



Consorti de
Serveis Universitaris
de Catalunya

Dancing with Networks

Maria Isabel Gandía Carriedo
7th SIG-NOC meeting
CSUC, Barcelona, 19-04-2018



Research and Education Networks

Stability, low latency, high capacity, dedicated circuits...science!



Fuente: CERN

Port d'Informació Científica (IFAE), connected to Anella Científica, is one of the LHC Tier1

Research and Education Networks are also...Art!



konicolab.alcañiz2017

The Key to Success: Networks and Tools



Network with packet loss, high definition tool

The Key to Success: Networks and Tools



Captura: Rosa Sánchez

Network without packet loss, standard videoconferencing tool.

The Key to Success: Networks and Tools



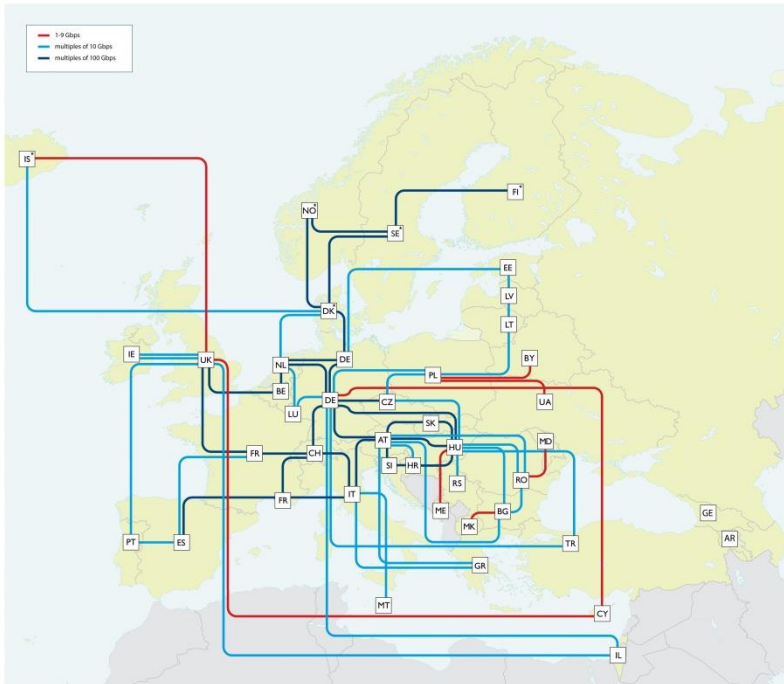
Jordi Pareto

What Networks?



www.geant.org

GÉANT's pan-European research and education network interconnects Europe's National Research and Education Networks (NRENs). Together we connect over 50 million users at 10,000 institutions across Europe.



- ✓ Stable
- ✓ High capacity
- ✓ Low latency
- ✓ Dedicated circuits

GÉANT's pan-European network is funded by the GÉANT Project (GN4-2). This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 731122. The map shows topology as at January 2017. The GN4-2 partners are listed below.



*Connections between these countries are part of NORDUnet (the Nordic regional network)

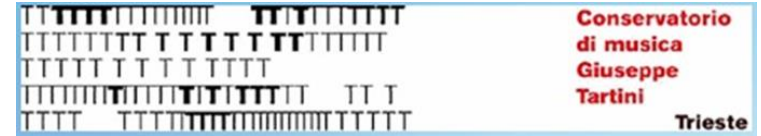


This document has been produced with the financial assistance of the European Union. The contents of this document are the sole responsibility of GÉANT and can under no circumstances be regarded as reflecting the position of the European Union.



What Tools? Software Created and Tested @ Research and Education Networks

- ✓ LOLA: LOw LATency Audio Visual Streaming System



- ✓ Ultragrid: high quality & low latency video



- ✓ Cinegrid, ConferenceXP, DVTS, iHDTV, ISABEL or VLC have been developed at universities
- ✓ EchoDamp: Echo cancellation



Live performance using LOLA: two piano players, one at Conservatorio Giuseppe Tartini (Trieste) and the other one at IRCAM (Paris).



- ✓ Opera Courses
- ✓ Master classes
- ✓ Network and Performing Arts Production Workshops
- ✓ Arts & Humanities Projects
- ✓ Development of Low Latency Software
- ✓ Rehearsals
- ✓ Live Performances
- ✓ Artistic Creations at the Universities
- ✓ Collaboration between students
- ✓ Demonstrations
- ✓ Celebrations



VLC
media player



University Course with previous tutorials and live HD operas, using multicast from Gran Teatre del Liceu to more than 50 universities.

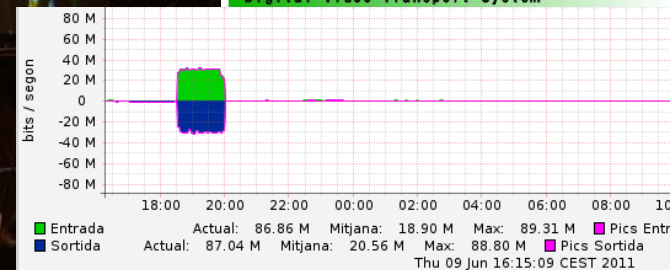
Master Class from Barcelona

Liceu  Òpera
Barcelona



Juan Luis Jiménez Tenorio

DVTS
Digital Video Transport System



Master Class from Liceu de Barcelona (Manel Porta) to a student at the Northern Illinois University (Katelyn Kozinski) during NPAPW2011.



Network and Performing Arts Production Workshops (NPAPW)

