

# Digital Video for the Arts

Ann Doyle, Internet2

April, 2011

Janet - Networkshop 39



# Arts & Humanities key members

- on Internet2
  - U.S. University Members – Departments of Music, Dance, Art, English, History, etc.
  - Affiliate Members –Berklee College of Music, Cleveland Institute of Music, Library of Congress, Manhattan School of Music, New World Symphony, The Philadelphia Orchestra, U.S. Holocaust Memorial Museum
  - Corporate Sponsor/Members – Polycom Worldwide, TANDBERG, Warner Bros.
  - USC Shoah Fondation Institute, EVIA Ethnomusicology repository, C-SPAN and Research Channel video archives, etc.

# Some A&H key community members

- on European NRENs
  - EU Universities – Departments of Arts, Literature, History, Music Conservatories, Arts Academies, Theaters, Museums, Libraries, Digital Archives, etc.



ORQUESTRA DE PORTÀTILS DE L'ESMUC



# New World Symphony

Michael Tilson Thomas / Luigi Alberto Bianchi



photo by R. Andrew Lepley



# Manhattan School of Music, Columbia University and CANARIE Inc. Pinchas Zukerman



# TCU School of Music

## Harold Martina & Jose Feghali

# Conservatorio G.Tartini

## Teresa Trevisan & Flavio Zaccaria



# The Philadelphia Orchestra Concert Series

[www.philorch.org/internet2](http://www.philorch.org/internet2)

- Live concerts from Verizon Hall at The Kimmel Center for the Performing Arts
- Over 57 campuses participated
- HD multicast



The Philadelphia Orchestra's  
**Global Concert Series**

Broadcasting **LIVE** concerts to your location with  
**INTERACTIVE** content through Internet2

INTERNET  
**2**

# Bradley University: The Adding Machine

(Elmer Rice's 1923 classic play)

- Bradley University
- University of Central Florida
- University of Waterloo
- Multicast DVTS





# University of California Santa Cruz New York University

© Ben Munisteri and Edward C.  
Warburton.

Photo: Jim MacKenzie. © University of  
California Regents.

# UbiquiLab 1

Rome - Cassino  
Laboratory of  
Ubiquitous  
Presence



# GÉANT Launch Event

## Volcano Dance



# ...much more...

- Catalonia Laptop Orchestra
  - <http://barcelonalaptoporchestra.blogspot.com>
- Anella Cultural Catalonia
  - <http://www.eu2010.es/es/agenda/agendacultural/evento0096.html>
- East15 Acting School UK
  - <http://www.east15.ac.uk/>
- Scottish Symphonic Orchestra Children Education
  - <http://www.bbc.co.uk/scotland/music/bbcso>
- Emeroteca Digital
  - <http://hemerotecadigital.institutdelteatre.cat/>
- Bologna University: Centro Musica e Spettacolo (MUSPE)
  - <http://www.muspe.unibo.it/attivita/cimes/>
- University for Music and Performing Arts, Vienna
  - <http://www.mdw.ac.at/?pageid=1>

# Technology options

# DVTS: What is it?

- “Open source” software developed by the WIDE Project (ie it’s free!)
- Sends firewire source over Internet with no additional compression

# DVTS

Digital Video Transport System

# DVTS: Vital Stats

- Latency: Good enough for conversation
- Quality:
  - Audio: 48kHz/16 bit uncompressed
  - Video: Standard definition, DV25 compression
- Bandwidth: 30 Mbps

# DVTS: What do I need?

- Computer (runs best on Windows but Mac and Unix versions exist)
- Camera or encoder with firewire output
- 30 Mbps of bandwidth



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*2*

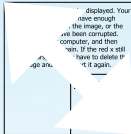
# DVTS: What do I need?



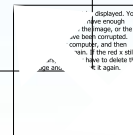
- 30 Mbps
- 0% loss
- Multicast (if broadcasting)



# DVTS: Example



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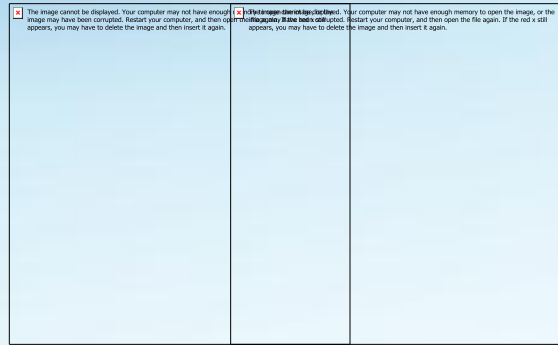


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# DVTS: What do I need?

