



Use-cases demanding applications vision statements

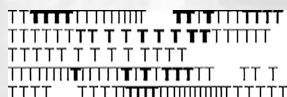
This session will aim to articulate the potential for better Internet experiences and applications if low latency goals can be realised.

How much faster could the Internet be?

What would that mean for applications and users?

Session lead: Claudio Allocchio
Contributors: Dave Täht, Lucien Avramov

90 minutes



Conservatorio
di musica
Giuseppe
Tartini
Trieste

The LOLA team
ISOC Low Latency WS

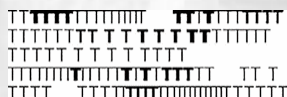


LOLA

LOWLatency Audio Visual Streaming System A Low Latency Use Case

**A LOW LATENCY, HIGH QUALITY AUDIO/VIDEO TRANSMISSION SYSTEM FOR
NETWORK MUSICAL PERFORMANCES AND INTERACTION**

Made by: ConservatorioG. Tartini, Trieste &
Consortium GARR



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14:00

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- talking at low latency is much less stress!

-

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100 Mbps → 500 Mbps
30 fps → 90 fps
2 ch → 10 ch

...

New programming approach!

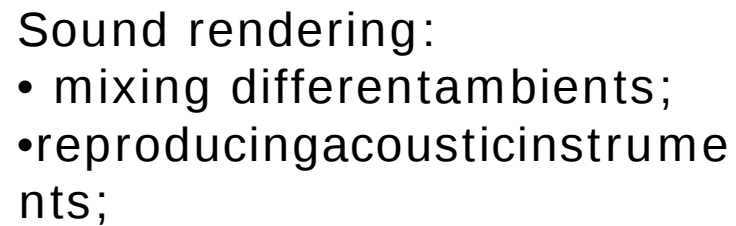
<http://www.conts.it/artistica/lola-project/>

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-
- 10ms
- 15ms
- 20ms
- 25ms
- 30ms
- The World**
POLITICAL
- 0 1000 Miles
0 1000 Kilometers
- Courtesy of Nathan Brock, UCSD
- maps.com
- © 2001 Maps.com - <http://www.maps.com>



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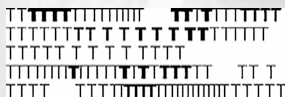


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- # NETWORK SERVICES!

Comments by LOLA users

“We are in a new unexplored world: how can we adapt interpretation/composition to two different Concert Hall acoustic environment at the same time?”

“Your horizon expands from a city to a continent”

“You can talk, listen, make examples BUT ALSO you can PLAY TOGETHER”

“We won the CODECs challenge! ... the challenge is for the network now!”

“A powerful tool to analyze and refine your performance”

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UltraLight

ain

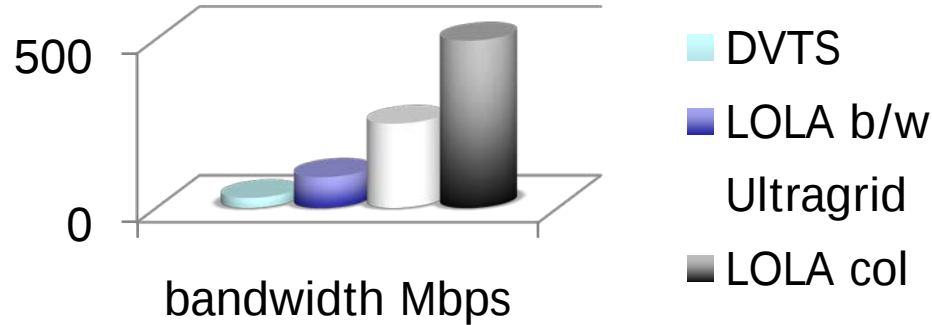
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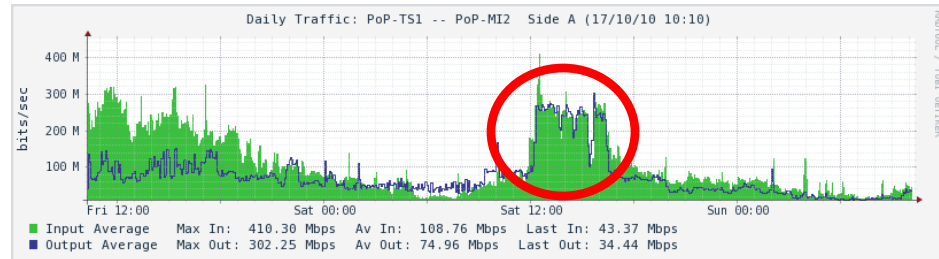


