Expression Encoder

Best Practices for live smooth streaming broadcasting.

Jamie Lang – Lead Program Manager

Microsoft Corporation

H.264 or VC-1?

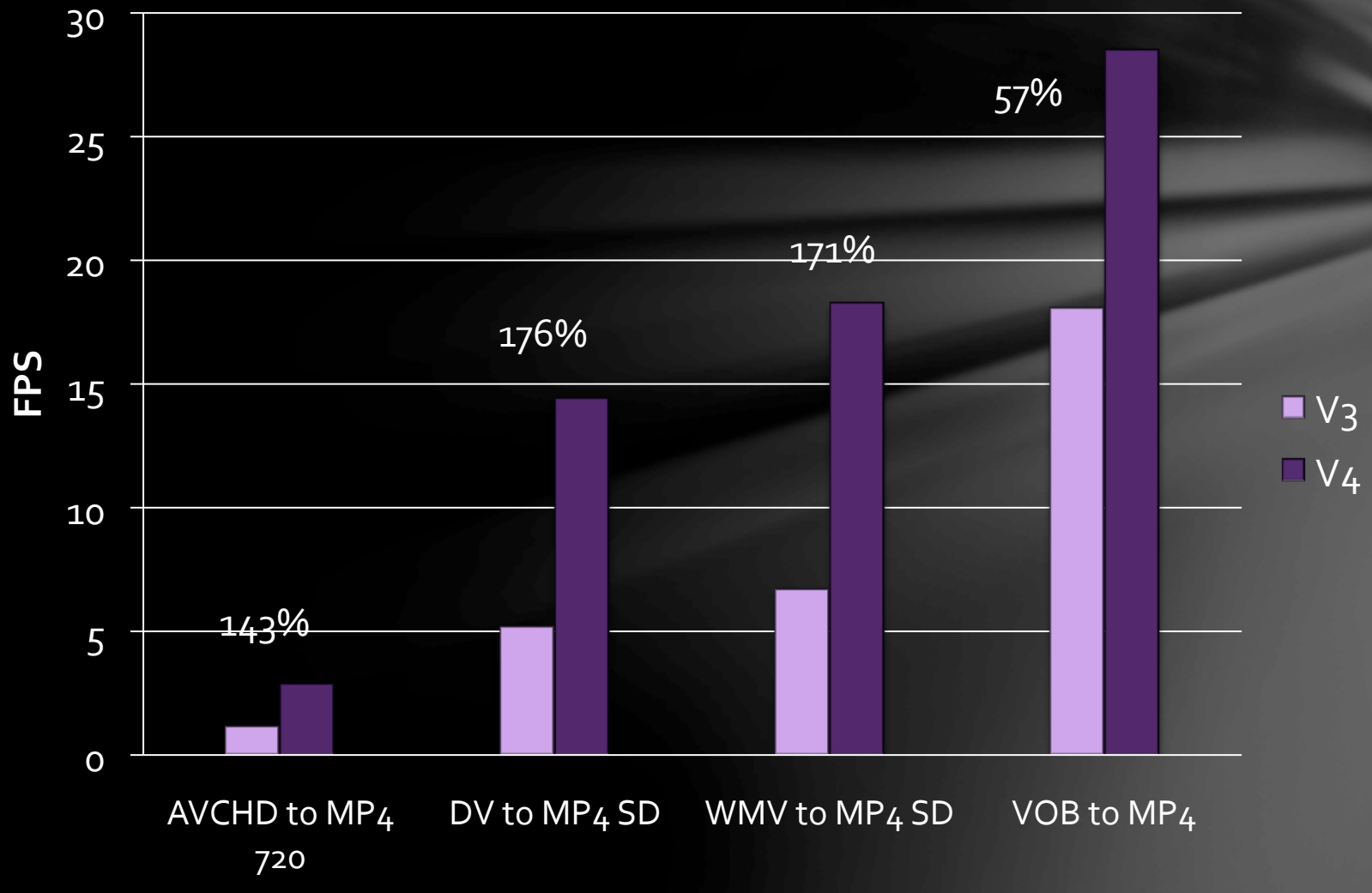
Customers should choose whichever codec best fits their encoding workflow and meets their quality requirements. However, keep in mind:

