

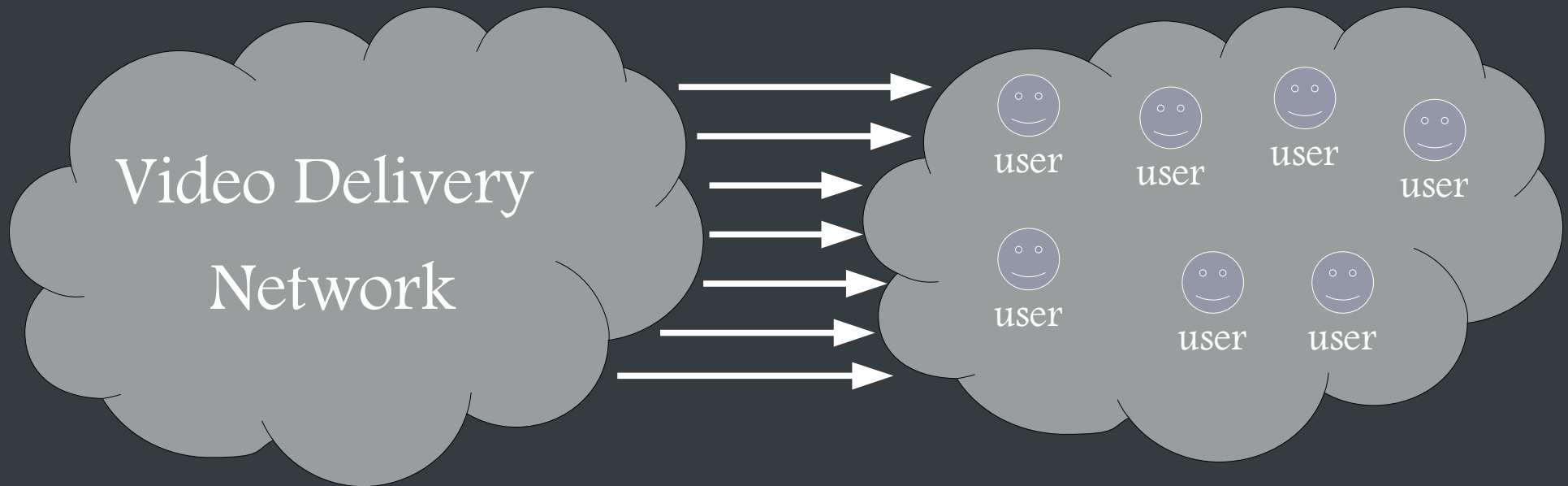
CD-GAIN: Measuring Traffic Gains from Peer-assisted Content Delivery

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Appetite comes with Eating

Video traffic now accounts for 66% of all traffic on the Internet and is predicted to reach 79% by 2018



