V-cloud: A Peer-to-peer Video Storage-Compute Cloud

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iitmadras
CELEBRATING TECHNOLOGY

Increasing video creation and viewing

48 hours of video uploaded per minute on Youtube*

flv
MP4
avi   3gp   mkv   ...

Variety of formats

Increasing heterogeneity of viewing devices

The problem

video-sharing system

available:

Y.mkv
MP4
Y.avi

I need video 'Y' in 3gp format in my resolution: 960x640, 15fps

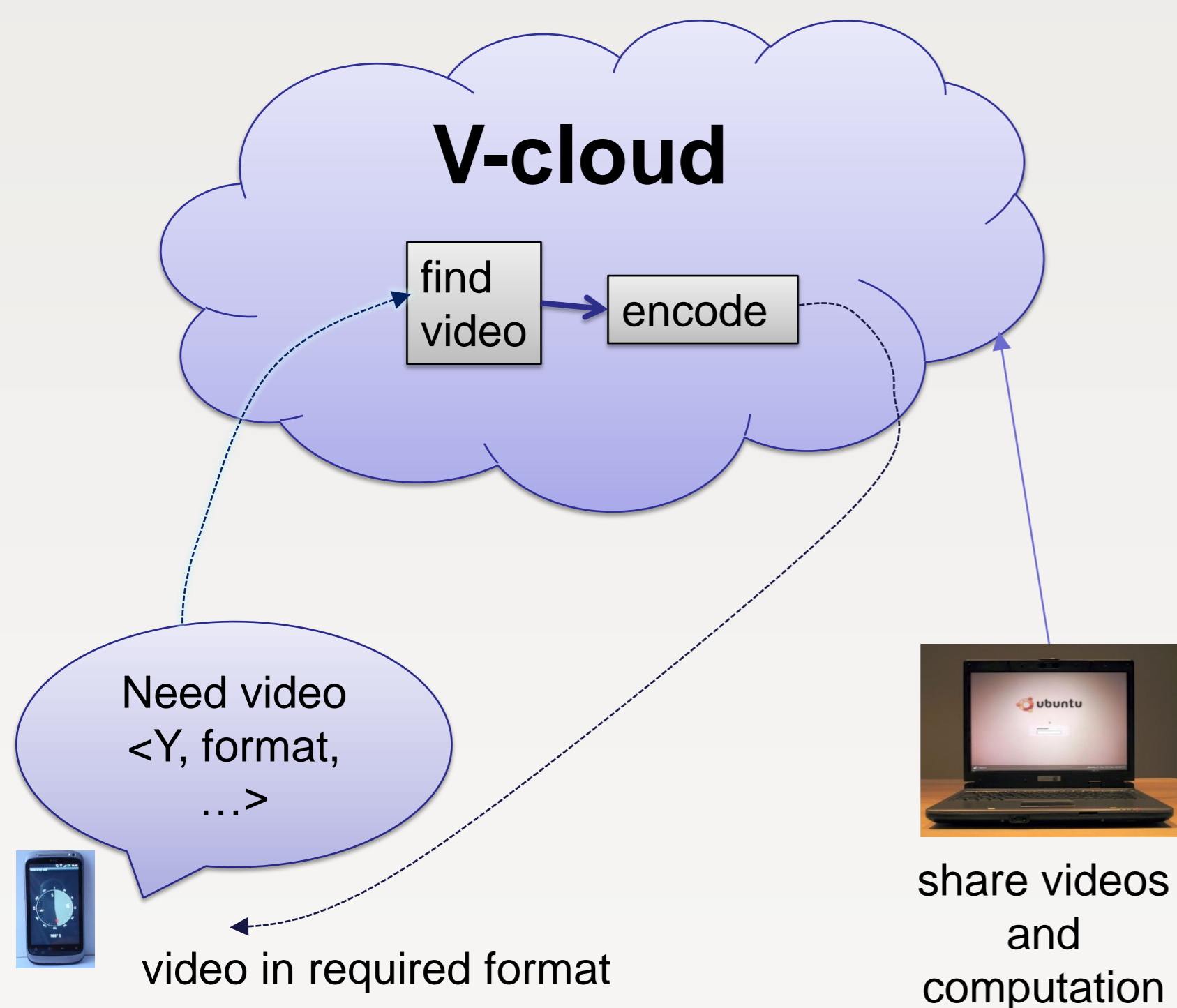Mismatch in content format!

