



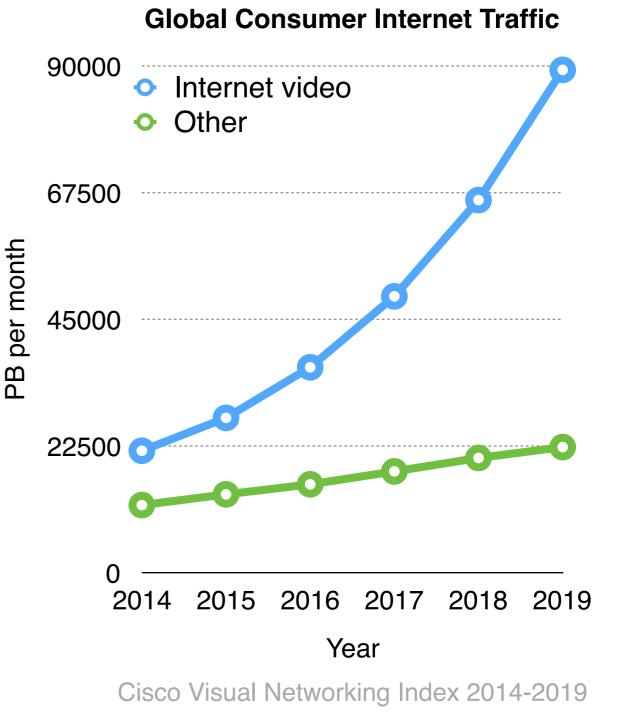
TCP Goes to Hollywood

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Multimedia Applications

- Significant and growing percentage of all Internet traffic
- Sensitive to latency, as well as loss
- Must use either TCP or UDP, and TCP when UDP not available

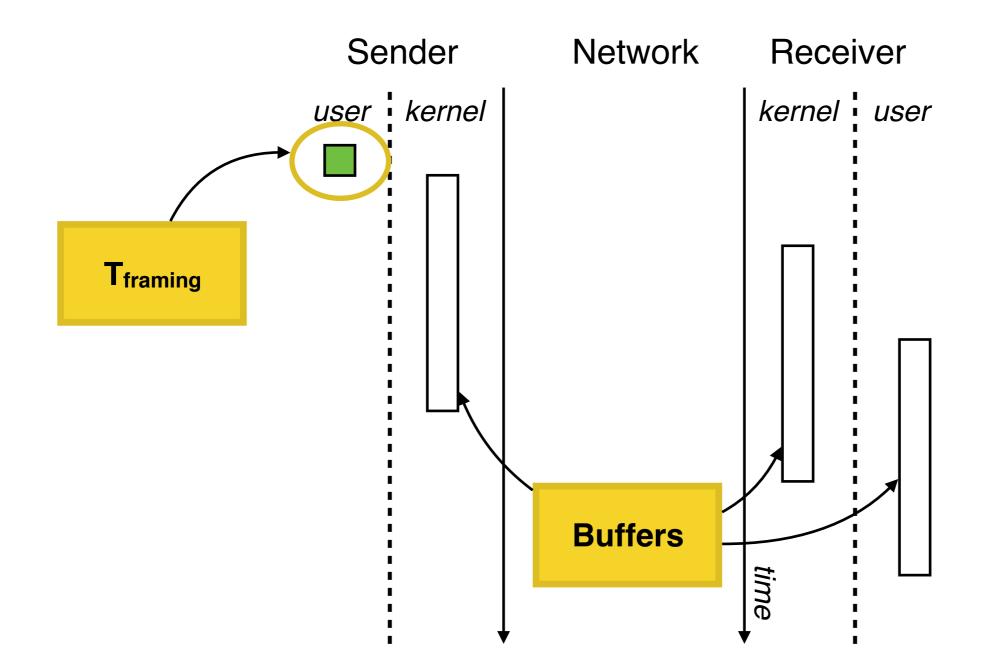


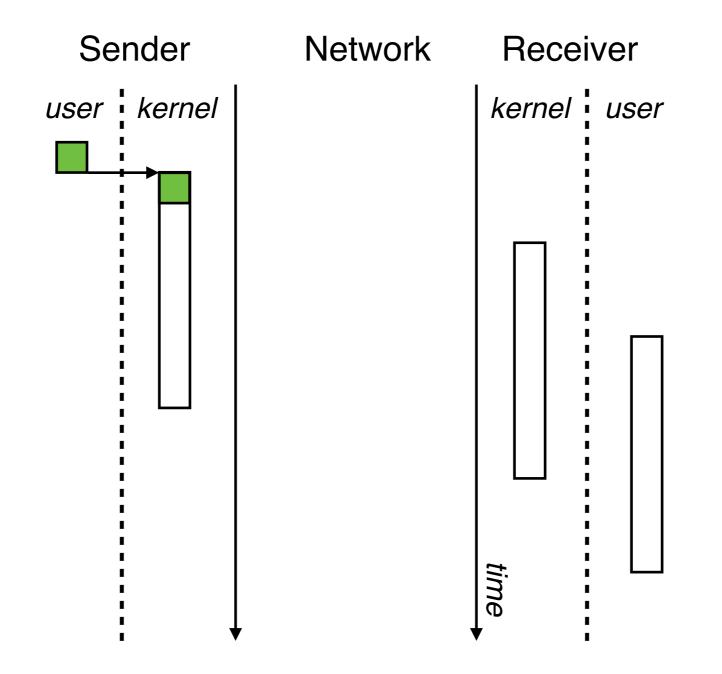
TCP adds latency

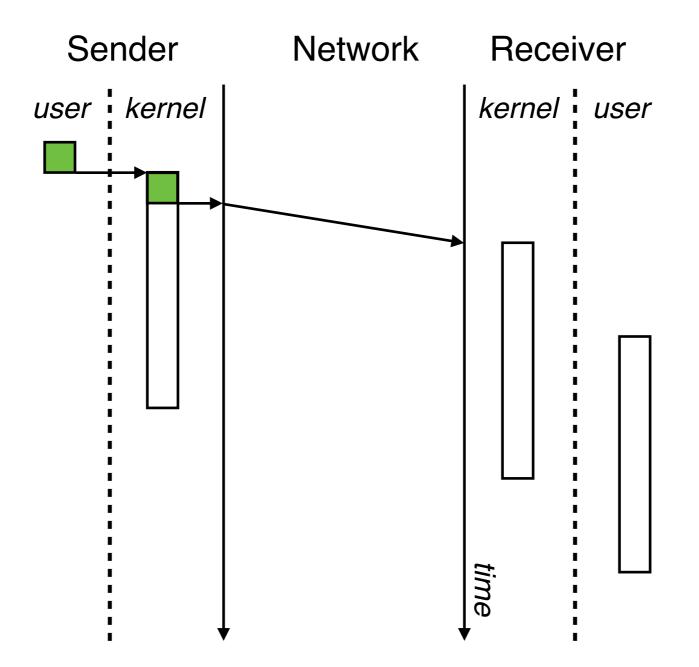
- In-order delivery means buffering out-of-order segments, waiting for the delivery of earlier data — head-of-line blocking
- Reliability involves detecting that a segment has been lost, and retransmitting it
- Both of these mechanisms add latency, making TCP a poor choice for real-time multimedia applications

