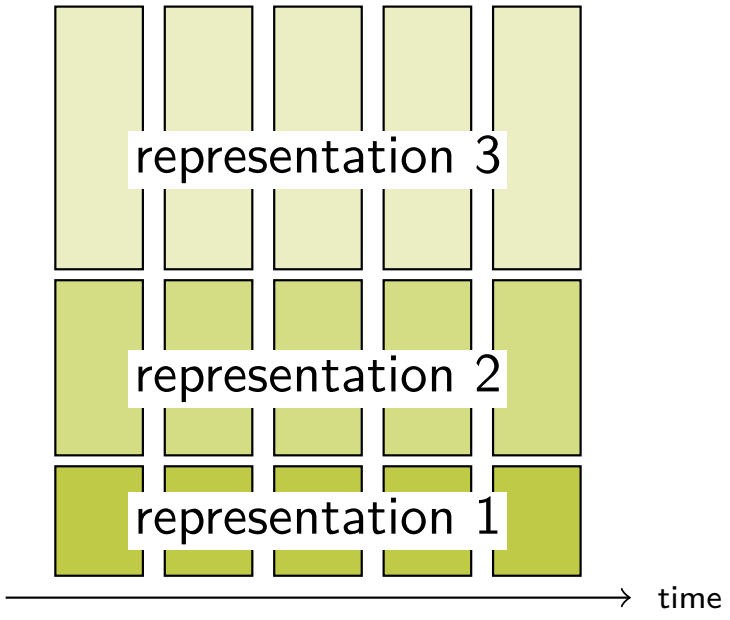

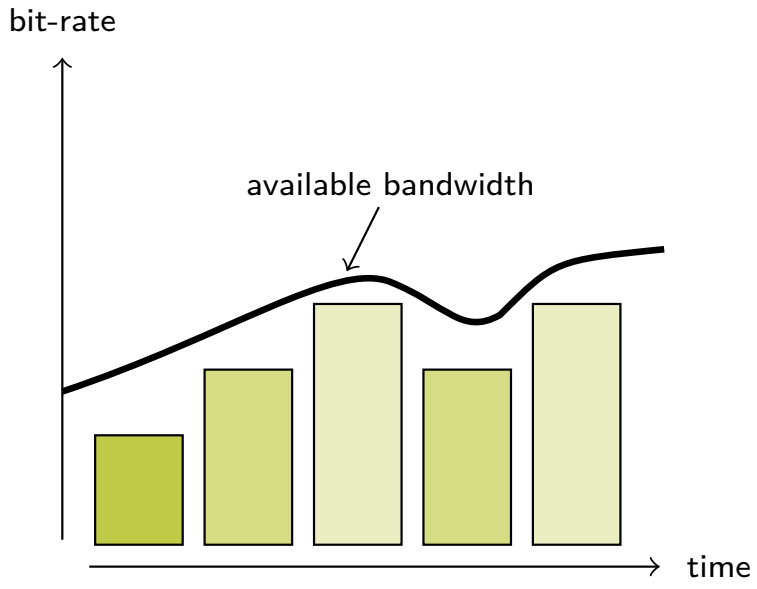

Rate-adaptive video streaming

A_1	50 kbps	320 x 240	D_1	900 kbps	1280 x 720
A_2	100 kbps	320 x 240	D_2	1.2 Mbps	1280 x 720
A_3	150 kbps	320 x 240	D_3	1.5 Mbps	1280 x 720
B_1	200 kbps	480 x 360	D_4	2.0 Mbps	1280 x 720
B_2	250 kbps	480 x 360	E_1	2.5 Mbps	1920 x 1080
B_3	300 kbps	480 x 360	E_2	3.0 Mbps	1920 x 1080
B_4	400 kbps	480 x 360	E_3	4.0 Mbps	1920 x 1080
B_5	500 kbps	480 x 360	E_4	5.0 Mbps	1920 x 1080
C_1	600 kbps	854 x 480	E_5	6.0 Mbps	1920 x 1080
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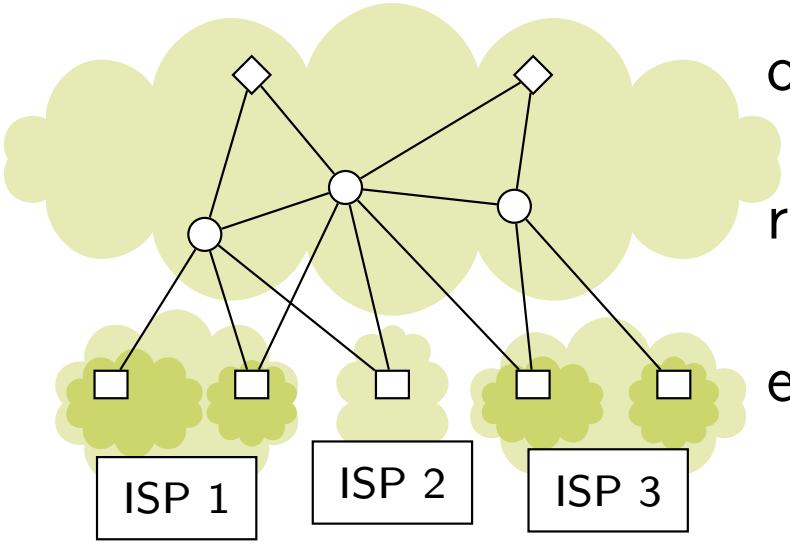
one video stream $=$ a dozen of representations