Liceu  Òpera
Barcelona

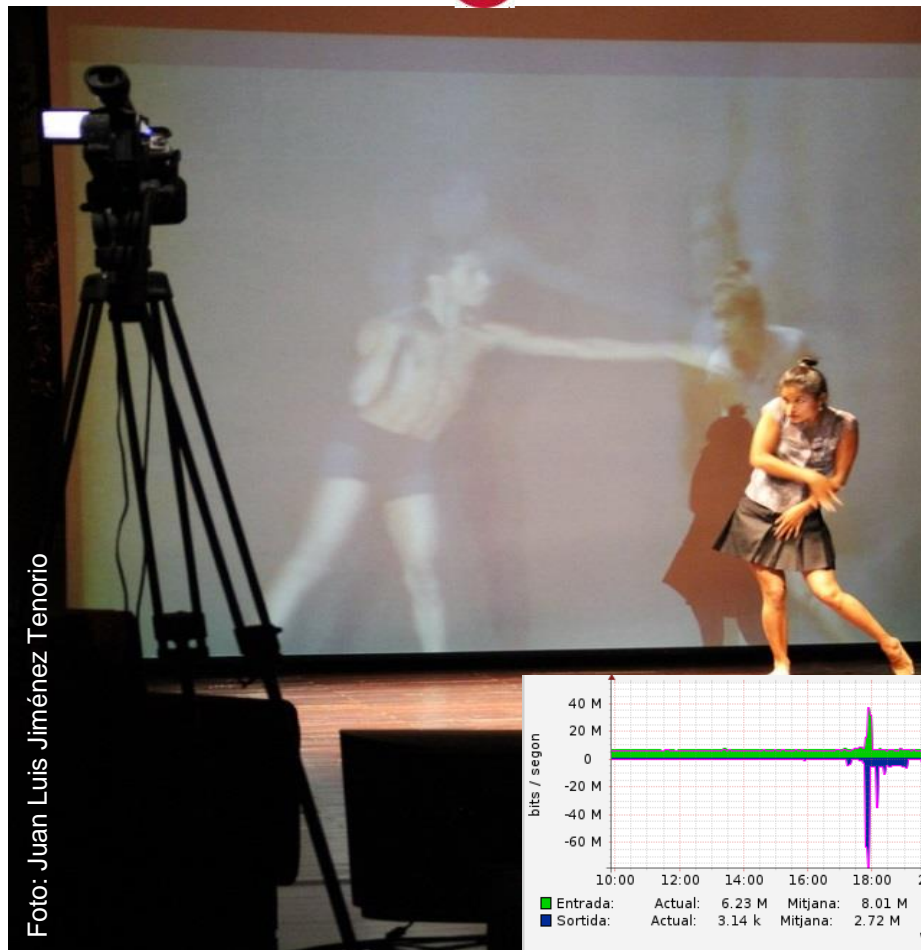
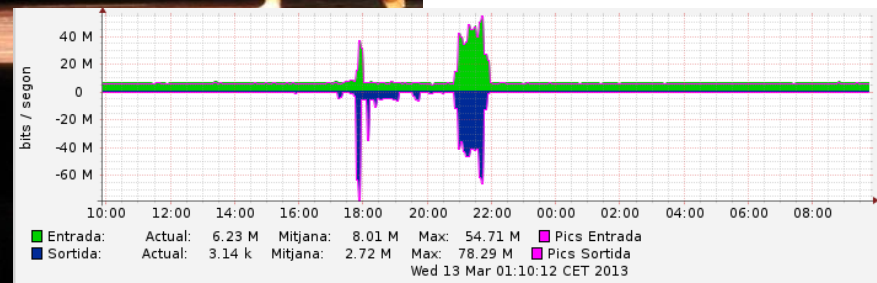
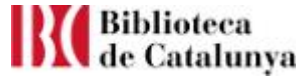


Foto: Juan Luis Jiménez Tenorio



E-Pormundos afeto, with Konic thtr and Ivani Santana, a distributed performance between Brasil and Barcelona (Gran Teatre del Liceu), NPAPW2011.

Arts & Humanities Projects: Specifi with Ultragrid



Diputació
Barcelona

Institut del Teatre



Fuente: Institut del Teatre



Fuente: Institut del Teatre

Demo Specifi Abril 2014

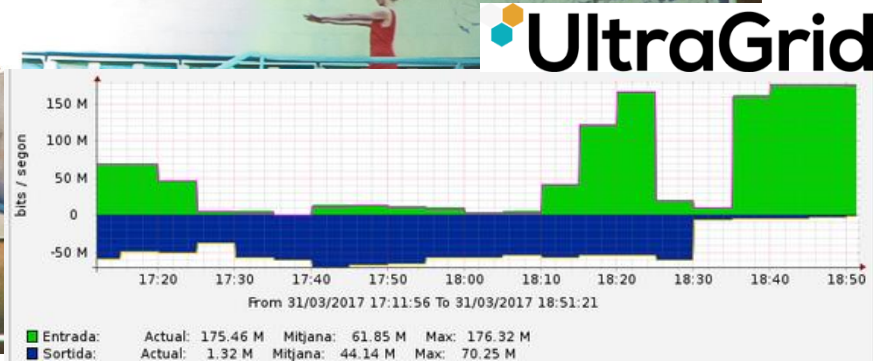
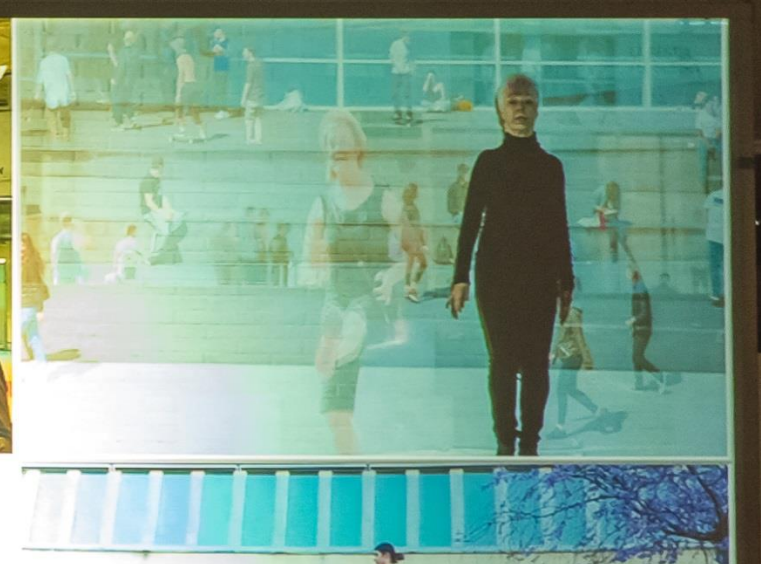