over 50% of all traffic for streaming TV

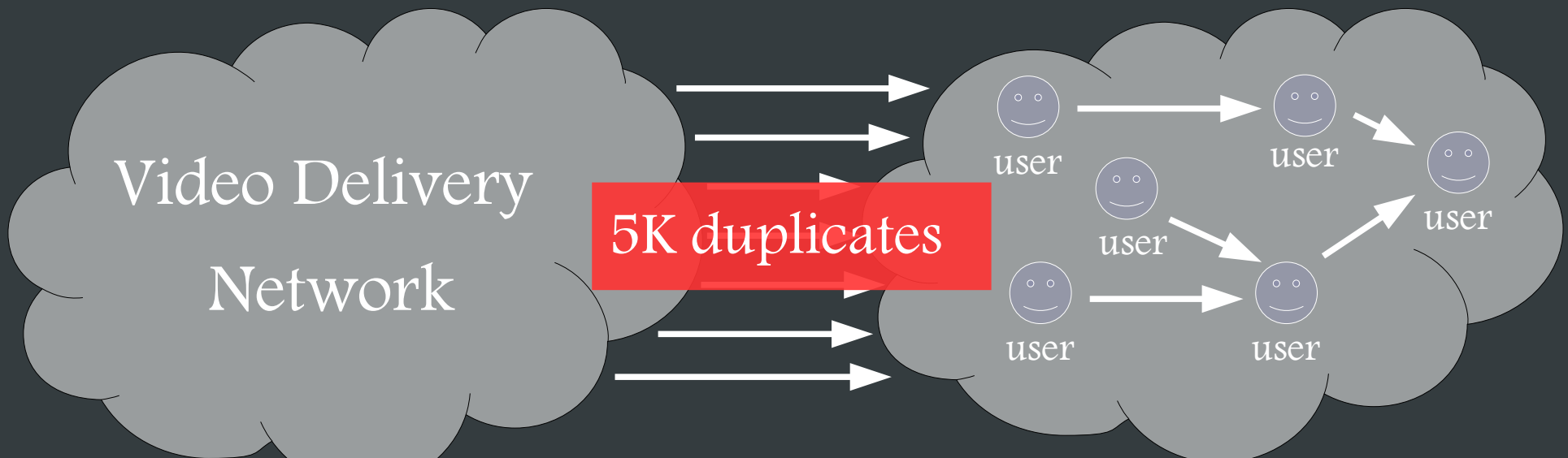
44% of UK' households

BBC iPlayer

Content is King



average of 5K users online every sec in the first day after release



Solution: ask users for assistance

Higher Demand means Higher Savings

Model traffic swarms as infinite-server queue
(extending Menasche et al., CoNext 2009)

Average number of peers online

$$c_i = u_i r_i$$

content duration request rate


How much we can offload to peers


$$G(c) = 1 - \left(\frac{c(1 + e^c c^{-m} (m \Gamma(m) - \Gamma(1 + m, c)))}{m} + 1 \right)^{-1}$$


The **share of traffic** which can be **offloaded to peers**
is growing with the **demand** and the **size of content**