- H.264 decoding is typically more CPU intensive than VC-1 decoding for the same resolution and frame rate
- In Silverlight 4: H.264 decoding requires about 15-25% more CPU time than VC-1 decoding with similar content properties

Good rule of thumb:

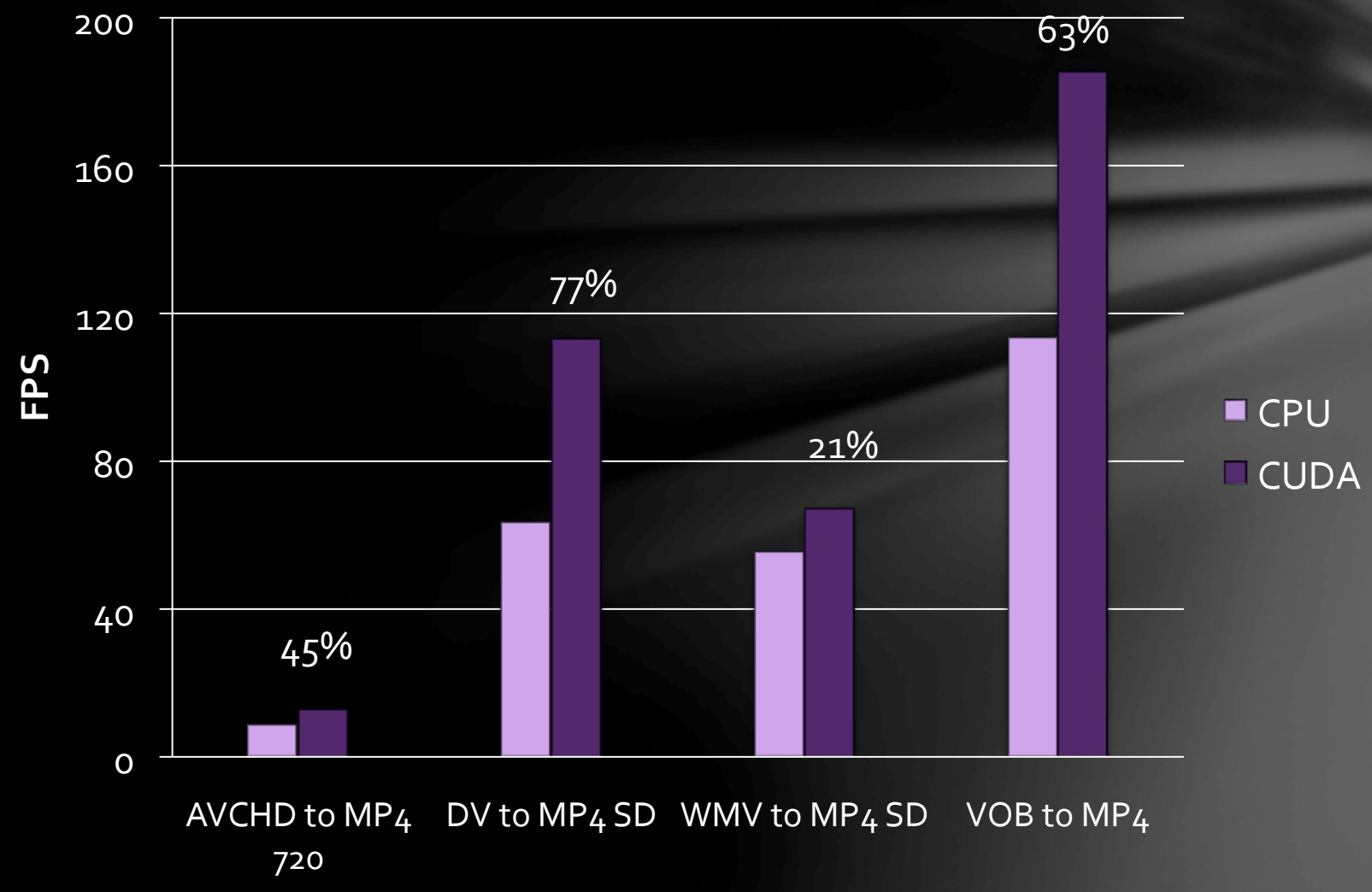
- For HD video, use VC-1 to reach largest audience
- For SD video and smaller, use H.264 if quality gains are noticeable

