# DASH FOR 3D NETWORKED VIRTUAL ENVIRONMENT

Thomas Forgione, Axel Carlier, Geraldine Morin,
Wei Tsang Ooi, Vincent Charvillat, Praveen Kumar Yadav

## GOAL: REPRESENT STATIC 3D CONTENT IN DASH FORMAT

|  | Period | Adaptation Set | Representation | Segment |
|---|---|---|---|---|
| **Video** | Start time and duration of content (e.g., chapters, ads) | Different media content (video, audio, subtitles) | One representation per video quality | Segmented into fixed duration |
| **3D** | N/A | One per geometry cell, one per texture | Multiple resolutions for textures | Segmented into fixed number of faces |

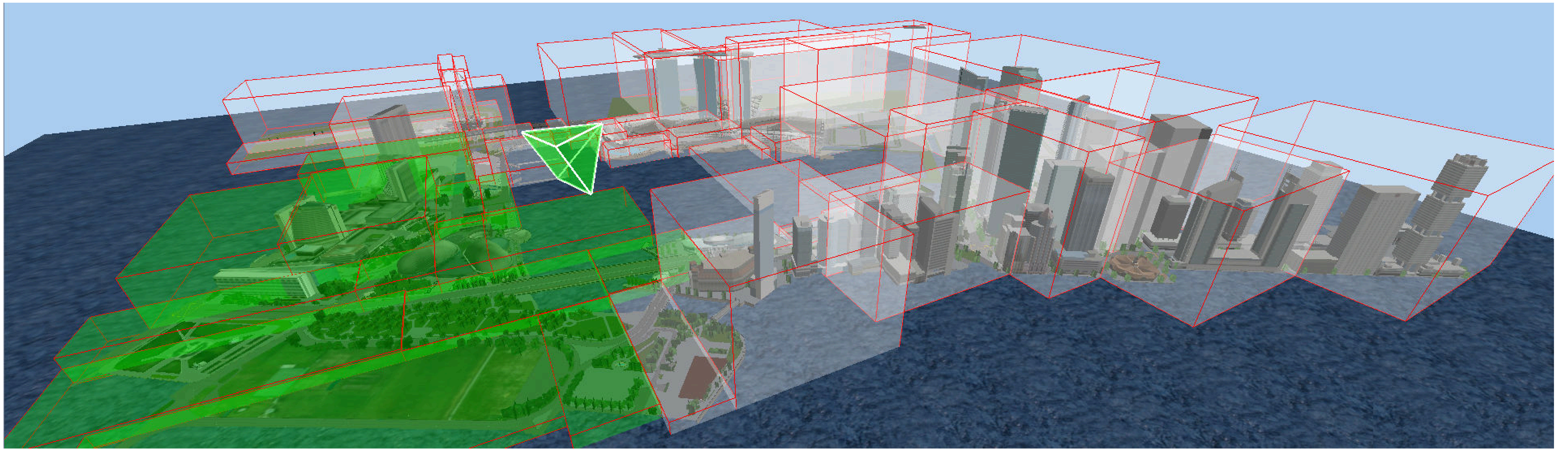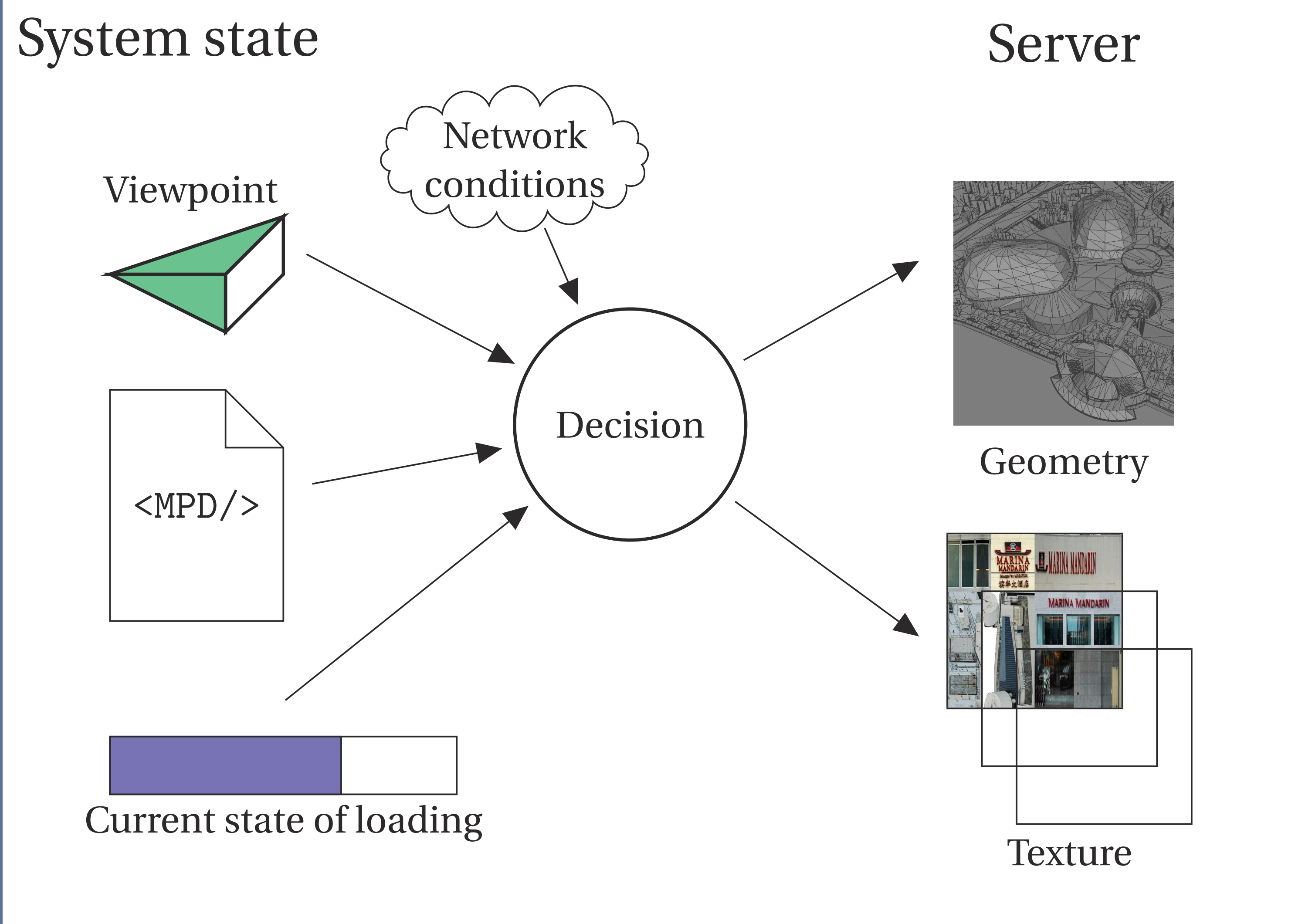## SCENE PARTITIONING FOR VIEW-DEPENDENT STREAMING



