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DQ12 Dancing Across Oceans: Barcelona (ES)-Salvador (BR)- Daejeon (KR) @Chiang Mai (TH)

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Abstract: At the 33rd APAN Meetings held in Chiang Mai, Thailand, the eCulture Working group successfully presented and streamed a cyber performance a live three-continent dance and music performance 'Dancing Across Oceans' on 13th February 2012. This is a documentation of the technical and performance logistics required to present such a performance.

Keywords: APAN eCulture, Cyber performance, R&E Network, High Definition Performance Technology, Dancing Q.

1. Introduction

The APAN (Asia Pacific Advanced Network) e-Culture Working group brings together a diverse group of organisations and individuals across continents who work collaboratively to advance cultural interchange. An activity organised by the eCulture WG at the 33rd APAN Meetings held in Chiang Mai, Thailand, on 13th February 2012 was a live interactive dance and music performance involving three continents and four sites. Teams at each of the four sites Chiang Mai (Thailand), Barcelona (Spain), Salvador (Brazil) and Daejeon (Korea) produced a shared performance event in real time which was then streamed to the wider Internet from the performance venue in Chiang Mai.

Production of any performance event such as this involves collaboration between several teams to create an environment where the show can be performed. In a typical production, the behind-the-scenes team and talent work together through a well-defined process to arrive at a

performance. Combining multiple groups of teams that are widely geographically dispersed also poses the challenge of dealing with a number of languages which can be described as unique to this environment.

2. Methods

Organisation of this particular event commenced a few months earlier during the preceding 32nd APAN Meetings held in New Delhi, India, in late August 2011. This provided approximately six months to define, engineer, compose and choreograph the Chiang Mai performance. Communication between the steering committee, local hosts in Thailand, participating partners and collaborators was conducted via a GoogleGroup set up for this purpose. Skype and video conferencing were the other modes used when verbal communication would help to clarify issues and discussions.

2.1. Participating Organisations

Representatives of the organisations listed in the table below, contributed to the artistic and technical aspects of the performance.:

Table 1. Participating Organizations

ORG	Name	Country
KAIST	Korea Advanced Institute of Science and Technology	Korea
KISTI	Korea Institute of Science and Technology Information	Korea
i2Cat	Fundació privada i2CAT Internet i Innovació Digital a Catalunya	Spain
LAViD	Laboratório de Aplicações de Video Digital (UFPB)	Brazil
RNP	Rede Nacional de Ensino e Pesquisa	Brazil
GP Tech Poetics	Technological Poetics Research Group University of Bahia (UFBA)	Brazil
UniNET	UniNET, Chiang Mai Venue	Thailand
ThaiSARN	Thai Social/Scientific and Research Network	Thailand

Table 2. Participants and Roles

Organiser	Faridah Noor Mohd. Noor Chair APAN e-Culture WG	University of Malaya	MY
Steering	Dae Young Kim Head of Dance performance Taskforce	CNU	KR
	Artur Serra	i2Cat	ES
	Michael Stanton	RNP	BR
	Panjai Tantatsanawong Head of local site	UniNet	TH
Support	Patama Secretariat	UniNet	TH
	Jeffrey Withaya Campbell Web	Culture360	TW
	Wichan Lertwipatrakul	UniNet	TH
	Luiz Claudio Mendonça	cpd-ufba	BR
	George Jales	cpd-ufba	BR
Artists	BonCheol Goo *Composer*	KAIST	KR
	Rosa Sánchez *Choreographer*	Kònic thtr	ES
	Alain Baumann *Real-time video*	Kònic thtr	ES
	Sachiko Fullita | dancer	Kònic thtr	ES
	Ivani Santana | dancer director/technological poetics	technological poetics	BR
	Aldren Lincoln | dancer/technological poetics	technological poetics	BR
	Hugo Leonardo | direction assistant/technological poetics	technological poetics	BR
Network/Audio/ Video	Andrew Howard *Technical lead*	The Australian National University	AU
	Seongtaek Lim | A/V technician	KAIST	KR
	BueSeung Cho | network engineer	KISTI	KR
	MinKi Noh | network engineer	KISTI	KR
	JaeHwa Lee | network engineer	APAN-KR	KR
	Francisco Iglesias | A/V technician/i2cat/IGLOR	IGLOR	ES
	Pedro Lorente | A/V technician/i2cat/IGLOR	IGLOR	ES
	Erick Melo | LAViD/br	LAViD	BR
	Sindolfo | LAViD/br	LAViD	BR
	Felipe André| musician/technological poetics/br	technological poetics	BR
	Bruno Rohde| video interactivity/technological poetics/br	technological poetics	BR
	Jacson Espirito Santo| production/technological poetics/br	technological poetics	BR
	Wutjanun M. (Nunny) | mu/th		TH

