

# Headend – Broadcast (Encode, multiplexing and RT)

Use-case	A20	E50	E60	H70
SRT/RIST/ZIXI/TS throughput	1.5Gbps or 80 streams	10.5Gbps or 750 streams	16.8Gbps or 1200 streams	TBA
scrambled/Unscrambled multiplexer throughput	2.0Gbps 200Mbps per TS	TBA 200Mbps per TS	12Gbps 200Mbps per TS	TBA
MPEG-2 SD 4:2:0 Extreme encode	7	48	69	92
MPEG-2 1080i 4:2:0 Extreme encode	4 (2 if src = 422 HD)	37 (14 if src = 422 HD)	50 (14 if src = 422 HD)	76 (43 if src = 422 HD)
MPEG-2 1080i 4:2:0 Up! encode	4 (2 if src = 422 HD)	24*	24*	24*
AVC SD 4:2:0 Standard encode	8	57	74	114
AVC SD 4:2:0 Extreme encode	7	44	54	83
AVC 1080i 4:2:0 High Standard encode	4	32	47	69
AVC 1080i 4:2:0 High Extreme encode	3 (2 if src = 422 HD)	25 (13 if src = 422 HD)	27 (13 if src = 422 HD)	55 (26 if src = 422 HD)
AVC 1080i 4:2:0 High Up! encode	2	12	17	27
AVC 1080i 4:2:0 High Up!+ encode	2	7 (7 if src = 422 HD)	11(10 if src = 422 HD)	18
HEVC 1080i 4:2:0 Extreme encode	2 (1 if src = 422 HD)	20 (17 if src = 422 HD)	28 (22 if src = 422 HD)	41(32 if src = 422 HD)
HEVC 1080i 4:2:0 Up! encode	1	7	10	TBA

\*limited by i/o

\*\* choose 2x A20 for controllers in distributed deployment

# Headend – Streaming (Encoding & Packaging)

Use-case*	C30/60	E50	E60	H70
Ladder 1 = SD AVC 480	14	44	58	82
Ladder 2 = HD AVC 720	8	28	37	50
Ladder 3 = HD AVC 1080	5	16	21	29
Ladder 4 = HD AVC 1080 Extreme	-	7	9	13
Ladder 5 = HD HEVC 1080	-	-	5	7
Ladder 6 = UHD HEVC 2160	-	-	1	2

### \* Ladder details in appendix

- Choose 2x A20 nodes for controllers in distributed deployment
- Assume 5% more capacity if transcode-only (i.e., no packager)
- Assume 15% less capacity if 4:2:2 10-bit sources for AVC ladders
- Assume 15% more capacity if 25fps (vs. 29.97fps default) for AVC ladders

# Contribution Encoding – low delay (SDI input)

Use-case	A20	X20	C30	E50	E60	H70	X40
MPEG-2 (720P) 4:2:2 10bit encode	5	5	8	24	24	24	24
MPEG-2 (1080i) 4:2:2 10bit encode	3	2	5	13	17	24	17
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AVC (720P) 4:2:2 10bit encode	4	3	5	15	22	24	12
AVC (1080P) 4:2:2 10bit encode	1	1	2	6	9	13	4
AVC (1080P) 4:2:2 8bit encode	2	1	3	8	10	16	5
AVC (1080i) 4:2:2 10bit encode	3	2	4	12	16	24	10
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HEVC (720P) 4:2:2 10bit encode	2	2	4	11	16	24	9
HEVC (1080P) 4:2:2 10bit encode	1	1	2	5	8	12	4
HEVC (UHD/4k) 4:2:2 10bit encode	0	0	1	1	2	3	1
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JPEG-XS (1080p) 10bit encode	4	4	7	24	24	24	24

# Contribution Latency

Use-case	Encode	Decode	End2End
Beam AVC (720p59.94) 4:2:2 10-bit	202ms	164ms	366ms
Beam AVC (1080p59.94) 4:2:2 10-bit	203ms	169ms	371ms
Beam AVC (1080p50) 4:2:2 10-bit	234ms	173ms	407ms
CE1/RX1 AVC (1080p59.94) 4:2:2 10-bit			405ms
Beam HEVC (1080p59.94) 4:2:2 10-bit	205ms	166ms	371ms
Beam HEVC (1080p50) 4:2:2 10-bit	234ms	178ms	412ms
Beam JPEG-XS (1080p59.94) 10bit	114ms	168ms	282ms
Beam JPEG-XS (1080p50) 10bit	140ms	182ms	322ms