**Figure 1:** A subdivided 3D scene with a viewport, with regions delimited with red edges. In white, the regions that are outside the field of view of the camera; in green, the regions inside the field of view of the camera

## DASH CLIENT DECISION MAKING

### System state



## DECISION COMPUTATION

**Geometry segment utility**

$$\mathscr{U}\left(s^G, v(t_i)\right) = \frac{\mathscr{A}_{3D}\left(s^G\right)}{\mathscr{D}\left(v(t_i), AS^G\right)^2}$$

A geometry segment is more important if:
- the segment contains large faces
- the camera is close to the segment

**Texture segment utility**

$$\mathscr{U}\left(s^T, v(t_i)\right) = \text{psnr}\left(s^T\right) \sum_{k \in K} \frac{\mathscr{A}_{3D}\left(s_k^G \cap \Delta(T, t_i)\right)}{\mathscr{A}_{3D}\left(s_k^G\right)} \mathscr{U}\left(s_k^G, v(t_i)\right)$$

A texture segment is more important if:
- it is high resolution
- it is often used in important geometry segments

**Greedy policy**

$$\underset{s \in \mathscr{S}_G \cup \mathscr{S}_T}{\arg\max} \frac{\mathscr{U}\left(s, \hat{v}(t_{i+1}(s))\right)}{t_{i+1}(s) - t_i}$$