Display



Don't forget echo



= no echo

# ECHOdamp

- A multi-channel audio mixer and echo controller for high-bandwidth musical videoteleconferencing
- Uses a dynamics-based algorithm rather than a frequency-based one (like *Acoustic Echo Cancellation*) to preserve the full frequency range of the audio signal
- Intuitive and easy-to-use controls work with any 4X4 (or larger) audio interface that supports *CoreAudio* on the Macintosh or *MME*, *DirectSound*, or *ASIO* on the Windows platform
- Available free to non-profit educational and performing arts institutions at <http://echodamp.com>

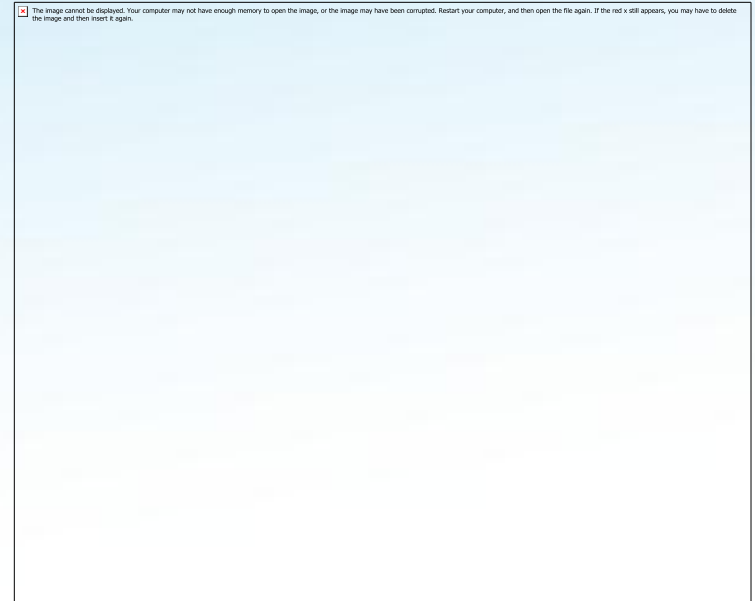
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# ECHOdamp collaborators

- Created by **Brian Shepard**, Assistant Professor of Pedagogical Technology, University of Southern California Thornton School of Music
- Internet2 community members helped test to ensure system's readiness for production. Critical testers included:
  - **Scott Deal**, Professor and Associate Director of Music Research Programs, IUPUI (Indiana University Purdue University Indianapolis);
  - **Ben Fineman**, System Administrator, Internet2;
  - **Dan Nichols**, Head of Recording Services and Internet2 Multimedia Specialist, NIU (Northern Illinois University);
  - **Justin Triege**, Internet2 Systems Manager, New World Symphony

# ConferenceXP (CXP)

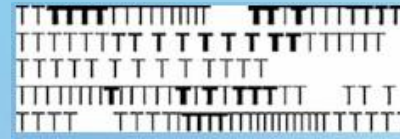
- Independent Audio/Video handling
  - (un)compression, codec, source, output
- Multiple audio/video channels
- Network and CPUs Challenging?
  - unicast, multicast, from 2Mbps up to ... infinity, CPU overflows



Courtesy by Justin Hourigan (HEAnet)

# LOLA

*LOw LAtency Audio Visual Streaming System*



Conservatorio  
di musica  
Giuseppe  
Tartini  
Trieste

## The Dream...

...at the GARR Conference 2005, in Pisa...  
Masterclass with NWS in Miami

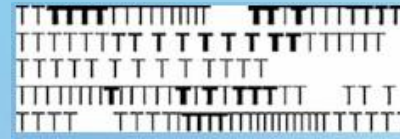
To perform together, from distant locations...



INTERNET  
A large, stylized red number '2' that is partially overlaid by the word 'INTERNET'.

# LOLA

*LOw LAtency Audio Visual Streaming System*



Conservatorio  
di musica  
Giuseppe  
Tartini  
Trieste

## The Reality...

November 2010 – two pianists performed Bach duet together from Trieste to Paris

INTERNET  


# LOLA specifications

- 1 GigaEthernet end-to-end circuit
  - runs also on IP
- 92Mbps to 460Mbps, Jitter<4ms
- audio 44K 24bit stereo
  - --> multichannel with CCRMA Stanford University
- 60 frames per second b/w or color, 680\*480
- **20ms** audio/video codec roundtrip latency
- ~1ms GE network latency per 100Km
- **how far away can we go?**
- **can it run on “routed” networks?**
- **... let's watch...**



