

**Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)****Submission Title:** [Re-summarization of merged Usage Model Definitions parameters ]**Date Submitted:** [September 15, 2006]**Source:** [Yozo Shoji<sup>1</sup>, Chang-Soon Choi<sup>1</sup>, Shuzo Kato<sup>1</sup>, Ichihiko Toyoda<sup>2</sup>, Kenichi Kawasaki<sup>3</sup>, Yasuyuki Oishi<sup>4</sup>, Kazuaki Takahashi<sup>5</sup>, Hiroyuki Nakase<sup>6</sup>]Company [NICT<sup>1</sup>, NTT<sup>2</sup>, SONY<sup>3</sup>, FUJITSU<sup>4</sup>, Panasonic(Matsushita)<sup>5</sup>, Tohoku University<sup>6</sup>]Address<sup>1</sup>[3-4 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan]<sup>2</sup>[1-1 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan]<sup>3</sup>[6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo 141-0001, Japan] <sup>4</sup>[5-5 Hikari-no-Oka, Yokosuka-shi, Kanagawa 239-0847, Japan] <sup>5</sup>[4-12-4, Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-8587, Japan] <sup>6</sup>[2-1-1 Katahira, Aoba-ku, Sendai-shi, Miyagi 980-8577, Japan]Voice:[+81-46-847-5295<sup>1</sup>, +81-46-859-2366<sup>2</sup>, +81-3-5795-7879<sup>3</sup>, +81-46-839-5373<sup>4</sup>, +81-3-6710-2029<sup>6</sup>, +81-22-217-5531<sup>6</sup>]FAX: [+81-46-847-5440<sup>1</sup>, +81-46-855-1497<sup>2</sup>, +81-3-5795-7385<sup>3</sup>, +81-46-839-5560<sup>4</sup>, +81-3-6710-3915<sup>6</sup>, +81-22-217-5533<sup>6</sup>]E-Mail:[shoji@nict.go.jp<sup>1</sup>, cschoi@nict.go.jp<sup>1</sup>, shu.kato@nict.go.jp<sup>1</sup>, toyoda.ichihiko@lab.ntt.co.jp<sup>2</sup>, Kenichi.Kawasaki@jp.sony.com<sup>3</sup>, yasu@labs.fujitsu.com<sup>4</sup>, takahashi.kazu@jp.panasonic.com<sup>5</sup>, nakase@riec.tohoku.ac.jp<sup>6</sup>]**Re:** []**Abstract:** [Re-summarizing parameters of merged Usage Model Definitions]**Purpose:** [To be considered in 15.3c Usage Model Document]**Notice:** This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.**Release:** The contributors acknowledge and accept that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

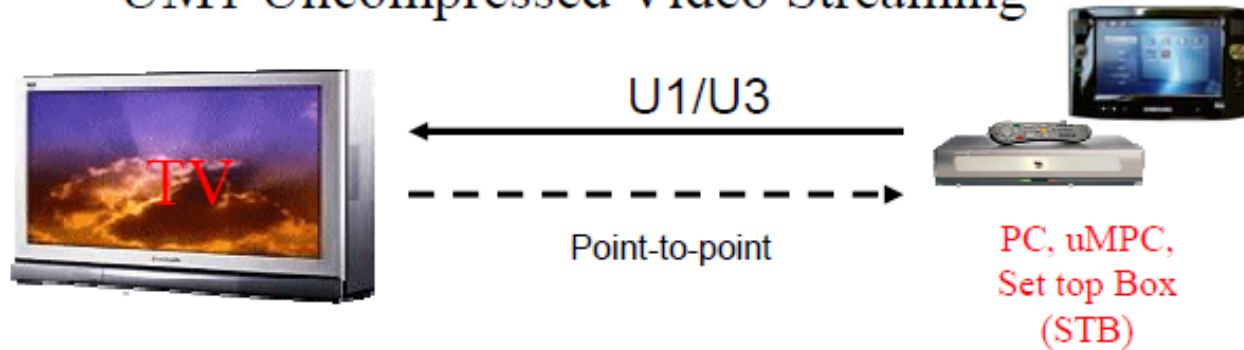
# Re-summarization of merged Usage Model Definitions parameters

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## Purpose of this document

- Proposal of UM5 (Kiosk file-downloading)
- Categorization of Usage Model Definitions (UMDs) and their data rate parameters considering “Mandatory” and “Optional” target data rate in TG3c
  - “Mandatory” UMDs are realized by more than 2-Gbps Mandatory PHY-SAP data rate
  - “Optional” UMDs are realized by more than 3-Gbps Optional PHY-SAP data rate