H.264 Performance



Cuda Performance

GTX 480 (480 cores)



Multi Bit Rate Encoding

- Smooth Streaming heavily utilizes the concept of encoding video at multiple bit rates and letting the client pick the most appropriate one
- Key differences between how MBR was used in the past and the way it's used in Smooth Streaming:
  - Resolution changes with bit rate in order to maintain consistent quality
  - Strict enforcement of video bitstream properties necessary to decode every chunk independently of other chunks
  - Temporal alignment of frames visually matches up with the same chunk in a different bit rate

Why Change Resolution?

- Encoding the same resolution at inappropriately low bit rates introduces objectionable compression side effects into the video: blockiness, twirling details, color smearing, etc.

- By lowering the resolution proportionally to the bit rate we maintain a consistent level of compression quality in exchange for giving up some visual detail

- It's a compromise: between two evils, customers prefer a blurry picture over a blocky picture

VC-1: 640x360 at 1250 kbps

VC-1: 640x360 at 300 kbps

VC-1: 288x160 at 300 kbps

VC-1: 640x360 at 750 kbps

VC-1: 400x224 at 750 kbps

Determining Bit Rate Levels

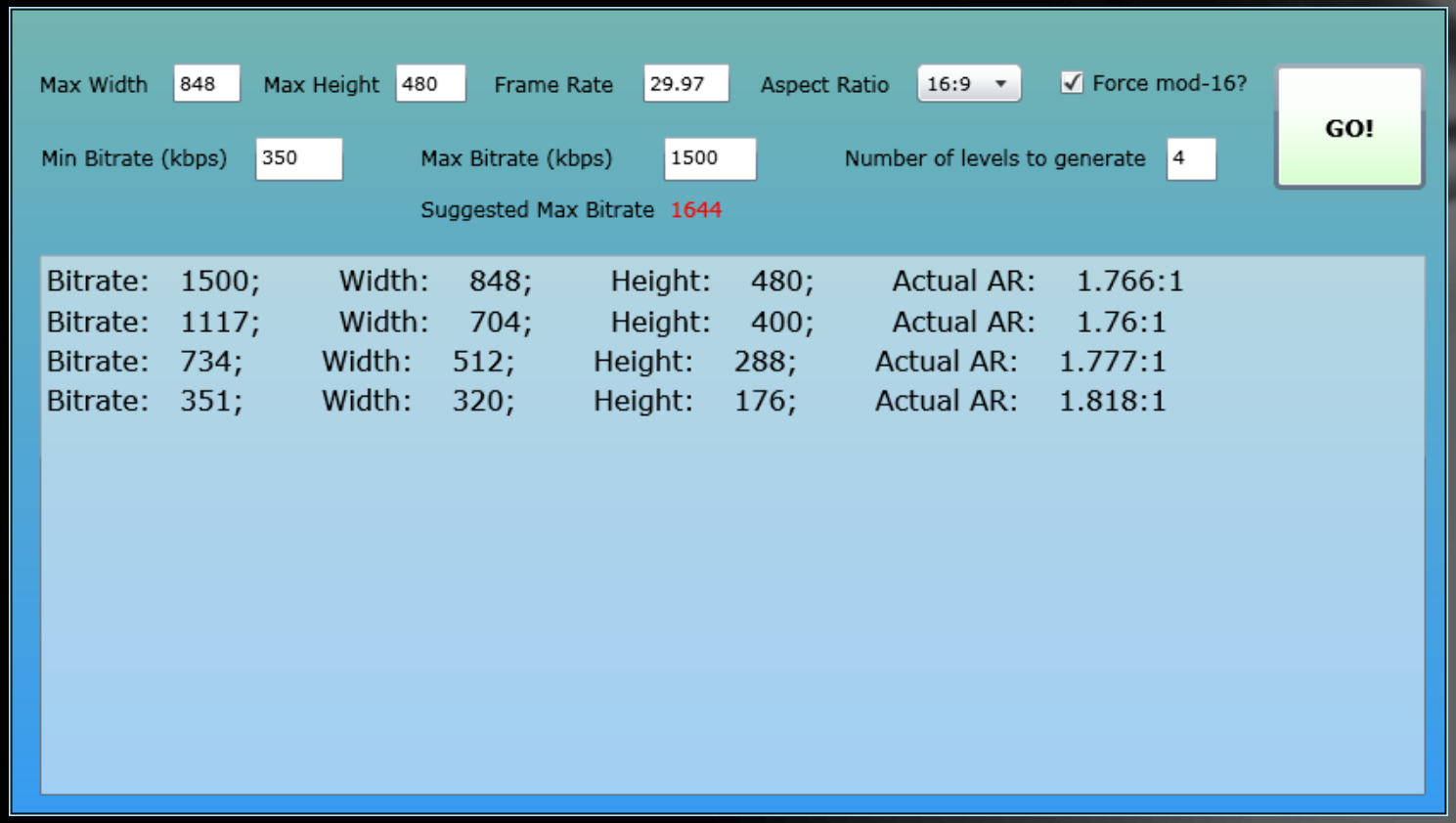
- You can use as few as you'd like – even just a single level
- Upper bound is typically set by the encoding software
- 4 bit rates for SD and 6 bit rates for 720p HD are good starting points

