On-line Video-Editing Challenges in Storisphere

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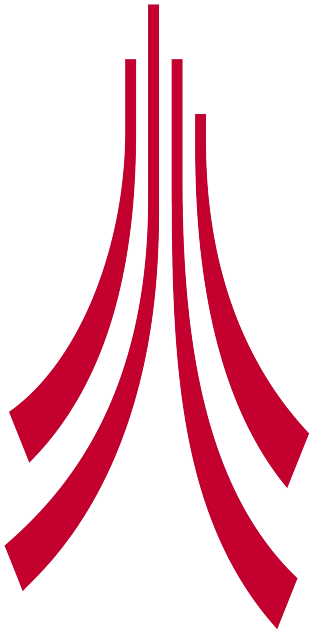

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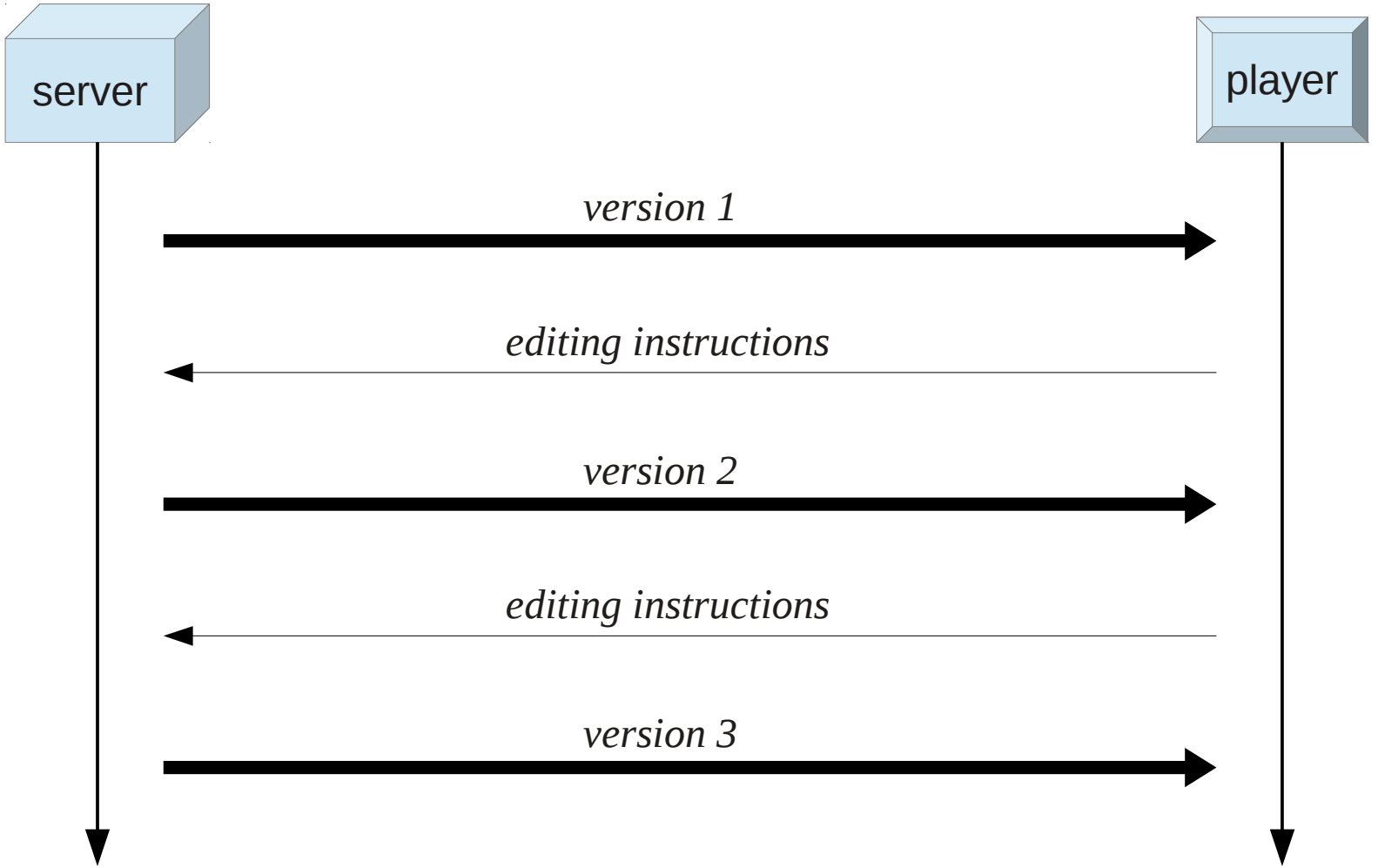
Storisphere aims