Generalitat de Catalunya
Departament de Cultura



Development and Demonstration of Low Latency Software: Similarities

MAC BA
MUSEU D'ART CONTEMPORANI DE BARCELONA

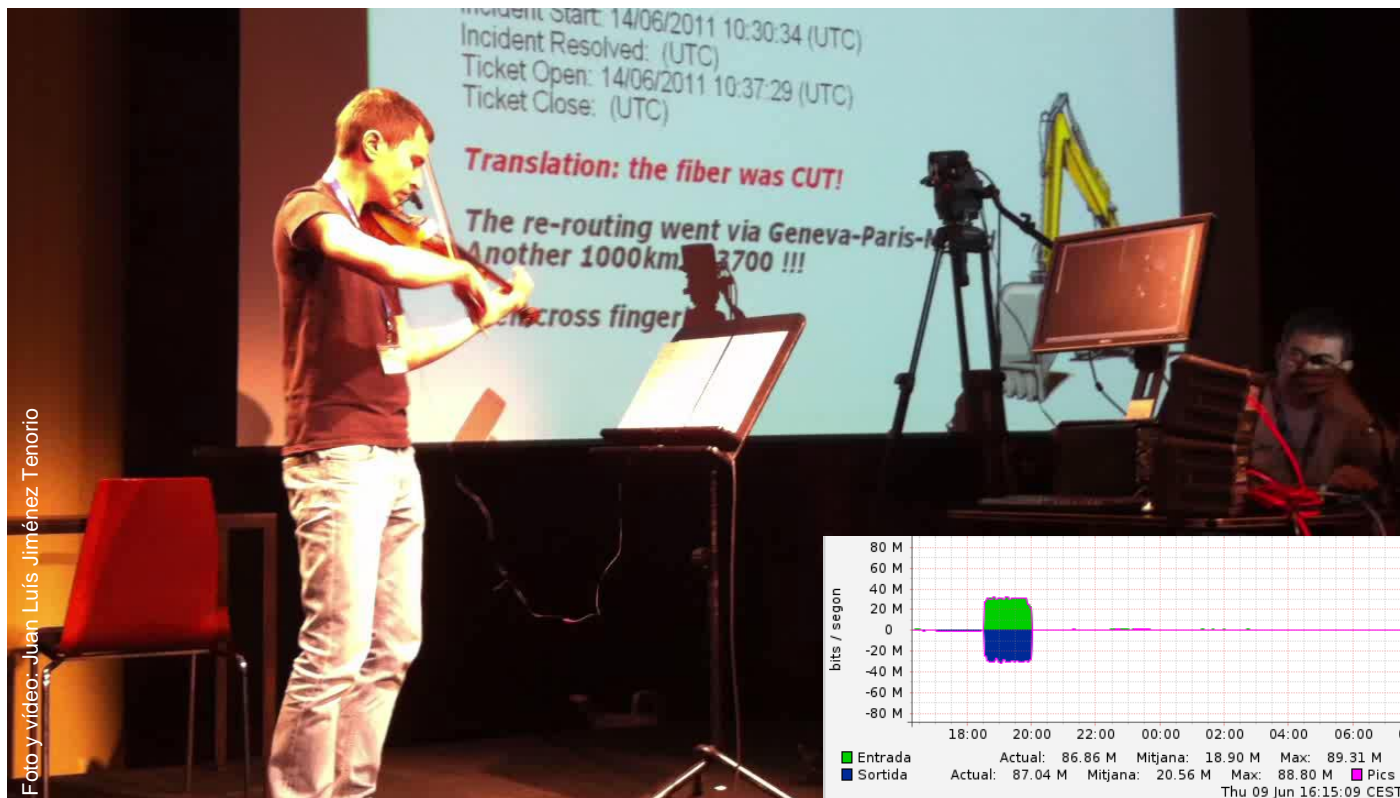


Similarities, Ultragrid demonstration Copenhagen/Prague/Miami/Barcelona, with Konic thtr, recorded during NPAPW2017 and presented at the New Media Film Festival (LA).

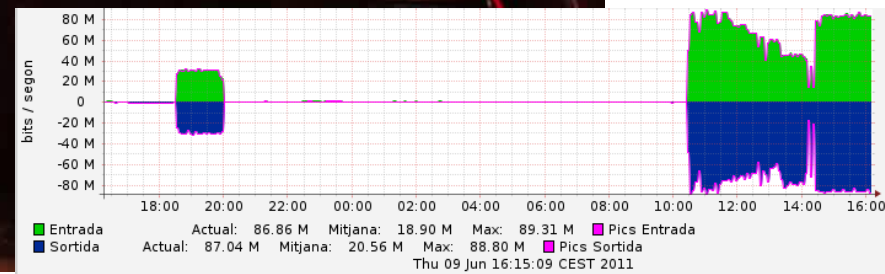


Rehearsals with LOLA, minimum latency

Liceu  Òpera Barcelona



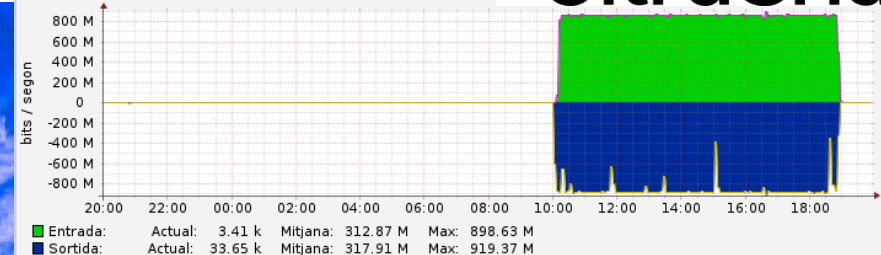
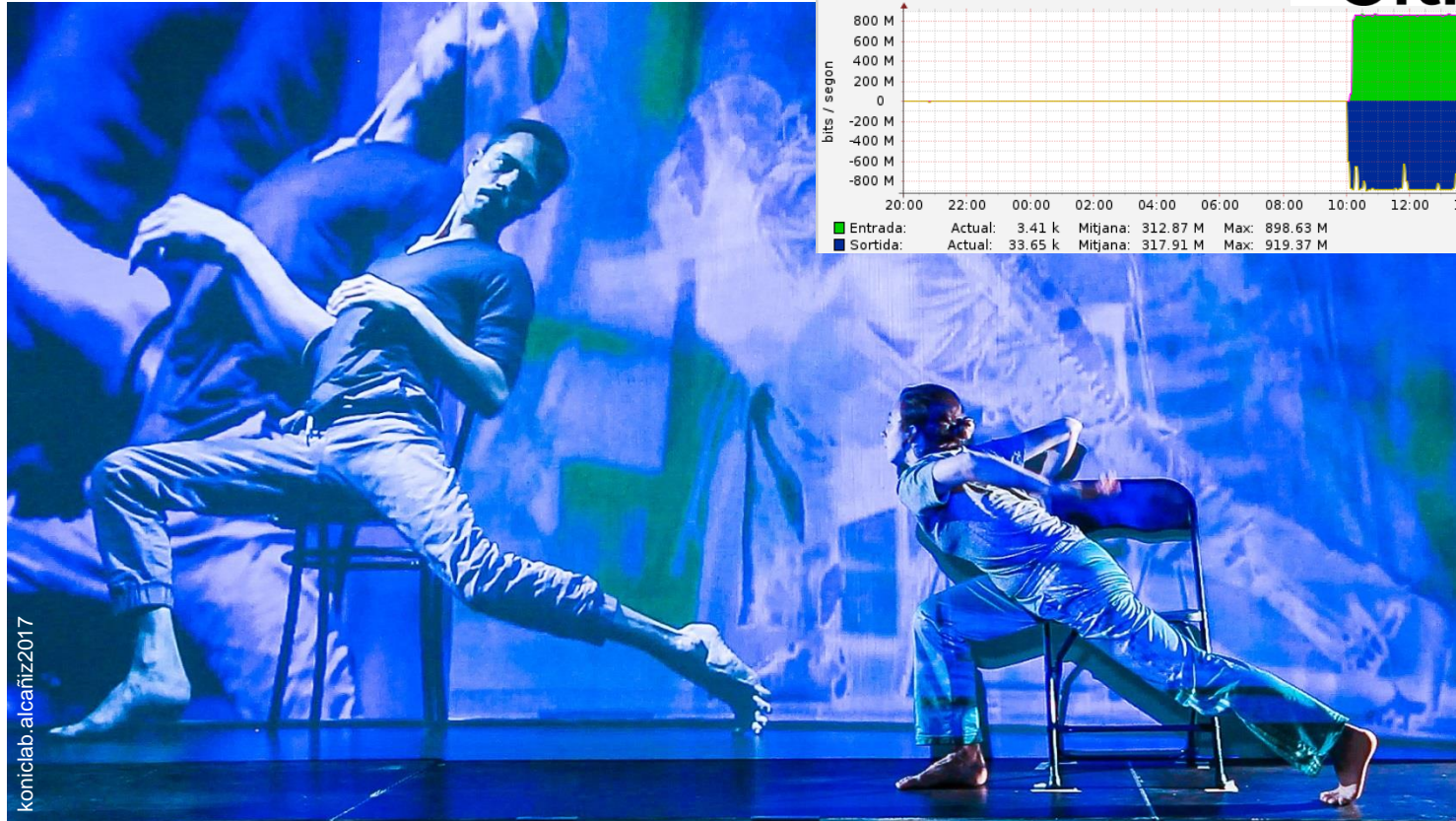
LOLA