# The LOLA team

## *Production*

Conservatorio di musica **G. Tartini** - Trieste

## *Implementation*

**Paolo Pachini**: general coordination

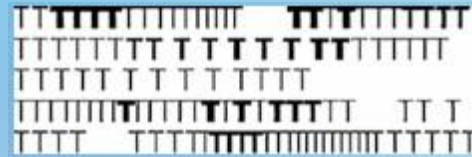
**Carlo Drioli**: programming

**Nicola Buso**: testing and musical advice

**Claudio Allocchio** (Consortium GARR): testing and networking advice

**Massimo Parovel**: conception and supervision

**Teresa Trevisan and Flavio Zaccaria**: ... our “Piano Duo”



Conservatorio  
di musica  
Giuseppe  
Tartini  
Trieste

# The Workshops

@ New World Symphony, Miami Beach

@ European Locations (Trieste, Paris,  
Barcelona)

# Network Performing Arts Production Workshop - History

- March 2003 -- New World Symphony and Internet2 host first annual Performance Production workshop
- May 2005 -- GARR and New World Symphony host demonstration at GARR annual user conference
- May 2006 -- Ann Doyle presents at TERENA, and discussions begin about hosting in Europe
- 2008 – Claudio Allocchio approaches Music Conservatory of Trieste as first local host candidate
- 2009 – Claudio attends workshop at New World Symphony
- 2009 – First European Performing Arts Production Workshop in Trieste, with GARR
- 2010 – Second European Workshop: IRCAM/COMEDIA will host in Paris with RENATER
- 15 17 June, 2011 – Gran Teatre del Liceu, Barcelona Opera

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# Workshops main Topics

- Technology:
  - DVTS, CXP, LOLA, EchoDamp, Network basics, Monitoring, Lighting, Audio and Video codecs, ...
- Case Studies and examples:
  - Masterclasses, ongoing projects and activities
- Social Networking:
  - discussions about arts and technology use, new collaborations.



Courtesy by Justin Hourigan (HEAnet)

