A Five-Country Collaboration of dQ19 (dancingQ19)

Faridah Noor Mohd Noor, University of Malaya
Goo Bon Cheol, CEO Next Inc., & Jeju Island University
Network Performing Arts Production Workshop 2019
April 2-4, 2019
Prague, Czech Republic
Tech-Fusion Workshop
Asi@connect and TEIN-CC Project

OUTPUT

dQ19: Dancing on cyber cloud
Intercontinental music and dance performance on advanced network

@ DCC, Daejeon KOREA
5~6pm(GMT+9) Tue 19 Feb 2019
Preparation for 5-Country Cyber Performance – DQ9

Training Programmes

During APAN Meetings
Hanoi, Vietnam
Dhaka, Bangladesh
Transmission Software (Bandwidth)

UltraGrid

http://www.ultragrid.cz/en

Software for low latency and high-quality video network transmissions
UltraGrid from Laboratory of Advanced Networking Technologies (SITOLA) is a software implementation of high-quality low-latency video and audio transmissions using commodity PC, Mac and Linux hardware. UltraGrid uses uncompressed or very low compression-ratio streams to achieve up to 8K resolution with as low as 100ms end-to-end latency. UltraGrid is used, among others in areas like collaborative environments, medical cinematography, broadcasting application and various educational activities.

JackTrip

https://code.google.com/p/jacktrip/

JackTrip is a Linux and Mac OS X-based system used for multi-machine network performance over the Internet. It supports any number of channels (as many as the computer/network can handle) of bidirectional, high quality, uncompressed audio signal streaming.

![Bandwidth Graphs](Image)
# Participating Countries

<table>
<thead>
<tr>
<th>Nation</th>
<th>Organization</th>
<th>City</th>
<th>Contact Person</th>
<th>email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>PERN</td>
<td>Jamshoro</td>
<td>Waqas Masood, Fawad Raza</td>
<td><a href="mailto:wmasoood@hec.gov.pk">wmasoood@hec.gov.pk</a>, <a href="mailto:fawadraza@hec.gov.pk">fawadraza@hec.gov.pk</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kamran Abid, Muhammad Amir Rafique</td>
<td><a href="mailto:kabi@hec.gov.pk">kabi@hec.gov.pk</a>, <a href="mailto:marafique@hec.gov.pk">marafique@hec.gov.pk</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bhai Khan Shar, Naz Sahito</td>
<td><a href="mailto:director@cead.edu.pk">director@cead.edu.pk</a>, <a href="mailto:sahito_naz@hotmail.com">sahito_naz@hotmail.com</a></td>
</tr>
<tr>
<td>India</td>
<td>ERNET</td>
<td>Chennai</td>
<td>Paventhan Arumugam</td>
<td><a href="mailto:paventhans@eis.ernet.in">paventhans@eis.ernet.in</a></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>BdREN</td>
<td>Dhaka</td>
<td>Arunkumar, Kesavan</td>
<td><a href="mailto:runa88@gmail.com">runa88@gmail.com</a>, <a href="mailto:kesavan@eis.ernet.in">kesavan@eis.ernet.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Naveena Muthukrishnan</td>
<td><a href="mailto:m.naveena26@gmail.com">m.naveena26@gmail.com</a></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>BdREN</td>
<td>Dhaka</td>
<td>Habibur Rahman, Md Sajidul Islam</td>
<td><a href="mailto:akmhabib@yahoo.com">akmhabib@yahoo.com</a>, <a href="mailto:sajid@bdren.net.bd">sajid@bdren.net.bd</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Khandakar Rashdul Arefin, Md Mahedi Hasan</td>
<td><a href="mailto:arefin@bdren.net.bd">arefin@bdren.net.bd</a>, <a href="mailto:mahedi@bdren.net.bd">mahedi@bdren.net.bd</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mustakim Abir</td>
<td><a href="mailto:khajmaatukuntara@gmail.com">khajmaatukuntara@gmail.com</a></td>
</tr>
<tr>
<td>Malaysia</td>
<td>MYREN</td>
<td>Penang</td>
<td>Faridah Noor Mohd Noor</td>
<td><a href="mailto:faridahnoor@gmail.com">faridahnoor@gmail.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mr Zulham, Ahmad Fadhlul Irham Yusoff</td>
<td><a href="mailto:zulham@usm.my">zulham@usm.my</a>, <a href="mailto:irham@usm.my">irham@usm.my</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dr Hardy</td>
<td><a href="mailto:hardy@usm.my">hardy@usm.my</a></td>
</tr>
<tr>
<td>Vietnam</td>
<td>VinaREN</td>
<td>Hanoi</td>
<td>Nguyen Hong Van</td>
<td><a href="mailto:hvan@vinaren.vn">hvan@vinaren.vn</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pham Thanh Son</td>
<td><a href="mailto:thanhson@vinaren.vn">thanhson@vinaren.vn</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nguyen My Huong</td>
<td><a href="mailto:huong17@gmail.com">huong17@gmail.com</a></td>
</tr>
<tr>
<td>Korea</td>
<td>NEXT Inc.</td>
<td>Daejeon</td>
<td>Boncheol Goo, Javier Diaz</td>
<td><a href="mailto:mgtech@kaist.ac.kr">mgtech@kaist.ac.kr</a>, <a href="mailto:shaifvier@gmail.com">shaifvier@gmail.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Boncheol Goo</td>
</tr>
</tbody>
</table>
Accommodating 5-Country Cyber Performance – DQ9