$=$ more than 20 Mbps

Identifying the issue

Where is the bottleneck in today's CDN ?



origin servers

reflectors

edge servers

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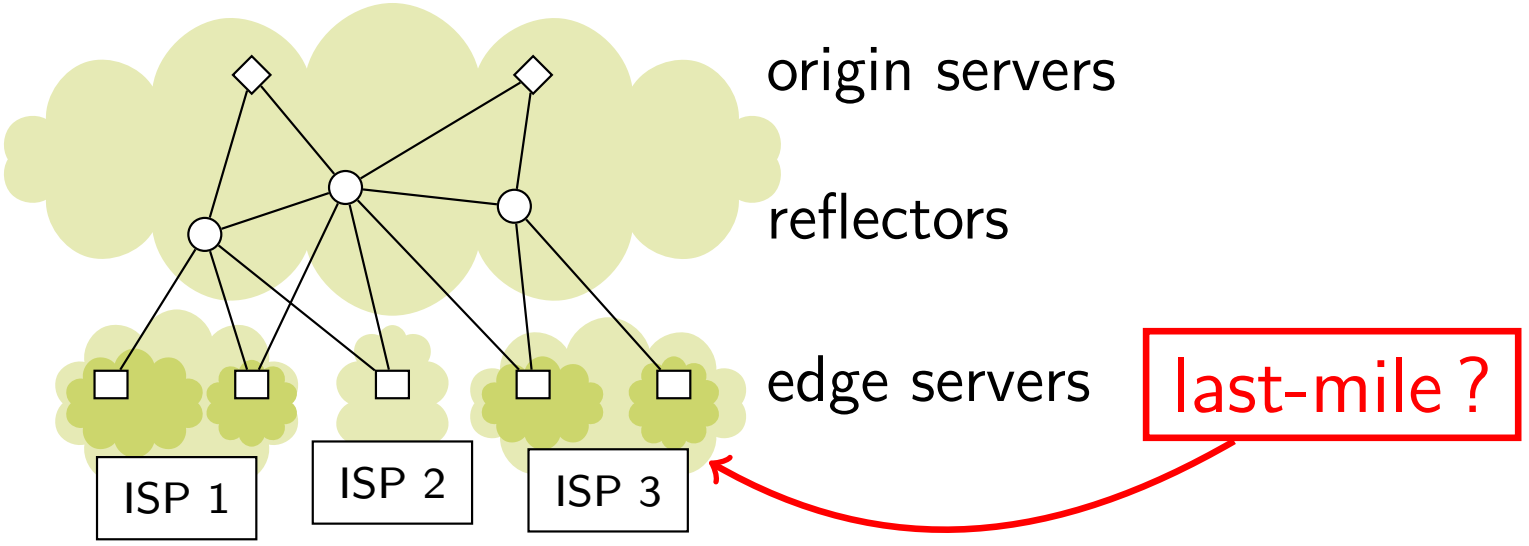