- Support collaborative storytelling
  - Like SourceForge/GitHub, but for video
  - Aimed at 'hyperlocal TV', community production
  - Support audio/video, stills, and audio commentary
- Edit on slim client devices
  - Web front-end
  - Minimal configuration
  - Server does the hard work
  - Cache and decode on client for playback

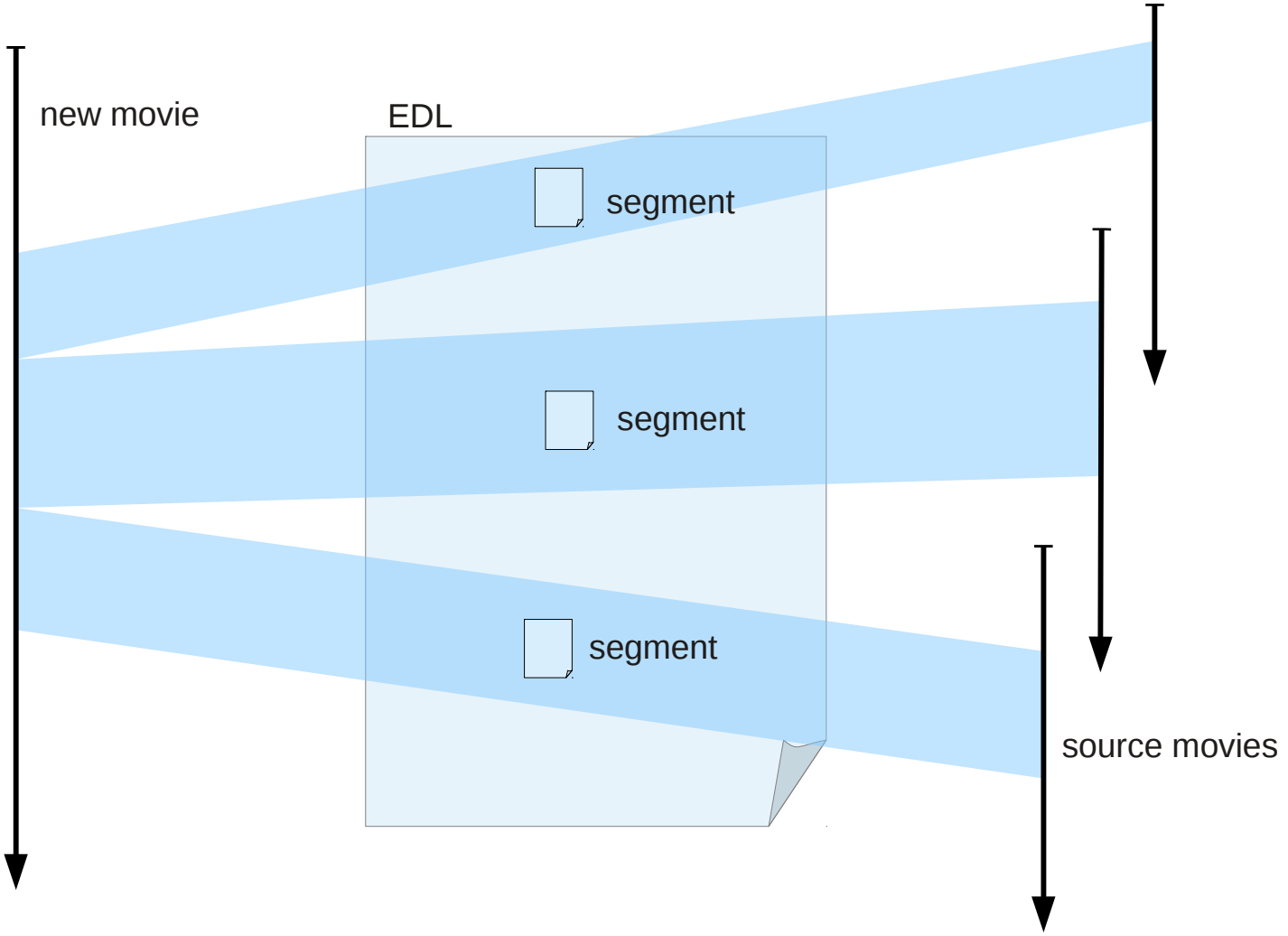
Editing on slim clients



Content preparation

- Separate video and audio tracks.
- Split each track into independent chunks.
  - On GOP boundaries
  - Using closed GOPs
  - Publish as static files
- Write a rush EDL (edit-decision list) to recombine them into the original.
  - One EDL segment per chunk