1. **Time difference**
   - Base site: Daejeon in Korea
   - From West to East:
     - Pakistan – India – Bangladesh – Vietnam – Malaysia
   - 30 minutes – 60 minutes between each site
   - 1 hour – 4 hours behind Korean time
Time Zone (Tue 19 Feb 2019, No DST)

1pm  Jamshoro  PK(GMT+5)
1:30pm  Chennai  IN(GMT+5:30)
2pm  Dhaka  BD(GMT+6)
3pm  Hanoi  VN(GMT+7)
4pm  Penang  MY(GMT+8)

5pm  Daejeon  KR(GMT+9)
Accommodating 5-Country Cyber Performance – DQ9

2. A range of band width capacity

<table>
<thead>
<tr>
<th>Sub Venue</th>
<th>Band Width</th>
<th>(Estimated) Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK</td>
<td>1 Gbps</td>
<td>PK → SG → HK → KR</td>
</tr>
<tr>
<td>IN</td>
<td>1 Gbps</td>
<td>IN → SG → HK → KR</td>
</tr>
</tbody>
</table>
| BD        | 45 Mbps 1 Gbps | Path 1: BD → SG → HK → KR  
|           |            | Path 2: BD → IN → SG → HK → KR |
| MY        | 10 Gbps    | MY → JPN → KR    |
| VN        | 1 Gbps     | Hanoi → Hongkong → Korea |
Accommodating 5-Country Cyber Performance – DQ9

3. Venue for transmitting the sound & Quality

<table>
<thead>
<tr>
<th>Country</th>
<th>Venue Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK (Jamshoro)</td>
<td>Mini Auditorium</td>
</tr>
<tr>
<td>IN (Chennai)</td>
<td>Lecture Hall</td>
</tr>
<tr>
<td>BD (Dhaka)</td>
<td>Conference Room</td>
</tr>
<tr>
<td>MY (Penang)</td>
<td>Recording Studio</td>
</tr>
<tr>
<td>VT (Hanoi)</td>
<td>Meeting Room</td>
</tr>
</tbody>
</table>
### Network Path

