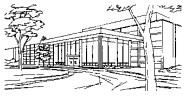


Digital Simulcast Layers

The digital simulcast hierarchy operates in a layered environment somewhat analogous to the CCITT ISO Layers defined for teletext service. The lowest layer corresponds to the physical transport of information. The highest layer corresponds to scene being viewed. We must assume the task of thoughtfully defining the layers and the interfaces among them. Detail pertinent to a low level is isolated from the higher levels by the interfaces.

As an attempt to start discussion of the layering definition, the following structure is suggested:

- level 10:Picture presentation level.
  This level relates to the actual scene being sent or viewed. It is continuous in space, color and motion. It is what the camera or viewer sees. Entities on this level are measured in lumens and position or angular position.

- level 9: Image level.
  This level deals with the image. The image is on the surface of an imaging device or display device. There is a two-dimensional spatial geometry that may or may not be quantized. (CCDs, LCDs, DMDs vs. Pickup and projection tubes with shadow-mask tubes in the middle) At this level the aspect ratio is defined.

- level 8: Display or camera interface level:
  This corresponds to video signals; both analog and digital. At this level, the geometry is quantized and defined to the pixel and scanline level. [pixel sampling rate?] [Digital video samples?] There are a variety of interconnect standards.

- level 7: Digital Video stream:

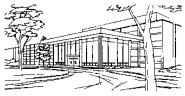
This is our well defined hierarchy ideal signal specification. On the input side, there has been no distortion. [1920 x 1080 x 60 or 1920 x 1080 x 24 or better] On the output side, this represents the desired picture. The resolution will depend upon various cost tradeoffs in the receiver or decoder design.

- level 6: Internal Representation:
  There are a variety of lossless transformations that may be applied to the input. Before actual compression takes place, the image may be converted to frequency domain, in various sub-bands, or may be otherwise transformed. When encoding this is a faithful representation of the input. When decoding, this represents the desired output, which may not be the same as the input.

- level 5: Source Coded representation:
  This is a compressed conglomeration of objects where each object is part of the picture stream. In general, each object contains descriptive information (this is a block of DCT coefficients, which block, how big, this is a global parameter block, this is a Huffman table, & etc.), and data. On the receiving end, the objects also contain exception information (this block contains errors at ..., this block is all garbage, this block was not received -- it should have been -- it is a dummy.). Hopefully, this representation can be channel independent.

- level 4: Channel object stream representation:
  This contains the source coded objects, re-arranged, re-ordered and adjusted for sequencing constraints of the channel. For example, very high priority items may be marked as duplicates and repeated. Objects with similar priorities may be conglomerated into larger blocks. Different channels will require different channel stream representations. Video tape may require blocking of refresh data into particular sequential blocks.

- level 3: Channel bit stream:
  This contains the object stream, forward error correction information, synchronization and framing. The data has been mapped to a stream of "bits" at a rate that matches the channel. The "bits" are probably arranged into symbols.



- level 2: Baseband Modulation:
  This is the modem modulator output, or demodulator input, but not translated to the final medium.

- level 1: Electrical signal:
  This is the modem signal as translated for the actual medium (on a carrier for broadcast, in some other form for tape, in some FM format for satellite, & etc.

- level 0: Medium:
  This is electromagnetic radiation for broadcast, magnetic domains for tape, photons for fiber optics. While it seems trite to include this level, this is where the noise and distortion comes in.