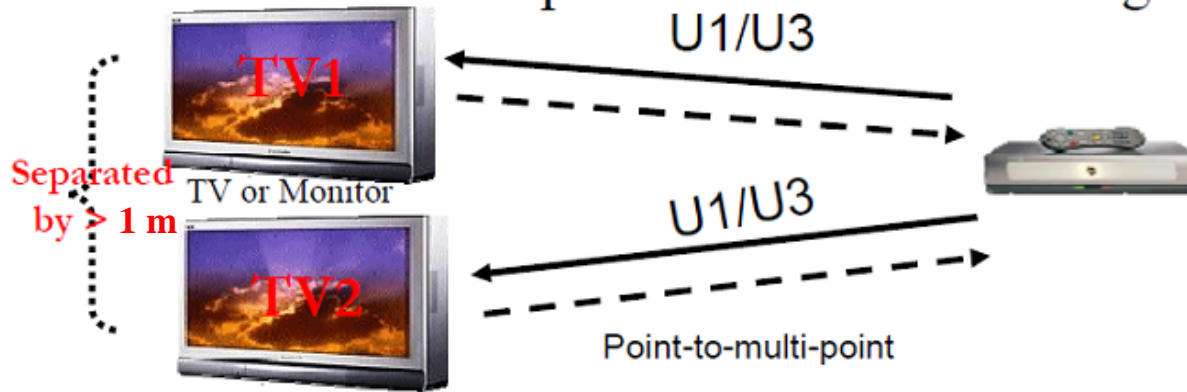
# UMI Uncompressed Video Streaming



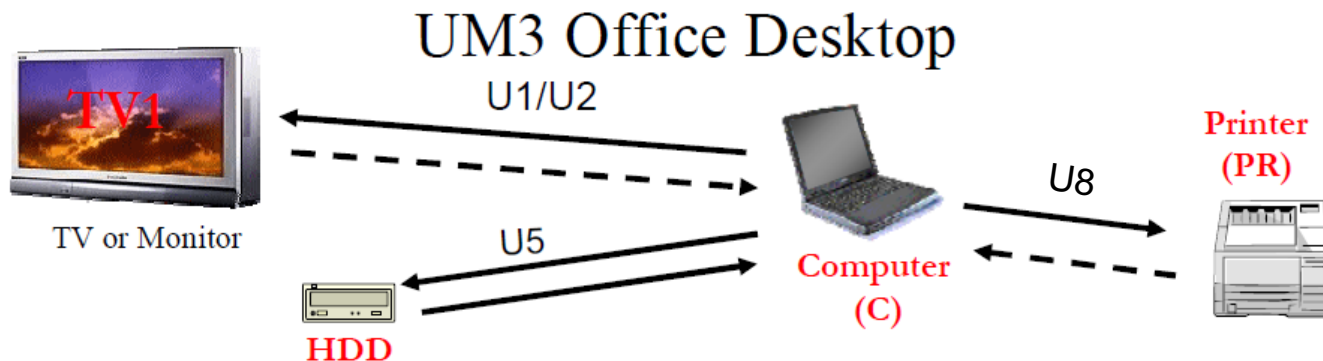
	Environment	Distance	Raw-data rate	PiER	Note
Mandatory	LOS/NLOS-Residential (STB-TV)	5 m	1.493 Gbps (1920 x 1080i x 24bit x 60Hz)	$< 10^{-9}$ (8bit character error rate of less than $10^{-9}$ is recommended for HDMI TMDS)	<ul style="list-style-type: none"> <li>No data retransmission required for video signal</li> <li>Low data rate reverse link is noted by dotted line</li> </ul>
Optional	LOS/NLOS-Residential (STB-TV)	5 m	4.95 Gbps (HDMI v1.2)	$< 10^{-9}$ (8bit character error rate of less than $10^{-9}$ is recommended for HDMI TMDS)	<ul style="list-style-type: none"> <li>Delay of less than a few frames is recommended</li> <li>Delay of less than 1 msec is recommended for the interface assuming HDCP</li> </ul>

