

FIGURE 1. R & D Issues in Advanced VOD Systems.

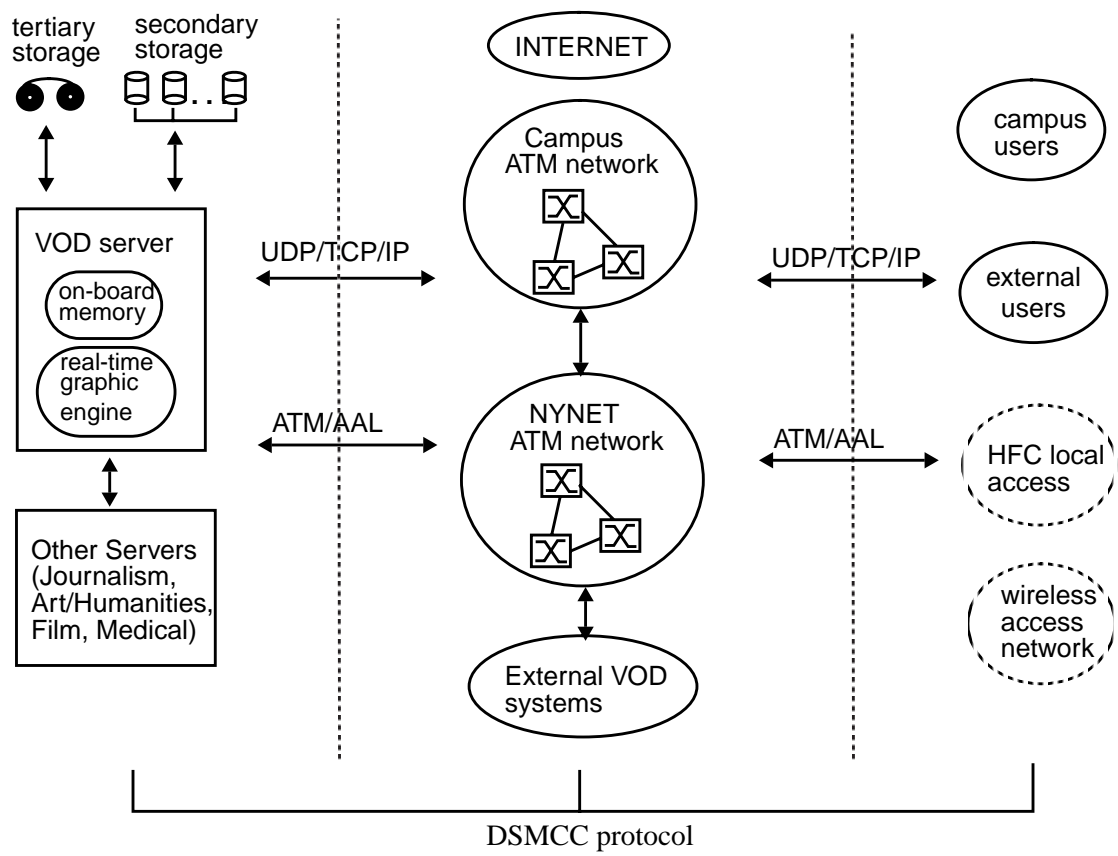


FIGURE 2. The system architecture of Columbia's VOD testbed.



FIGURE 3. Current user interface of Columbia University's VOD tested. This snapshot shows the video scene browser, the MPEG-2 playback interface, the QoS setup panel, and the bibliographic search database.

