



# SHARKFEST '13

Wireshark Developer and User Conference

How to Use Wireshark to Analyze Video

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Endace a division of Emulex

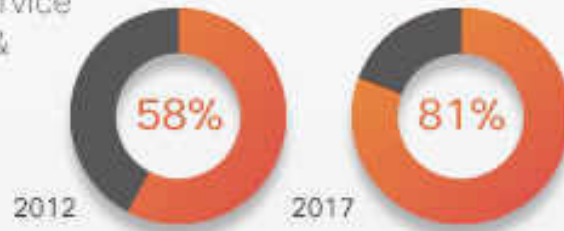
<http://tinyurl.com/tcptraces>

# Why care about video?

## Global Residential Service Adoption Trends



By 2017, **Online Video** will have 2 billion users, ranking as the **highest penetrated service** among all residential service categories (TV & Internet).



**Online Video** will be the **fastest growing service** across all residential service categories (TV & Internet) from 2012 to 2017. ▲ 13.2% CAGR



**Video on Demand (VoD)** will be the **fastest growing digital television service** from 2012 to 2017. ▲ 9.4% CAGR



By 2017, **Video on Demand (VoD)** will be the **highest penetrated residential TV service** with 402 million subscribers, reaching 29% of digital TV households.



The average household will have **3 fixed devices/connections** by 2017.

- According to Cisco Visual Networking Index

# Why care about video?

## Global Business Service Adoption Trends

 By 2017, **Business Mobile SMS** will have 537 million users, ranking as the **highest penetrated service** among all business service categories (data & mobile).



 **Business Location-based Services (LBS)** will be the **second fastest growing business service** category from 2012 to 2017. ▲ 32.9% CAGR

 By 2017, **Business IM** will have 703 million users, ranking as the business service category with the **largest number of users**.

 **Desktop Video Conferencing** will be the **fastest growing service** across all business service categories (data & mobile) from 2012 to 2017. ▲ 51.7% CAGR

 By 2017, there will be **2 billion business Internet users** and **565 million business mobile users**.

- According to Cisco Visual Networking Index

# Why care about video?

## Global Consumer Mobile Service Adoption Trends



By 2017, **Mobile SMS** will have 4.4 billion users, ranking as the **highest penetrated service** among all consumer mobile services.



Mobile **Video** will be the **second fastest growing consumer mobile service** from 2012 to 2017.  
▲ 36.0% CAGR



By 2017, Mobile **Social Networking** will be the **second highest penetrated consumer mobile service** with 3 billion users, reaching 65% of consumer mobile users.



Mobile **Commerce** will be the **fastest growing consumer mobile service** from 2012 to 2017.  
▲ 36.0% CAGR



The average mobile consumer will have **1.9 devices/connections** by 2017.

- According to Cisco Visual Networking Index

# Just how much bandwidth?

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- **Netflix**
  - 1 Mbps for viewing on a computer
  - 2 Mbps for SD video on a TV
  - 4 Mbps for 720p HD video
  - 5 Mbps for "the best video and audio experience" (according to Netflix)
- **Hulu**
  - 1 Mbps for SD video
  - 2 Mbps for 720p video
  - Over 3.2 Mbps for best quality HD video and audio
- **Vudu** - Note: All Vudu movies are streamed with Dolby Digital Plus 5.1 audio.
  - 1.0 - 2.3 Mbps for SD video
  - 2.3 - 4.5 Mbps for 720p video
  - 4.5 - 9.0 Mbps for HDX 1080p video
  - Over 9 Mbps for 3D HD movies

According to [www.hometheater.com](http://www.hometheater.com)

# Where do I start?

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- Use policies
  - What can you block
- Business approved
  - How much bandwidth is it really taking – capacity planning
  - How much packet loss is there – capacity planning & troubleshooting
  - What QoS is in place – is that what I designed
  - How much jitter

# What are the common protocols?

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## Compression

- MPEG4
- MPEG2
- H.264

## Transfer

- RTP
- RTCP
- RTSP
- RTMP

# RTSP

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- Real Time Streaming Protocol
- The protocol is used for establishing and controlling media sessions between end points
- Similar to HTTP
  - DESCRIBE responses will show media type



# RTSP – TrendnetViaServer.pcap

- Telephony | RTSP | Packet Counter | Create Stat
- Filters:
  - rtsp
  - sdp.media.media=="video"
  - rtsp.status>299



The screenshot shows a window titled "RTSP/Packet Counter with filter:" containing a table with the following data:

Topic / Item	Count	Rate (ms)	Percent
▼ Total RTSP Packets	13	0.000142	
▼ RTSP Request Packets	7	0.000076	53.85%
DESCRIBE	2	0.000022	28.57%
SETUP	2	0.000022	28.57%
PLAY	2	0.000022	28.57%
TEARDOWN	1	0.000011	14.29%
▼ RTSP Response Packets	6	0.000066	46.15%
??? : broken	0	0.000000	0.00%
1xx: Informational	0	0.000000	0.00%
▶ 2xx: Success	6	0.000066	100.00%
3xx: Redirection	0	0.000000	0.00%
4xx: Client Error	0	0.000000	0.00%
5xx: Server Error	0	0.000000	0.00%
Other RTSP Packets	0	0.000000	0.00%

# RTP


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- Real Time Protocol
- Used for voice or video
- For video transfers, RTP most commonly used in video conferencing
- Check QoS
  - Apply as column
  - Does the value change as travel through the environment?

```
▼ Differentiated Services Field: 0xb8 (DSCP 0x2e: Expedited Forwarding; ECN: 0x00: Not-ECT (
  1011 10.. = Differentiated Services Codepoint: Expedited Forwarding (0x2e)
  .... ..00 = Explicit Congestion Notification: Not-ECT (Not ECN-Capable Transport) (0x00)
```

# RTP – TrendnetViaServer.pcap

- Telephony | Show All Streams
- How much loss?
  - Packet loss is determined by the sequence numbers, much like TCP



Wireshark: RTP Streams

Detected 2 RTP streams. Choose one for forward and reverse direction for analysis

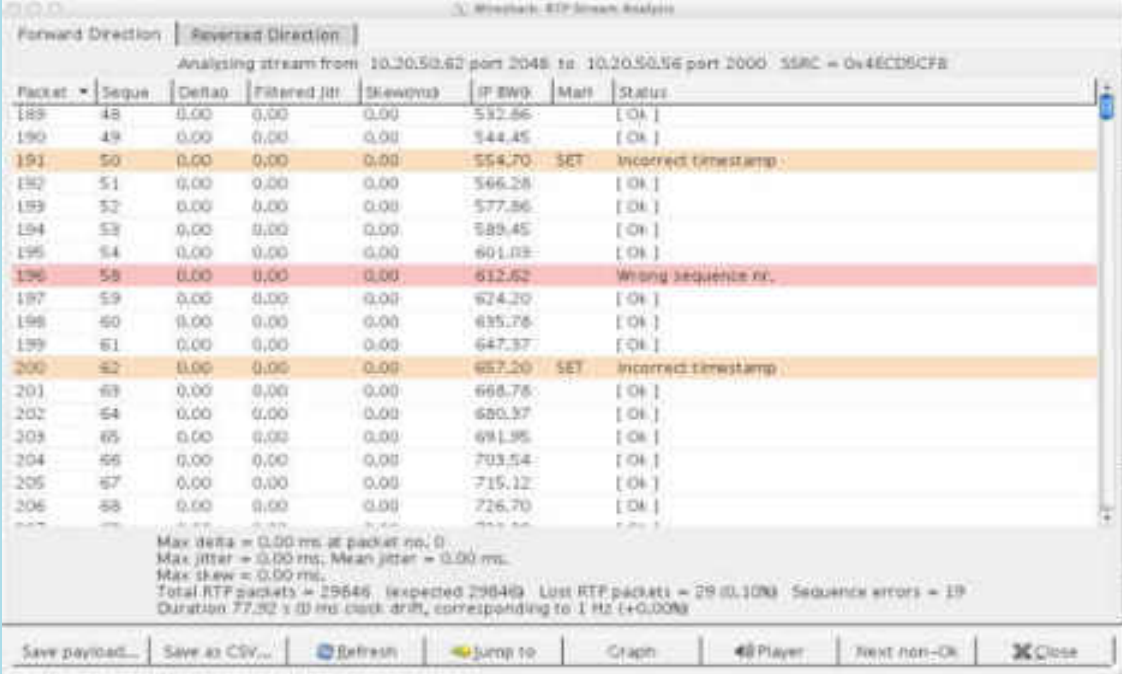
Src addr	Src port	Dst addr	Dst port	SSRC	Payload	Packets	Lost	Max Delta (m)	Max Jitter (r)	Mean Jitter (n)	Pb?
10.20.50.62	2048	10.20.50.56	2000	0x4ECD5CF8	RTPTYPE-99	29817	29 (0.1%)	0.00	0.00	0.00	X
10.20.50.62	2050	10.20.50.56	2000	0x2B12C4C	RTPTYPE-99	3783	1 (0.0%)	0.00	0.00	0.00	X

Forward: 10.20.50.62:2048 -> 10.20.50.56:2000, SSRC=0x4ECD5CF8  
Select a reverse stream with Ctrl + left mouse button

Unselect Find Reverse Save As Mark Packets Prepare Filter Copy Analyze Close

# RTP – TrendnetViaServer.pcap

- Telephony | Stream Analysis
- If loss is greater than 1%, how is the loss spread?
- Wrong timestamps?