LOLA Network Issues

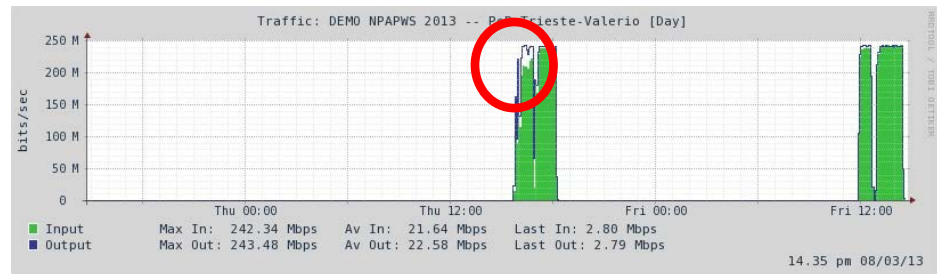
Bandwidth!



Traffic!

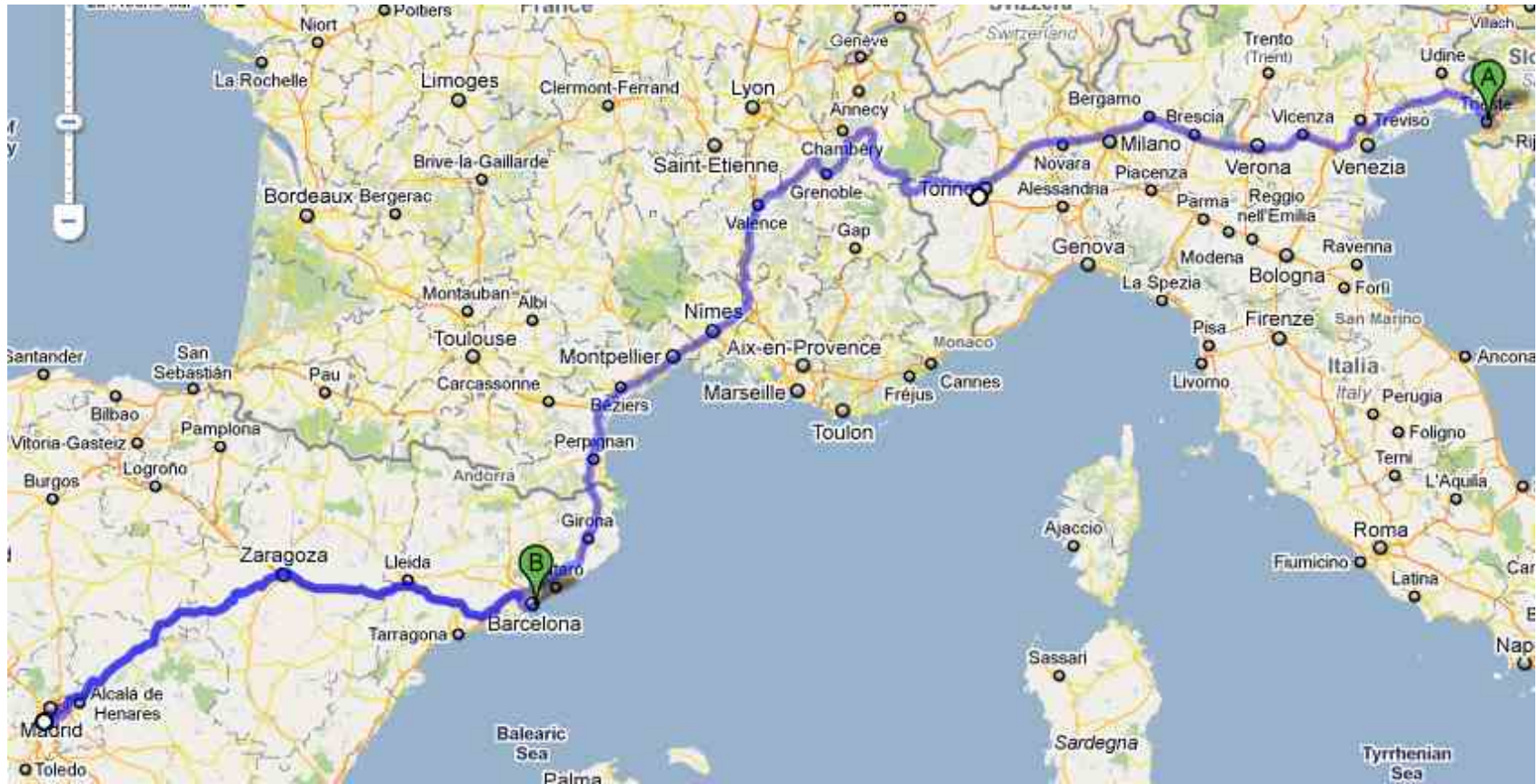


Firewalls, Switches!



LOLA Network Issues: topology

- Trieste-Barcelona (via Madrid): ~ 3200km instead of 2400!

