JPEG ULL Interoperability Activity Group

February 2019
John Dale, Media Links
Andrew Krupiczka, ESPN

MEDIA LINKS®
Media Defined Networking®

VSF
VIDEO SERVICES FORUM

Presentation Outline

1. Status update summary
2. J2KULL Interoperability Workshop and Demo
3. Proposed future work

1. Status update summary

- TR-01:2018 published in June 2018

- J2KULL TR-01:2018 compliant systems demonstration @VidTrans'19
    - ✓ dirty hands Interoperability workshop held in Houston last month
    - ✓ participants: Evertz, GrassValley, Media Links, Artel
    - ✓ 1080p Interoperability Points #7 (Standard) and #19 (ULL-9 Stripes)

- future technical work – proposing to add a new three work items:
    1) adding a new 1080p/4K HDR Interoperability Points to TR-01
    2) adding 4K/UHD 2SI interface support to TR-01
    3) JPEG-2000ULL elementary streams transport using ST 2110-22

2. J2KULL Interoperability Workshop and Demo

For the technology demonstration event: #7 & # 19 Selected

Interop Points	Profile/ Short Name	extended_capability_flag	Format & Frame Rate*	Bit Rate**	Capability Rsiz parameter***	Bit Depth	Color Sampling	Color Space	Striping	Blocking	Code Block Tx	Code Block Rx	Audio	Audio	Audio ****	B-B Target Latency	Carry over from TR-01 2013
1	SD	0	480i/29	50Mbps	0x0101	10bit	4:2:2	BT 601-6	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
2	SD	0	576i/25	50Mbps	0x0101	10bit	4:2:2	BT 601-6	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
3	HD	0	720px1280/59	75Mbps	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
4	HD	0	720px1280/50	75Mbps	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
5	HD	0	1080ix1920/29	75Mbps	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
6	HD	0	1080ix1920/25	75Mbps	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
7	3G	0	1080px1920/59	200Mbps	0x0104	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID		Just audio change
8	3G	0	1080px1920/50	200Mbps	0x0104	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID		Just audio change
9	S3D-HD	0	720px1280/59	75Mbps Each (L,R)	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
10	S3D-HD	0	720px1280/50	75Mbps Each (L,R)	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
11	S3D-HD	0	1080ix1920/29	75Mbps Each (L,R)	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
12	S3D-HD	0	1080ix1920/25	75Mbps Each (L,R)	0x0102	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
13	S3D-3G	0	1080px1920/59	200Mbps Each (LR)	0x0104	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
14	S3D-3G	0	1080px1920/50	200Mbps Each (LR)	0x0104	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	20-bit	1 ChPr	1 PID		Yes
15	HD	1	720px1280/59	125Mbps	0x0102	10bit	4:2:2	BT-709	6	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	6-8ms	ULL Application
16	HD	1	720px1280/50	125Mbps	0x0102	10bit	4:2:2	BT-709	6	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	7-9ms	ULL Application
17	HD	1	1080ix1920/29	125Mbps	0x0102	10bit	4:2:2	BT-709	5	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	20-27 ms	ULL Application
18	HD	1	1080ix1920/25	125Mbps	0x0102	10bit	4:2:2	BT-709	5	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	24-32ms	ULL Application
19	3G	1	1080px1920/59	200Mbps	0x0104	10bit	4:2:2	BT-709	9	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	6-8ms	ULL Application
20	3G	1	1080px1920/50	200Mbps	0x0104	10bit	4:2:2	BT-709	9	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	7-9ms	ULL Application
21	UHD4	1	2160px3840/59	800Mbps	0x0106	10bit	4:2:2	BT-709	None	4x 1080	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	3-4frames	UHD Application
22	UHD4	1	2160px3840/50	800Mbps	0x0106	10bit	4:2:2	BT-709	None	4x 1080	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	3-4frames	UHD Application
23	UHD4	1	2160px3840/59	800Mbps	0x0106	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	3-4frames	UHD Application
24	UHD4	1	2160px3840/50	800Mbps	0x0106	10bit	4:2:2	BT-709	None	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	3-4frames	UHD Application
25	UHD4	1	2160px3840/59	800Mbps	0x0106	10bit	4:2:2	BT-709	9	4 x 1080 Sq. Div.	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	6-8ms	ULL UHD Application
26	UHD4	1	2160px3840/50	800Mbps	0x0106	10bit	4:2:2	BT-709	9	4 x 1080 Sq. Div.	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	7-9ms	ULL UHD Application
27	UHD4	1	2160px3840/59	800Mbps	0x0106	10bit	4:2:2	BT-709	9	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	6-8ms	ULL UHD Application
28	UHD4	1	2160px3840/50	800Mbps	0x0106	10bit	4:2:2	BT-709	9	None	32 x 32	32 x 32	24-bit	1 ChPr	1 PID	7-9ms	ULL UHD Application