# Next Workshop: 15 - 17 June 2011, Barcelona

## Registration now available!

<http://www.terena.org/activities/network-arts/barcelona>



CENTRE DE SUPERCOMPUTACIÓ  
DE CATALUNYA



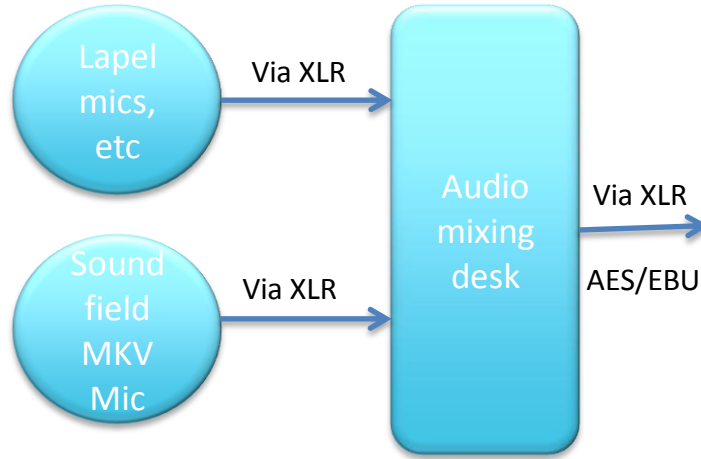
# Arts and Humanities Project

Emma Smith  
Applications Development Team

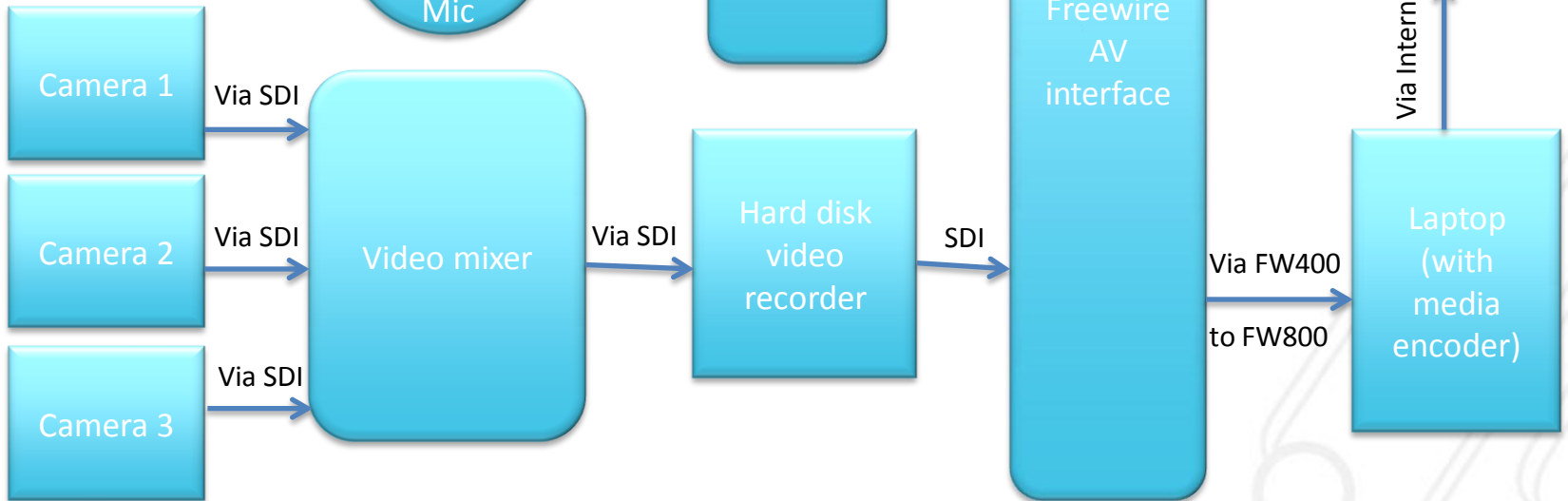