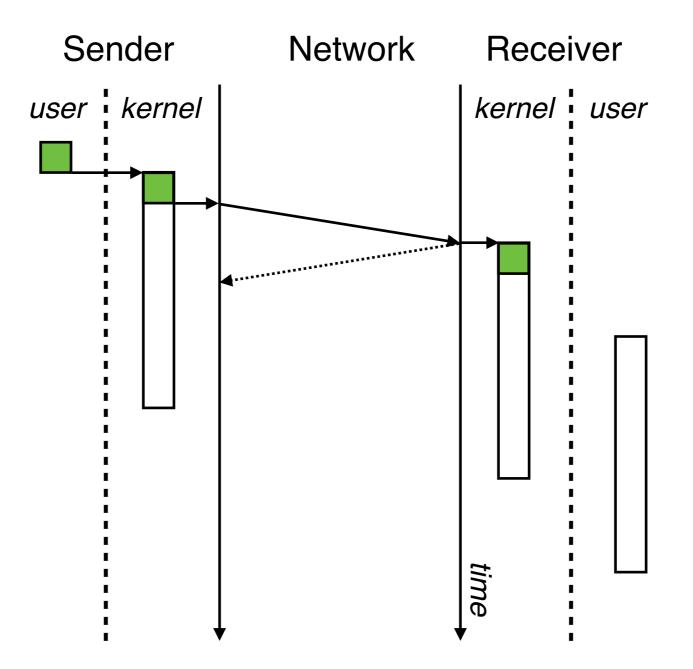
Introducing TCP Hollywood

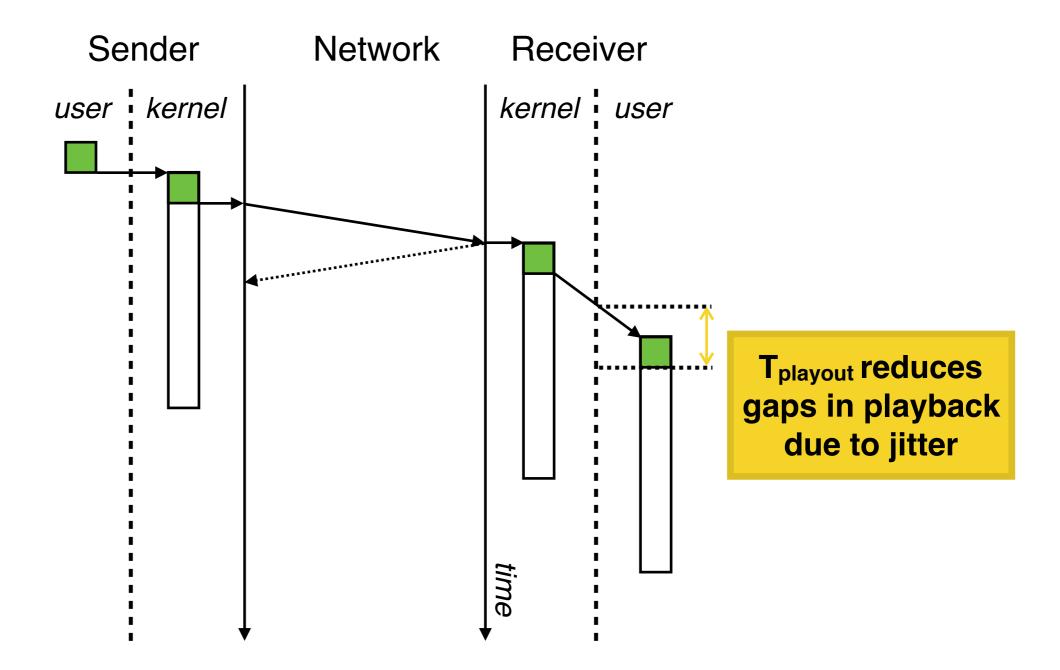
- Uses TCP as a substrate, to overcome ossification, but modified to reduce latency
- Message-oriented to allow application data units to be sent
- Unordered delivery of messages, given independent utility
- Partially reliable based on time and dependency information