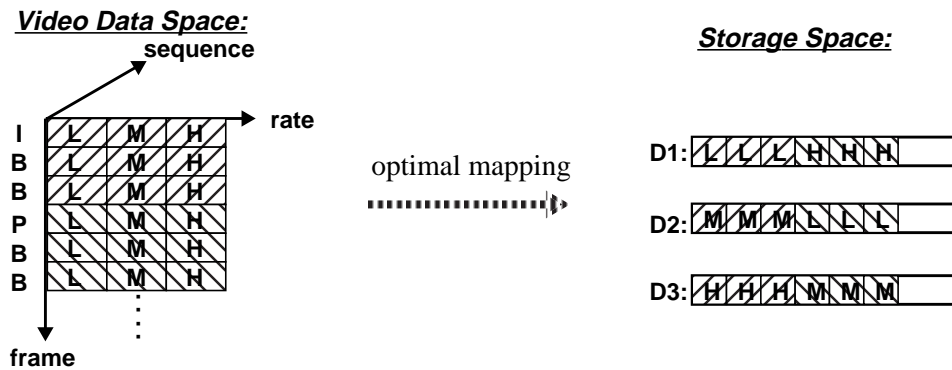


FIGURE 4. Mapping multiple components of each image frame of each video sequence to multiple disks. L, M, H represents different rate components, I, B, P are different frame types of MPEG.