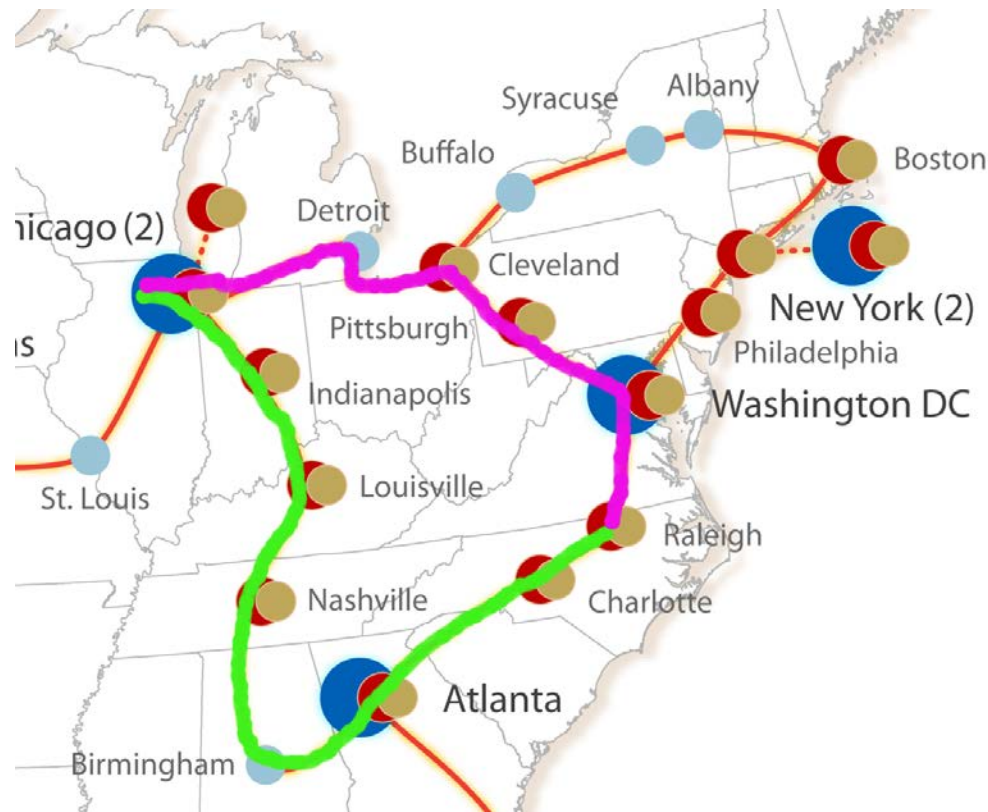


LOLA Network Issues: asymmetry

Internet2 Fall Meeting: NIU School of Music, DeKalb IL – Raleigh
NC: 1290 Miles / 2080km (green), 1170 Miles / 1890km (pink)