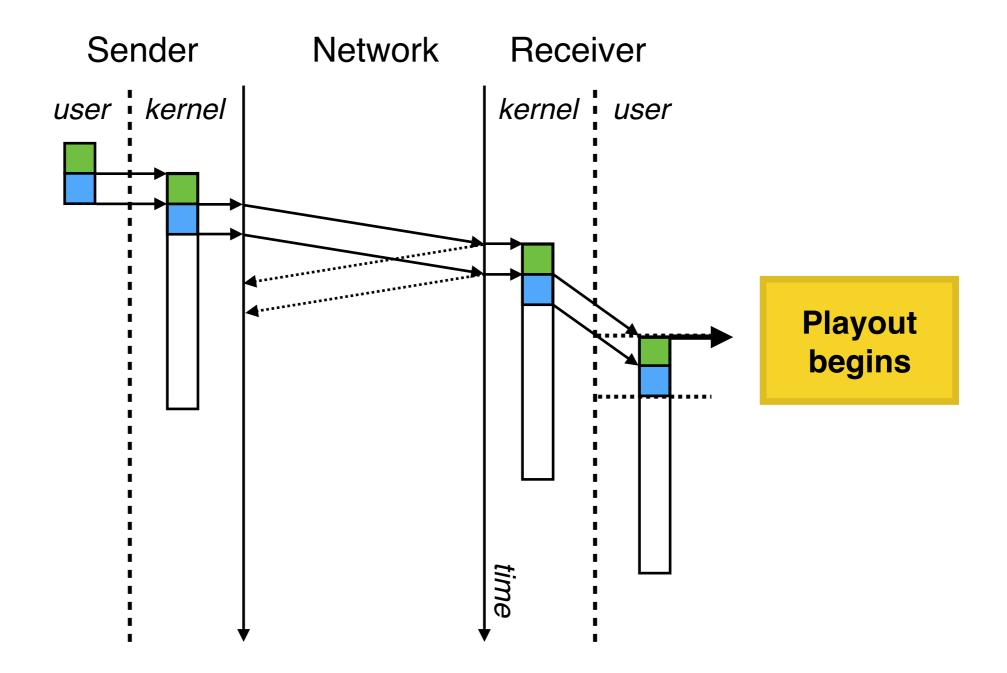


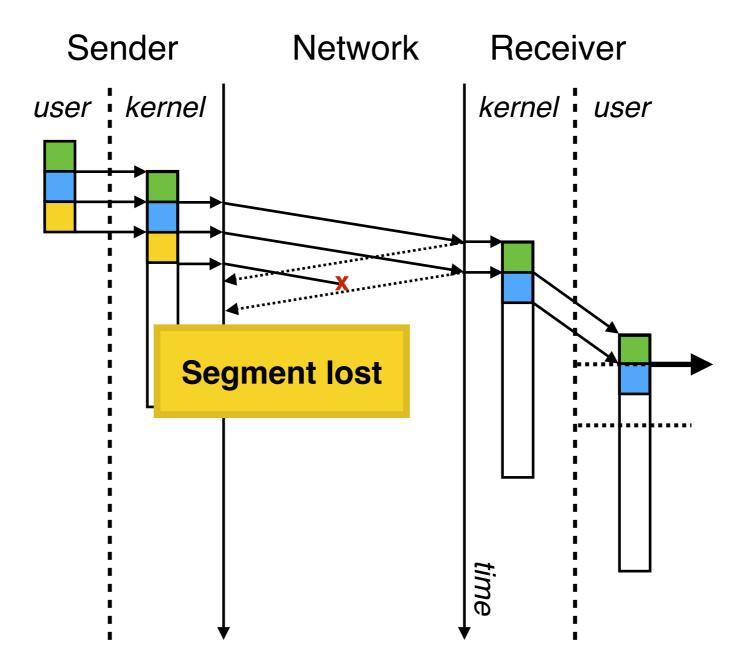


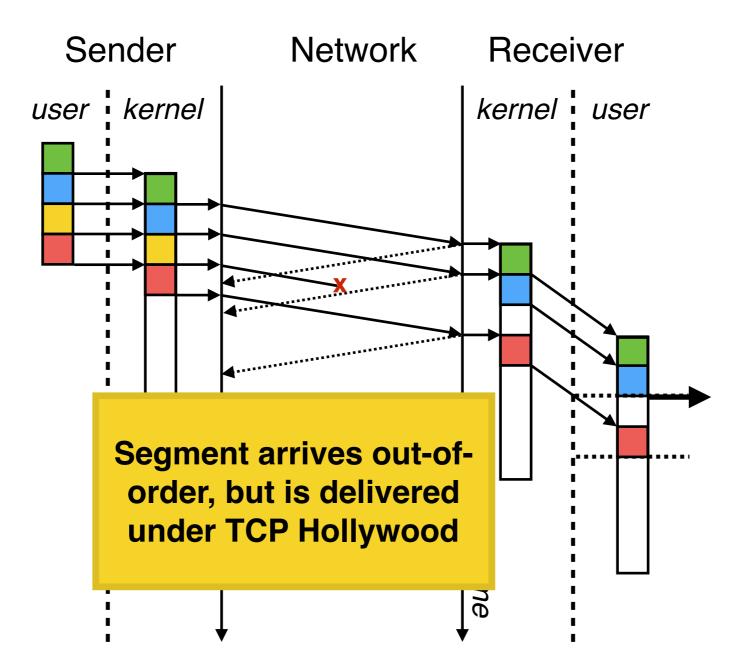