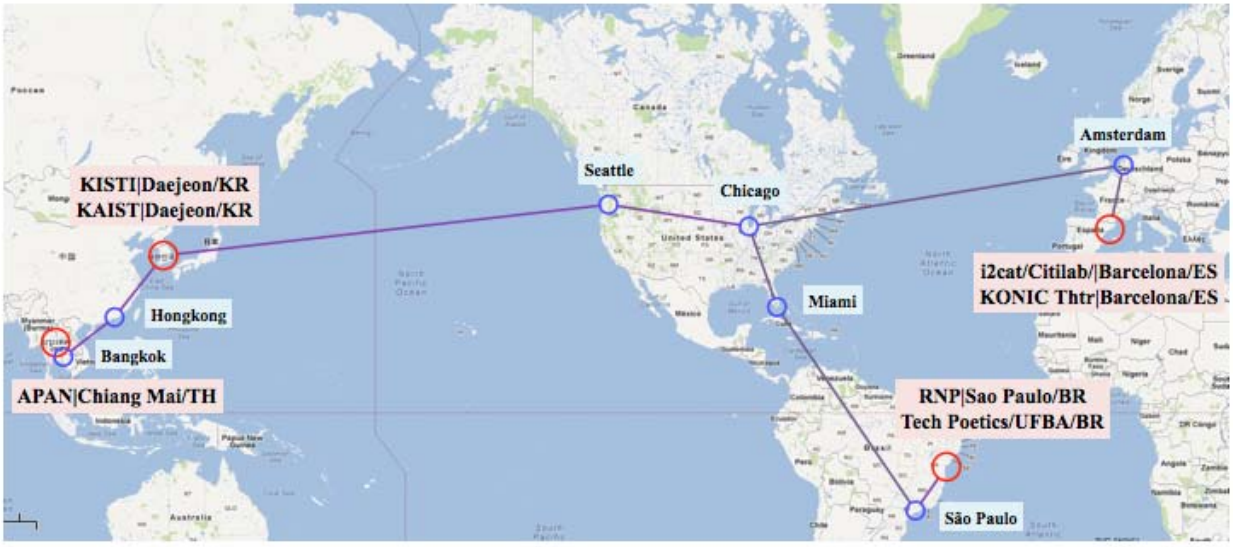
2.2. Network

Creating the network for the event required significant global collaboration between the participant's domestic, national and international peering partners, to establish a set of routes with deterministic RTT and jitter. The assistance of each of the network operators involved is much appreciated.

The nature of global networks allows a number of methods of network connection (fully routed, lightpath and/or combination) to support an event of this type. A primary underlying requirement of the network design was to ensure that minimal impact to the TH R&E operational network be imposed, and that other working group activities at the conference venue with realtime bandwidth requirements could also be supported.

To support this goal, traffic routing for the conference was separated so that the JGN-X network was used for the Dancing Across Oceans performance and the TEIN3 network for the Medical Working group testing activities and onsite monitoring of both groups' testing procedures scheduled for a weekend to minimise impact on Thai domestic R&E activity using the UniNet Bangkok to Chiang Mai link.

Figure 1. Network used for the Dancing Across Oceans (DAO) performance.



The network created for the event traversed a wide range of links:

Chiang Mai University (10Gb from the conference venue)
UniNet (1Gb Chiang Mai to Bangkok)
ThaiREN (Bangkok 1Gb to ThaiSARN Bangkok)
ThaiSARN (Bangkok 622Mbs to JGN-X Hong Kong via Singapore)
JGN-X (via HK-IX 1Gb to KRLight Hong Kong)
KRLight (GLORIAD to KRLight Daejeon)
KREONET (to KAIST and KISTI Daejeon)
KRLight
(GLORIAD to KRLight Seattle)
(GLORIAD KRLight Seattle to Starlight Chiacago)
Starlight
(NLLight Amsterdam)
NLLight
i2Cat Barcelona (Spain)
(C-wave to AMPATH)
AMPATH (SouthernLight to Sao Paulo Brazil)
RNP (Sao Paulo to Salvador Brazil)

While every effort was made to engineer a realtime network, the reality of the number of hops involved, traversing lightpaths and routed networks, combined to create an experienced network delay of around 7.5seconds (measured subjectively). This required an innovative method of synchronisation to co-ordinate the dancers which is described in section 2.4.

