

## Lecture 9 –Video Compression

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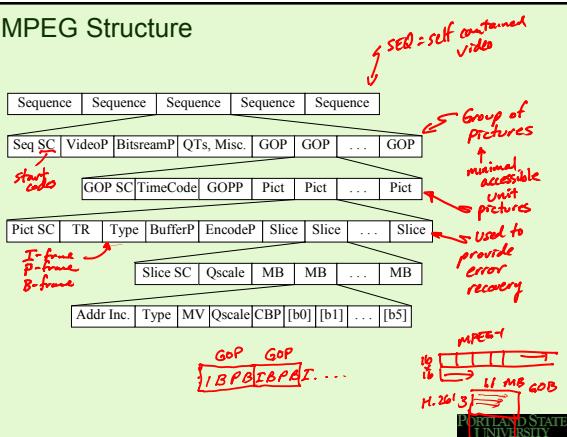
**NO CLASS  
MONDAY**

### Admin

- HW 4 due now
  - Due Monday – Hardcopy only
- PA2
  - Due Nov. 18, 2015
  - You can work with a partner

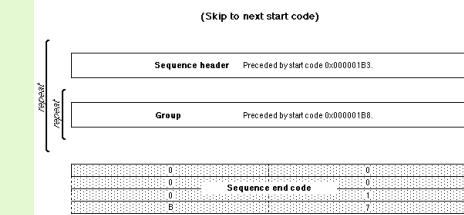
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### MPEG Structure