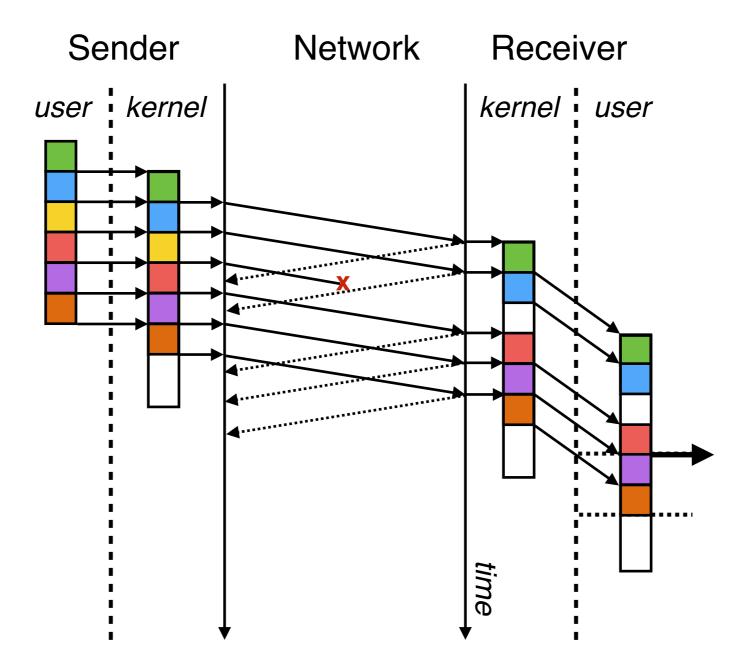


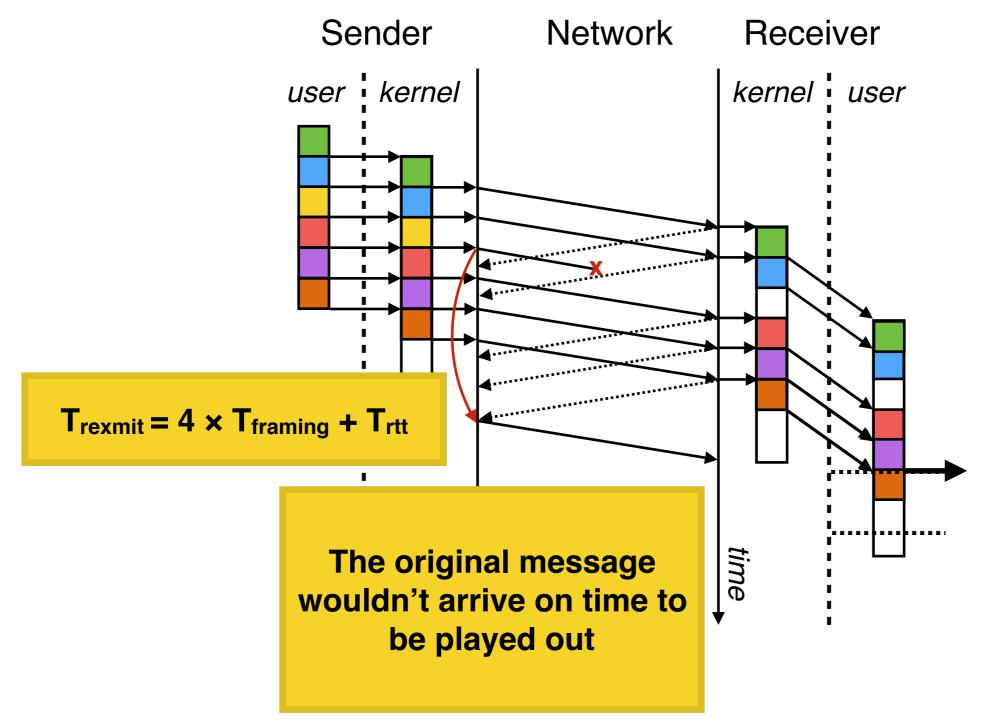


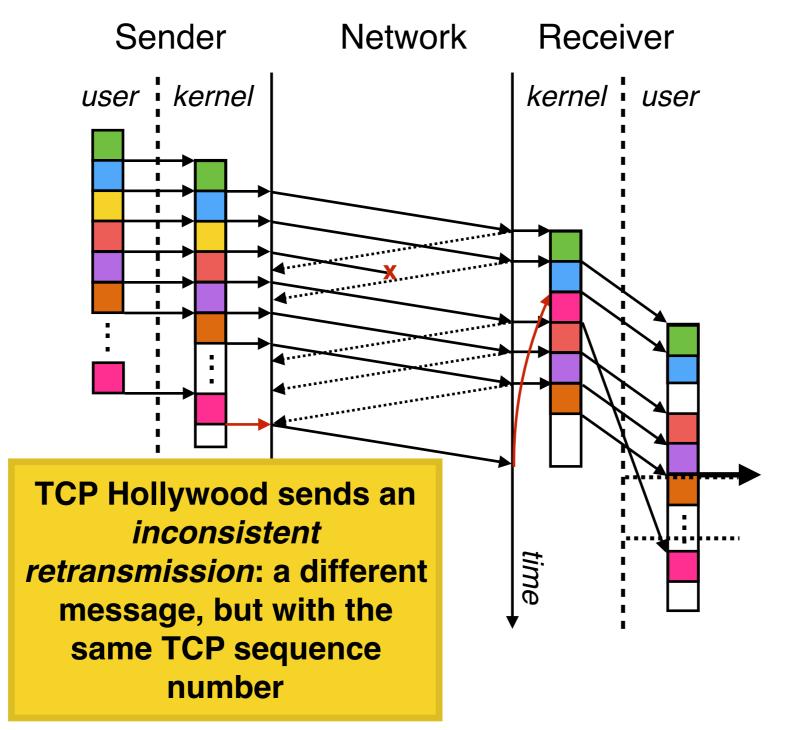


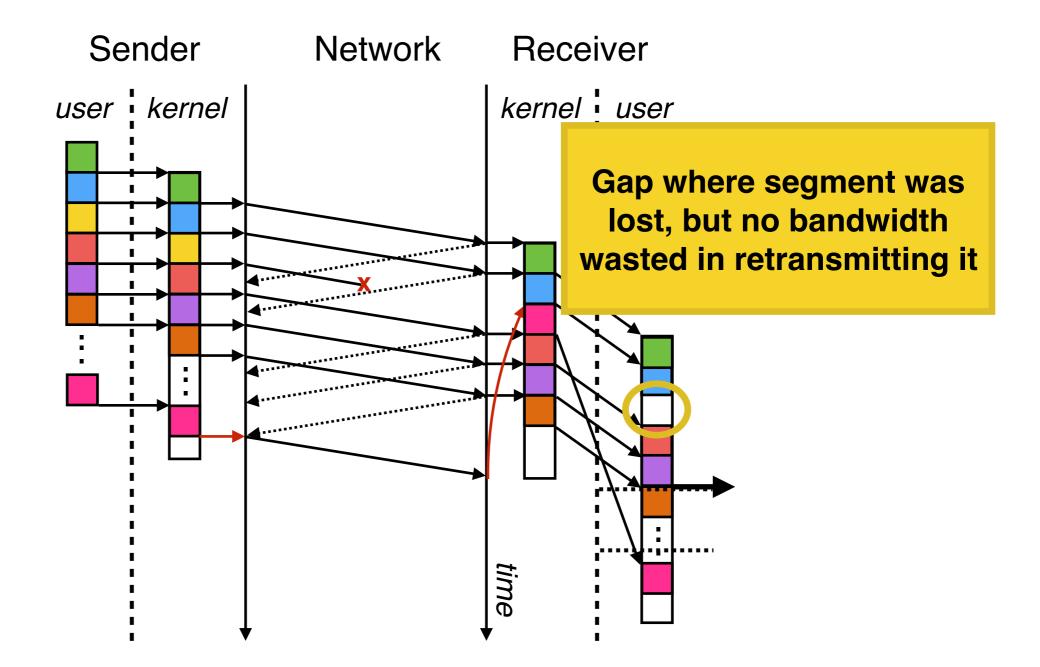