Table 3. Network Endpoints

Endpoints	
Barcelona, Spain	Kònic
Chiang Mai, Thailand	APAN Venue
Daejeon , Korea	KAIST
	KISTI
Salvador, Brazil	Ivani Lab
	LAViD Lab

2.3. Audiovisual transport system

The Arthron software developed by the Laboratório de Aplicações de Vídeo Digital [1] ***lavid*** at the UFPB Universidade Federal da Paraíba in Brazil was selected as the underlying technology platform for the event.

Arthron is a remote management tool for capturing and distributing multiple simultaneous streams of media to support various scenarios of video collaboration [1,2]. The software was developed in the framework of research and development in Art and Technology, Health and Telemedicine, and has been utilised by the developers at ***lavid*** for both artistic performances and transmission of surgery for telemedicine.

The tool set consists of the following components: Articulator (Manager), agent encoder (Encoder), agent decoder (Decoder), reflector (Distributor of flow), Video Server (VideoServer), User Management Server (WebService) and Agent videoconference (VideoRoom).

The main functionality of Arthron is to provide a simple interface for handling different sources of simultaneous distributed media streams. Arhtron users can remotely add; remove; configure the display format and control the time and space of flows of media.

These flows can be generated in geographically distributed locations and are handled by the tool which is responsible for the capture, management, transcoding, transmission and decoding the media captured in real time or replayed from a file. Media streams can be sent in high, medium and low definition, simultaneously, both for specific decoders in the network and for the Internet.

The audio-video set up is summarised in Figure 2. While the initial intent was to use a Canon HD video camera, connected using a Black Magic card, at the Chiang Mai site for confidence, monitoring the specific hardware and software configuration available presented errors when attempting to capture using the BlackMagic hardware. Due to the very limited rehearsal period available at the venue, the local technical team switched to a HD USB webcam which provided better reliability.

1 http://www.lavid.ufpb.br/

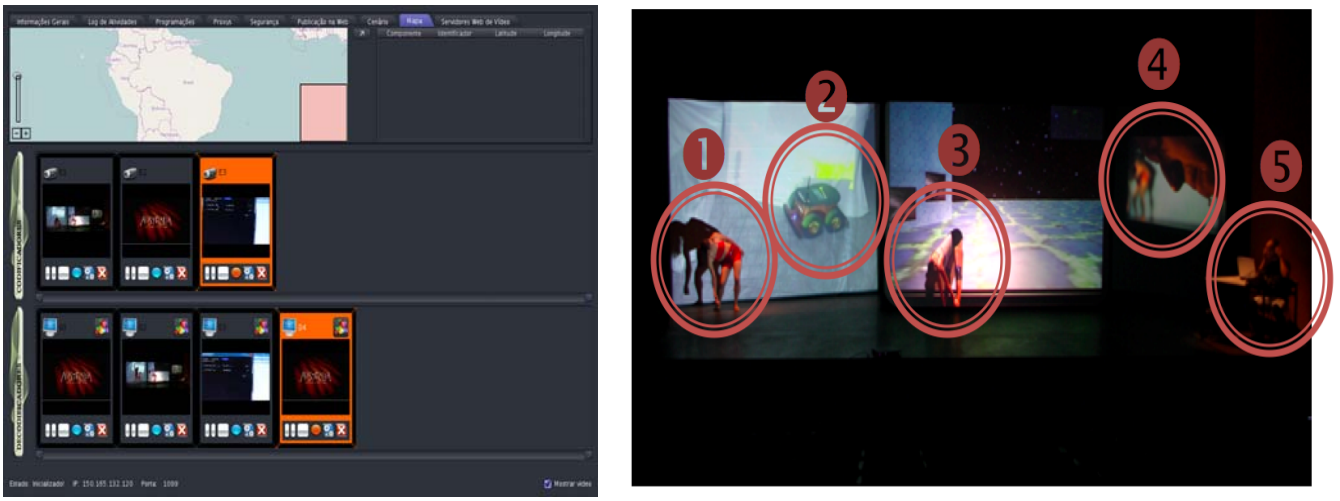


Figure 2. Audio-video setup.