Rehearsal with two violin students between Liceu de Barcelona and Conservatorio Giuseppe Tartini during NPAPW2011.



Live Performances: Near in the distance 3, TNC



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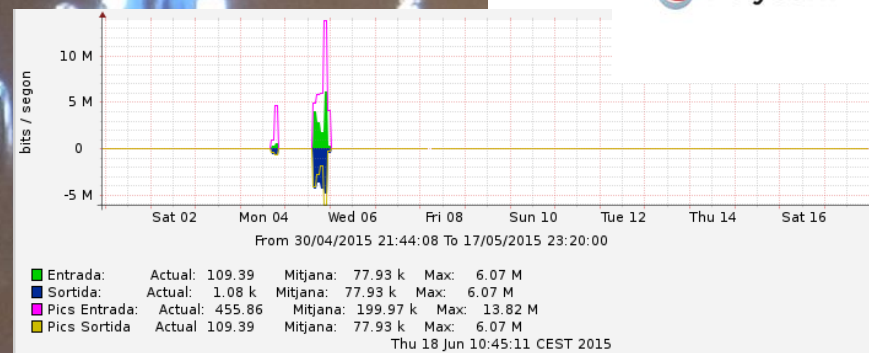
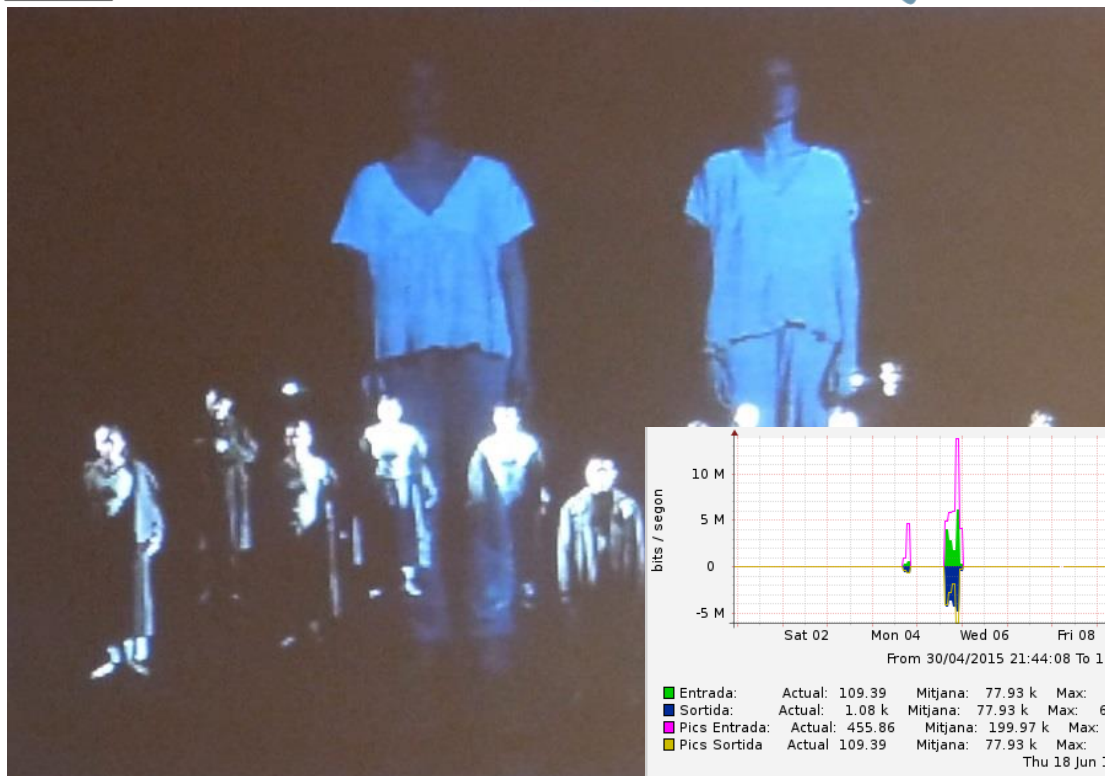
Distributed performance Linz, Barcelona (UPF), Prague, Rome, Hailuoto and Mumbai during the TNC2017, with Konic thtr.



Artistic Creations at the Universities: The Infinite Bridge

MAC
BA

MUSEU
D'ART CONTEMPORANI
DE BARCELONA



The Infinite Bridge, created by the Royal College of Music students: London (RCM), Helsinki (SibA) and Barcelona (MACBA), with Handmadedance (NPAPW2015).



Collaboration between students: PULSAR Festival 2017: Longing for the Impossible for the moment it is real: Copenhagen calling London & Barcelona