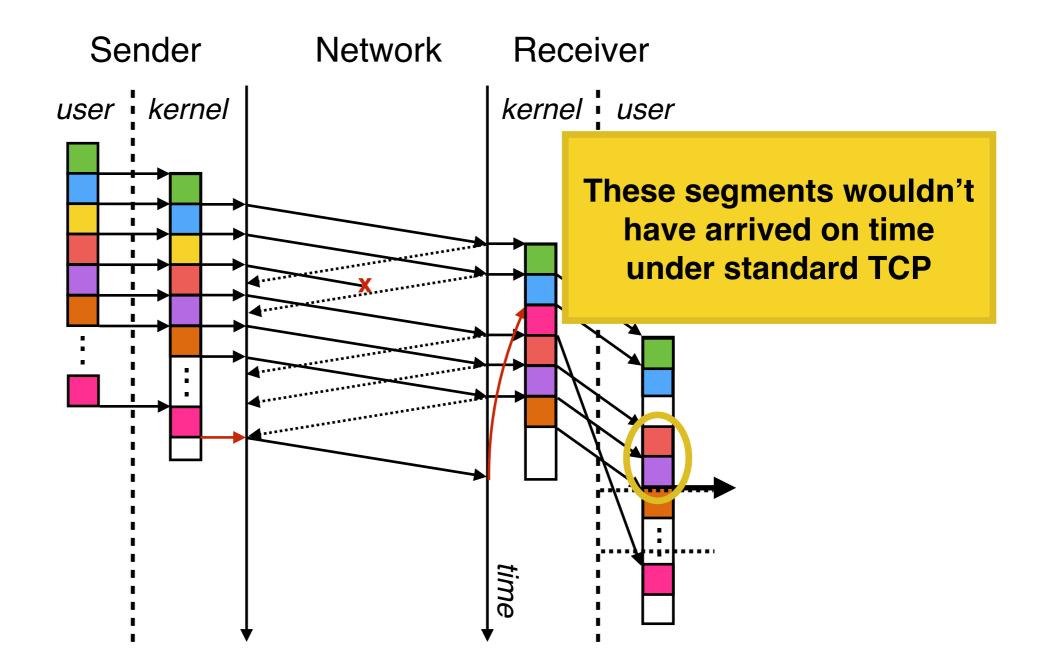




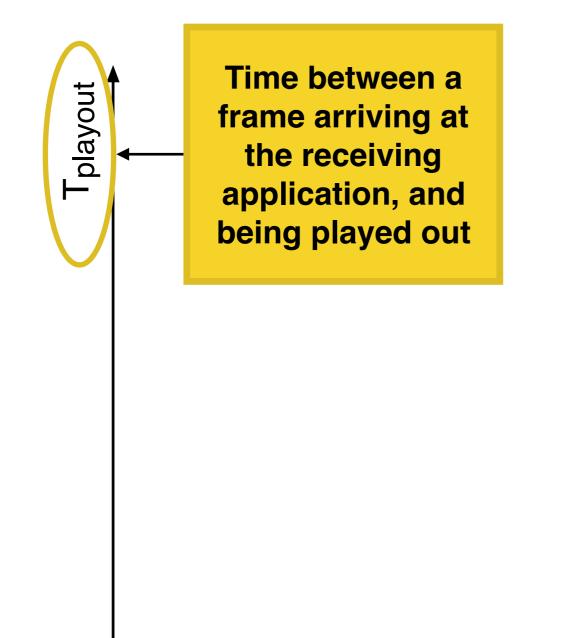


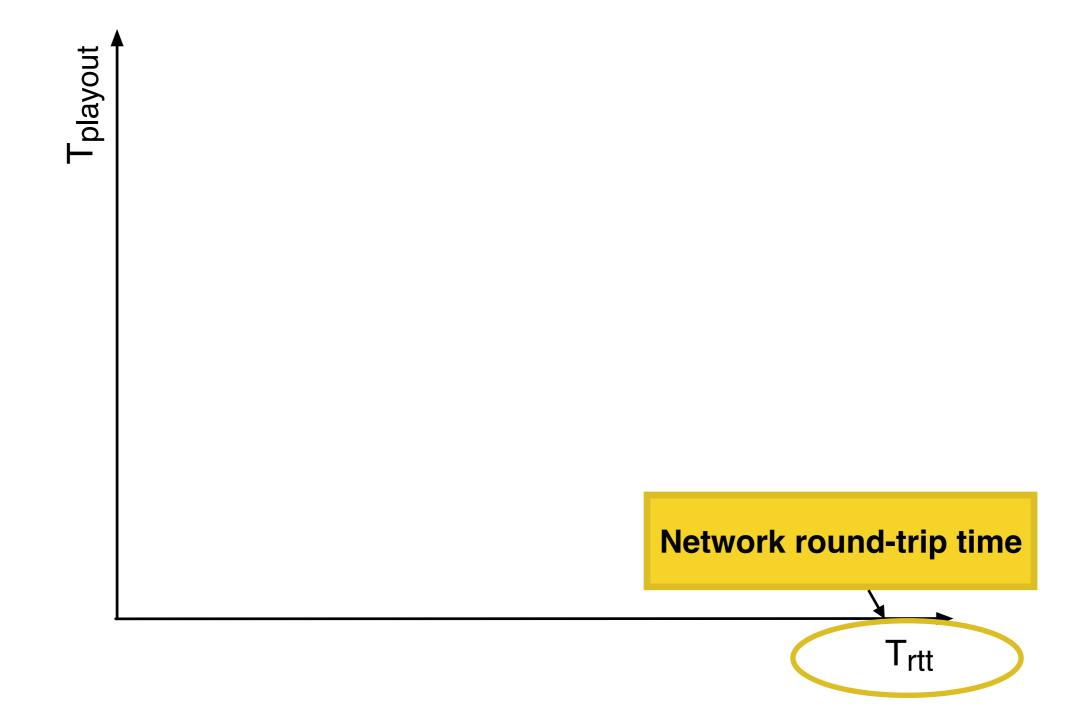