2.4. Music and Dance

The musical composition was by BY Goo, Co-Chair of the eCulture WG. The theme was 'Cyber World' as described below:

> *"Cyber World, now the tools of the digital age give us to easily communicate with people on the other side of the world in new ways. New contacts create a new culture, new arts create new paradigm. Here, there are gestures from three locations meeting virtually and they are suddenly transferred to another space. Three points disperse and flock dreamily. Harbor your futuristic dream in the wide world while taking a cyberwalk with them."*

The whole dance was choreographed and performed at each venue, namely, Barcelona, Salvador and Chiang Mai. Following the synchronisation of the music, the three dances combined when streamed to form a unified dance.

2.5. Synchronisation of Music

The extended network delay experienced at the Chiang Mai required the use of the Max 6 software to synchronise the start of the music playout at each site. To reduce the overall complexity of the performance it was decided early in the planning stage that no audience audio would be transmitted between the participants and that each venue would perform to a local audio track. This choice removed the requirement to echo cancel from multiple sites with variant audio dynamics and a network delay which exceeded contemporary hardware echo cancelation systems.

Table 4: Specifications of Chiang Mai Equipment

EQIPMENT		SPECIFICATIONS
Arthron 1	OS	Ubuntu 11.04 OS
	CPU	Intel Core2 Duo 2.13GHz
	RAM	4GB (3.16GB)
	VIDEO	Quadro FX 1500 256MB (2 DVI, 1 S-Video)
	CAPTURE	Black Magic Studio
		IEEE 1394
Arthron 2	OS	Ubuntu 11.04 OS
	CPU	Intel Xeon 5110 1.6GHz
	RAM	4GB (3.16GB)
	VIDEO	ATI Radeon HD 5570 1GB (1 DVI, 1 HDMI, 1 S-Video)
	CAPTURE	Black Magic Studio
		IEEE 1394
Max 6	OS	Windows XP
	CPU	Intel Xeon X3330 2.66GHz
	RAM	4GB (3.62GB)
	VIDEO	Onboard
	CAPTURE	Black Magic Duo
		IEEE 1394
TVideo Mixer	Panasonic	AV-HS400AE
		2DVI-IN, 4 SDI-IN, 4 SDI-OUT
Camera	Canon	XHG1

Measurement of the delay was performed at the Chiang Mai venue using the following method:

Step 1: Measuring the RTT using OSC(Open Sound Control)

- Sending a ***bang*** signal from Chiang Mai to Spain and Brazil
- The arrived ***bang*** signal returns to Chiang Mai immediately.
- Measuring the RTT between emitted ***bang*** and returned ***bang*** at Chiang Mai (Figure 3). Using this method the RTT exhibited a close match to the 80ms observed from a ***ping*** to the remote site.

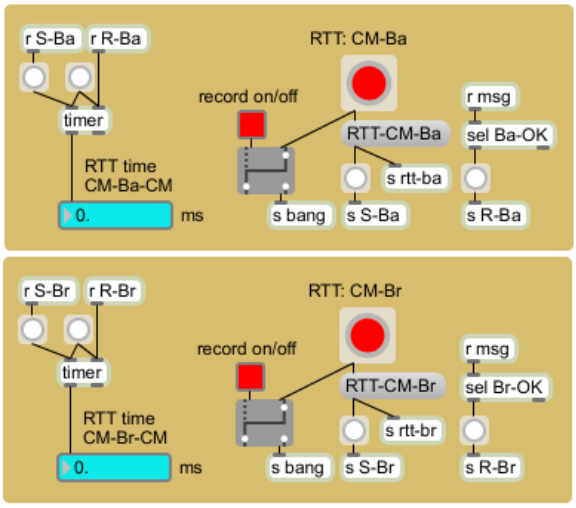


Figure 3. Measuring RTT

Step 2 : Measuring delay time including latency through ARTHRON from each site Ba/Br to Chiang Mai