**Note1: “Raw-data rate”, “PER”, and “Delay” are defined as the requirement at the top of MAC-SAP**

# UM2 multi Uncompressed Video Streaming



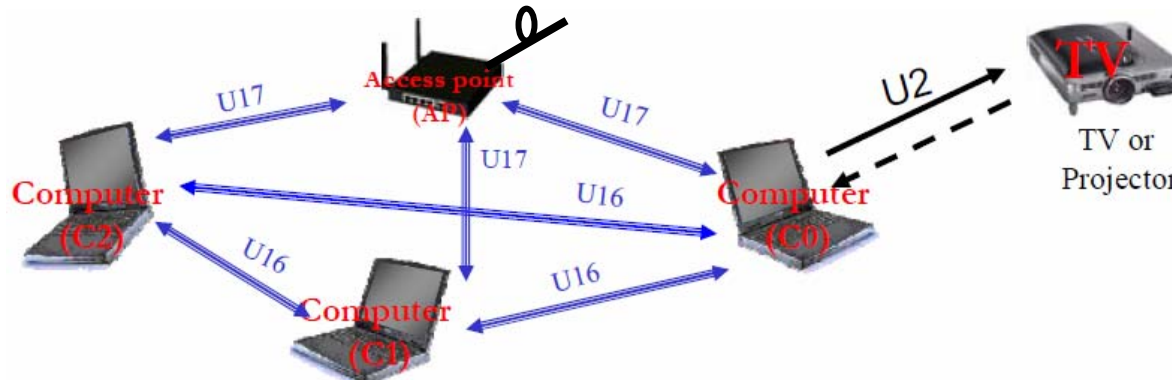
	Environment	Distance	Raw-data rate	PiER	Note
Mandatory	LOS-Residential (STB-TV1)	5 m	<b>0.497 Gbps</b> (720 x 480p x 24bit x 60Hz )	< 10 <sup>-9</sup> (8bit character error rate of less than 10 <sup>-9</sup> is recommended for HDMI TMDS)	<ul style="list-style-type: none"> <li>No data retransmission required for video signal</li> <li>Low data rate reverse link is noted by dotted line</li> <li>Separation between TV1-TV2 is more than 1 m</li> <li>Different Video contents on each link</li> </ul>
	NLOS-Residential (STB-TV2)		<b>0.497 Gbps</b> (720 x 480p x 24bit x 60Hz )		
Optional	LOS-Residential (STB-TV1)	5 m	4.95 Gbps (HDMI v1.2)	< 10 <sup>-9</sup> (8bit character error rate of less than 10 <sup>-9</sup> is recommended for HDMI TMDS)	<ul style="list-style-type: none"> <li>Recommended delay less than several frames</li> <li>Delay of less than 1 msec is recommended for the interface assuming HDCP</li> </ul>
	NLOS-Residential (STB-TV2)		4.95 Gbps (HDMI v1.2)		



	Environment	Distance	Raw-data rate	PiER/PER	Note
Mandatory	LOS Desktop (C-TV1)	1 m	1.258 Gbps stream (SXGA, 16bit *see appendix)	PiER of less than 10 <sup>-9</sup> is recommended for DVI-D	<ul style="list-style-type: none"> <li>No data retransmission required for video signal (U1/U2)</li> <li>Low data rate reverse link is noted by dotted line (U1/U2)</li> <li>Asymmetric download/upload (U5, U8)</li> <li>Link could be reversible(U5, U8)</li> <li>Recommended delay less than several frames</li> <li>Required Delay is N/A</li> </ul>
	LOS Desktop (C-HDD)	1 m	1 Gbps, burst (shared by U5 link and U8 link)	10 % (with 1024 octet frames)	
	NLOS Office (C-PR)	5 m			
Optional	LOS Desktop (C-TV1)	1 m	2.517 Gbps stream (SXGA, 32bit *see appendix)	PiER of less than 10 <sup>-9</sup> is recommended for DVI-D	<ul style="list-style-type: none"> <li>No data retransmission required for video signal (U1/U2)</li> <li>Low data rate reverse link is noted by dotted line (U1/U2)</li> <li>Asymmetric download/upload (U5, U8)</li> <li>Link could be reversible(U5, U8)</li> <li>Recommended delay less than several frames</li> <li>Required Delay is N/A</li> </ul>
	LOS Desktop (C-HDD)	1 m	1 Gbps, burst (shared by U5 link and U8 link)	10 % (with 1024 octet frames)	
	NLOS office (C-PR)	5 m			

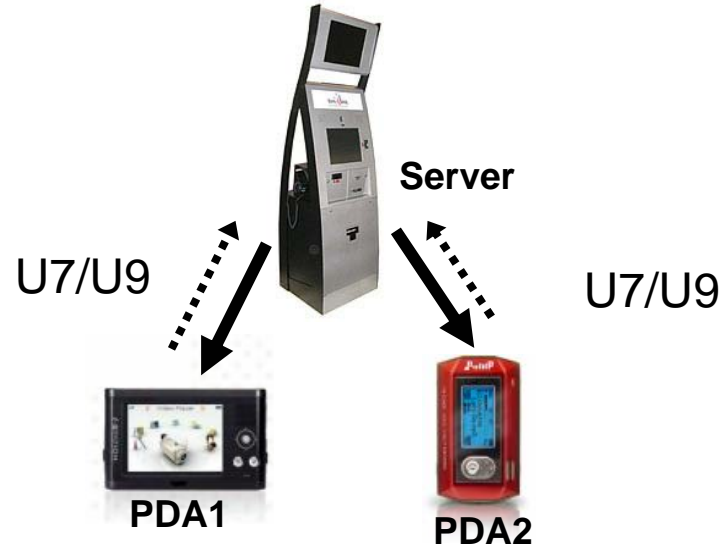
**Note2: "PER" is the required PER without re-transmission mode**