London, Sep. 2013



 Users – 2.2 M

 IP address – 1.3 M

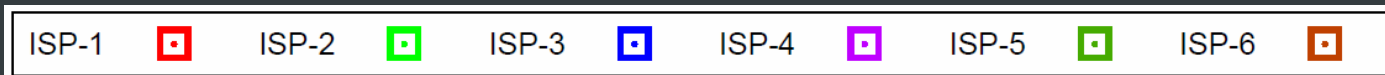
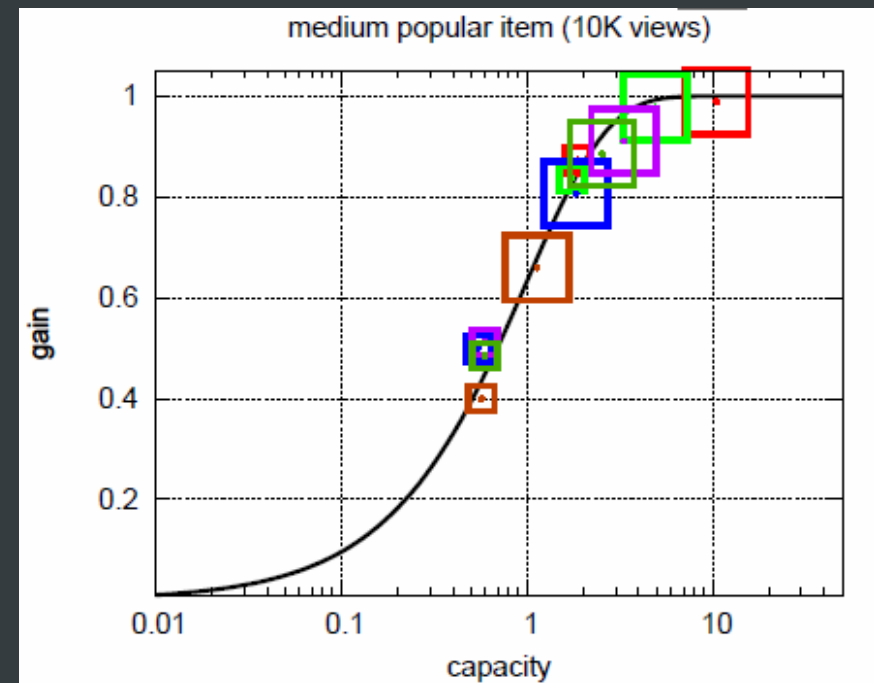
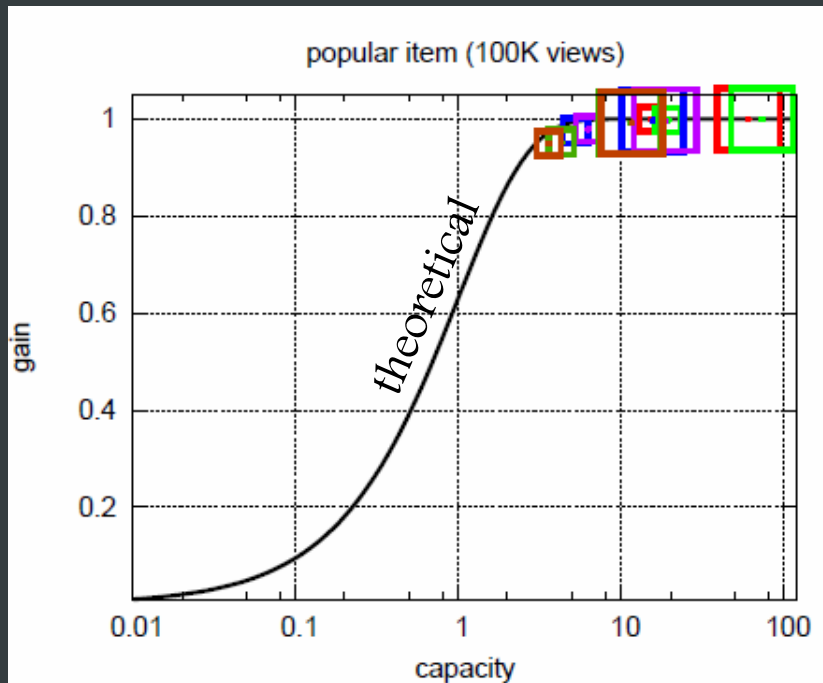
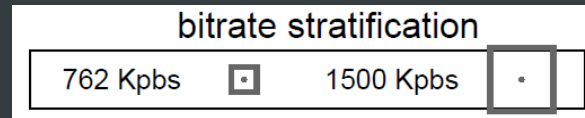
 Sessions – 15.9 M

 Traffic – 6.5 Gbps

Records in the Dataset:

<network id, ISP, user id, request time, session duration,
bitrate, content id>

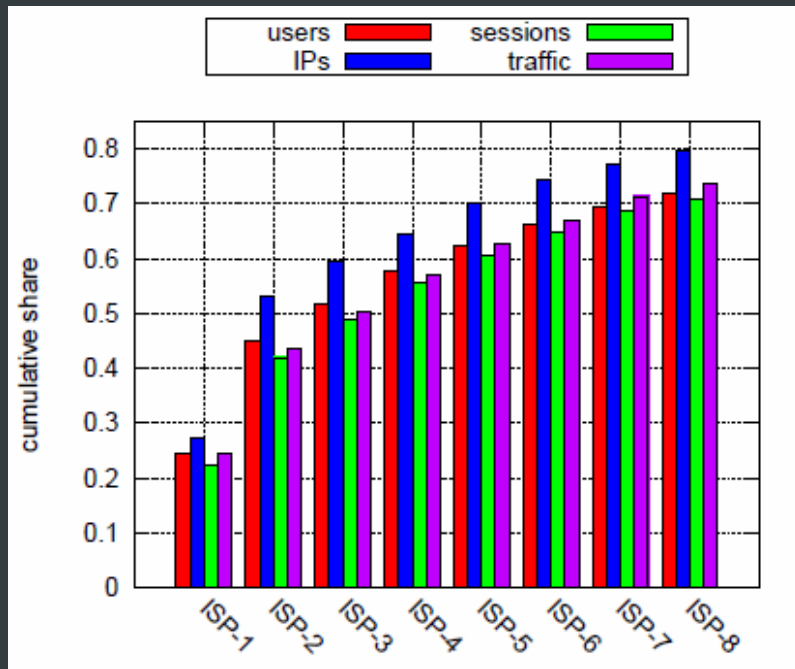
So, How Much we can Offload?