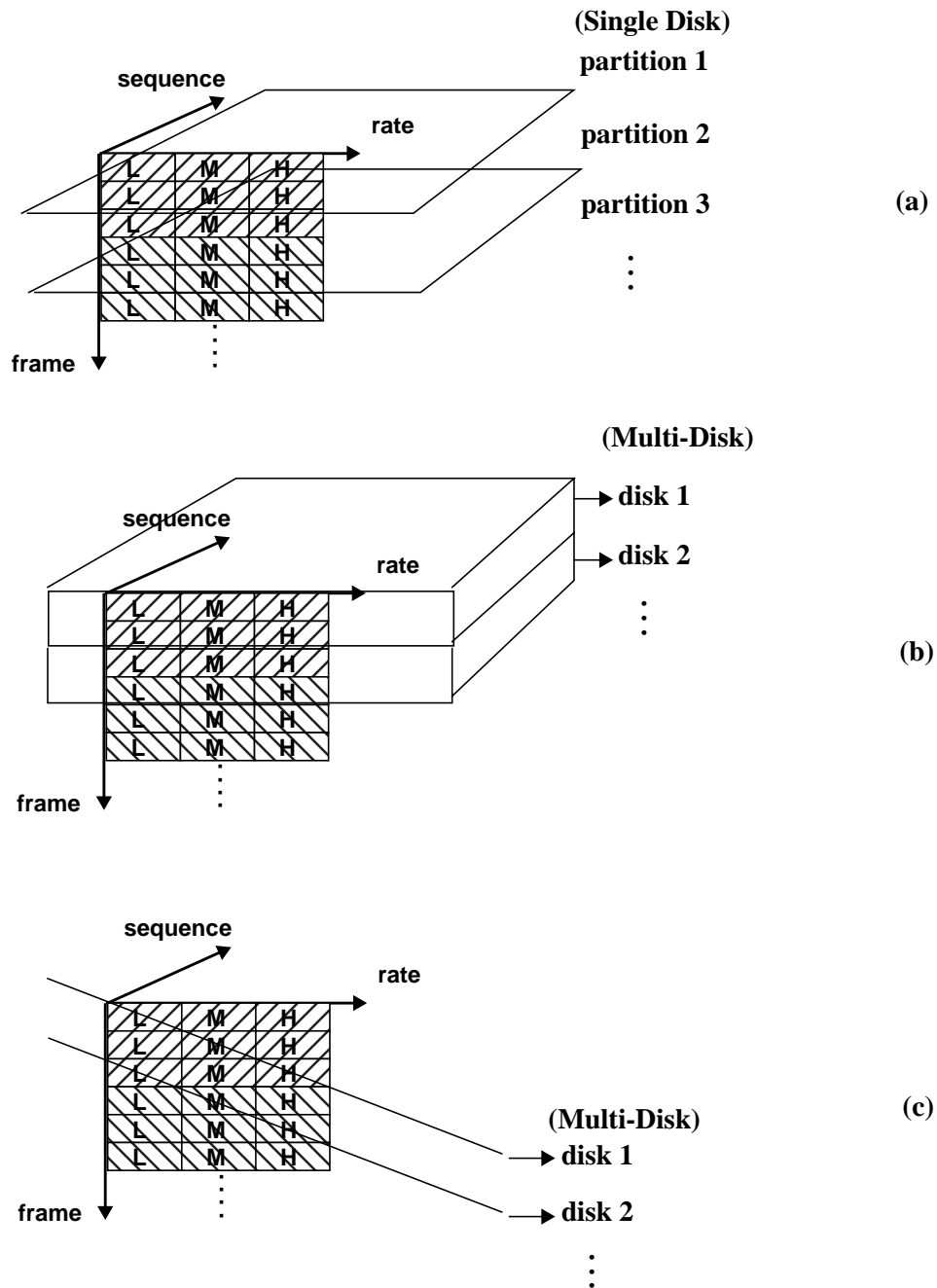


FIGURE 5. (a) A disk partitioning technique [13] for reducing the single-disk access delay. (b) & (c) Mapping multi-rate multi-stream video data to multiple disks. In (b), each group of frames (GOF) is completely mapped to a single disk; while in (c) each GOF is further separated into multiple segments, which are striped across multiple disks.

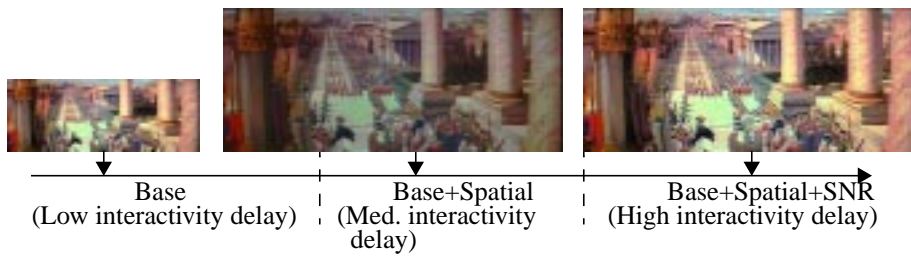


FIGURE 6. Use progressive display and scalable MPEG-2 coding to improve utilization/interactivity performance.

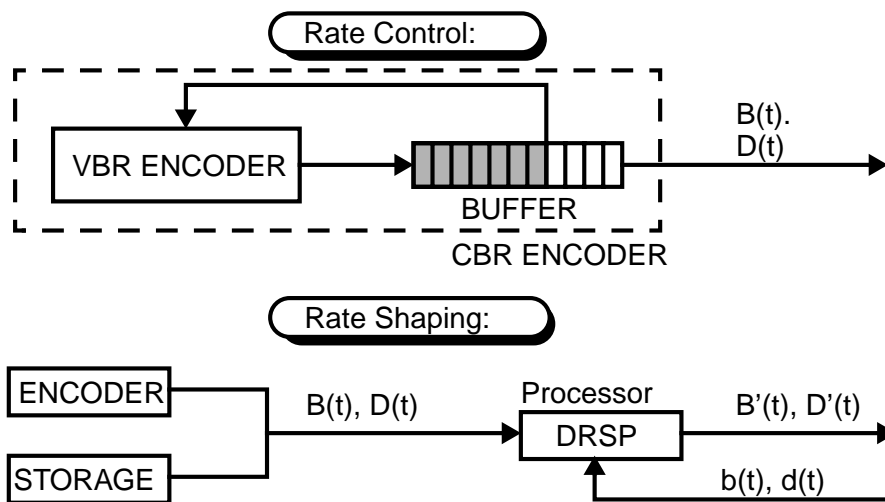


FIGURE 7. Comparison between rate shaping and rate control.  $B$  and  $D$  are constraints on bandwidth and delay respectively.