File sharing systems

- Deal with content availability only
- *Ignores* content format
- E.g., BitTorrent, DC++

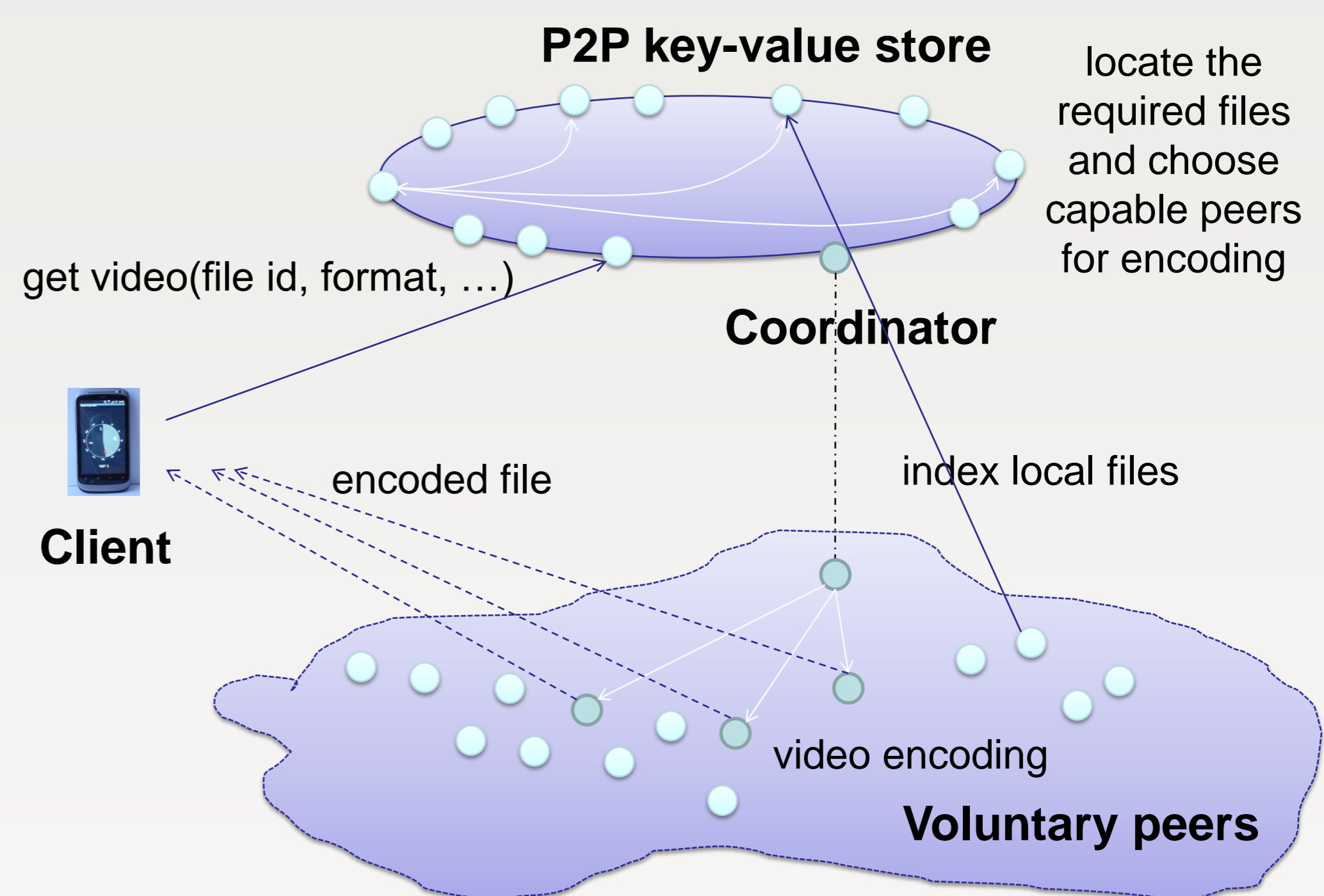## Centralized solutions

- Video encoding is highly compute intensive
- Centralized components will lead to *bottleneck* and *single points of failure*

The solution

V-cloud

find video → encode

Need video <Y, format, ...>

video in required format

share videos and computation

V-cloud architecture

P2P key-value store

locate the required files and choose capable peers for encoding

get video(file id, format, ...)