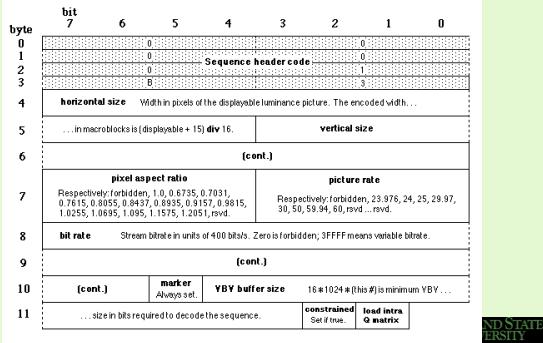


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### MPEG-1 Video Sequence

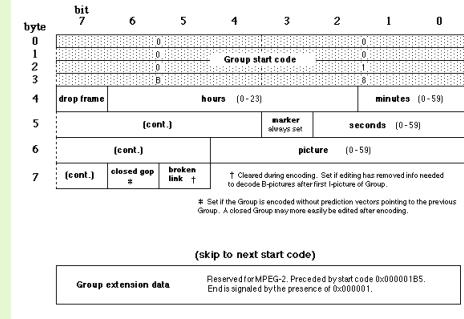


### MPEG-1 Sequence Header

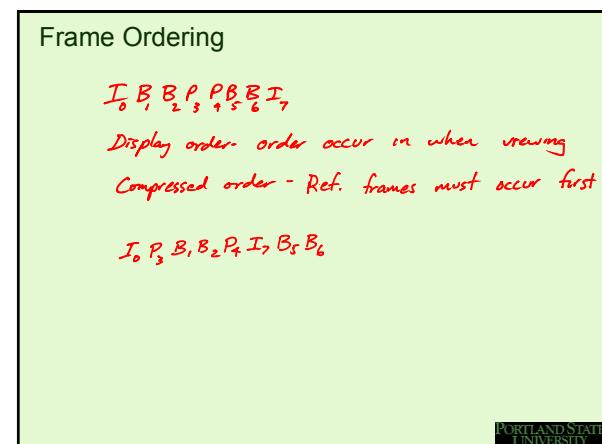
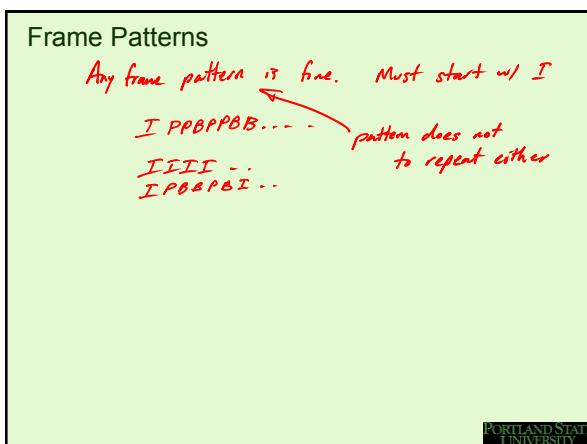
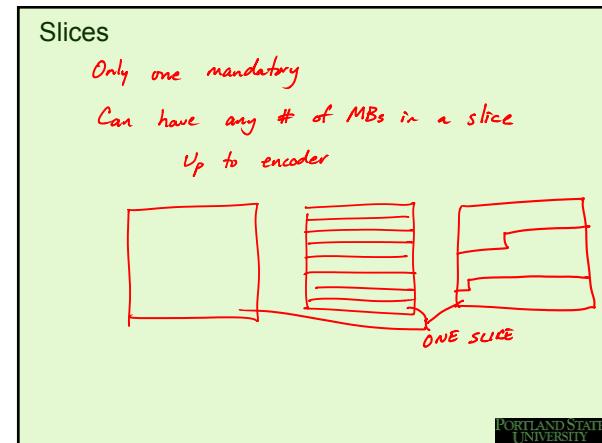
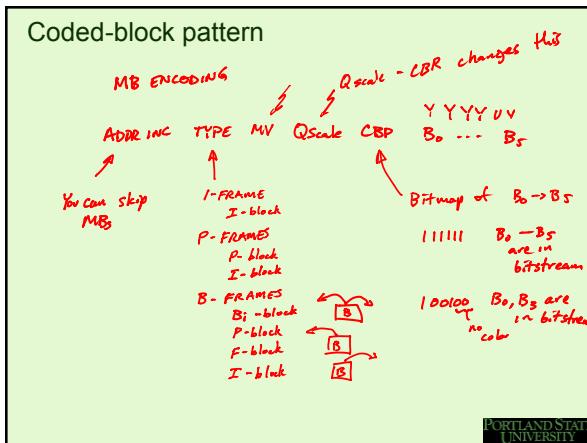
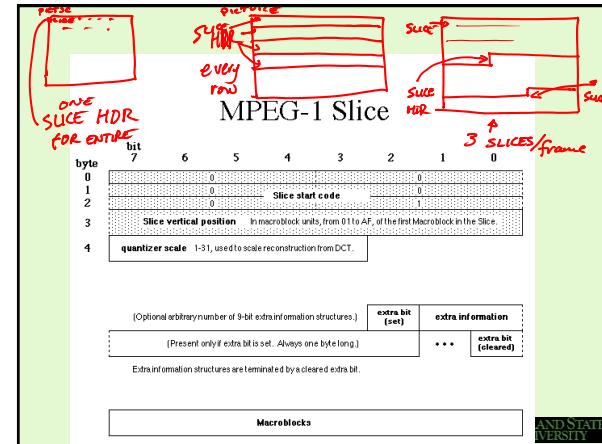
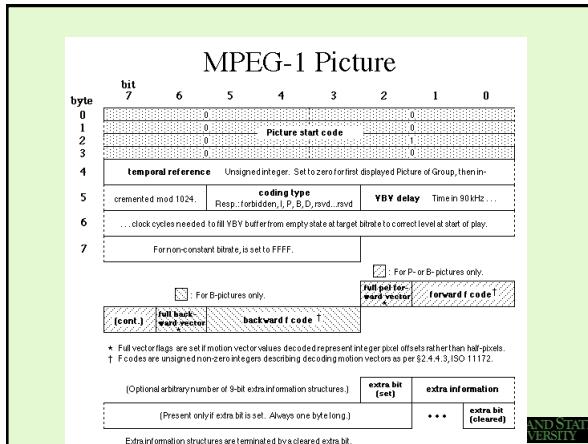