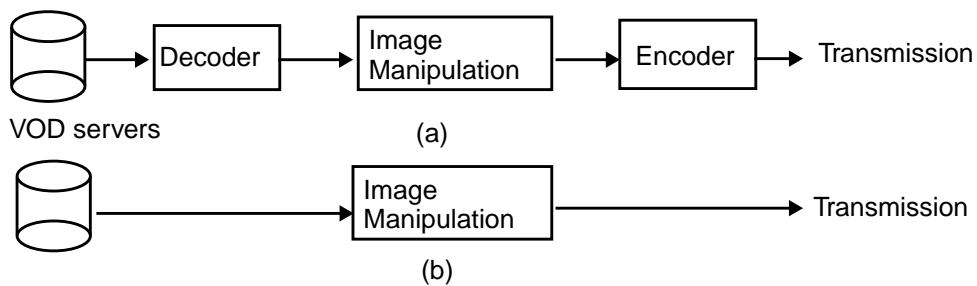
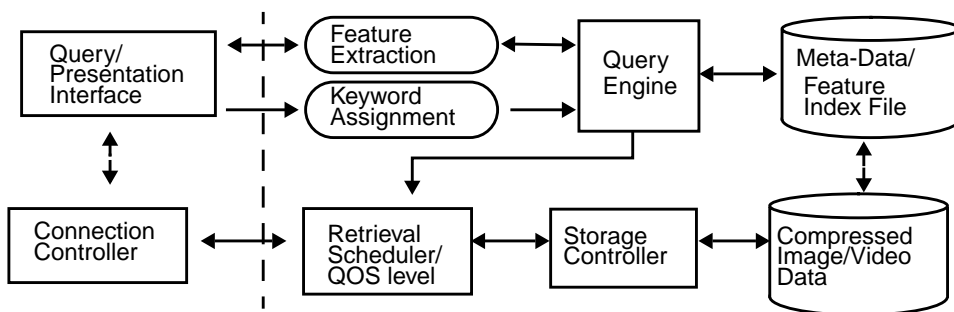


FIGURE 8. Processing retrieved video in (a) the uncompressed domain (b) the compressed domain.



**FIGURE 9. One example scenario of manipulating retrieved compressed images. Multiple retrieved images are scaled, translated, and composited into a single displayable stream.**



**FIGURE 10. A system model of the content-based visual query engine in the VOD server.**

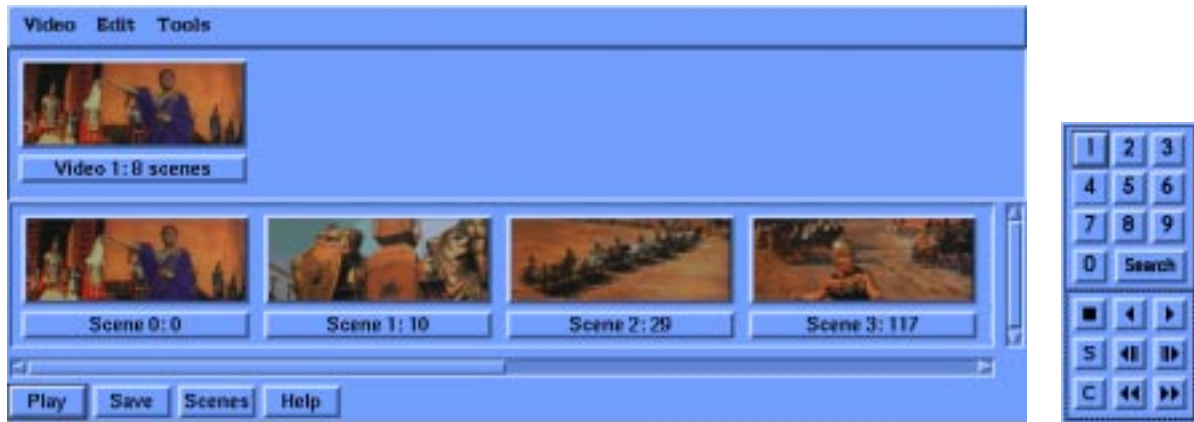


FIGURE 11. The Video Browser User Interface with Scene Change Detection

**Table 1: Bitrate Allocations in Our Scalable Video Coding Scheme**

<p><b>Base layer: (layer 0)</b>            Avg. bit rate: 0.32 Mbps      Frame size: 304x112            Subjective Visual Quality: Super VHS            Avg. PSNR: 35 dB</p>
<p><b>Spatial enhancement layer: (layer 1)</b>            Avg. bit rate: 0.832 Mbps      Frame size: 608x224            Subjective Visual Quality: Super VHS            Avg PSNR: 34 dB</p>
<p><b>SNR enhancement layer: (layer 2)</b>            Avg. bit rate: 1.856 Mbps      Frame size: 608x224            Subjective Visual Quality: LaserDisc            Avg. PSNR: 37 dB</p>

(All frame rates are 24fps)