EDL Composition



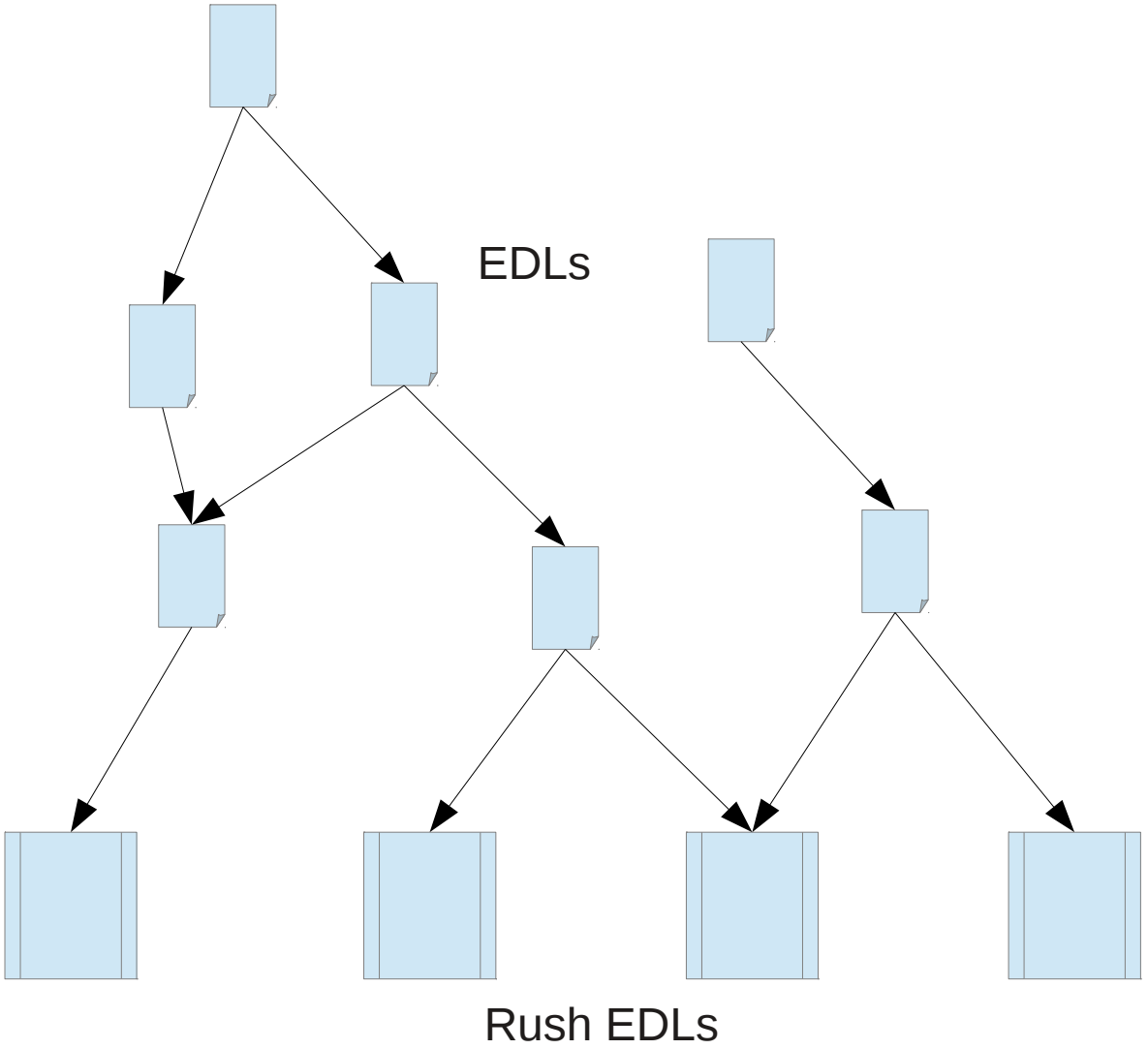
Content retrieval

- Convert chunk-describing segments into MPEG-4 structural data.
- Add URI references to chunk files.
- Send to player.
- Player parses structural data and fetches chunks.
- Cache chunks for re-use!