- Shoot the Max 6 window with a camera connected to **ARTHRON** at Ba/Br (Figure 4)
- Send a ***bang*** signal from Chiang Mai to Ba/Br, at the same time start video recording with a webcam connected to Max 6 machine at Chiang Mai (Figure 5)
- When a ***bang*** signal arrived at Ba/Br, the object in the Max 6 window will blink in red.
- Video recording at Chiang Mai will continue until the red blinking on the video from Ba/Br appears
- Calculate video frames from the start to red blinking, and then multiply 33(fps: 30)
- The actual delay time is {video delay time - (OSC RTT/2)}

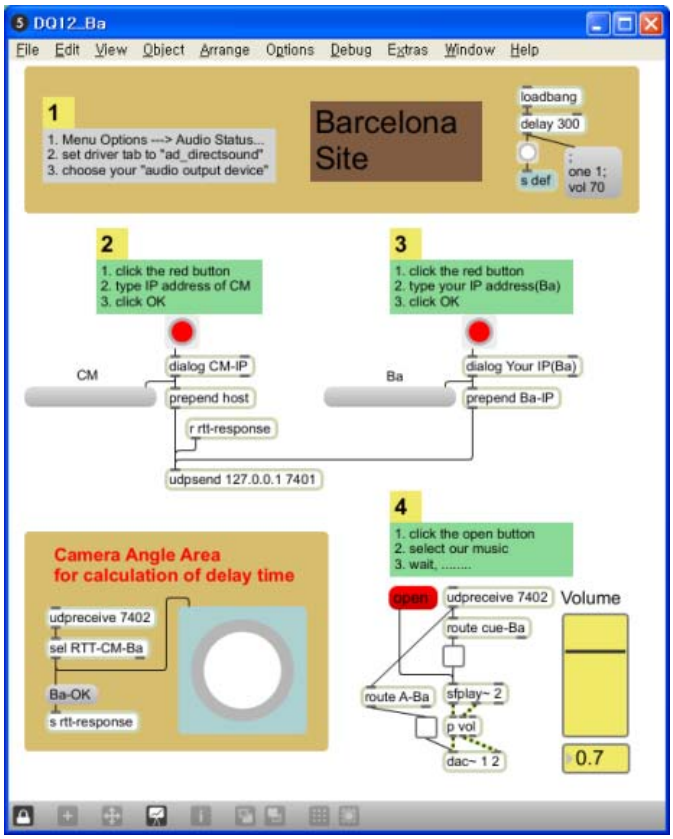


Figure 4. Shooting Max6 window.

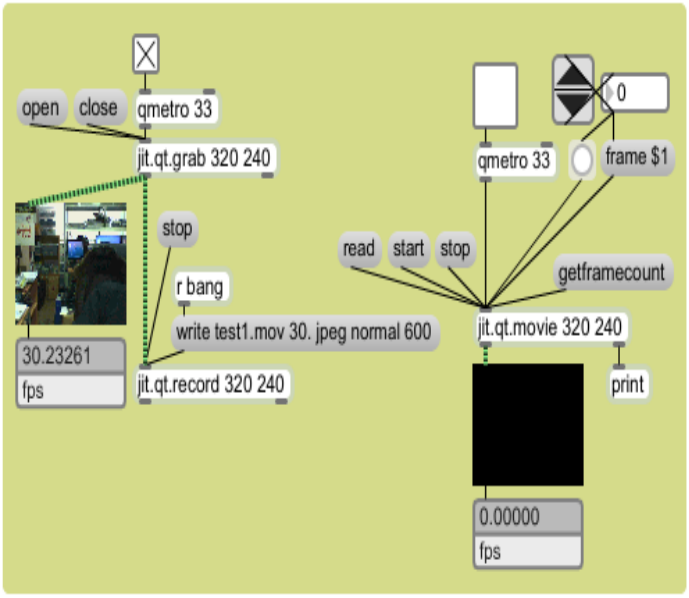


Figure 5. Recording video received from far-end site.

Step 3 : Remote control of starting point of music at Ba/Br

• Adjust the delay time of each start signal sent to Ba/Br and of start signal for the local music which should be synchronised with receiving video from Ba and Br

• The outcome is the audio and video are both synchronised at all three sites.