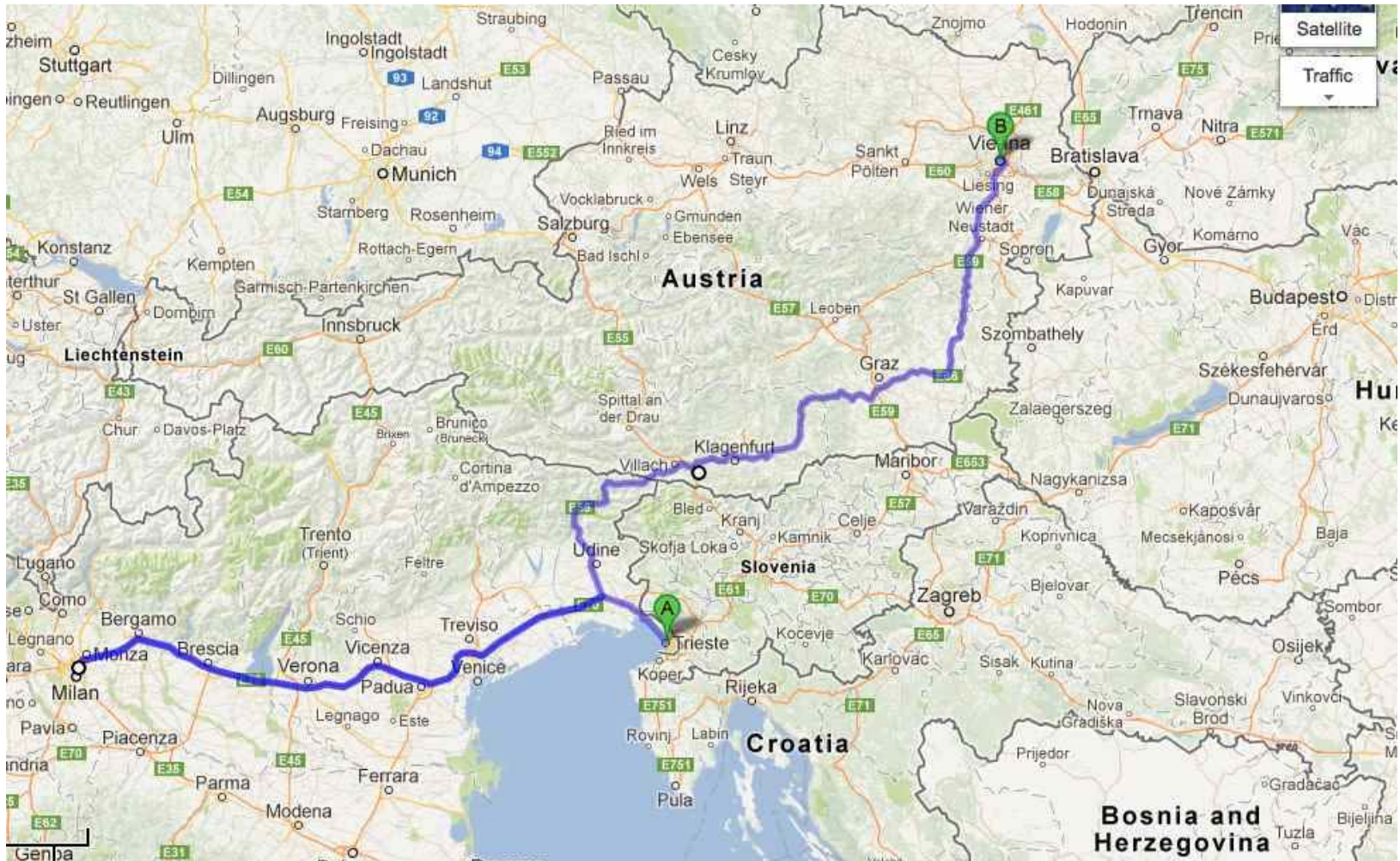
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Network Design