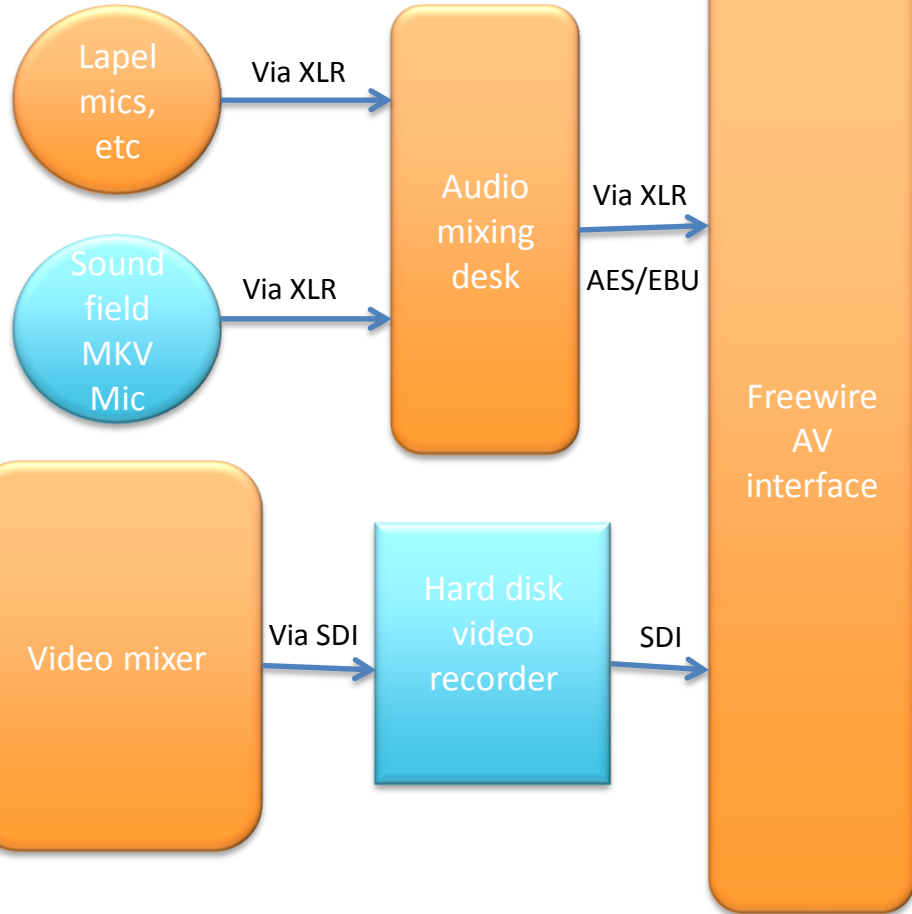
Audio Signal path



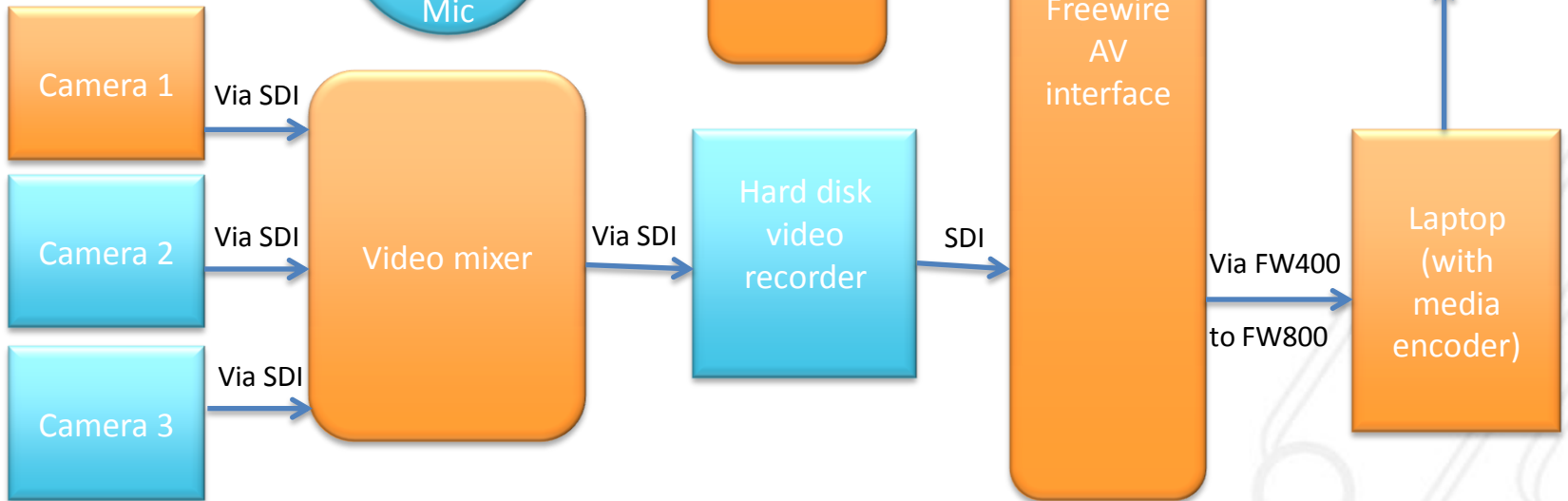
Video Signal path



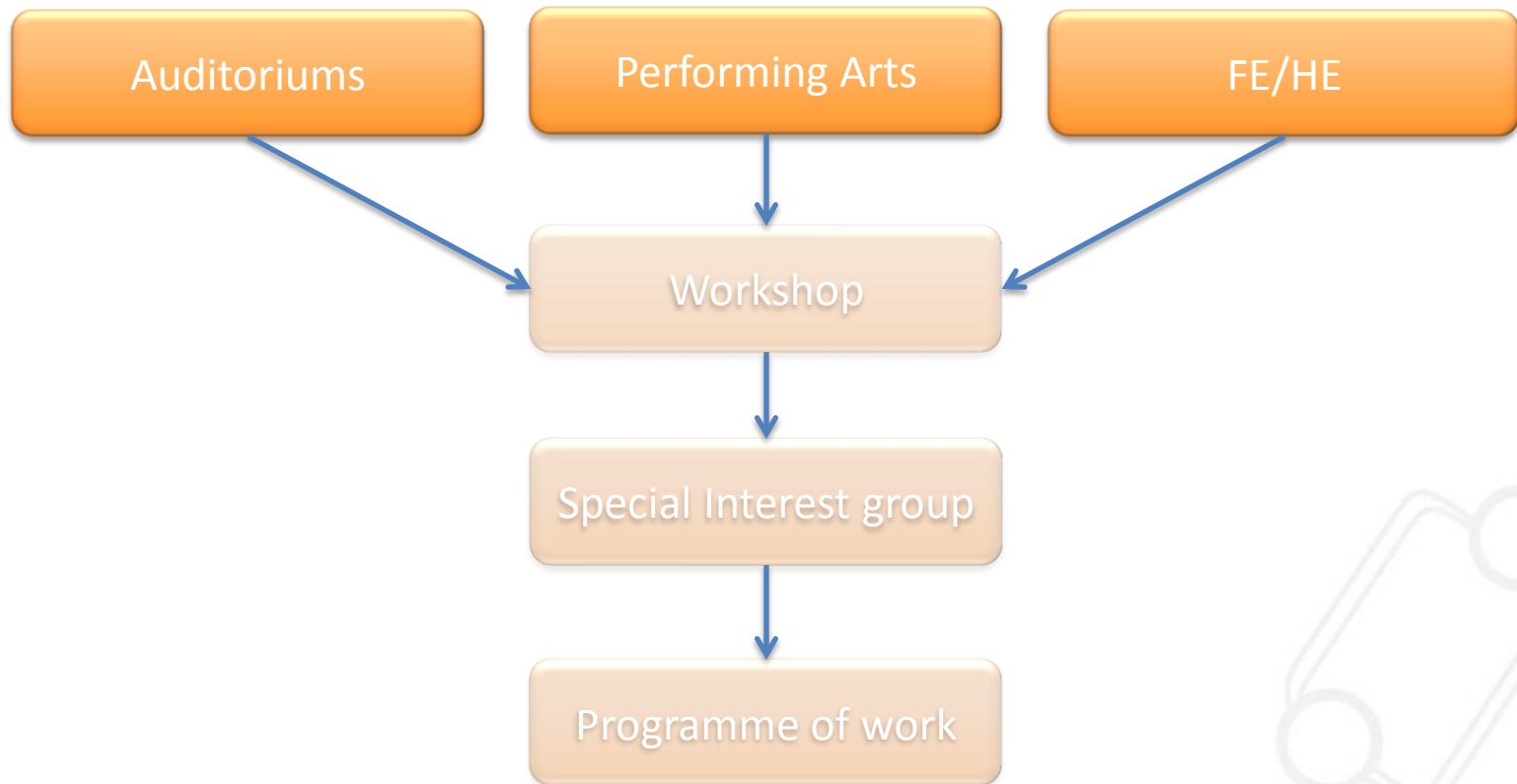