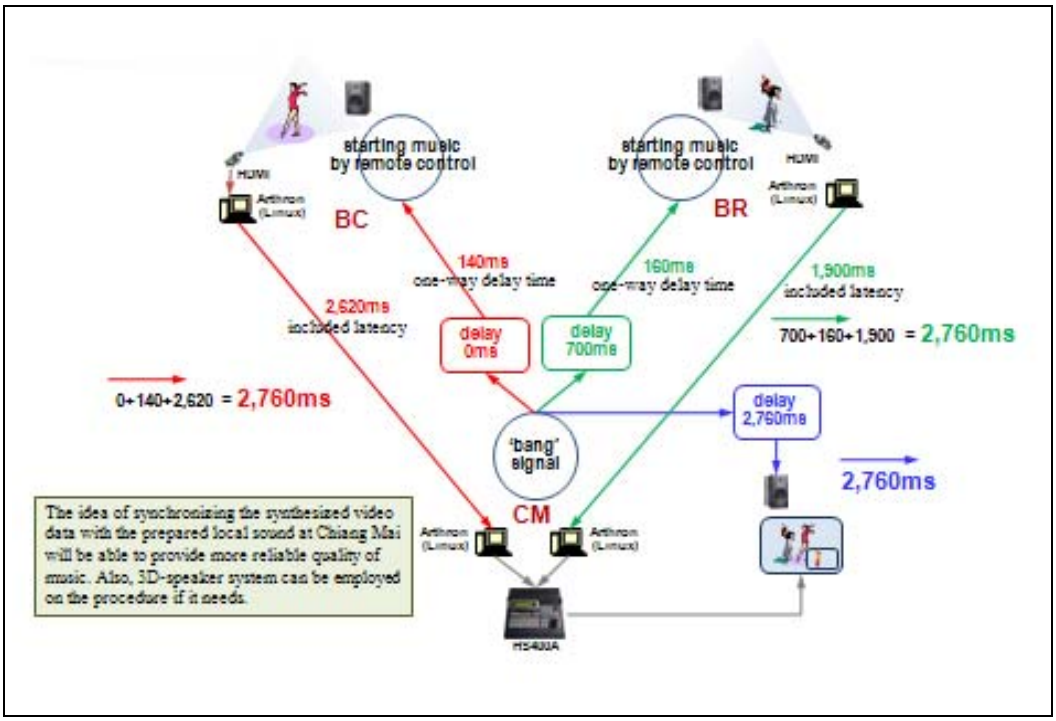


Figure 6. Remote control for music to synchronise audio and video from multi-sites.

3. Results

An audience of over 250 participants watched the cyber performance in Chiang Mai with other viewers at the different endpoints. Internet viewers watched at the multicast at http://84.88.41.177/apan.html and http://www.livestream.com/ANUCHANNEL. Some viewer statistics are shown in Fig. 6 below.