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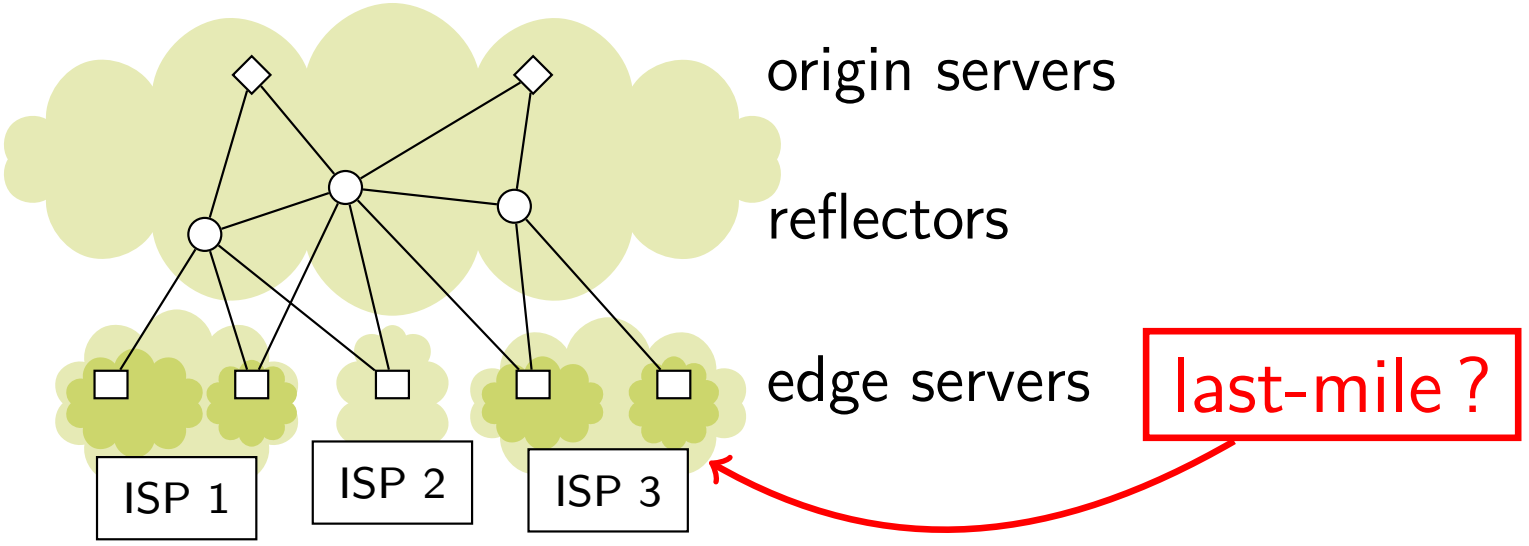

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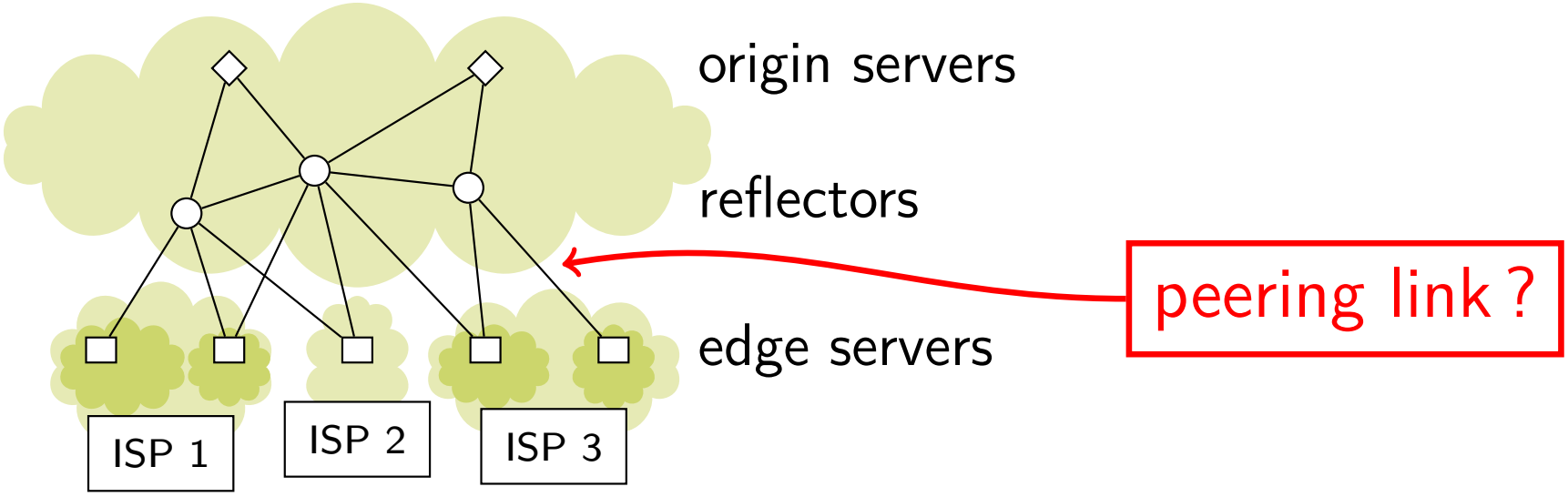