Audio Signal path



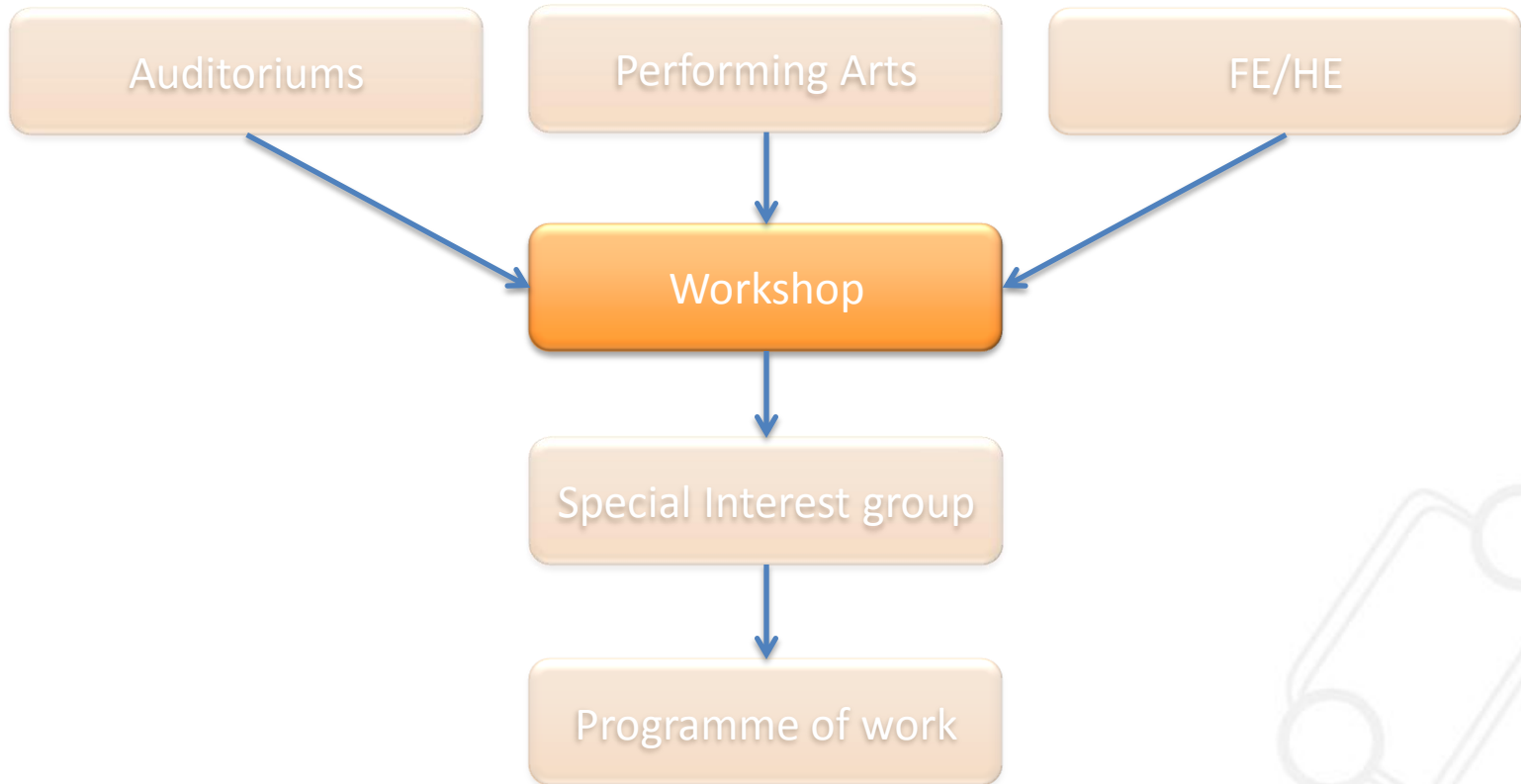
Video Signal path



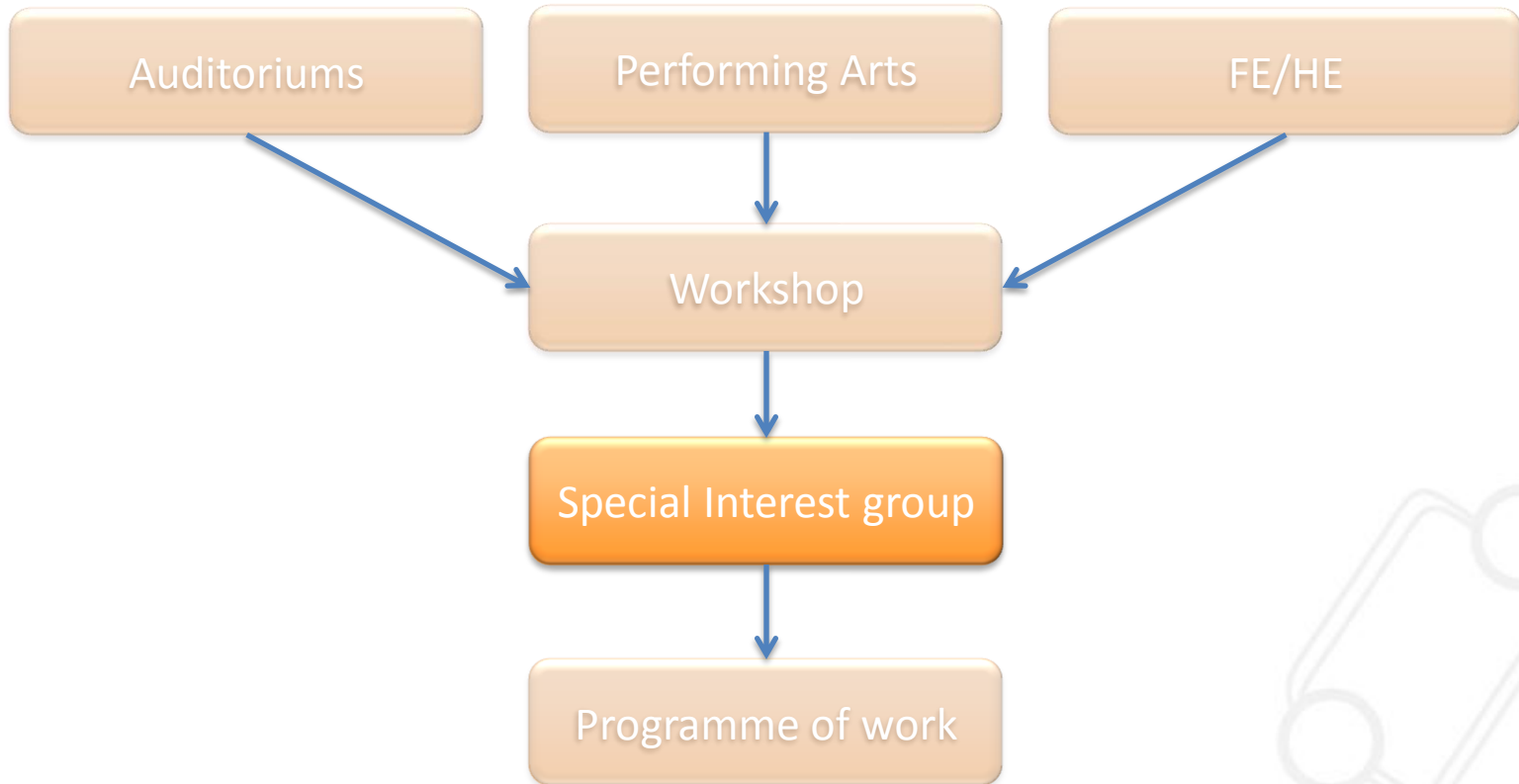
# What we want to do?