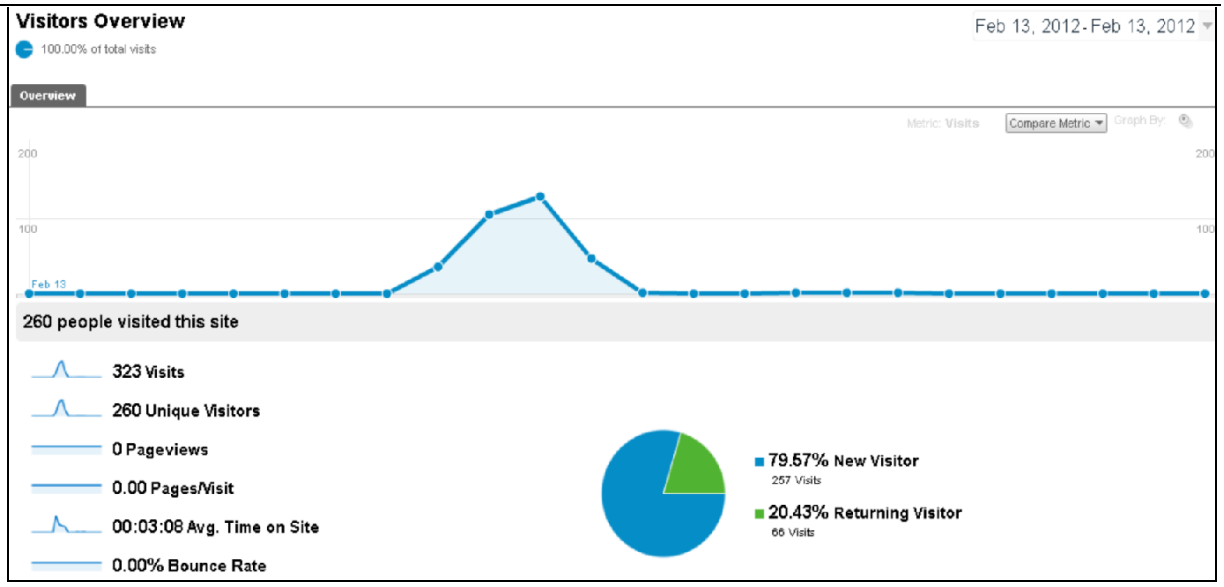


Figure 6. Visitor's overview.

The live performance was conducted at 4.38 pm. As a result of this cyber performance, the eCulture WG has gained participation of new members at its session. An announcement was made as the presentation was being conducted about this performance at the Global Collaboration Workshop on 14th February 2012. Figures 7-13 summarize the event.

Figure 7. Announcement of the performance at Chiang Mai venue.

Figure 8. Main stage.

Figure 9. Audience at the Empress Grand Hall, Chiang Mai venue.

Figure 10. Barcelona Team:
Alain – Rosa - Sachiko – Pedro – Fran.

Figure 11. Salvador
Aldren Lincoln.

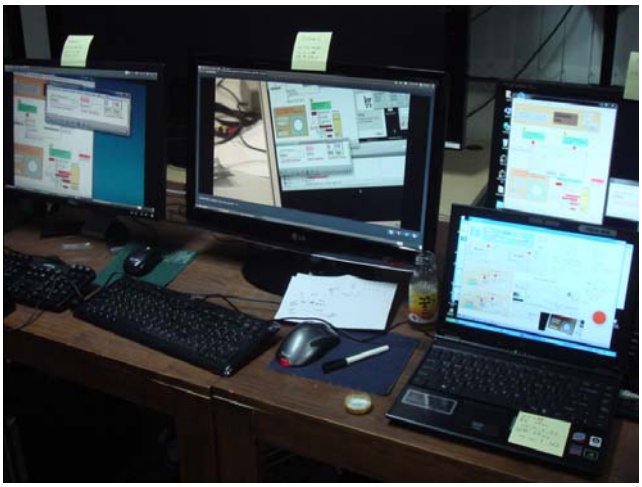


Figure 12. Music control test.

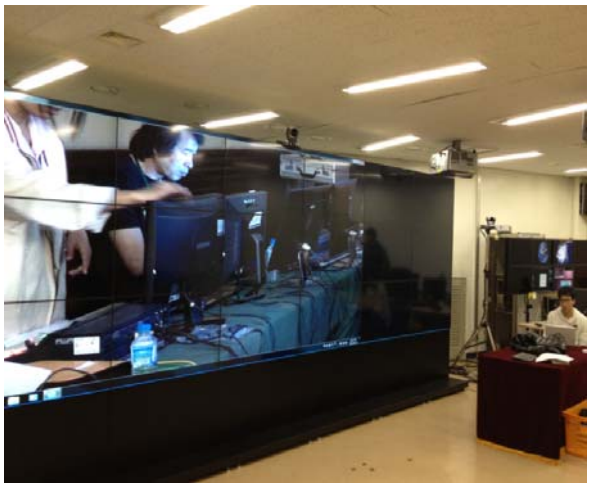


Figure 13. @KISTI(KR) using NeTD.

(Figures 7-13 contributed by eCulture WG team and partners of the DAO performance)

4. Conclusions

The eCulture WG looks forward to future collaboration with existing partners, and welcomes new partners in the future performances at different APAN sites. Based on the experience gained from this event, the Dance Performance Team headed by Chairman DY Kim will head the upcoming performance in Colombo, Sri Lanka, during the 34th APAN Meetings in August 2012.

Acknowledgements

The eCulture Working group takes this opportunity to thank all members of the organisations (Br, Ba, APAN-JP, US), APAN network team and secretariat, eCulture WG and local hosts and performance partners of the 33rd APAN Meetings in Thailand for support and team spirit.

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