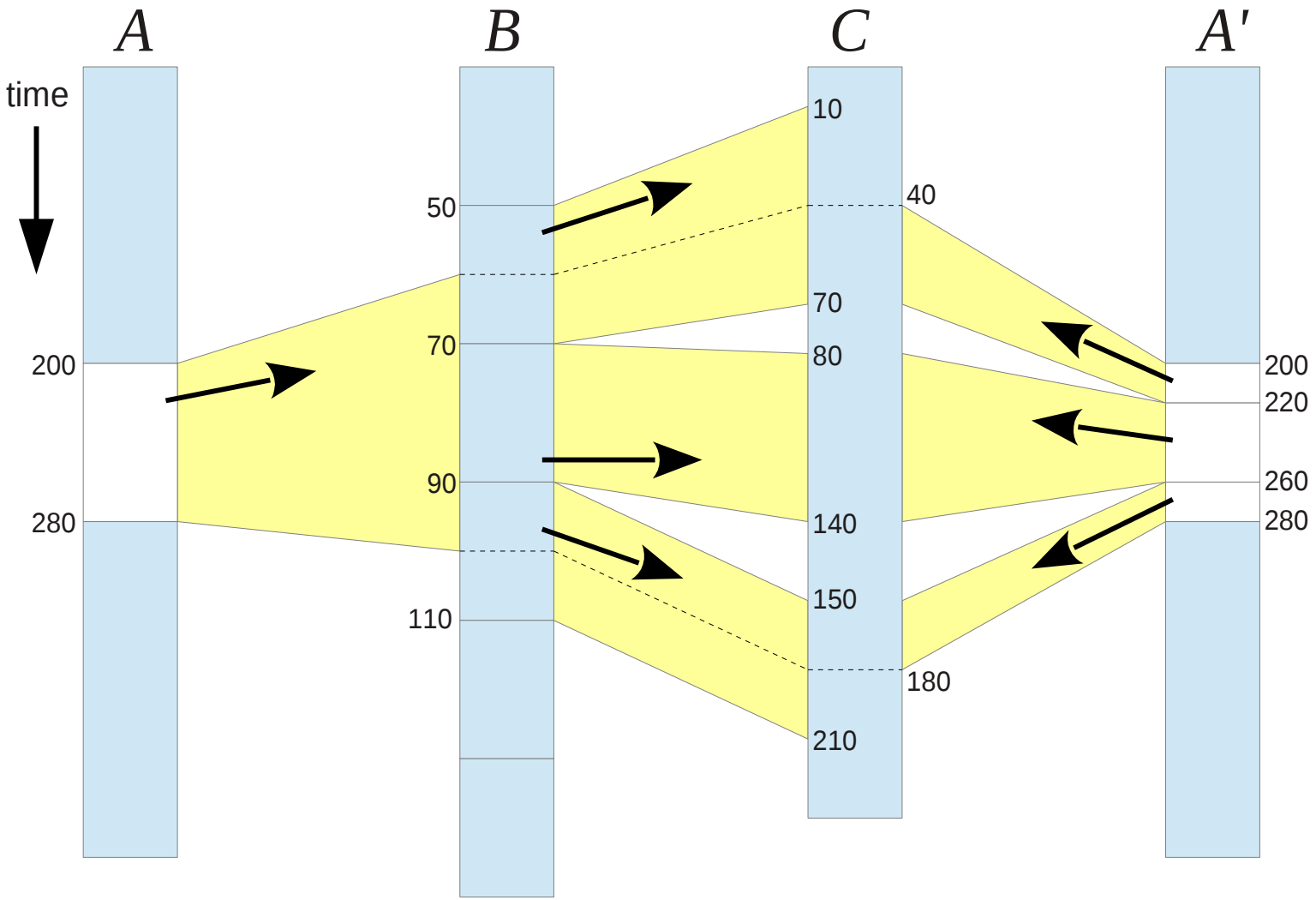
Benefits of EDLs

- All derived content expressed as small text documents
  - Combine segments from separate rushes
  - Once ingested, no need for further transcoding
- EDL hierarchy
  - Can reference rush EDLs or other derived content
  - Build up advanced stories in stages
  - Track origins
  - Defer choice of resolution until point of playback

Recursive EDLs



EDL resolution



Challenges

- EDLs
  - Rational numbers
    - Propagation of prime factors
- MPEG-4 format
  - Limited effects
    - No visual combination
    - Fixed audio volume
  - 32- or 64-bit limits
- Player
  - Missing functionality
    - MPEG-4 edit lists
    - External chunks
    - 64-bit integers
  - Inefficient implementation
    - No playback until all chunks fetched
  - Faulty implementation
    - Chunks abandoned
    - Mixed audio frequencies
    - Lingering stills
    - Mixed aspect ratios

Solutions: Rational numbers

- Limited set of frame rates
  - Numerator of rate becomes denominator of frame durations: 30000/1001=29.97Hz => 30000 MPEG-4 timescale
- Record ideal 'cut' positions.
  - Frame boundaries
  - Editor forbids cutting at arbitrary positions