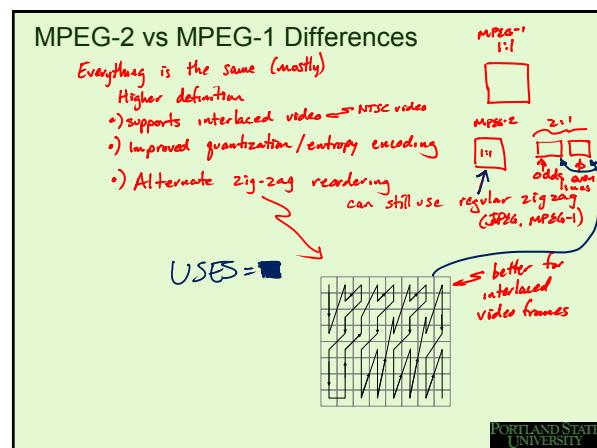
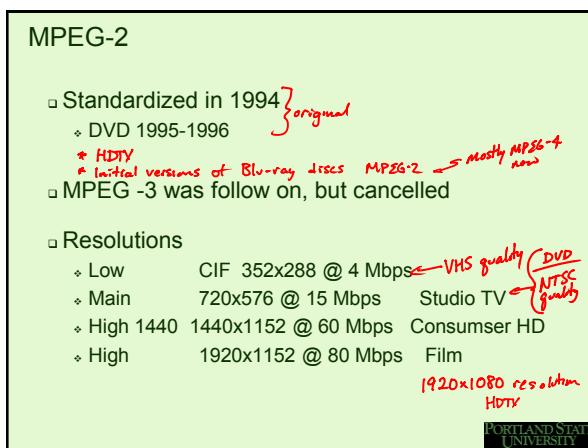
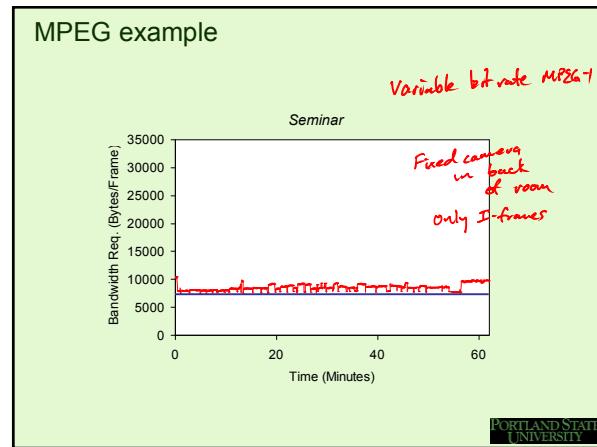
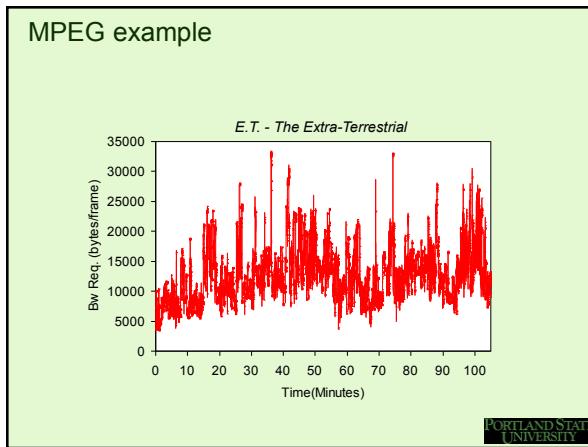
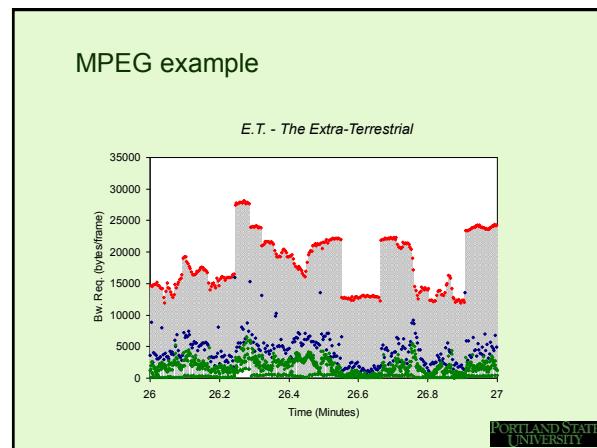
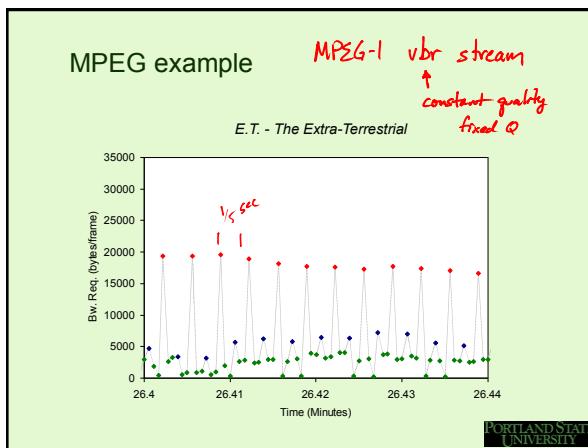
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### MPEG-1 Group of Pictures