Forward Direction | Reversed Direction

Analysing stream from 10.20.50.62 port 2048 to 10.20.50.56 port 2000 SSRC = 0x46CD6CFB

Packet #	Sequence	Delta	Filtered Jitter	Skew(ms)	IP BWG	Mark	Status
188	48	0.00	0.00	0.00	532.66		[Ok]
190	49	0.00	0.00	0.00	544.45		[Ok]
191	50	0.00	0.00	0.00	554.70	SET	Incorrect timestamp
192	51	0.00	0.00	0.00	566.28		[Ok]
193	52	0.00	0.00	0.00	577.86		[Ok]
194	53	0.00	0.00	0.00	589.45		[Ok]
195	54	0.00	0.00	0.00	601.03		[Ok]
196	55	0.00	0.00	0.00	612.62		Wrong sequence nr.
197	59	0.00	0.00	0.00	624.20		[Ok]
198	60	0.00	0.00	0.00	635.78		[Ok]
199	61	0.00	0.00	0.00	647.37		[Ok]
200	62	0.00	0.00	0.00	657.20	SET	Incorrect timestamp
201	63	0.00	0.00	0.00	668.78		[Ok]
202	64	0.00	0.00	0.00	680.37		[Ok]
203	65	0.00	0.00	0.00	691.95		[Ok]
204	66	0.00	0.00	0.00	703.54		[Ok]
205	67	0.00	0.00	0.00	715.12		[Ok]
206	68	0.00	0.00	0.00	726.70		[Ok]

Max delta = 0.00 ms at packet no. 0  
Max jitter = 0.00 ms; Mean jitter = 0.00 ms;  
Max skew = 0.00 ms;  
Total RTP packets = 29646 (expected 29649) Lost RTP packets = 29 (0.10%) Sequence errors = 19  
Duration 77.92 s @ 0 ms clock drift, corresponding to 1 Hz (+0.00%)

Save payload... Save as CSV... Refresh Jump to Graph Play Next non-OK Close

# RTP – VLC\_rtp\_stream.pcap

- UDP???
  - Wireshark doesn't realize it is RTP because it is a stream
  - there is no control protocol
  - Or control protocol is missing (in other examples)
  - Decode as RTP
    - Show Current
    - Save to Profile

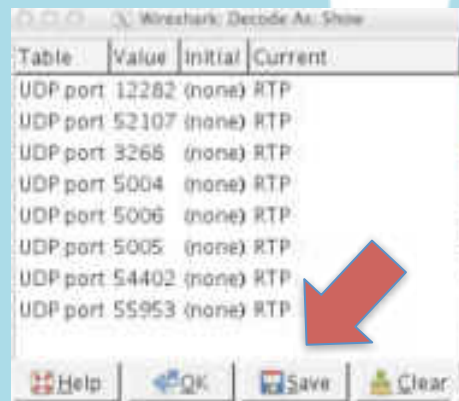
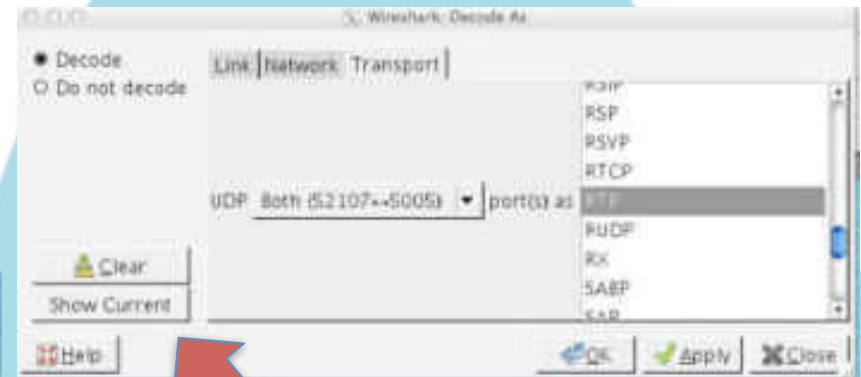


Table	Value	Initial	Current
UDP port 12282	(none)	RTP	
UDP port 52107	(none)	RTP	
UDP port 3268	(none)	RTP	
UDP port 5004	(none)	RTP	
UDP port 5006	(none)	RTP	
UDP port 5005	(none)	RTP	
UDP port 54402	(none)	RTP	
UDP port 55953	(none)	RTP	