2. J2KULL Interoperability Workshop and Demo

For the technology demonstration event: #7 & # 19 Selected

   #7 1080p/59 Non ULL (TR-01:2013) except 24bit audio
   #19 1080p/59 ULL (TR-01: 2018) 9 stripes

Expected workshop workflows:

   #7 encoder to #7 decoder
   #19 encoder to #19 decoder
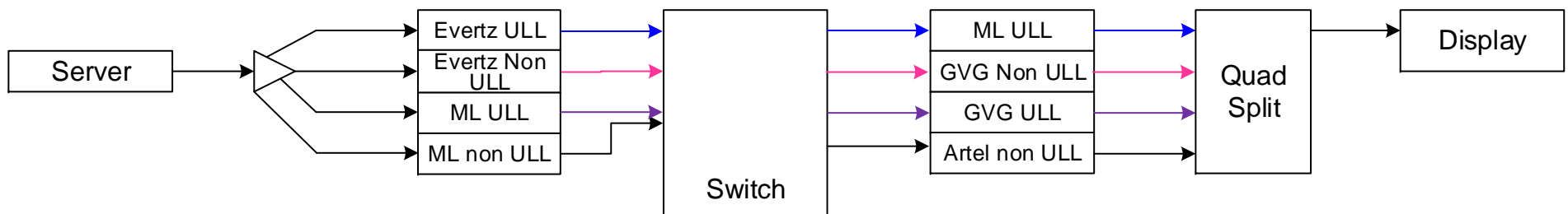   #7 encoder to #19 decoder
   Comparison of #7 output to #19 output

   Focus on video and audio, will not involve ancillary at this time

2. J2KULL Interoperability Workshop and Demo

Demo Set up

Server		Evertz ULL	→	Switch	→	ML ULL	→	Quad Split	→	Display

Server → Evertz ULL / Evertz Non ULL / ML ULL / ML non ULL → Switch → ML ULL / GVG Non ULL / GVG ULL / Artel non ULL → Quad Split → Display

1. Media Links To GVG # 19 ULL 239.1.1.20	2. Evertz To Media Links #19 ULL 239.2.2.1
3. Media Links To Artel #7 Non ULL 239.1.1.21	4. Evertz To GVG #7 Non ULL 239.1.1.21

2. J2KULL Interoperability Workshop and Demo

Limited Success, 6 out of 20 Cases

- Based on very short period for development, good results
- No consistent problems
- Understanding of TR-01 was consistent

Stream	Profile	Received by V1	Received by V2	Received by V3	Received by 4
V1	7		Not Received	Received, decoded, Good	Not Received
V1	19		Received, Decoded, Good	Not Received	Not Received
V2	19	Not Received		Received, decoded, Good	Not Received
V2	7	Not Received		Not Received	Receive, decoded, Good
V3	7	Not Received	Not Received		Not Received
V3	19	Not Received	Not Received		Not Received
V4	7	Received, Decoded, Good	Received, Decoded, Good	Not Received	

3. Future Technical Work

Future technical work – proposing to add a new three work items:

1) adding a new 1080p/4K HDR Interoperability Points to TR-01
2) adding 4K/UHD 2SI interface support to TR-01
3) JPEG-2000ULL elementary streams transport using ST 2110-22

3. Future Technical Work (1)

<u>a new workitem #1</u>

Add to Table12 a limited # of Interoperability Points for UHD/4K & 1080P HDR video

- ✓ motivation/value: to accommodate/support a live production-level HDR signals
- ✓ *static/base formats:* HDR10, HLG, Slog-3 vs *dynamic formats:* DolbyVision, HDR10+
- ✓ technical target: specify a limited number of HDR ready IOPs with the support!
- ✓ <u>*notes/questions:*</u> *due to market fragmentation is it too early for dynamic formats?*
- ✓ *shouldn't 12 bit video also be supported for a workflows requiring HDR format conversions?*

<u>a new workitem #2</u>

Add UHD/4K 2SI interface support to TR-01

- ✓ motivation/value: popular interface for 4K signals
- ✓ technical target: embed 2SI signaling into TR-01 compliant streams for interoperability
- ✓ *notes:*

2. Future Technical Work (2)

a new workitem #3

JPEG-2000ULL elementary streams transport via SMPTE 2110-22

- ✓ motivation/value: to bring J2KULL bitstreams into ST 2110 compatible workflows
- ✓ technical target: develop a new RFC for 2110 compliant transport of J2KULL video over RTP to allow for design of 2110 based multi-format IP gateways
- ✓ *notes/questions:*
- ✓ *example workflow#1 – to enable compressed video inter facility trunked transport systems (as targeted by 2110overWAN AG @VSF*
- ✓ *example workflow#2 – to enable combination of SDI and J2KULL video streams in a PCR and/or MCR environments for more efficient media workflows, e.g. by reducing a number of multigenerational media transcoding iterations as required today*

Further Discussion, Questions, Comments
- Discussion of J2KULL Interoperability Workshop results
- Discussion/questions regarding the proposed work-items:
  - ➢ J2KULL HDR IOPs, 2SI interface, J2KULL support in 2110

Thank You