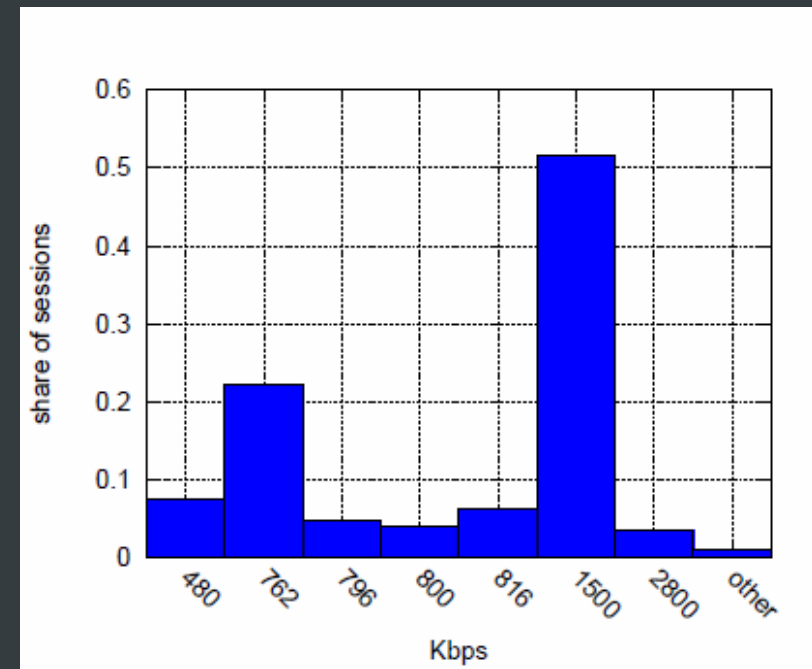
- model is in a good agreement with simulations
- significant traffic savings can be achieved despite constraints