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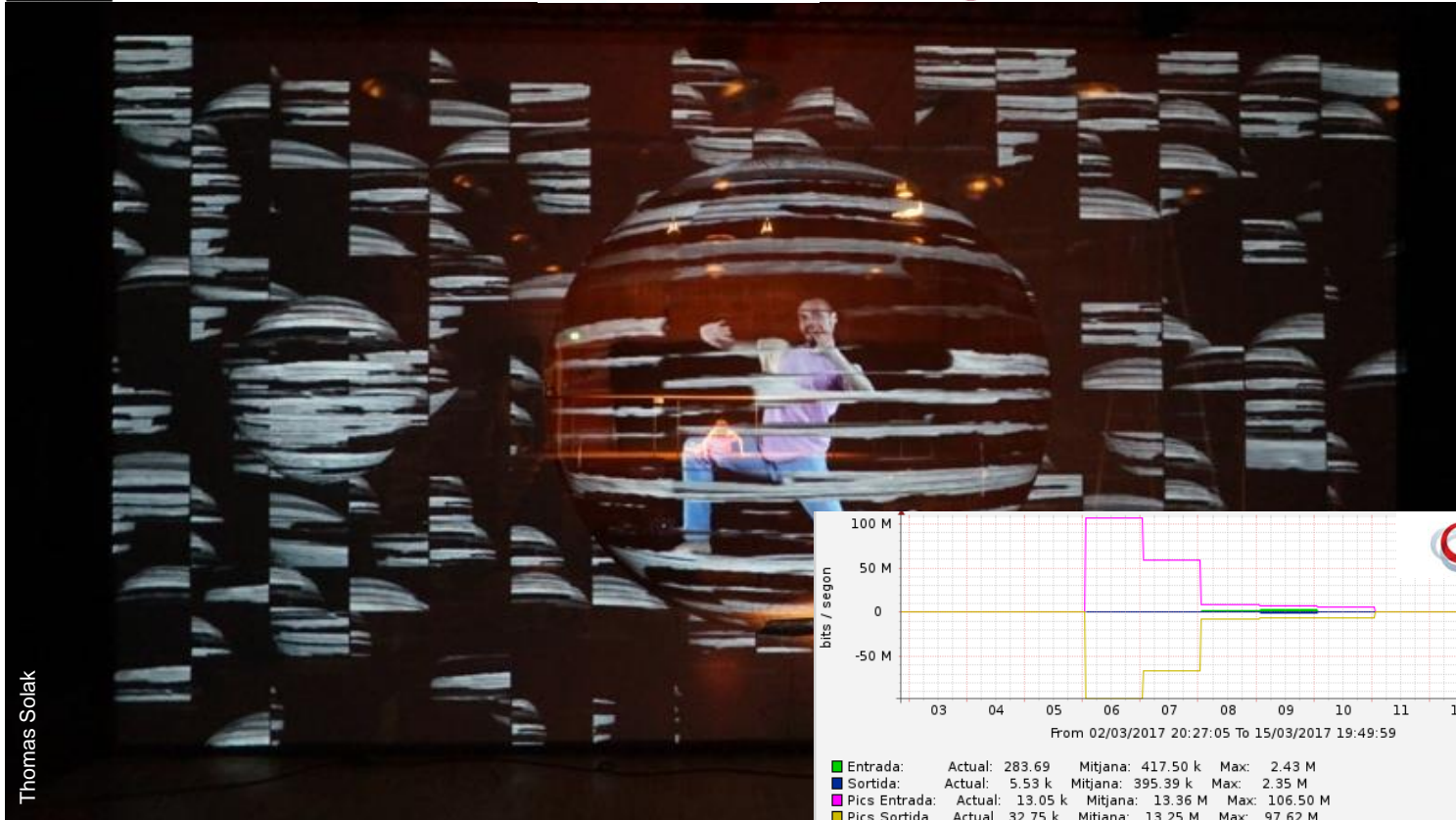


Ajuntament de
Barcelona

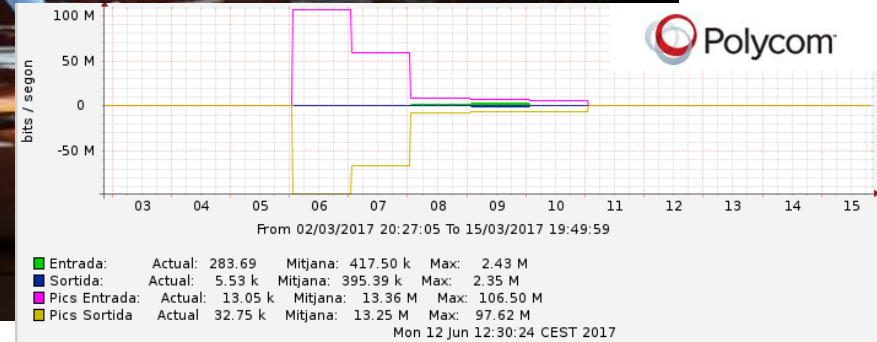


Diputació
Barcelona

Institut del Teatre



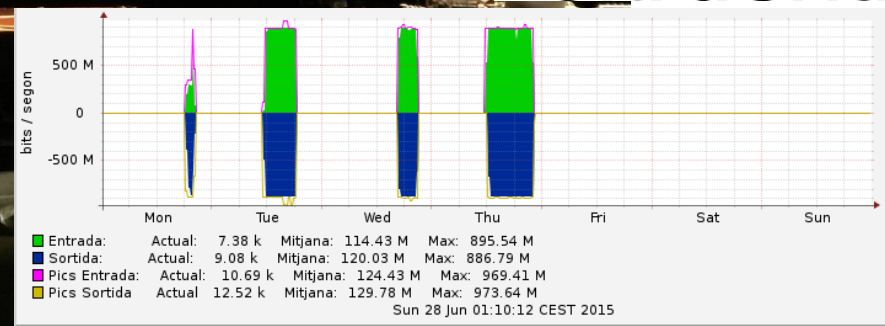
Thomas Solak



PULSAR Festival performance: Copenhagen London and Barcelona (MACBA), distributed performance with students from Institut de Teatre and DKDM



Celebrations: Near in the distance 2

“Near in the distance 2” with Konic Thtr: Vienna (mdw), Judenburg, Prague, New York, Ljubljana and Barcelona (MACBA), AConet 25th & University of Viena 650th anniversary celebrations.



Celebrations: Near in the distance 2



“Near in the distance 2” with Konic Thtr: Vienna (mdw), Judenburg, Prague, New York, Ljubljana and Barcelona (MACBA), ACOnet 25th & University of Viena 650th anniversary celebrations.



- ✓ The space
- ✓ The network
- ✓ Equipment & software
- ✓ Rehearsals
- ✓ Unforeseen problem resolution