<table>
<thead>
<tr>
<th>Sub Venue</th>
<th>Band Width</th>
<th>(Estimated) Path</th>
<th>Venue Type</th>
<th>Geographic End Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK</td>
<td>1 Gbps</td>
<td>PK → SG → HK → KR</td>
<td>Mini Auditorium</td>
<td>The Centre of Excellence in Arts and Design (CEAD), Jamshoro Sindh Pakistan</td>
</tr>
<tr>
<td>IN</td>
<td>1 Gbps</td>
<td>IN → SG → HK → KR</td>
<td>Lecture Hall</td>
<td>3rd Floor, IIT Madras Research Park Chennai, India</td>
</tr>
<tr>
<td>BD</td>
<td>45 Mbps</td>
<td>Path 1: BD → SG → HK → KR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Gbps</td>
<td>Path 2: BD → IN → SG → HK → KR</td>
<td>Conference Room</td>
<td>4th Floor, UGC Bhaban, Agargaon, Dhaka, Bangladesh</td>
</tr>
<tr>
<td>MY</td>
<td>10 Gbps</td>
<td>MY → JPN → KR</td>
<td>Recording Studio</td>
<td>Dewan Budaya, Universiti Sains Malaysia Penang, Malaysia</td>
</tr>
<tr>
<td>VN</td>
<td>1 Gbps</td>
<td>Hanoi → Hongkong → Korea</td>
<td>Meeting Room</td>
<td>7th Floor, 24 Ly Thuong Kiet, Hanoi, Vietnam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Venue</th>
<th>IP address for prior test (End Point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PK</td>
<td>121.52.156.115, 121.52.156.116</td>
</tr>
<tr>
<td>IN</td>
<td>202.141.25.10</td>
</tr>
<tr>
<td>BD</td>
<td>103.28.120.19</td>
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<tr>
<td>MY</td>
<td>202.170.58.30</td>
</tr>
<tr>
<td>VN</td>
<td>Ip: 119.18.130.30, gw: 119.18.130.1, sm: 255.255.255.224</td>
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<tr>
<td>KR</td>
<td>121.188.223.31 (jeju)</td>
</tr>
</tbody>
</table>
Accommodating 5-Country Cyber Performance – DQ9

4. Testing different sites and equipment

• From local sites to KR

• From all sites to actual venue – Daejeon, KR

(Challenging connectivity ‘incidents’)
vLAN setup and definition of relevant R&R

<table>
<thead>
<tr>
<th>Type</th>
<th>Points</th>
<th>Bandwidth</th>
<th>R&amp;R (contact info.)</th>
<th># of vLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone</td>
<td>KREONet2 HK – TEIN HK</td>
<td>10G</td>
<td>KREONet2 NOC &amp; TEIN*CC/NOC</td>
<td>1331-1335</td>
</tr>
<tr>
<td></td>
<td>VinaREN – TEIN HK</td>
<td>1G</td>
<td>TEIN*CC/NOC, VinaREN</td>
<td>1334</td>
</tr>
<tr>
<td></td>
<td>TEIN HK – TEIN SG</td>
<td>10G</td>
<td>TEIN*CC/NOC</td>
<td>1331,1332,1333,1335</td>
</tr>
<tr>
<td></td>
<td>TEIN SG – MyREN</td>
<td>1G</td>
<td>TEIN*CC/NOC, MyREN</td>
<td>1332</td>
</tr>
<tr>
<td></td>
<td>TEIN SG – BdREN</td>
<td>45M</td>
<td>TEIN*CC/NOC, BdREN</td>
<td>1333</td>
</tr>
<tr>
<td></td>
<td>TEIN SG – PERN</td>
<td>1G</td>
<td>TEIN*CC/NOC, PERN</td>
<td>1331</td>
</tr>
<tr>
<td></td>
<td>TEIN SG - NKN</td>
<td>2G</td>
<td>TEIN*CC/NOC, NKN</td>
<td>1335</td>
</tr>
<tr>
<td>Last mile</td>
<td>KREONet2/KREONET - Stage</td>
<td>10G/1G</td>
<td>KREONet2/KREONET</td>
<td>1331-1335 (991)</td>
</tr>
<tr>
<td></td>
<td>MyREN – Stage</td>
<td></td>
<td>MyREN</td>
<td>1332</td>
</tr>
<tr>
<td></td>
<td>VinaREN – Stage</td>
<td>1G</td>
<td>VinaREN</td>
<td>1334</td>
</tr>
<tr>
<td></td>
<td>BdREN – Stage</td>
<td></td>
<td>BdREN</td>
<td>1333</td>
</tr>
<tr>
<td></td>
<td>PERN – Stage</td>
<td></td>
<td>PERN</td>
<td>1331</td>
</tr>
<tr>
<td></td>
<td>NKN – Stage</td>
<td></td>
<td>NKN &amp; ERNET</td>
<td>1335</td>
</tr>
</tbody>
</table>

- Zhonghui Li, lizhh@cernet.edu.cn
- Buseung Cho, bscho@kisti.re.kr
- Chanjin Park, pcj0722@kisti.re.kr
- Sharizan Sumuui, sharizan@myren.net.my
- Hamid, hamid@myren.net.my
- Kesavan, kesavan@eis.ernet.in

- NKN team, support.tn@nkn.in, s.gopinath@gov.in
- Kesavan, kesavan@eis.ernet.in
Basic Configuration (@Each sub-venue site)