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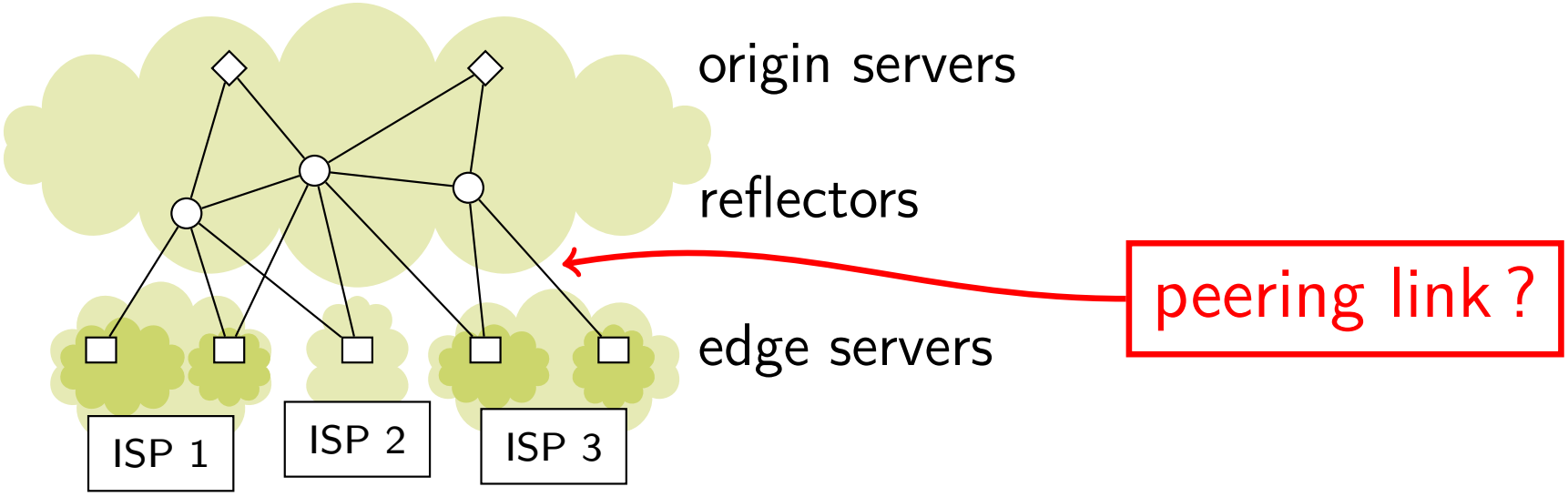

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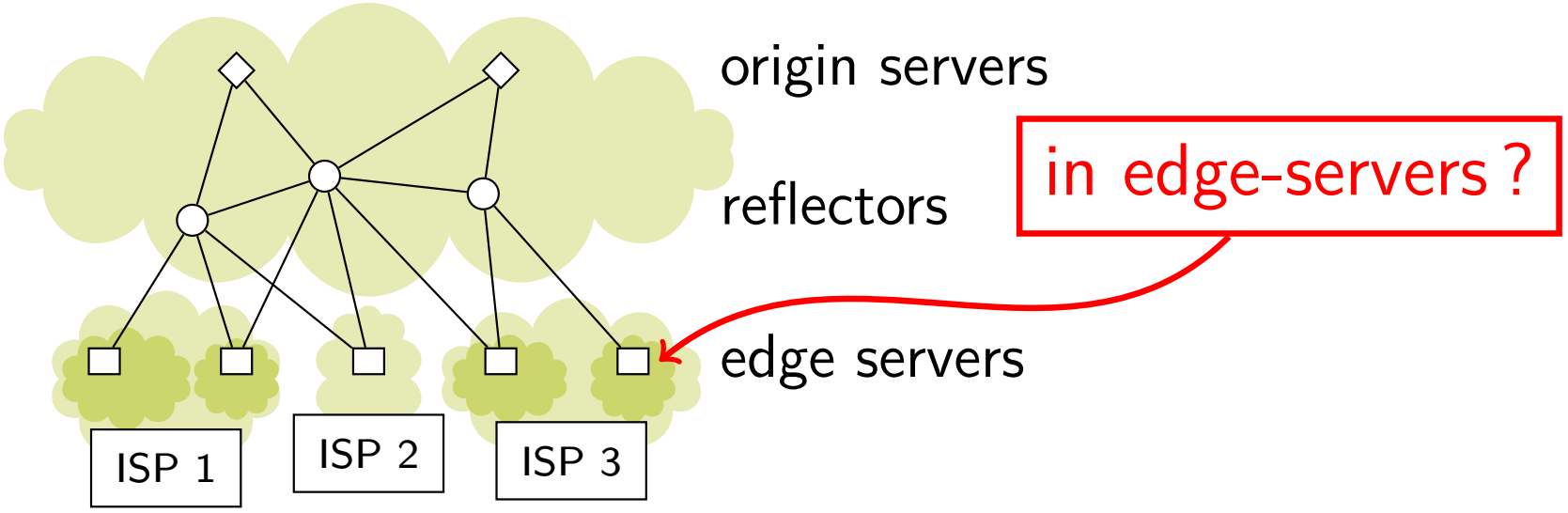