Picking Bit Rates

- Start by figuring out your maximum bit rate and minimum bit rate
- Allow about 250-500 kbps between bit rate levels
- Don't set minimum bit rate lower than 200 kbps
- Consider grouping the lower bitrates a little closer together than the rest because client bandwidth is most diverse on the lower end.

Smooth Streaming Calculator

http://alexzambelli.com/wmv/MBRCalc.html



Encoding for Smooth Streaming

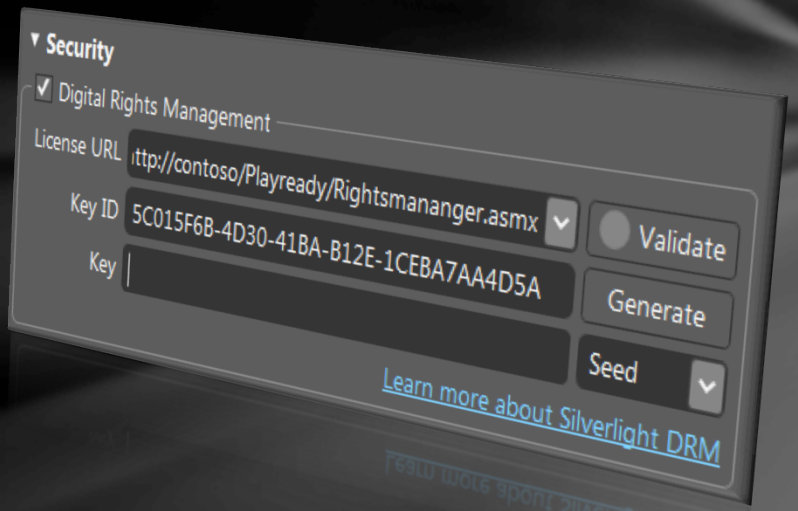
- Use VC-1 Advanced Profile or H.264 Main/High Profile
- 2 second key frame distance works very well
- Client heuristics are currently tuned for CBR content, so if using VBR set the peak bit rate within 15% of average bit rate for best playback
- Set video buffer size to 2x-3x key frame distance

Demo

Live Smooth Streaming Performance Tool -
http://gallery.expression.microsoft.com/en-us/EE4LivePerfTool