Get next most useful segment

**Predictive policy**

$$\underset{s \in \mathscr{S}_G \cup \mathscr{S}_T}{\arg\max} \int_{t_{i+1}(s)}^{t_i + \chi} \mathscr{U}(s, \hat{v}(t_i)) \, dt$$

Get most useful segment over the next $\chi$ s
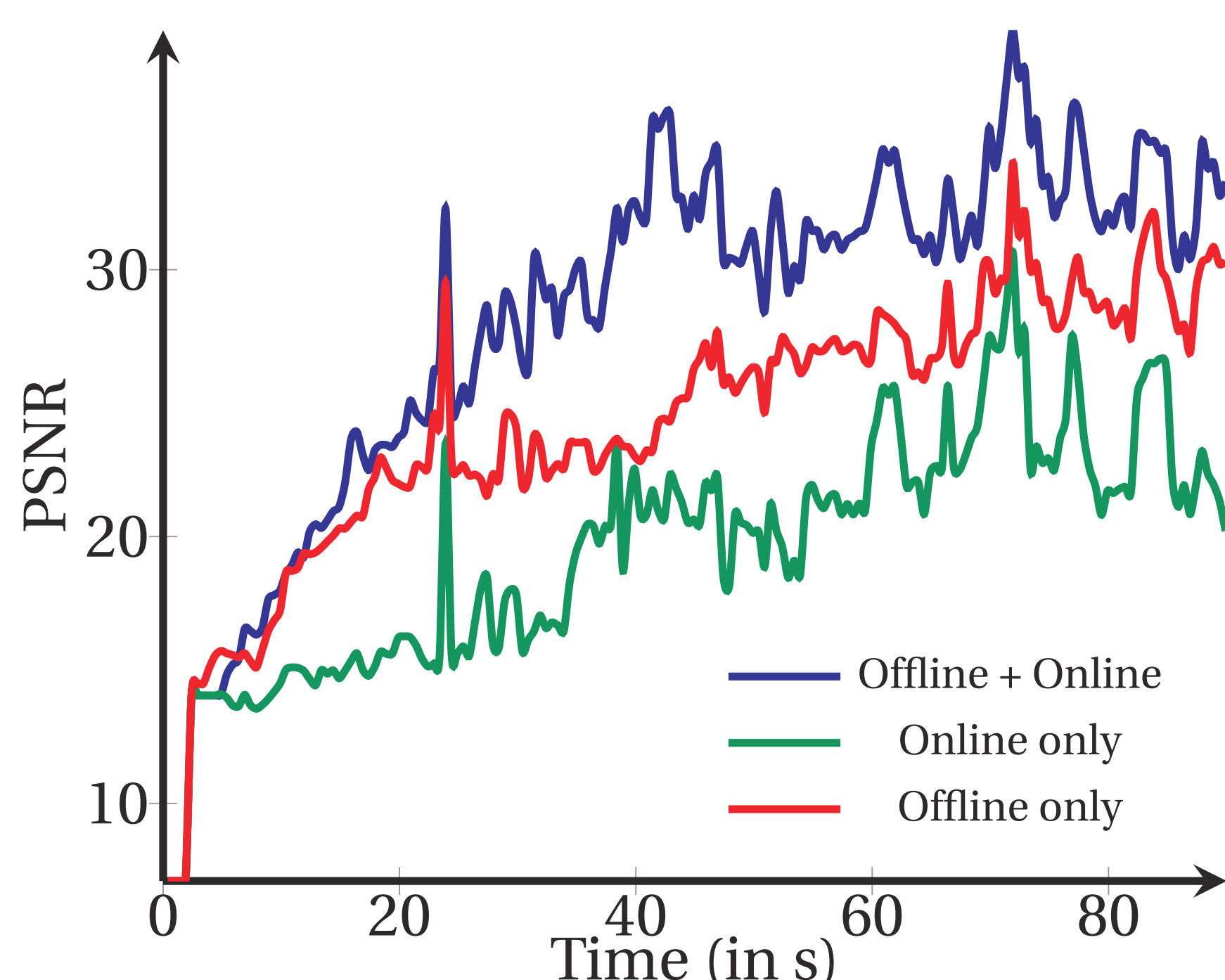
## EXPERIMENTAL RESULTS
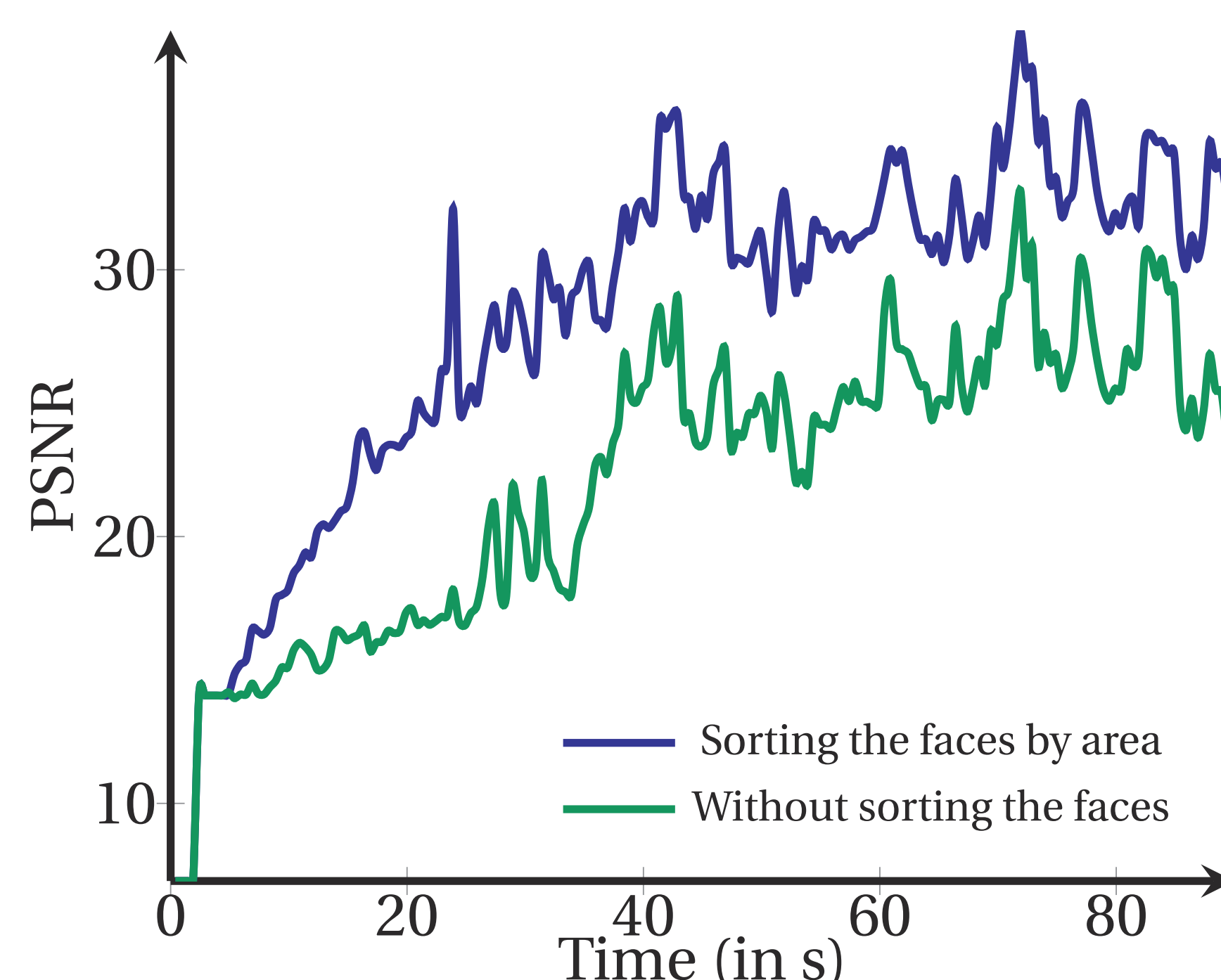