# UM4 Gb Conference Ad-hoc



	Environment	Distance	Raw-data rate	PiER/PER	Note
Mandatory	LOS Office	5 m	1.258 Gbps stream (SXGA, 16bit *see appendix)	PiER of less than $10^{-9}$ is recommended for DVI-D	<ul style="list-style-type: none"> <li>No data retransmission required for video signal (U1/U2)</li> <li>Low data rate reverse link is noted by dotted line (U1/U2)</li> <li>AP is connected to wired LAN</li> <li>1 Gbps burst file-transfer link is shared by U16 and U17</li> <li>Delay of less than a few frames is recommended for U2 link</li> <li>Required Delay is N/A for U16/U17</li> </ul>
	LOS Desktop (C0-C1-C2)	1 m	1 Gbps, burst (Equivalent to Gb Ethernet access)	10 % (with 1024 octet frames)	
	LOS Office (C0,C1,C2)-AP	3 m			
Optional	LOS Office	5 m	2.517 Gbps stream (SXGA, 32bit *see appendix)	PiER of less than $10^{-9}$ is recommended for DVI-D	<ul style="list-style-type: none"> <li>No data retransmission required for video signal (U1/U2)</li> <li>Low data rate reverse link is noted by dotted line (U1/U2)</li> <li>AP is connected to wired LAN</li> <li>1 Gbps burst file-transfer link is shared by U16 and U17</li> <li>Delay of less than a few frames is recommended for U2 link</li> <li>Required Delay is N/A for U16/U17</li> </ul>
	LOS Desktop (C0-C1-C2)	1 m	1 Gbps, burst (Equivalent to Gb Ethernet access)	10 % (with 1024 octet frames)	
	LOS Office (C0,C1,C2)-AP	3 m			

# UM5 Kiosk file-downloading



	Environment	Distance	Raw-data rate	PER	Note
Mandatory	LOS-Office (Server-PDA)	1 m	1 Gbps burst (shared by Server-PDA1 link and Server-PDA2 link)	10 % (with 1024 octet frames)	<ul style="list-style-type: none"> <li>Asymmetric download/upload</li> <li>Link could be reversible</li> <li>Required Delay is N/A</li> </ul>
Optional	LOS-Office (Server-PDA)	1 m	1.5 Gbps burst (shared by Server-PDA1 link and Server-PDA2 link)	10 % (with 1024 octet frames)	<ul style="list-style-type: none"> <li>Asymmetric download/upload</li> <li>Link could be reversible</li> <li>Required Delay is N/A</li> </ul>



# Summary

- Re-summarized the parameters of Usage Model Definitions
- Organized the parameters into two categories, “Mandatory” and “Optional” following the current target PHY-SAP data rate in TG3c
- This re-summarization was reviewed in CoMPA (Consortium for Millimeter-wave Practical Applications)

## Appendix (Required raw data rate)

### CEA-861-D Primary Video Format

Resolution	Frame rate	Raw data rate (24bit)
640 × 480p	59.94/60Hz	0.442 Gbps
1280 × 720p	59.94/60Hz	1.327 Gbps
1920 × 1080i	59.94/60Hz	1.493 Gbps
1920 × 1080p	60Hz	2.986 Gbps
720 × 480p	59.94/60Hz	0.497 Gbps
720(1440) × 480p	59.94/60Hz	0.497 (0.995) Gbps
1280 × 720p	50Hz	1.106 Gbps
1920 × 1080p	50Hz	2.488 Gbps
720 × 576p	50Hz	0.497 Gbps
720(1440) × 576p	50Hz	0.497(0.995) Gbps

### DVI-D

Quality of graphic	Resolution (pixels)	16 bit color (Gbps)	32 bit color (Gbps)
QVGA (Quarter-VGA)	320 × 240	0.074	0.147
CGA	640 × 240	0.147	0.295
VGA	640 × 480	0.295	0.590
SVGA (Super-VGA)	800 × 600	0.461	0.922
XGA	1024 × 768	0.755	1.510
Quad-VGA	1280 × 960	1.180	2.359
SXGA (Super-XGA)	1280 × 1024	1.258	2.517
SXGA+	1400 × 1050	1.411	2.822
UXGA (Ultra-XGA)	1600 × 1200	1.843	3.686
QXGA (Quad-XGA)	2048 × 1536	3.020	6.040
QUXGA (Quad-Ultra-XGA)	3200 × 2400	7.373	14.746
QUXGA Wide	3840 × 2400	8.847	17.695

Note: A refresh rate of 60 Hz was assumed for the data rate calculations in the DVI table above.