What do we do with the Obstacles

Eight biggest ISPs account for
over 70% of traffic



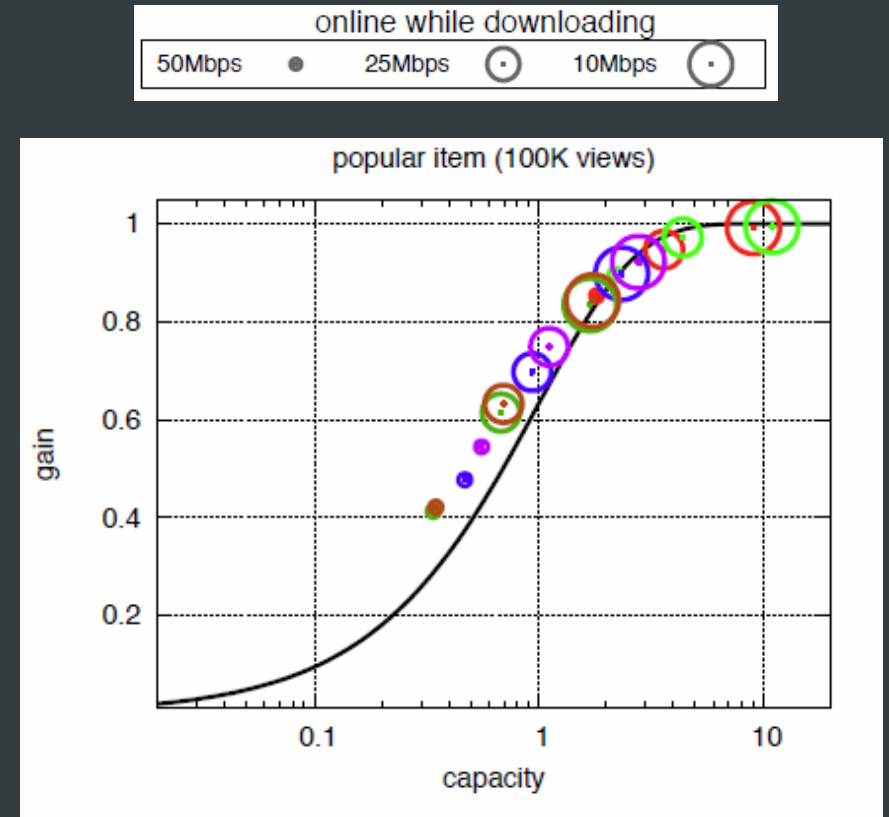
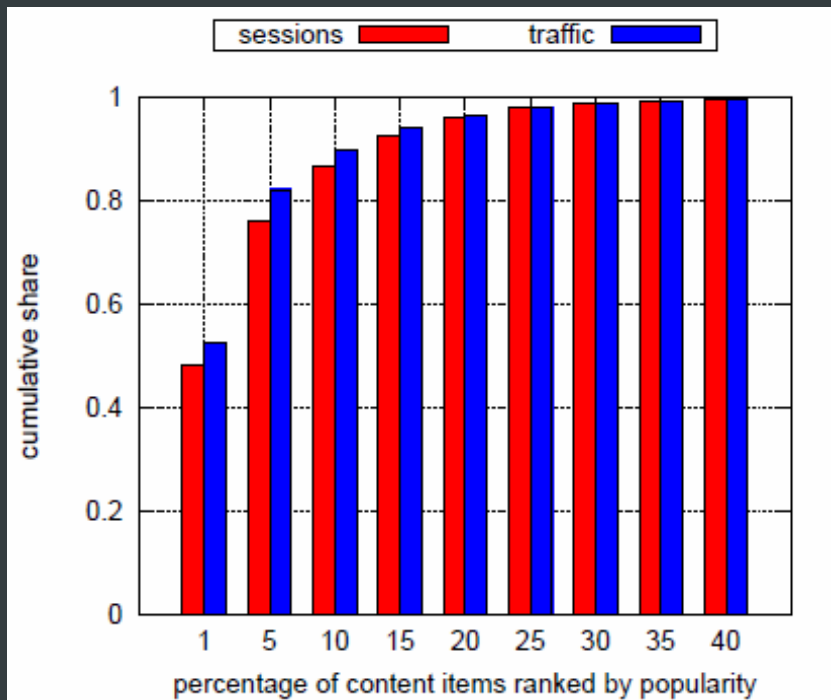
Two main bitrate formats
dominate in over 70% of sessions



Fragmentation of traffic by ISP and bitrate formats
yields several large content swarms

Why it works in the end?

Top-5% of the content
corpus accounts for 80% of traffic



- most traffic is generated by a small amount of popular content
- “online while watching” model is important

Takeaways

- **online while watching** model and **long-duration content** are crucial factors for feasibility of peer-assistant content delivery
- **fragmentation** of peer-to-peer swarms by ISP, quality format and content **doesn't impose significant limitations** on the system
- up to **80%** of all traffic for the whole content corpus in iPlayer can be **offloaded** for the **biggest ISPs**

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<http://bit.ly/cd-gain>

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