The Space (1): Near in the distance 2



The Space (1): Near in the distance 2



Jordi Pareto

The Space (2): Near in the distance 3



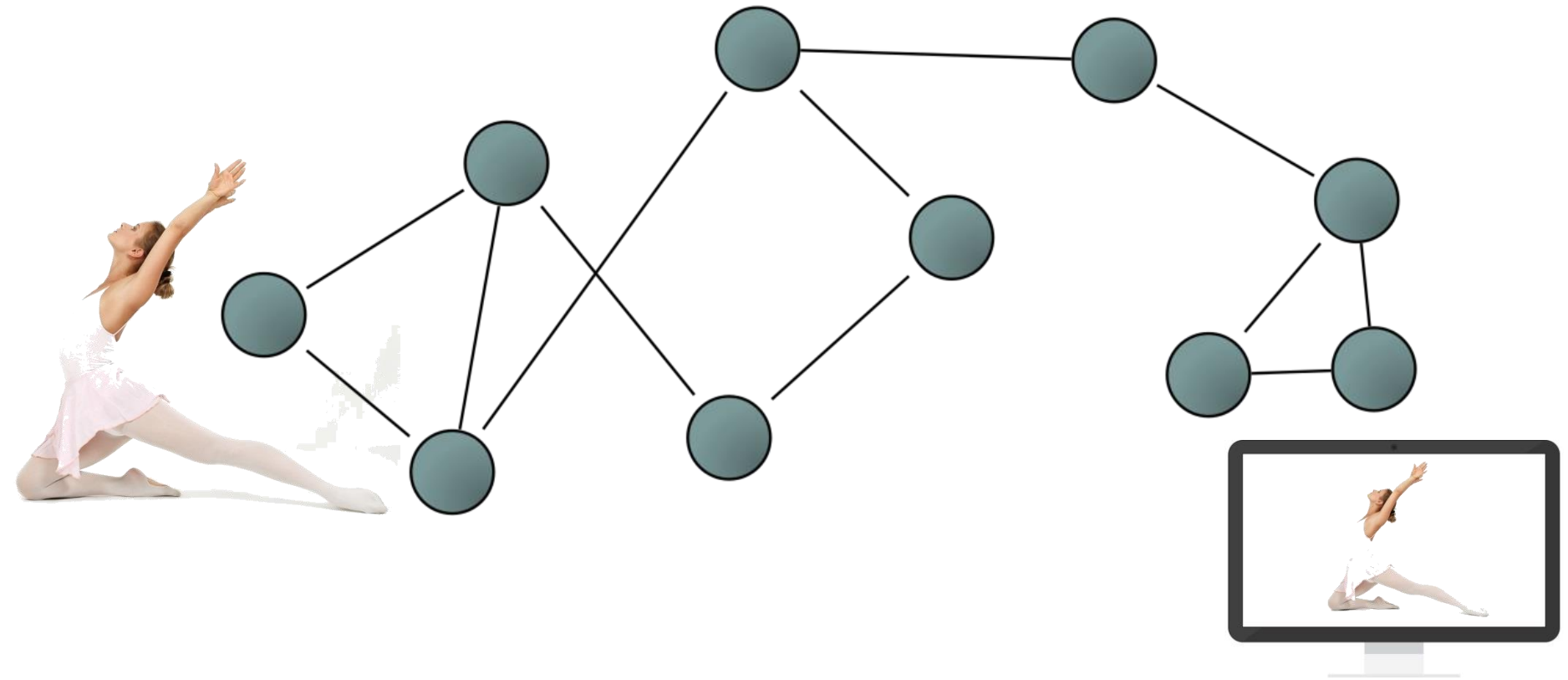
UPF

The Space (2): Near in the distance 3



The Network

- ✓ We try to reserve dedicated circuits for the events whenever it is possible.
- ✓ We check we have the expected bandwidth without packet loss.
- ✓ We reserve dedicated VLANs and IP ranges for the event.
- ✓ We try to isolate the event from the internal network.



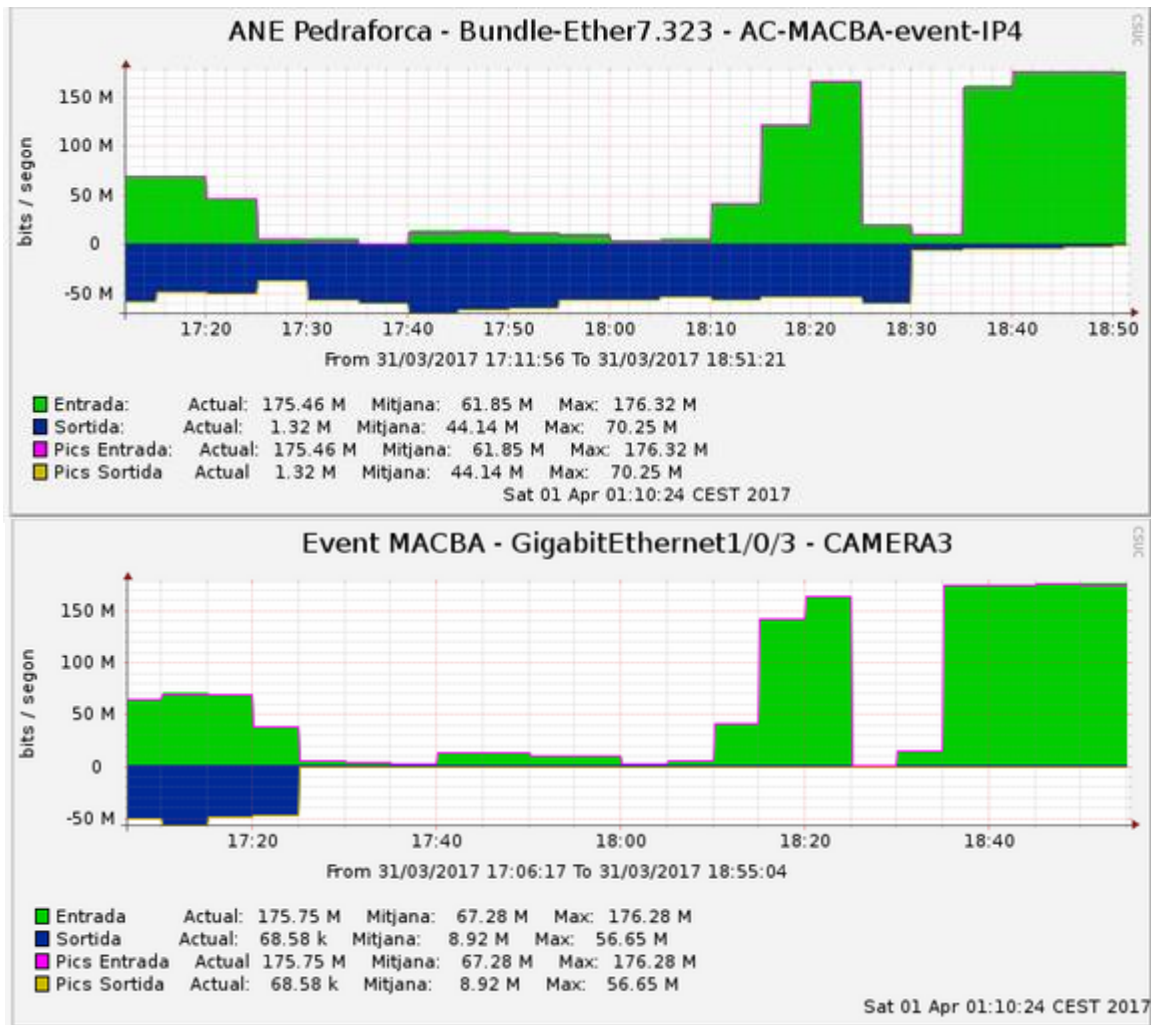
The Network (1): Near in the distance 2



886 Mbps

- ✓ New internal switches at the Museum in order to support 1 Gbps
- ✓ New equipment and a dedicated fiber ring from the provider
- ✓ Temporary Upgrade in the Anella Científica connection
- ✓ Dedicated circuit MACBA \leftrightarrow Anella Científica