Default link Trieste-Vienna via Milan: ~25ms

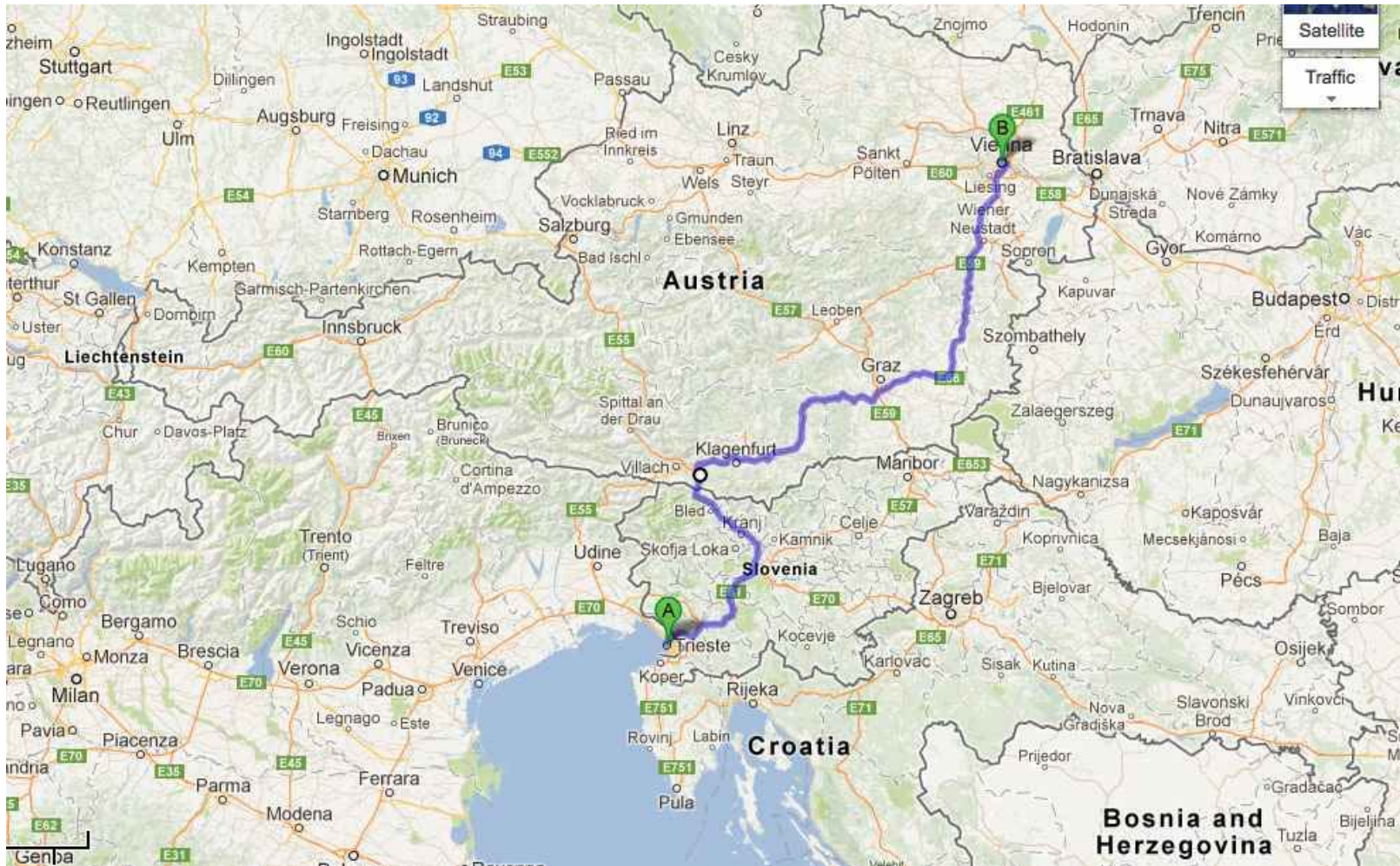


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Network Design

Trieste-Ljubljana (d.f.) + Ljubljana-Vienna (circuit): 9 ms

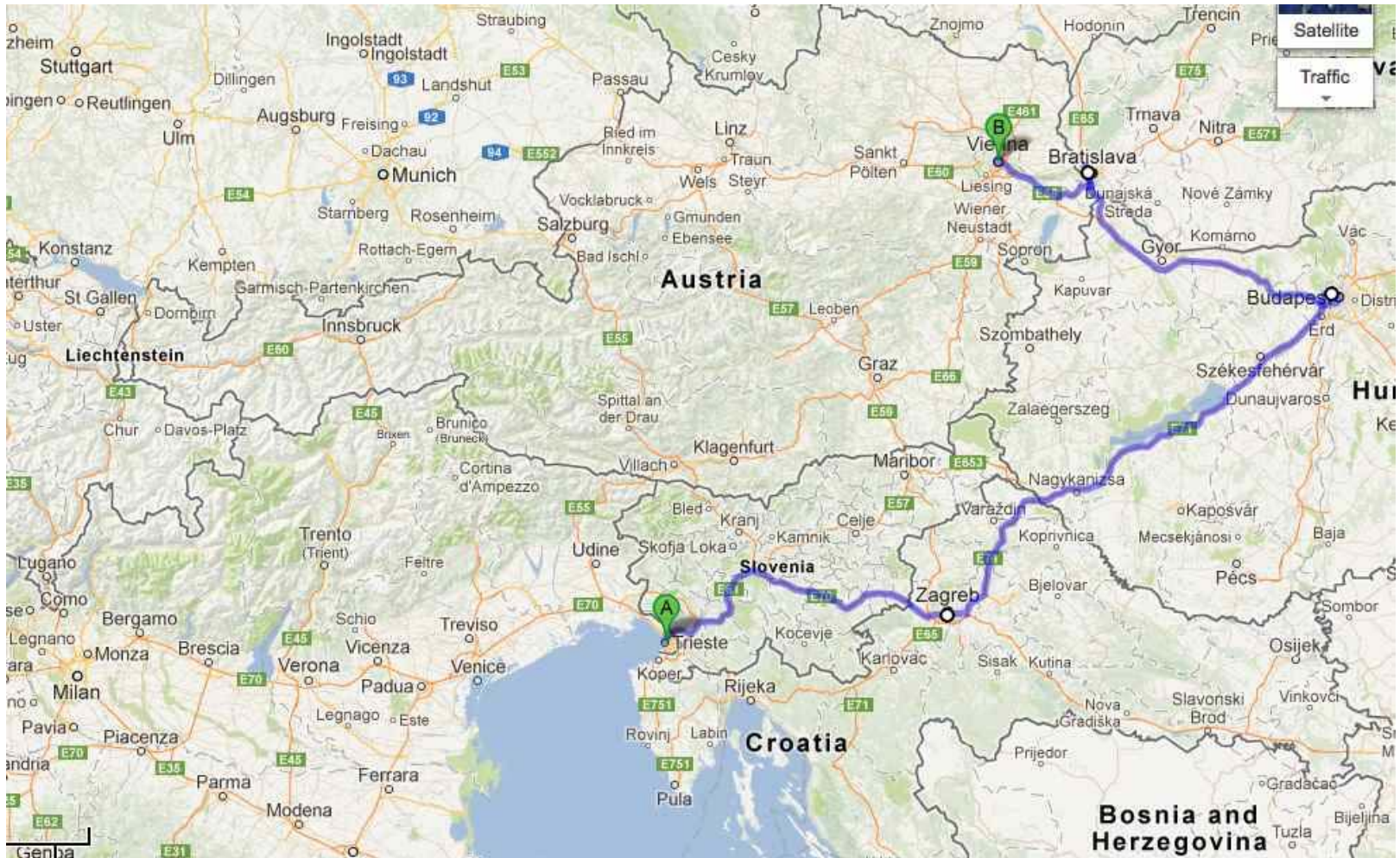


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Network Design

If something goes wrong on the “circuit”: ? ms



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Incident Start: 14/06/2011 10:30:34 (UTC)
Incident Resolved: (UTC)
Ticket Open: 14/06/2011 10:37:29 (UTC)
Ticket Close: (UTC)

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But useless video data!

Packets reordering at optical layer!



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- getting rid of “additional features” seems to be a win strategy...
- we did it for the codecs → latency down to 5ms
- I/O A/V devices: old CRT displays and RGB BARCO projectors
- no filters, ACLs, no “intelligent devices”...
- end-to-end layer 1 optical link with ethernet frames on it (and no checksum!)
- do we need IP at all?
- microwaves are 30% faster than fibers (but what about stability?)

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