# Reception / Receivers / IRDs

Use-case	A10 (new CPU)	A20 (new CPU)	X20	C30	E50	E60
MPEG-2 1080i 4:2:0 decode	5	13	10	24	24	24
MPEG-2 1080p 4:2:2 decode	4	11	10	13	24	24
AVC 1080i 4:2:0 decode	3	7	5	23	24	24
AVC 1080p 4:2:2 decode	2	5	4	9	24	24
HEVC 1080i 4:2:0 decode	2	4	3	18	24	24
HEVC 1080p 4:2:2 decode	2(p50) 1(p59)	3	3	8	24	24
HEVC UHD 4:2:2 decode	0	1	1	3	6	6
JPEG-XS 1080p 4:2:2 decode	3	4	3	8	24	24
SRT/RIST/ZIXI/TS throughput	1.2Gbps or 80 streams	1.5Gbps or 80 streams	1.0Gbps or 60 streams	TBA	10.5Gbps or 750 streams	16.8Gbps or 1200 streams

# Streaming profile detail

Ladder 1	Codec	Resolution	Bit rate
SOURCE	MPEG-4	1080i29.97 420 8-bit	20
1	MPEG-4 Standard	854x480 29.97	2.5
2	MPEG-4 Standard	768x432 29.97	1.2
3	MPEG-4 Standard	640x380 29.97	0.8

Ladder 3	Codec	Resolution	Bit rate
SOURCE	MPEG-4	1080i29.97 420 8-bit	20
1	MPEG-4 Standard	1920x1080 29.97	6
2	MPEG-4 Standard	1280x720 29.97	3.7
3	MPEG-4 Standard	854x480 29.97	3
4	MPEG-4 Standard	768x432 29.97	1.8
5	MPEG-4 Standard	640x360 29.97	1.3

Ladder 2	Codec	Resolution	Bit rate
SOURCE	MPEG-4	1080i29.97 420 8-bit	20
1	MPEG-4 Standard	1280x720 29.97	3.7
2	MPEG-4 Standard	768x432 29.97	2.4
3	MPEG-4 Standard	640x360 29.97	1.3
4	MPEG-4 Standard	512x288 29.97	0.8
5	MPEG-4 Standard	320x180 29.97	0.4
6	MPEG-4 Standard	256x144 29.97	0.25

Ladder 4	Codec	Resolution	Bit rate
SOURCE	MPEG-4	1080i29.97 420 8-bit	20
1	MPEG-4 Extreme	1920x1080 59.94	8
2	MPEG-4 Extreme	1280x720 59.94	6
3	MPEG-4 Extreme	1280x720 59.94	4.5
4	MPEG-4 Standard	854x480 29.97	2.5
5	MPEG-4 Standard	854x480 29.97	1.8
6	MPEG-4 Standard	768x432 29.97	1.2
7	MPEG-4 Standard	640x360 29.97	0.8

# Streaming profile detail

Ladder 5	Codec	Resolution	Bit rate
SOURCE	HEVC	1080p5994 422 10-bit	40
1	HEVC Extreme	1920x1080 59.94	6
2	HEVC Extreme	1280x720 59.94	4.5
3	HEVC Extreme	1280x720 59.94	3
4	HEVC Standard	854x480 29.97	2
5	HEVC Standard	854x480 29.97	1.5
6	HEVC Standard	768x432 29.97	1
7	HEVC Standard	640x360 29.97	0.7

Ladder 6	Codec	Resolution	Bit rate
SOURCE	HEVC	2160p5994 422 10-bit	80
1	HEVC Extreme	3840x2160 59.94	18
2	HEVC Extreme	2560x1440 59.94	12
3	HEVC Extreme	1920x1080 59.94	8
4	HEVC Extreme	1280x720 59.94	5
5	HEVC Standard	960x540 59.94	2
6	HEVC Standard	960x540 59.94	1.5