- MacBook Pro
- BlackMagic Mini Recorder
- HD Cam
- ThB3-Ethernet
- ThB3-ThB2
- ThB3-USB
- IP
- Audio Mixing Console
- Microphone
- Speaker
- Audio Interface
- HD Monitor
- BlackMagic Mini Monitor
- HDMI
- Video Mixing Console
- ThB3-ThB2
- Ethernet
- Audio Mixing Console
- HD Monitor
- Projector & Screen
- HDMI
In case of PK site
The details of the Configuration (KR site)

Stage

Samgomu(4) | Big Drum(1) | D.Piano(1) | Percussion(1)

Monitor

IP

SDI/HDMI

HDMI

USB

Power

from

BD | PK | MY

Audio Interface

Audio Mixer

Video Mixer

SDI/HDMI

Recorder

Audio Interface

USB

Power

to

BD | PK | MY

IP

IN | VN

SDI/HDMI

Power

Audio Interface

IN | VN

SDI/HDMI

Audio Interface

from

IN | VN

IP

HDMI

USB

Audio Interface

Big Drum(1) | Percussion(1)

Samgomu(4) | D.Piano(1)
VLAN network & Basic Configuration (KR site)

Network
Video
Audio

KRLight HK POP (KREONet2)

TEIN HK POP

TEIN SG POP

KREONET @Daejeon

DCC (APAN Venue)

Audio Mixer

Video Mixer

UltraGrid Receiver

Final sound

Multicast or Unicast

UltraGrid Sender

Final view

Zoom or Vidyo Communication

Network

Video

Audio

BD

PK

IN

VN

MY

10G

10G

10G

1G

1G

2G

45M/1G

1G

1G

1G
Set up @Main Venue

Stage

Title

KR
MY
VN

Final View

Floor

Logos

BD
IN
PK

Lighting

dQ19@Daejeon
Software for low latency and high-quality video network transmissions

UltraGrid from Laboratory of Advanced Networking Technologies (SITOLA) is a software implementation of high-quality low-latency video and audio transmissions using commodity PC, Mac and Linux hardware. UltraGrid uses uncompressed or very low compression-ratio streams to achieve up to 8K resolution with as low as 100ms end-to-end latency. UltraGrid is used, among others in areas like collaborative environments, medical cinematography, broadcasting application and various educational activities.

JackTrip is a Linux and Mac OS X-based system used for multi-machine network performance over the Internet. It supports any number of channels (as many as the computer/network can handle) of bidirectional, high quality, uncompressed audio signal streaming.

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>1080p@30</th>
<th>4k@60fps</th>
</tr>
</thead>
<tbody>
<tr>
<td>930 Mbps</td>
<td>245 Mbps</td>
<td>7910 Mbps</td>
</tr>
<tr>
<td>489 Mbps</td>
<td>From 20 Mbps</td>
<td>From 12 Mbps</td>
</tr>
<tr>
<td>H.264</td>
<td>From 60 Mbps</td>
<td>From 140 Mbps</td>
</tr>
<tr>
<td>Codec</td>
<td>From 12 Mbps</td>
<td>From 40 Mbps</td>
</tr>
<tr>
<td>DXT1</td>
<td>H.265</td>
<td>DXT5 YCoG</td>
</tr>
<tr>
<td>M-JPEG</td>
<td>H.264</td>
<td>H.265</td>
</tr>
</tbody>
</table>

http://www.ultragrid.cz/en

https://code.google.com/p/jacktrip/
Prior Test

WED 16 January 2019
5pm(Hanoi/VN)/7pm(Jeju/KR)
  VN : 119.18.130.25   Skype : minhkeo1983
  KR : 121.188.223.31 / 121.188.240.115   Skype : ctnet.goo
Bi-directional transmission using Built in camera, gl, microphone and speaker in MacBook Pro
* some problems with audio transmission (one way is OK, but disconnected for bi-directional connection.)