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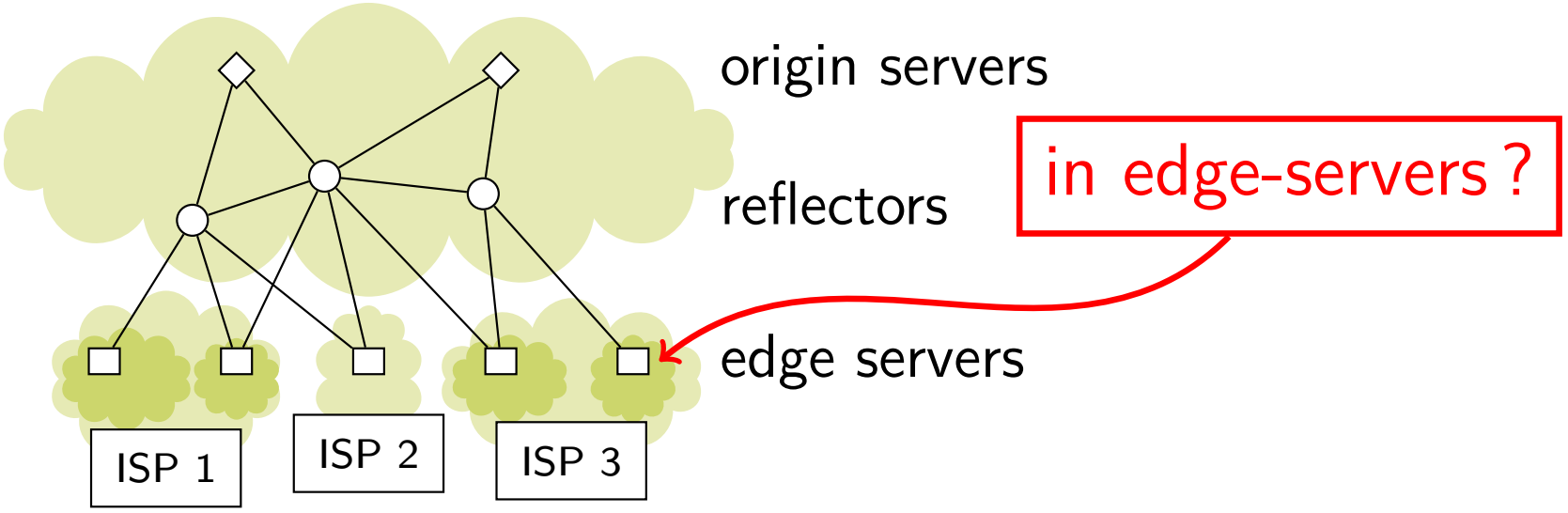

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commoditized hardware$\rightarrow$ ~~server under-provisioning~~

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Finding a trade-off between :

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Typical services : multiple simultaneous live streams

- user-generated live video services
- multiview live events
- second-screen services