Coordinator

encoded file

index local files

Client

video encoding
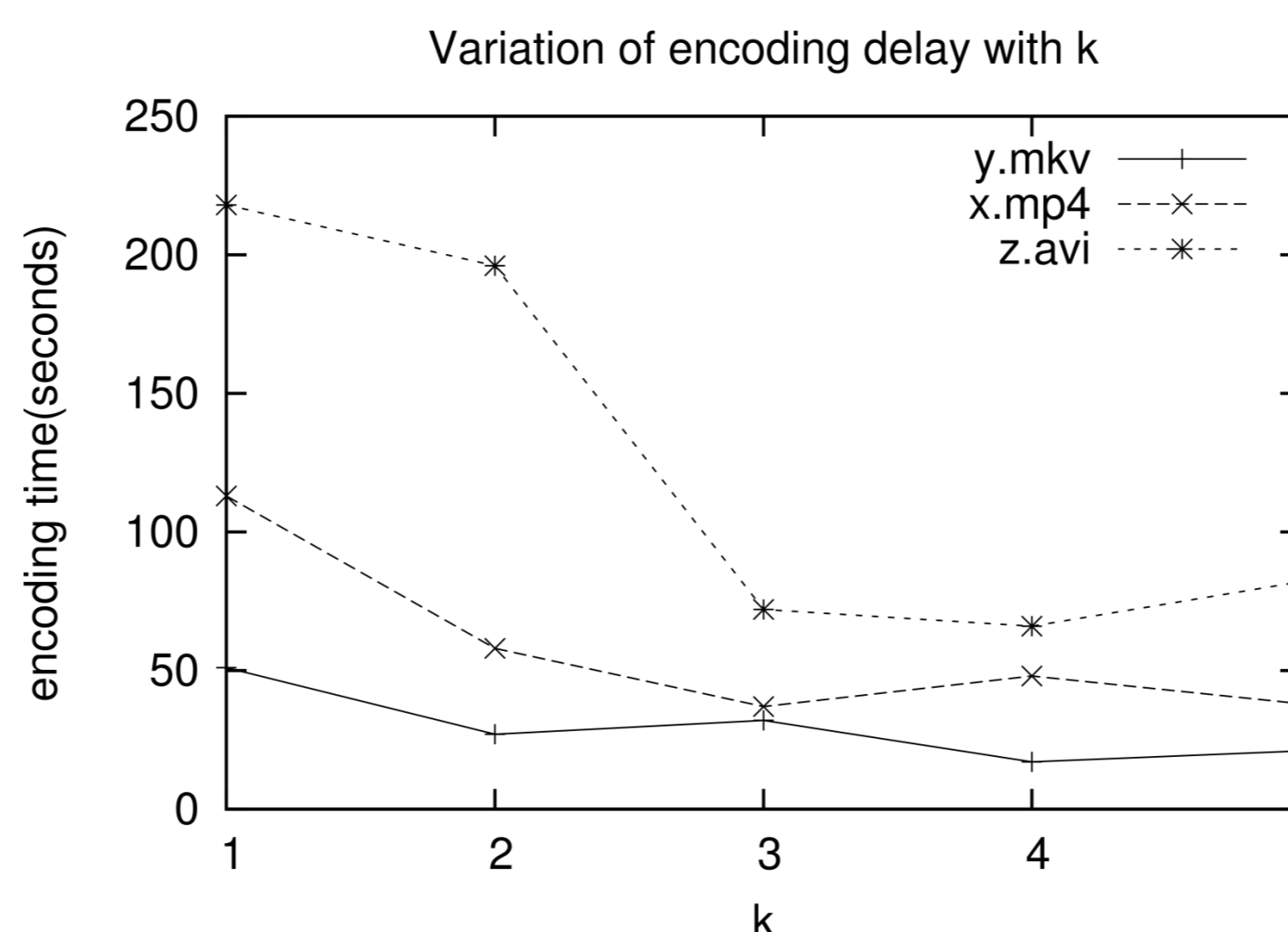
Voluntary peers

V-cloud internals

- Fully peer-to-peer architecture with no centralized components
- Distributed encoding of videos performed among donor peers
- Current locations of each file and file metadata like fps etc. stored in peer-to-peer key-value store with file id as key
- Peer responsible for a video acts as coordinator for requests on that video
- Locality and peer capability(measured using HPF[+]) considered for assigning encoding tasks
- Peers having video are ranked based on current HPF values
- Encoding performed on top-k peers

Evaluation

- Casssandra as key-value store with 5 donor peers and parallel video requests(flv)
- Maximum number of peers for encoding(k) varied from 1 to 5

Variation of encoding delay with k

Applications

- Sharing of video lectures, training modules and technical talks within campuses, companies etc.
- Elastic device-aware streaming of videos from video-sharing websites

Future works

- Optimizations on peer/chunk selection process, streaming, incentives and generic abstraction for distributed stream processing

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+ B. Johnson, R. Karthikeyan, and D. Ram. DP: a paradigm for anonymous remote, computation and communication for cluster computing. Parallel and Distributed Systems, IEEE Transactions on, 12(10):1052 –1065, Oct 2001.

* source: http://www.reuters.com/article/2012/01/23/us-google-youtube-idUSTRE80M0TS20120123
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