# RTMP – WSB\_live.pcap

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- Real Time Messaging Protocol
- Flash video streaming
- Message flow:
  - Handshake
  - Connection parameter exchange
  - Play video – createStream
- Troubleshoot like any other TCP stream

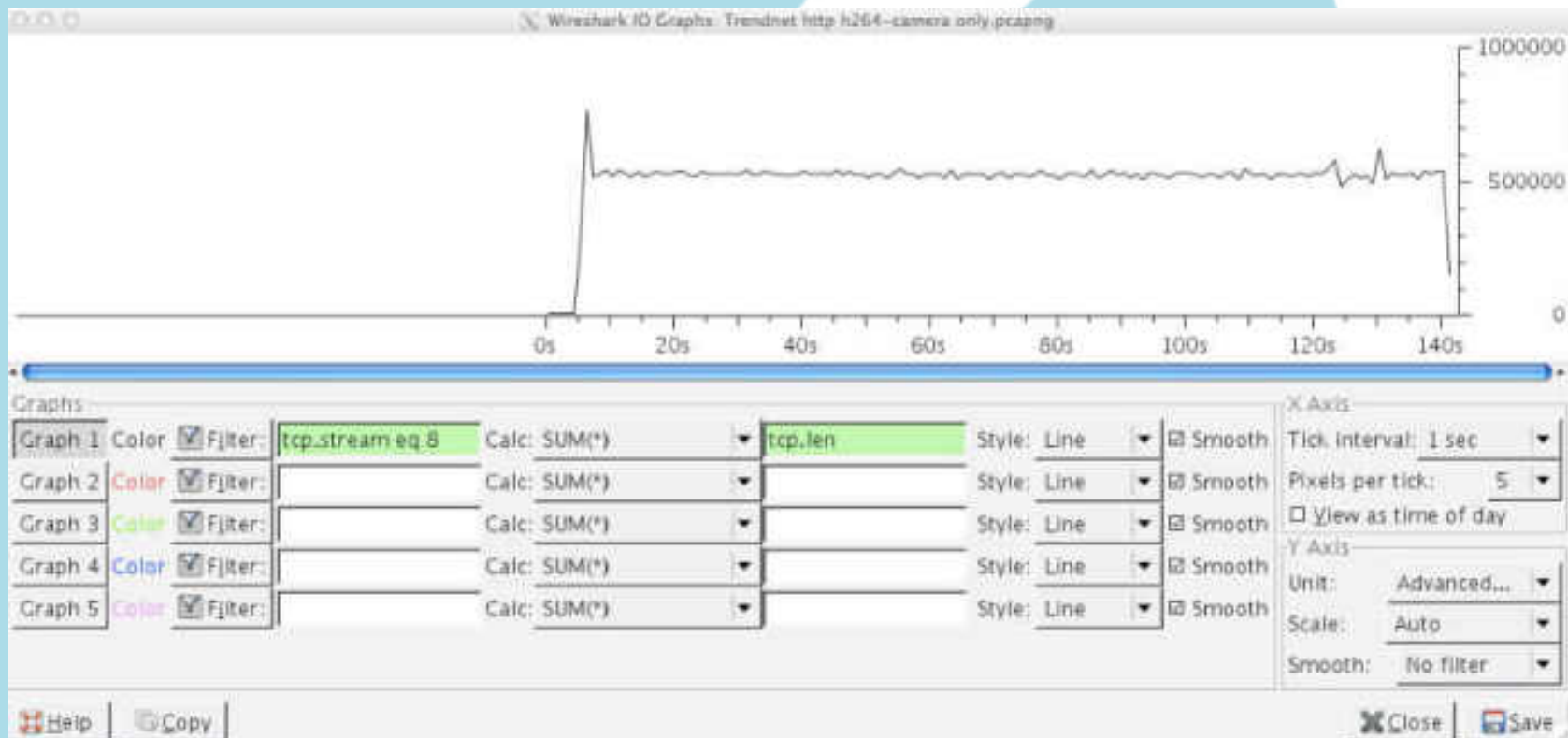
# H.264

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- Most common high definition video compression
- Used by Vimeo, YouTube, iTunes, Flash Player, Silverlight and Blu-ray discs

# Trendnet\_h264.pcap

- Filter http.content contains video
- 500,000Bps = 3.8Mbps





# Video Stream in HTTP

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- Example is a .swf file
- Users complaining of video pausing
- Packet loss and TCP recovery issue – yet because it is video, it is infinitely more noticeable to the user
- Sort by TCP delta time

# Questions?

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