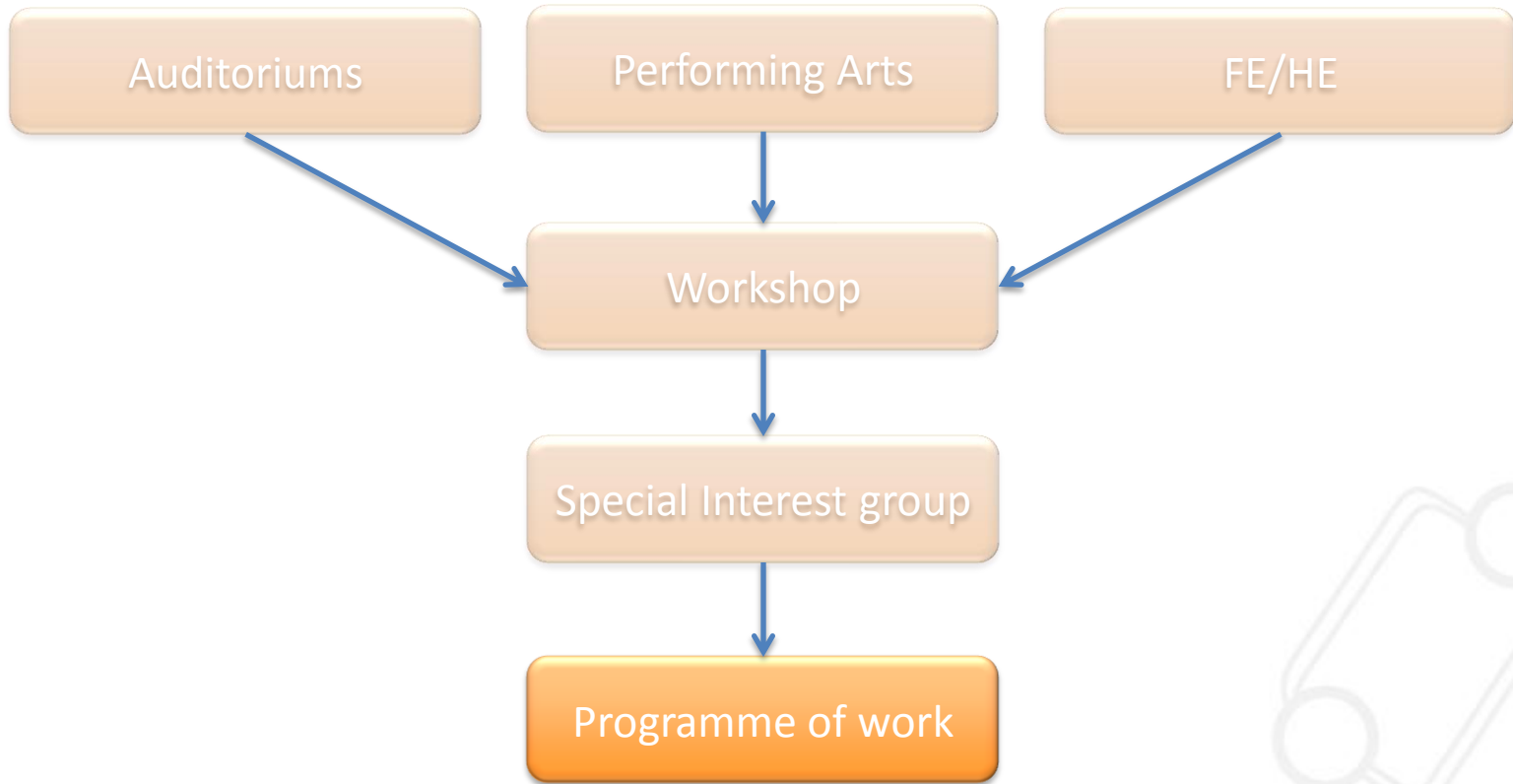
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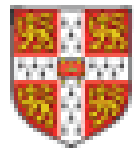


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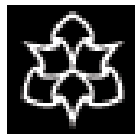


# What we want to do?





UNIVERSITY OF  
CAMBRIDGE



Manchester  
Metropolitan  
University



CITY OF BIRMINGHAM  
SYMPHONY ORCHESTRA



- If you would like to hear more, please contact:

[Emma.Smith@ja.net](mailto:Emma.Smith@ja.net)

01235 822343

# Any questions?

Ann Doyle, Internet2

[adoyle@internet2.edu](mailto:adoyle@internet2.edu)

+1 734.352.7011 (GMT - 4:00)

Emma Smith, JANET(UK)

[Emma.Smith@ja.net](mailto:Emma.Smith@ja.net)

01235 822343