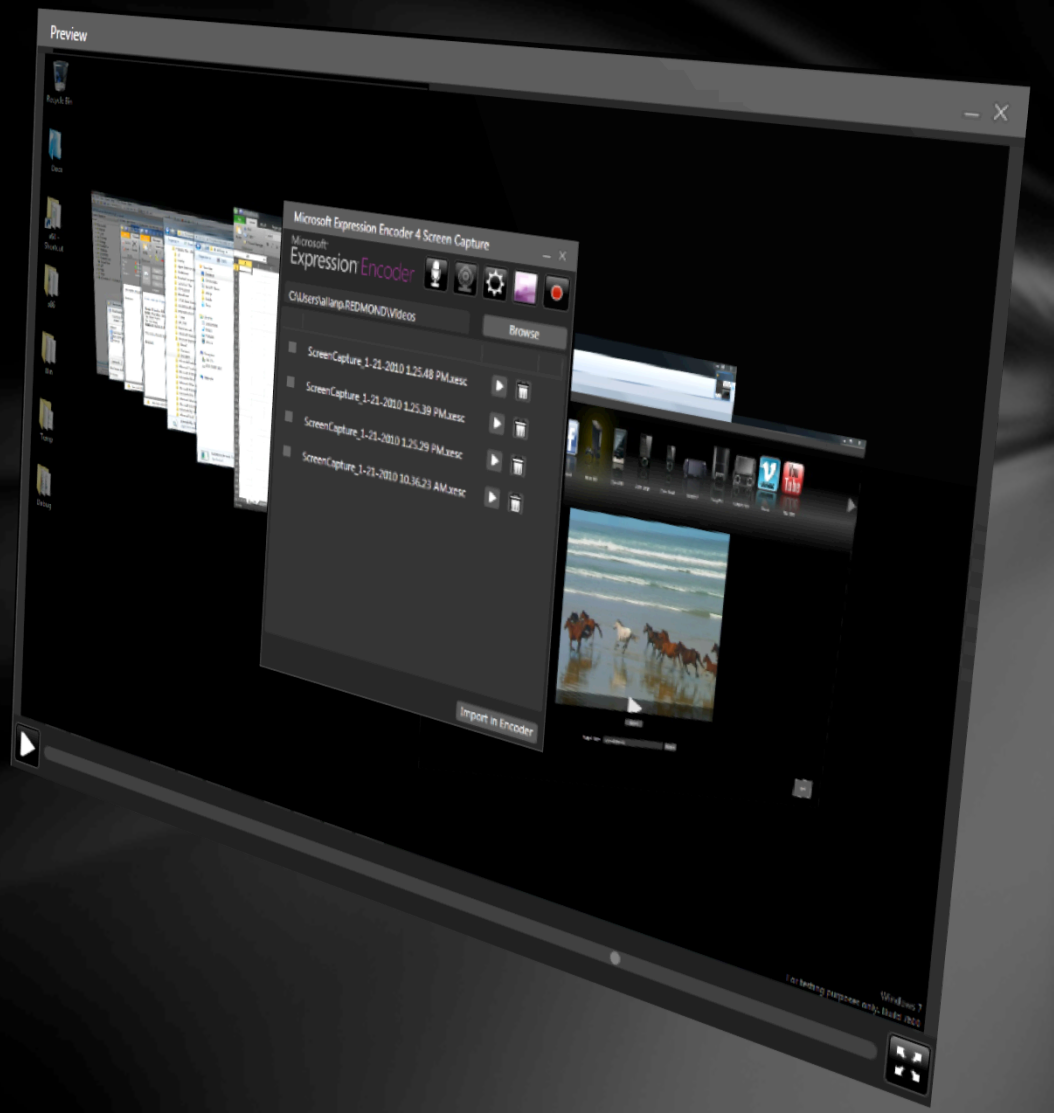
Digital Rights Management

- PlayReady
- Integrated into the application
- On-Demand & Live
- Smooth Streaming
- VC-1 & H.264



Screen Capture

- Registered Codec
- Full Object Model
- Capture Manager
- Zooming
- Mouse Tracking



User Requests

- **Improved Closed Captioning**
- **Performance**
- **Azure Publishing**
- **Watch Folders (Sample)**

Q & A

jlang@microsoft.com

http://social.expression.microsoft.com/Forums/en-US/encoder/