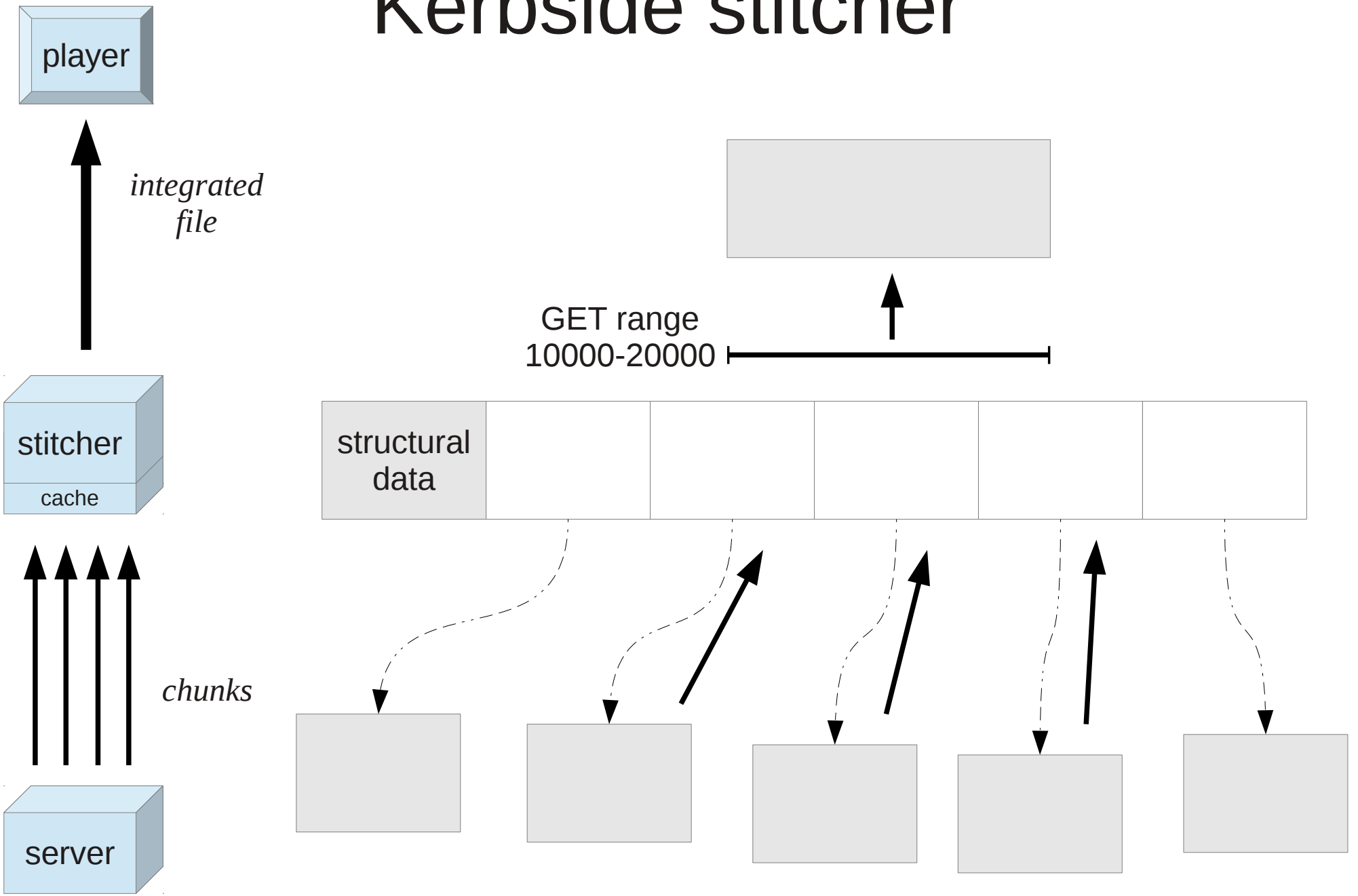
Solutions: MPEG-4 format

- Don't do effects!
  - Audio overlays okay, though
- Lose some accuracy in generation of MPEG-4 edit list.
  - Shouldn't be easily perceptible

Solutions: Player

- Force use of QuickTime
  - Good support for edit lists
- Use a kerbside stitcher
  - Gets round bad/missing implementations of external chunk fetching
- Ingest at only one audio quality (44.1kHz)
- JIT translation of stills into 'very slow' edits
- Put up with aspect-ratio problems

Kerbside stitcher



Better solution: Our own player

- Requirements
  - Needs to be in JavaScript for maximum portability
  - Needs access to native decoder
    - Byte-based, not file/URI-based
- Benefits
  - Not limited by MPEG-4
  - Could do our own effects
  - Build the stitcher into the player

Links

http://one.lancs.ac.uk/

Storisphere: collaborative video editing system

(formerly “ONE”)

Acknowledgements

FIRM
http://www.firm-innovation.net/

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