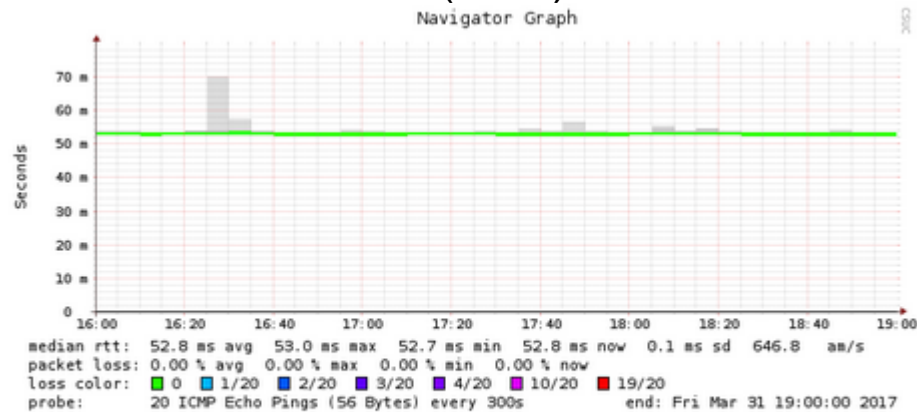
The Network (2): Similarities (or the disappearing traffic mystery)



Barcelona, solve the problem!

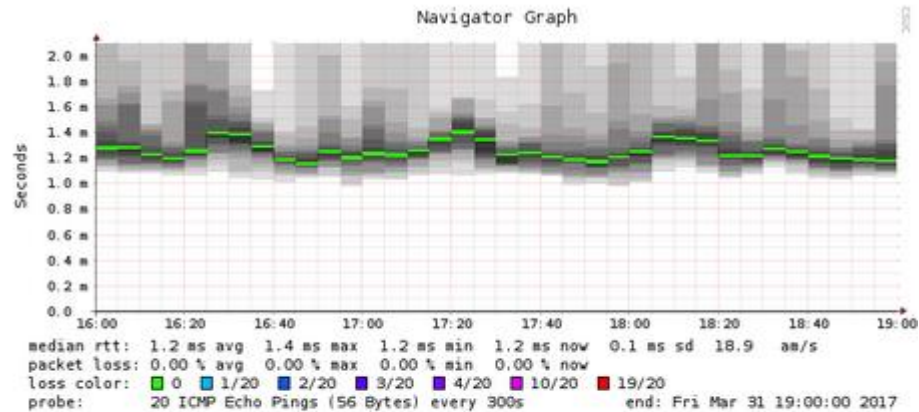
The Network (2): Similarities (or the disappearing traffic mystery)

Ping from Anella Científica to Géant (DFN):



Time range: to

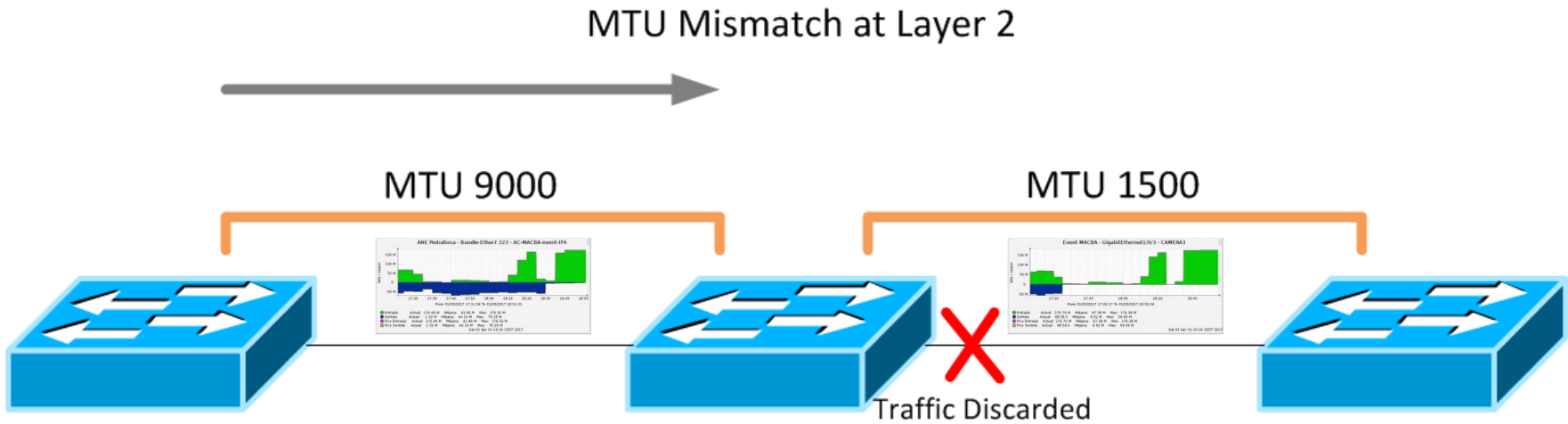
Ping from Anella Científica to MACBA:



Time range: to

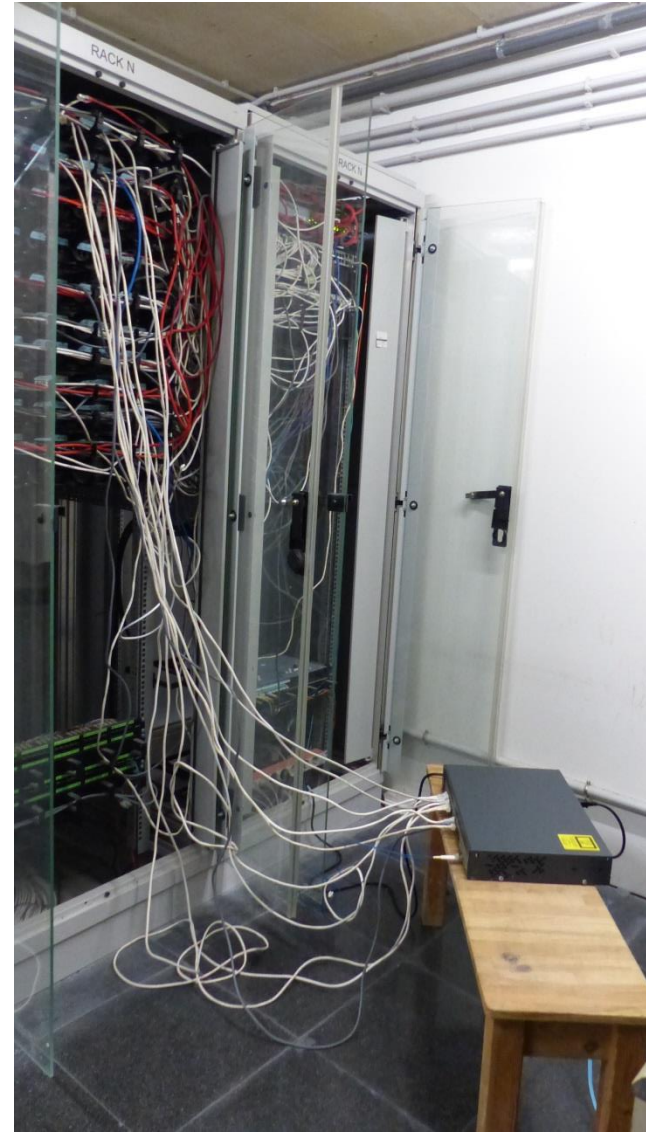
The Network (2): Similarities (or the disappearing traffic mystery)