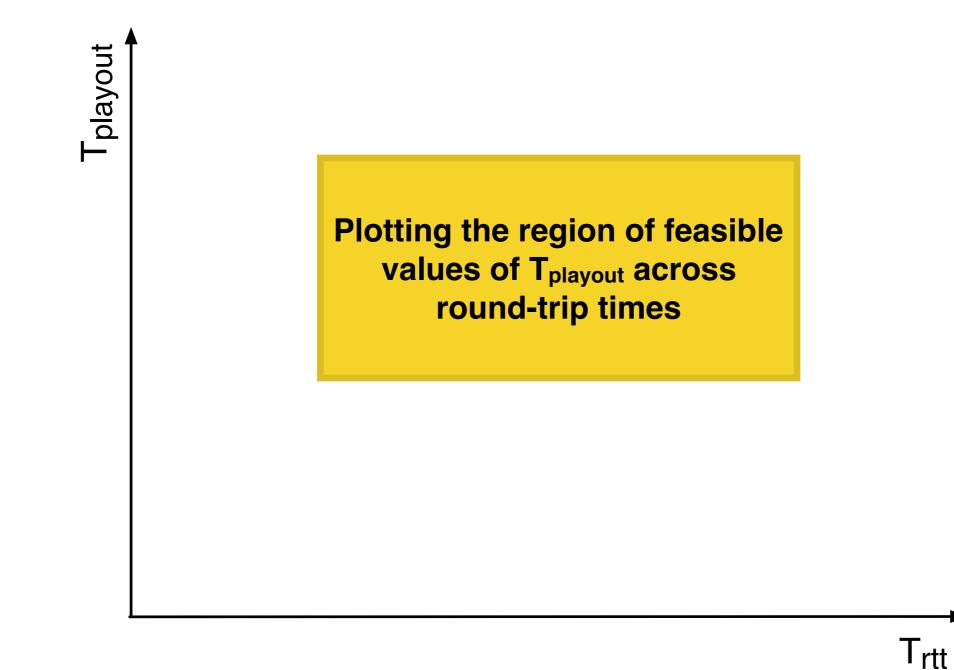


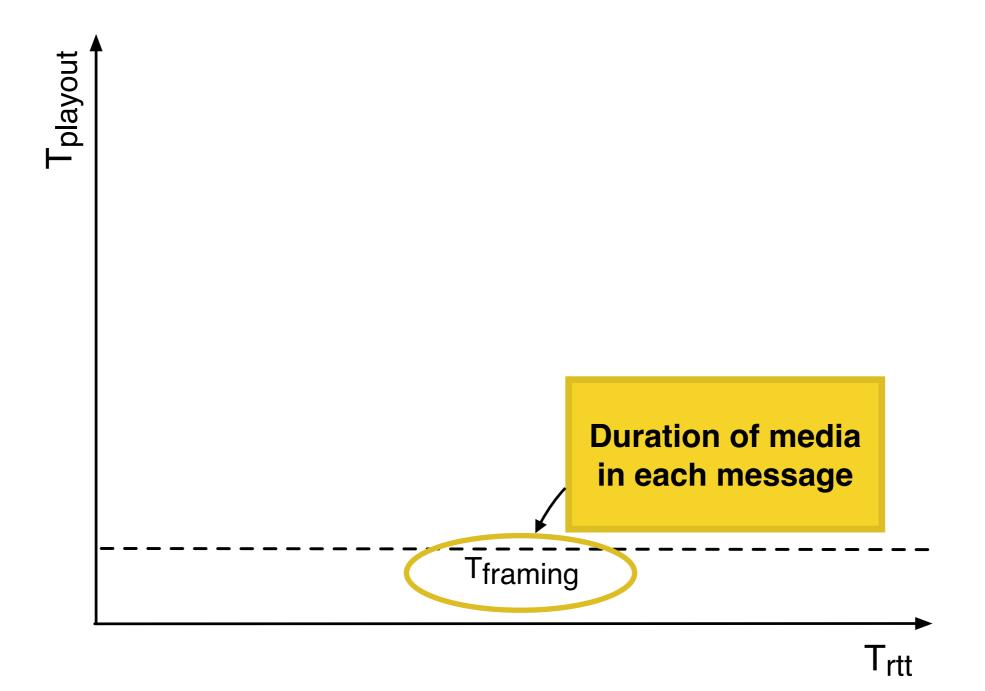


When are inconsistent retransmissions useful?