FRI 18 January 2019
3.30pm(Chennai/IN)/7pm(Jeju/KR)
  IN : 202.141.25.10 (IP pool 202.141.25.0/24)   Skype : kesavan R
  KR : 121.188.223.31 / 121.188.240.115   Skype : ctnet.goo
Bi-directional transmission using Built in camera, gl, microphone and speaker in MacBook Pro
* successful

TUE 22 January 2019
3pm(Jamshoro/PK)/7pm(Jeju/KR)
  PK : 111.68.100.7   Skype : fawad raza
  KR : 121.188.240.94 / 112.184.31.165   Skype : ctnet.goo
Bi-directional transmission using Built in camera, gl, microphone and speaker in MacBook Pro & Audio interface,
* successful
Prior Test

SUN 10 February 2019
4pm(Dhaka/BD)/7pm(Jeju/KR)
  BD : 103.28.120.198   Skype : szd.141 and Mahedi.cse
  KR : 121.188.223.32 / 121.188.221.166   Skype : cnet.goo
Bi-directional transmission using Built in camera, gl, microphone and speaker in MacBook Pro
  * Only audio was able to transmitted because video transmission is blocked between BD and KR.

WED 13 February 2019
6:30pm(Kuala Lumpur/MY)/7:30pm(Jeju/KR)
  MY : 119.40.121.103   Skype : rizalkhanafie
Bi-directional transmission using Built in camera, gl, microphone and speaker in MacBook Pro
  * successful
Accommodating 5-Country Cyber Performance – DQ9

Communication and cultural issues

• Interpretation issues
• Choice of songs and performances
• Length of performance
• Understanding instructions
• Protocol – cultural gatekeepers
Artist (BD)

Mustakim Abir
Bansuri (Flute)

Ishrar Habib
Violin

Chironjit Saha
Tabla

Emon Goswami
Guitar and Vocal

Paromita Riya
Vocal
Artist (IN)

Naveena Muthukrishnan
Classical dance

Swetha Sridhar
Nattuvangam

Bhuvaneshwari s
Carnatic vocal

Bhavana s
Carnatic vocal

Kiran R Pai
Mridangam

Arya Nagarajan
Violin
Artist (MY)

Andy Siti
Vocal

Faisal Mohd
Guitar

Nick Fadriel Anak John
Sapeh
Artist (VN)

Nguyen My Huong
Violin

Nguyen Dinh Huong
Violin

Nguyen Thu Binh
Violin & Viola
Artist (KR)

Chanhee Yang  
Performer

Hyeji Noh  
Performer

Geumseo Yun  
Performer

Wonkyoung Kim  
Performer

Jinyong Joung  
Big Drum

Junseok Kang  
Percussion

Namhoon Kim  
Piano
Dancing on Cyber Cloud
Intercontinental Music and Dance Performance on Advanced Networking

Jointly Organized by:

ERNET INDIA
CHENNAI
19 1 EB 2019 - 1.30p
THE DQ19 TEAM
dQ19: Dancing on cyber cloud
Intercontinental music and dance performance
on advanced networking

@ DCC, Daejeon KOREA
5~6pm(GMT+9) Tue 19 Feb 2019
Thank You
IT/Technical staff
Artists
NRENs
Tech-Fusion Partners
Participants
For the support

This document has been produced with the financial assistance of the European Union under the Asi@Connect Project. The contents of this project are sole responsibility of NEXT Inc. and can under no circumstances be regarded as reflecting the position of the European Union.
dQ19 Program

Total running time: 50m

- □ Opening Ceremony (2m)
- □ Introduction to Live CP 2019 (5m)
  - ◇ CP 1: Streaming (1 way) (15m = 5m*3 countries): BD, PK and IN
    - Traditional music and dance of each country one after another
      - BD: Flute, Violin, Tabla, Guitar and Vocal
      - PK: Vocal, Tabla, Dholak, Keyboard, Guitar and Flute
      - IN: Dance, Nattuvangam, Vocal, Maridangam and Violin
  - ◇ CP 2: Interaction (3 way) (5m): MY, VN & KR
    - Winter sonata – From the beginning until now, one of K-pops
      - MY: Vocal, Guitar and Sapeh
      - VN: 3 string instruments
      - KR: Vocal, Piano and Percussion
  - ◇ CP 3: Collaboration (Multi) (10m): 5 countries and KR
    - Take me home country roads by John Denver
    - At the start, all artists perform together (music and dance), and then each country plays one verse one after another, at the end, all participants perform together again.
  - ◇ Final performance: (5m) KR
    - Samgomu, Korean traditional music and dance
- □ Closing Address (3m)
- □ Photo Time (5m)
dQ19: Dancing on cyber cloud
Intercontinental music and dance performance on advanced network

Video Presentation