Scadoosh

Main idea in a nutshell

To not send all representations to all edge servers

Formal Scadoosh

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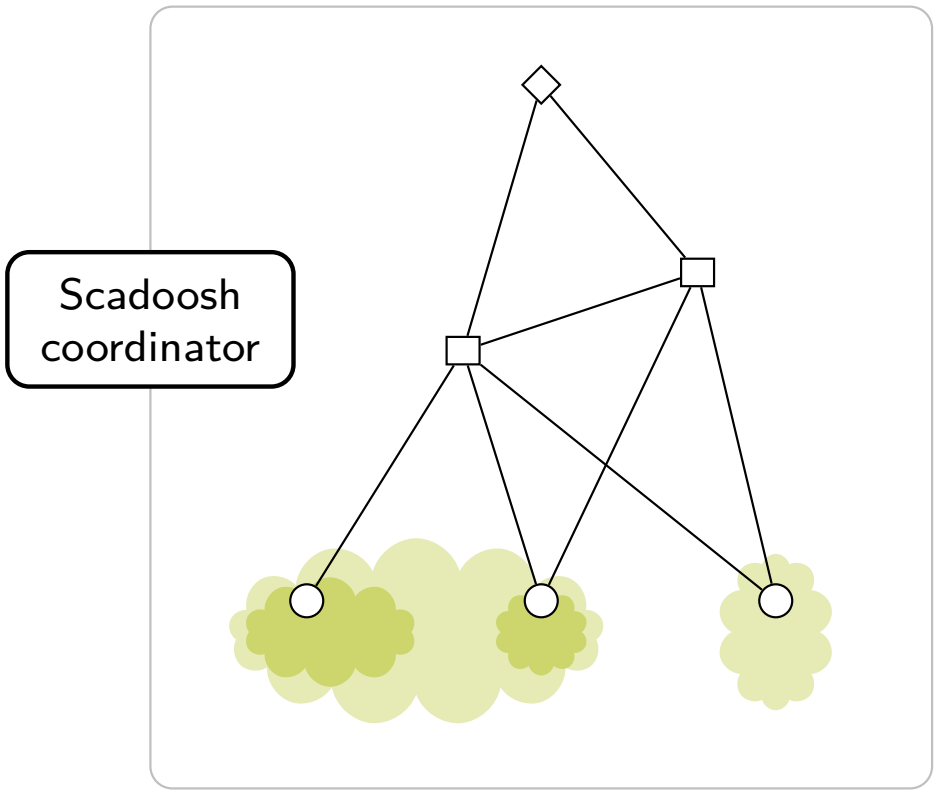
objective :

$$\max \sum_{e} \sum_{j} \sum_{i} u_{ij}^{e} \times x_{ij}^{e}$$

Scadoosh Principle



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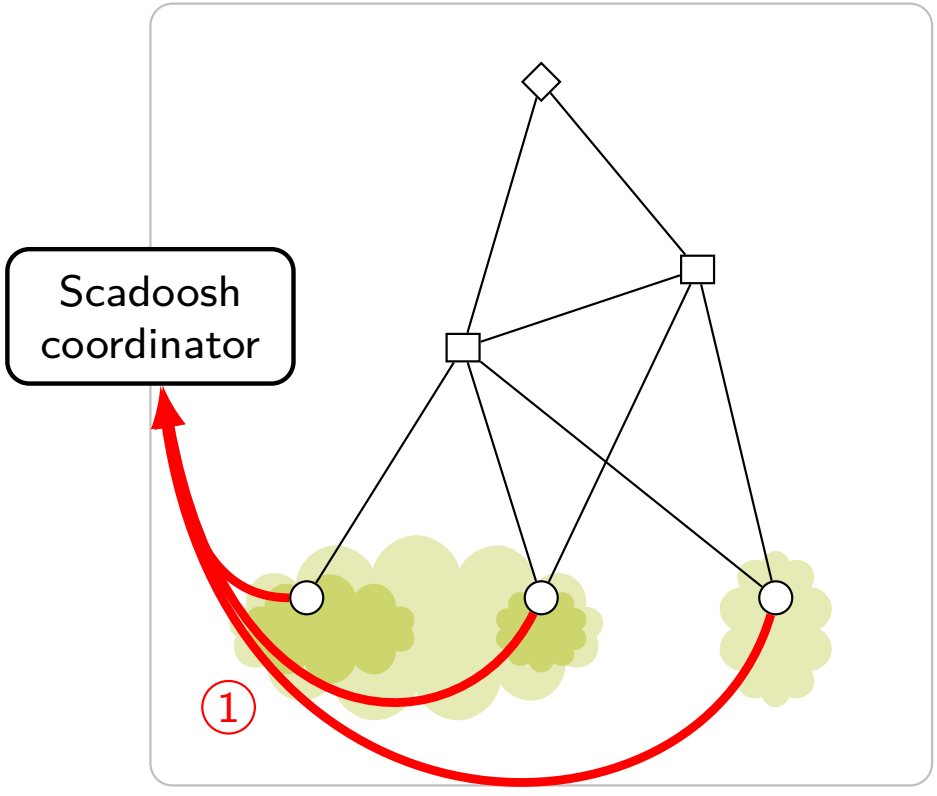
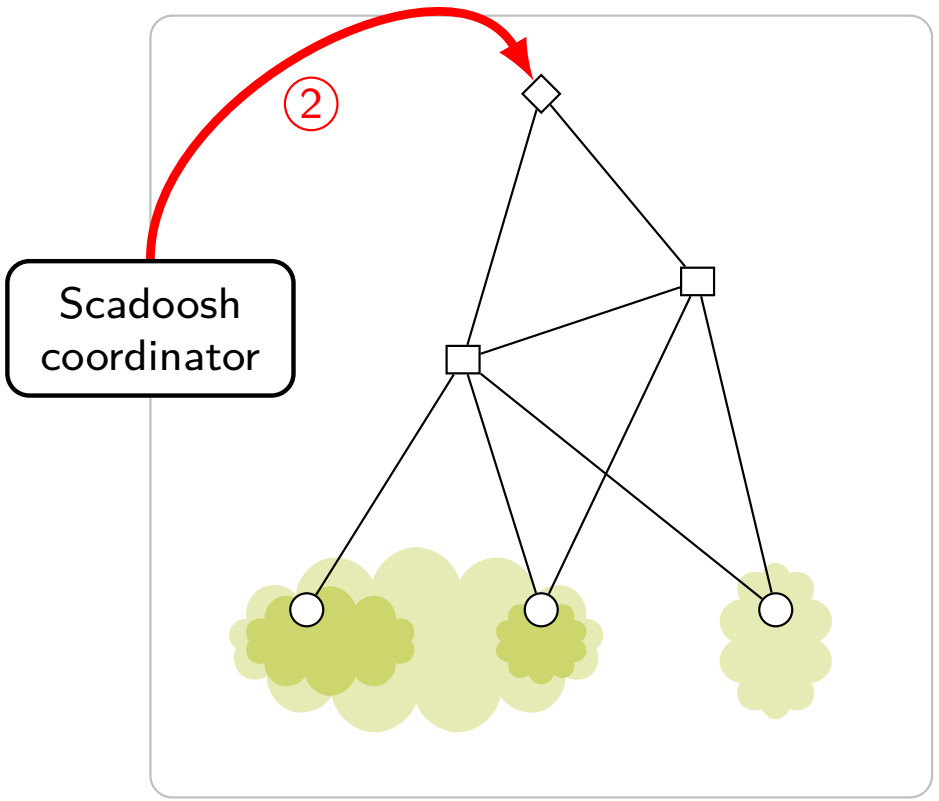