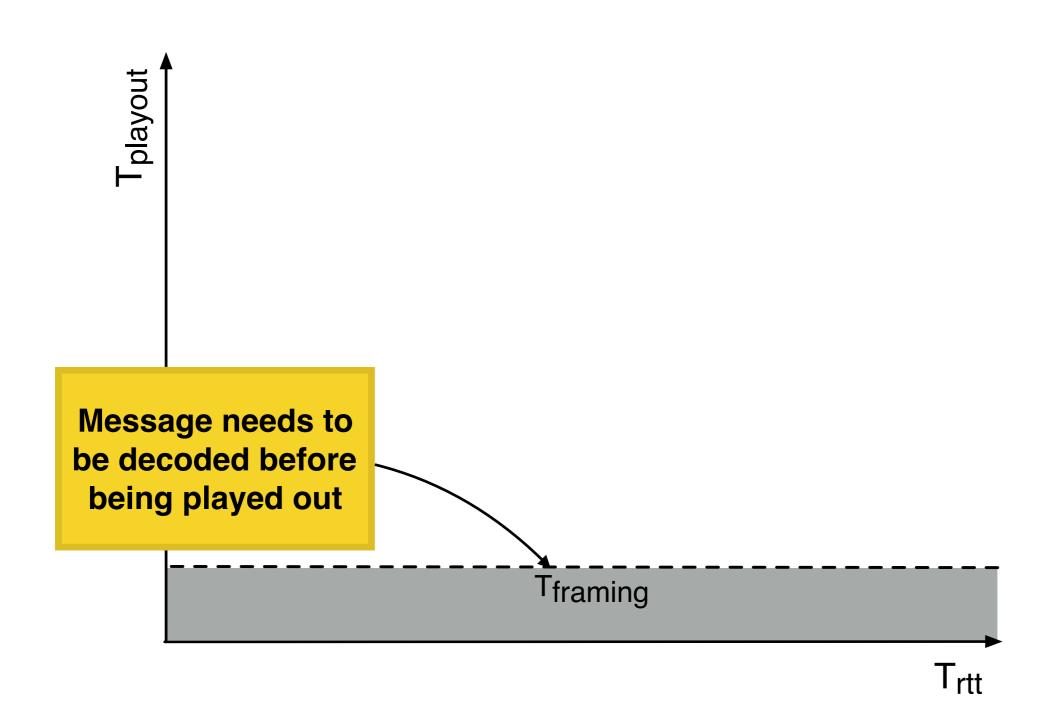


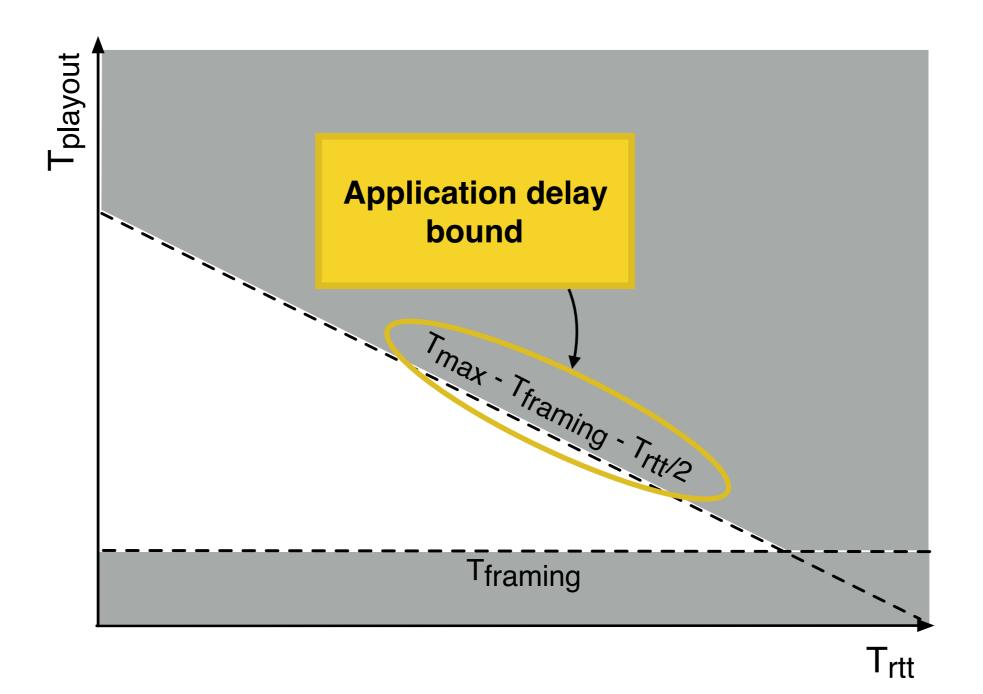


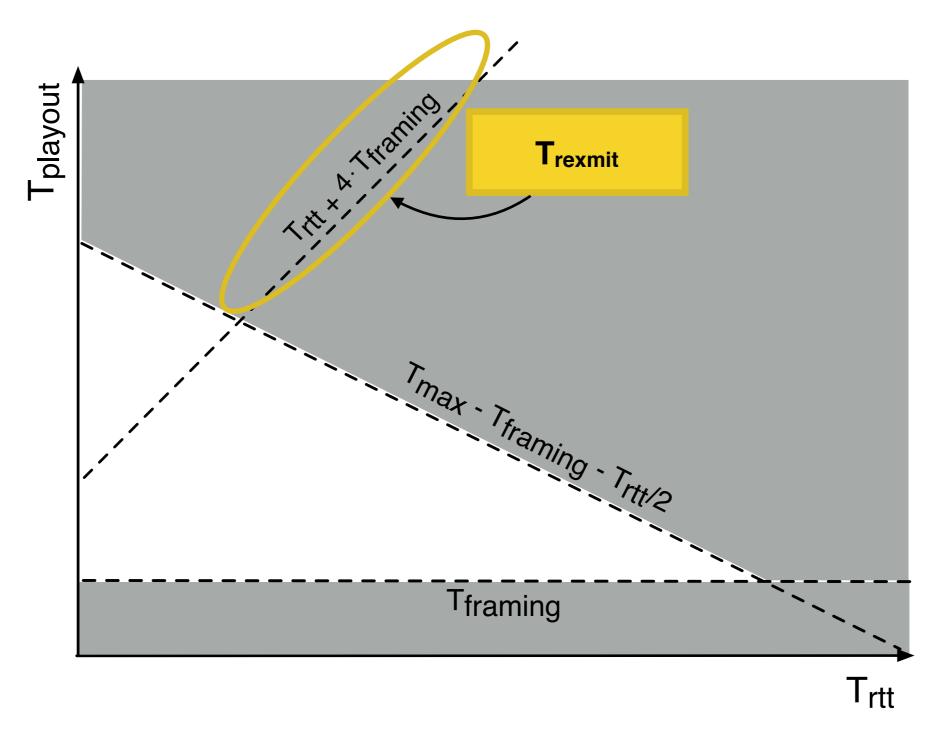


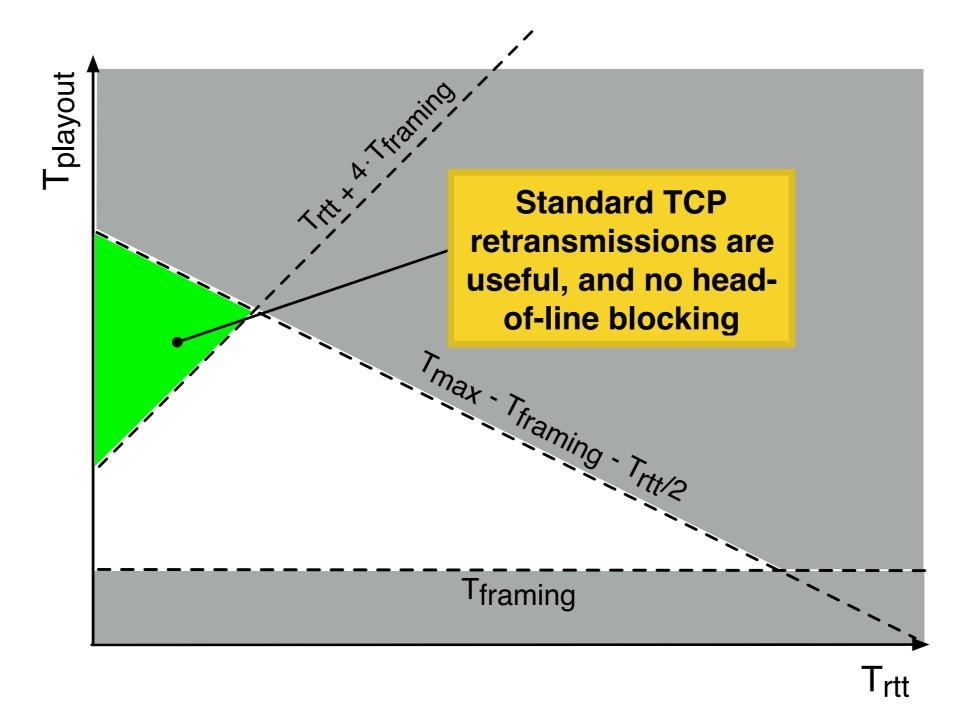


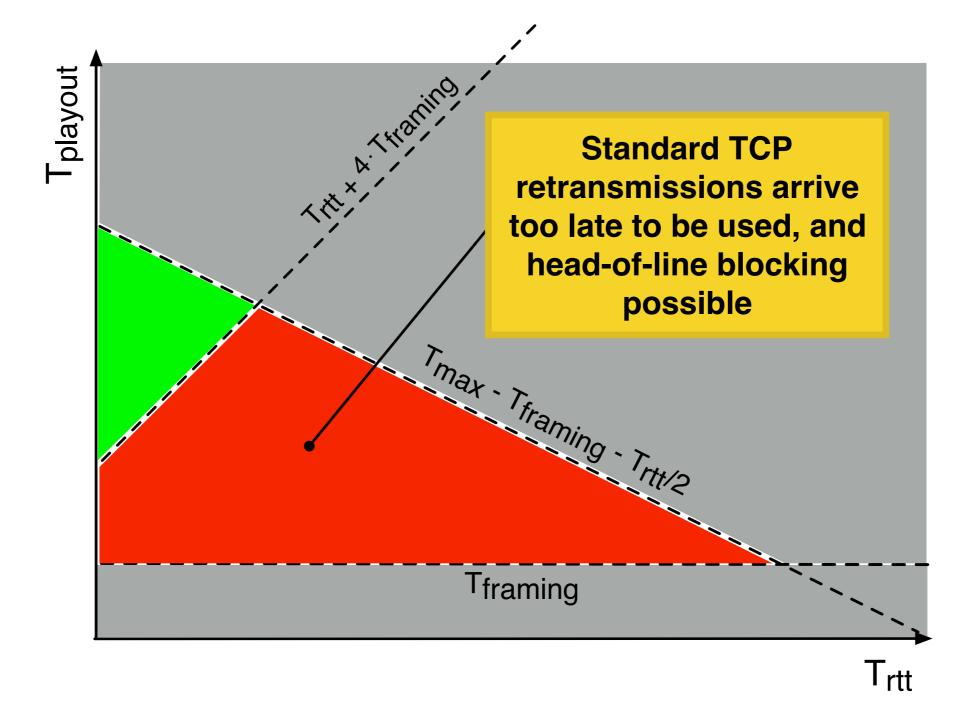


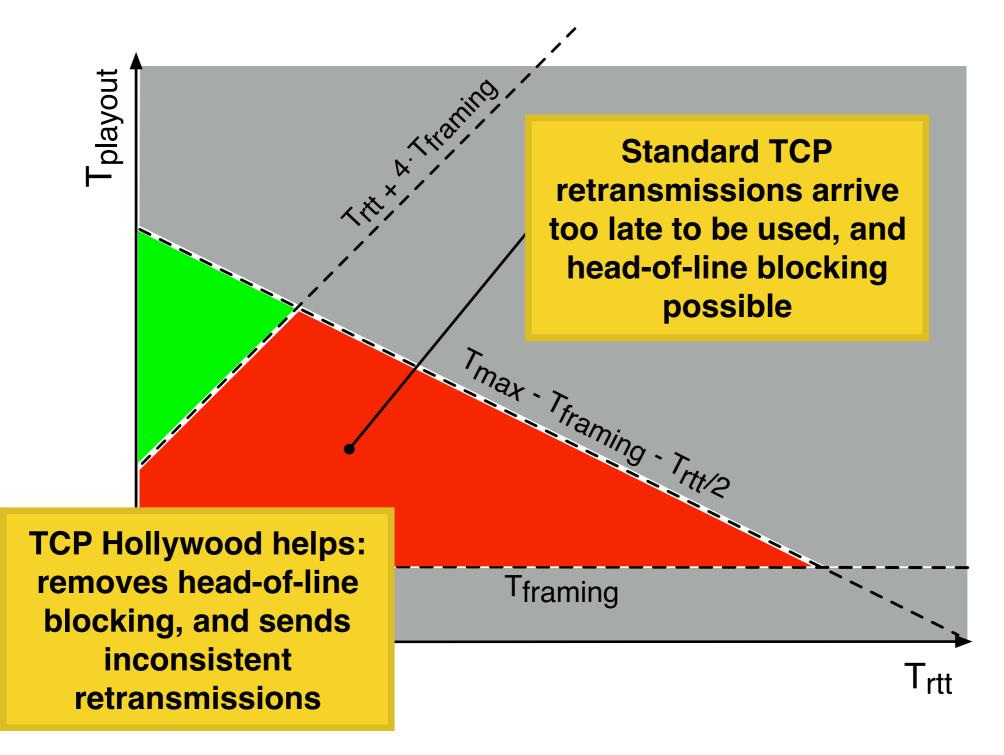












Deployability

- Inconsistent retransmissions are the only wire-visible modification vs. standard TCP — same TCP sequence number, different payload
- Middleboxes performing payload inspection may interpret the behaviour as an attack — man on the side
- Experiments between TCP Hollywood server, and 14 UK clients
- 8 fixed-line ISPs, 4 cellular operators all major UK ISPs

TCP Hollywood is deployable

I inconsistent retransmissions delivered successfully

O segments cached by middlebox, so original delivered instead performance no worse than standard TCP

 Safe failure mode for TCP Hollywood

ISP	P	ort
	80	4001
Fixed-line		
Andrews & Arnold	- I	1
BT	- I	1
Demon	- I	1
EE	- I	1
Eclipse	- I	1
Sky	- I	1 - E
TalkTalk	- I	1
Virgin Media	- I	
Mobile		
EE	0	0
02	0	0
Three		
Vodafone	0	I.

TCP Hollywood

- Unordered, partially reliable message-oriented transport protocol
- Wire-compatible with TCP
- Analysis shows when TCP Hollywood helps applications
- Deployable across all major
 UK fixed-line and cellular
 ISPs



"Hollywood Sign", Gnaphron - CC BY-SA 2.0 flickr.com/photos/gnaphron/8485145044

TCP Hollywood

 "TCP Goes to Hollywood" NOSSDAV 2016

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- "TCP Hollywood: An Unordered, Time-Lined, TCP for Networked Multimedia Applications" IFIP Networking 2016
- "Implementing Real-Time Transport Services over an Ossified Network" Applied Networking Research Workshop 2016

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	D 2016 ACM PERSON STATISTICS AND A STATE	so cossure that these are acproyate on the wider Internet. Applications require a message-oriented protocol, to allow inde- pendently decodeable application data units (ADUS) to be sent. This abstraction also enables out-of-order delivery, removing the latency
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