Yeah, it was Jumbo-frames!!!



<https://keepingitclassless.net/2013/03/jumbo-frames-beyond-the-broadcast-domain/>

The Network (3): Near in the distance 3 (layer 1 issues)



Equipment: Near in the distance 3



Captura: Alain Baumann

Equipment: Near in the distance 3



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Equipment: Near in the distance 3

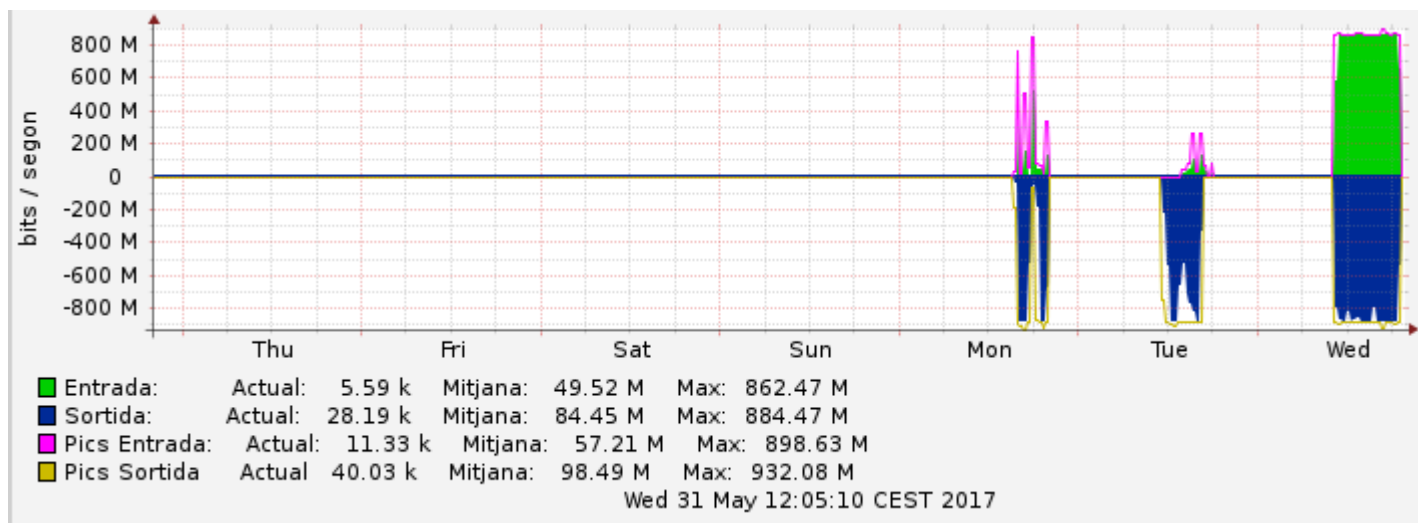
```
Performing-arts#show int gi1/0/26
GigabitEthernet1/0/26 is up, line protocol is up (connected)
  Hardware is Gigabit Ethernet, address is 0013.191c.f19a (bia 0013.191c.f19a)
  Description: PERFORMING-ARTS-TRUNK
  MTU 9000 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 220/255, rxload 223/255
  Encapsulation ARPA, loopback not set
  Keepalive not set
  Full-duplex, 1000Mb/s, link type is auto, media type is 1000BaseSX SFP
  input flow-control is off, output flow-control is unsupported
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output 00:00:00, output hang never
  Last clearing of "show interface" counters 03:19:15
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 878080000 bits/sec, 74374 packets/sec
  5 minute output rate 862826000 bits/sec, 81527 packets/sec
    892174028 packets input, 1317083089621 bytes, 0 no buffer
    Received 257907 broadcasts (0 multicasts)
    0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
  973155185 packets output, 1287710082883 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 PAUSE output
  0 output buffer failures, 0 output buffers swapped out
Performing-arts#
```

Equipment: Near in the distance 3



Alain Baumann

Equipment: Near in the distance 3 (Blessed Jumbo-frames)



Rehearsing: Longing for the impossible... (or the green dresses mystery)



All the connections are important, not only the network connections!

Unforeseen problem resolution: Near in the distance 2



Working on a holiday

Koniclab.albañiz2015

“Big” emergency switch

Break a leg! Literally...



Unforeseen Problem Resolution: PULSAR Festival (the green background)



Unforeseen Problem Resolution: PULSAR Festival (the green background)



Unforeseen Problem Resolution: PULSAR Festival (the green background)



Unforeseen Problem Resolution: PULSAR festival, “Close Dancing”



Unforeseen Problem Resolution: PULSAR (Only Black or Green!)



Unforeseen Problem Resolution: PULSAR Festival (the green background)



The Space is Ready, the Network Works, Problem Solved!



A special “THANK YOU!” to the people and institutions that make it possible:

Adolf Alcañiz
Francisco Banderas
Alain Baumann
Ulf Busch
Xavier Carreras
Irene García
Elia Genís
Dominik Grunbuhel
Gemma Felius
Anna Hierro
Miquel Huguet

Fran Iglesias
Juan Luis Jiménez
Andrea Just
Renate Kreil
Neus Ledesma
Pedro Lorente
Victoria Macarte
Christian Panigl
Caterina Parals
Jordi Pareto
Xavier Peiró

Manel Pérez
Rafel Plana
Miquel Puig
Bruno Ramri
Hermann Rothe
Rosa Sánchez
Thomas Solak
Teresa Via
Marc Vives
And many others...

ACONET
CESNET
CSUC
Fundació i2CAT
GARR
Gran Teatre del Liceu de
Barcelona

GEANT
Handmadedance
Iglor
Institut de Cultura de l’Ajuntament
de Barcelona
Institut del Teatre
Internet2

Konic thtr
MACBA
RedIRIS
UPF
And many others...

THANK YOU!!!



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Thanks for you attention!

Questions?

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