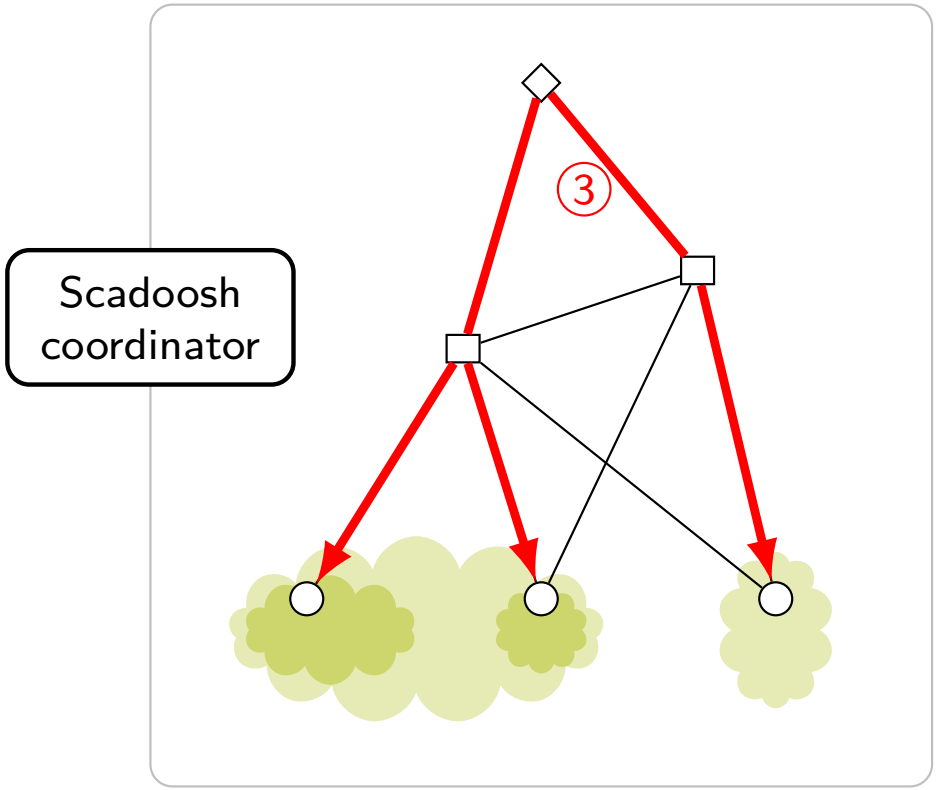
① edge servers report to Scadoosh coordinator about their activities during last period