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## MPEG-4

Started in late 90s



Two different parts

MPEG-4, part 2 - continuation of MPEG-2  
• adds quarter pel searching

MPEG-4/H.264 AVC  
Lots more differences  
next slide

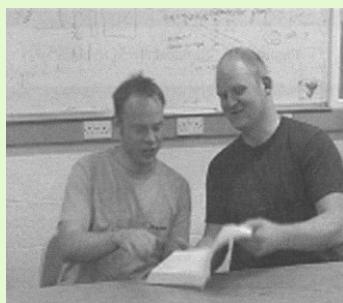
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## MPEG-4 vs. MPEG-2

*MPEG-4 • same quality as  
MPEG-2 1/2 bit rate*

	MPEG-2/H.263	MPEG-4AVC
Intra prediction	None <i>I frame</i>	4x4 or 16x16 <i>4x4</i>
Motion block size	16x16, 16x8, 8x16 8x8, 8x4, 4x8, 4x4	16x16, 16x8, 8x16 8x8, 8x4, 4x8, 4x4
MVs	Full, Half	Full, Half, Quarter
P Frame	Single <i>I P</i>	Single, Multiple <i>I PP</i>
B Frame	1 - each way	1 each way, multiple weighted
DCT	8x8	8x8, 4x4
In loop filters	None	<i>block artifacts</i> De-blocking <i>Filter to P frame</i>

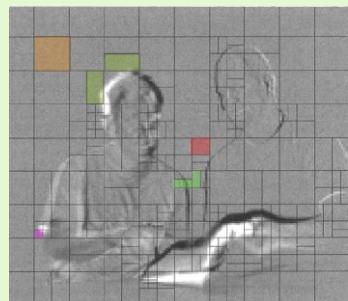
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Source: H.264 and MPEG-4 Video Compression, Lain E.G. Richardson, Wiley

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*END OF NOTES FOR QUIZ 2*



*MAN BEFORE LAST QUIZ  
IMAGE COMPRESS  
↓  
MPEG VIDEO*

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## Basic Audio Compression

"Ideal" signal

44,100 Hz 16-bit sample with 2 channels  
1.4 Mbps

Compression

Entropy encode - e.g. LZW or Huffman  
2-to-1 ratio  
Exact compression is often not required

Use lower resolution / freq. sampling

ITU G.711 A-law format  
8000Hz samples w/ 8-bit samples

Linear vs. logarithmic samples



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## Basic Audio Compression

Silence compression

2 people talking  $\approx 40\%$  silence

- + can't really achieve high compression ratios, particularly for music

Differential coding

Encode differences between samples

- + in general smaller codewords

- max. rate of change

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## MPEG Audio Compression

↳ general purpose audio compression

Really take advantage of human hearing limitations

Freq. limitation

20 Hz - 20,000 Hz

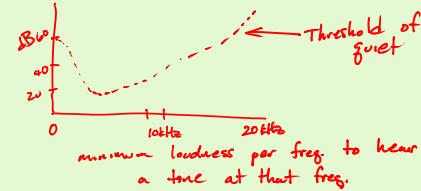
Highest acuity in 2,000 - 4,000 Hz

Normal speaking 500 to 2000 Hz

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## MPEG Audio Compression

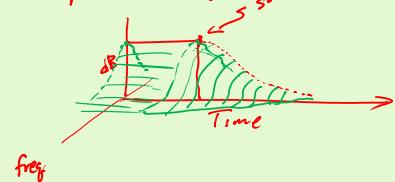
Threshold of Quiet



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## MPEG Audio Compression

Temporal masking  
solid tone stops



█ = freq masking

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