**Figure 2:** Segment utility
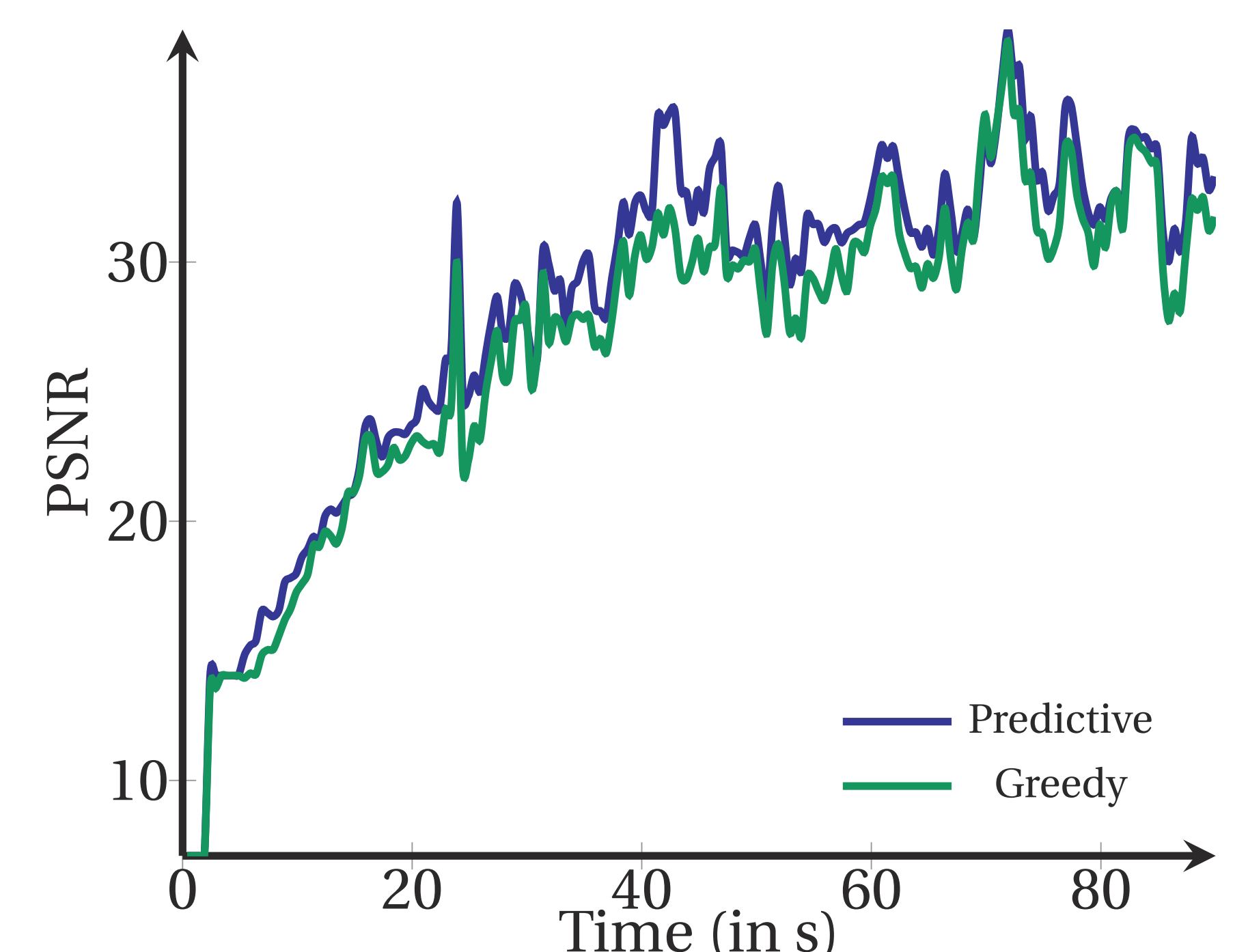


**Figure 3:** Face sorting



**Figure 4:** Streaming policy

## REFERENCES

[1] Zampoglou, M. et Al. 2016. Adaptive streaming of complex Web 3D scenes based on the MPEG-DASH standard. Multimedia Tools and Applications
[2] Niamut, O. A., et Al. 2016. MPEG DASH SRD. In Proceedings of the 7th International Conference on Multimedia Systems - MMSys '16 (pp. 1âĂŞ8). New York, USA.