Scadoosh Principle



② Scadoosh coordinator decides utility scores, computes delivery forest overlay and notifies sources

Scadoosh Principle



③
sources use the forest overlays to deliver the live representations to the edge servers

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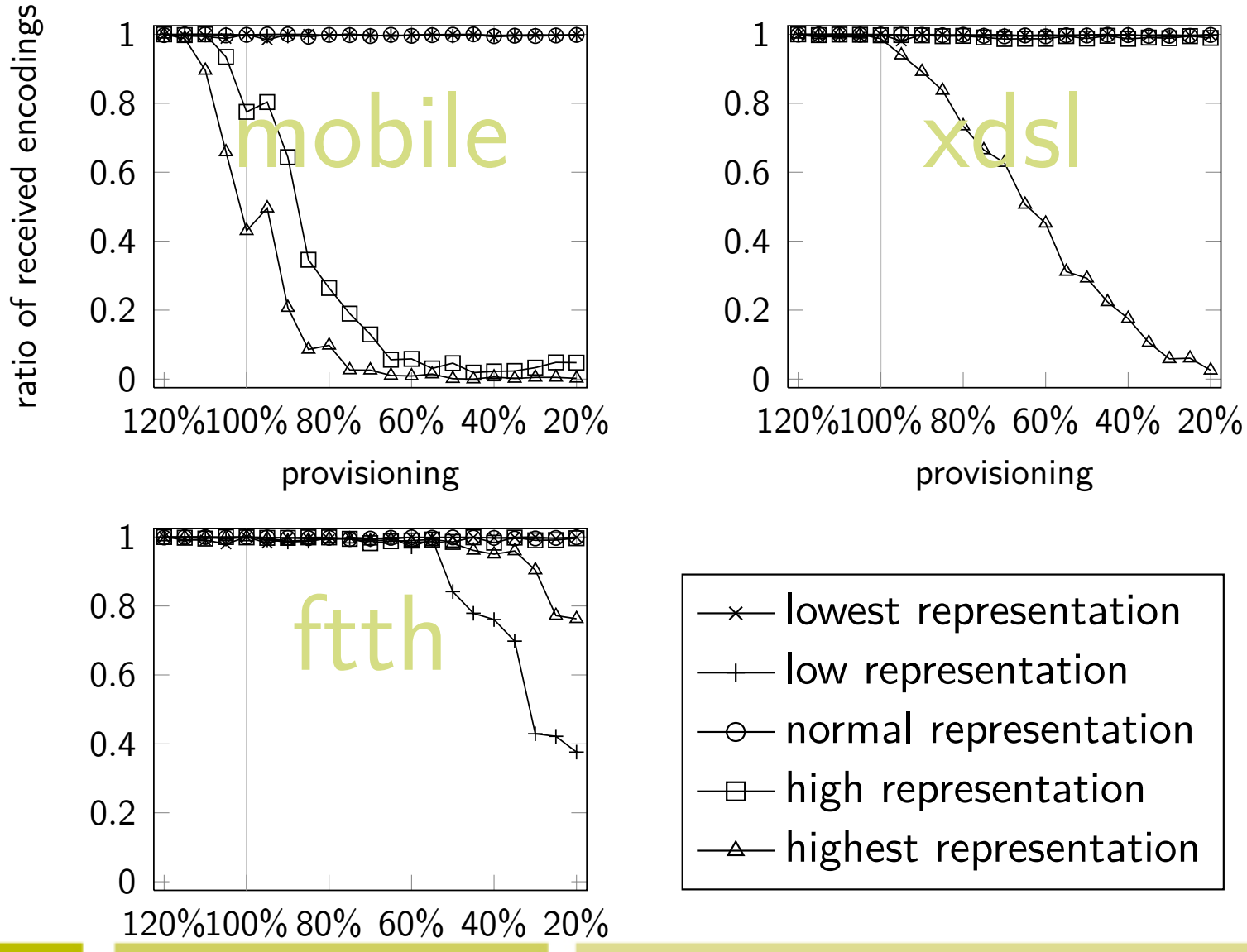
Design and test **a system**

- Catherine Rosenberg (University of Waterloo)
- Jiayi Liu (Telecom Bretagne)

Results Overview



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Stay tuned :
http ://perso.telecom-bretagne.eu/gwendalsimon