Is there any value in bulk network traces?

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Is there value in bulk network traces?

Yes.

Any questions?

What problem are you trying to solve?

Trends

- Particular protocols
- Specific applications or use cases

Existence

- When did something come on line?
- Who uses a service?

Resiliency

- How networks react to an event

Education

Let's try an example.

Hypothesis:

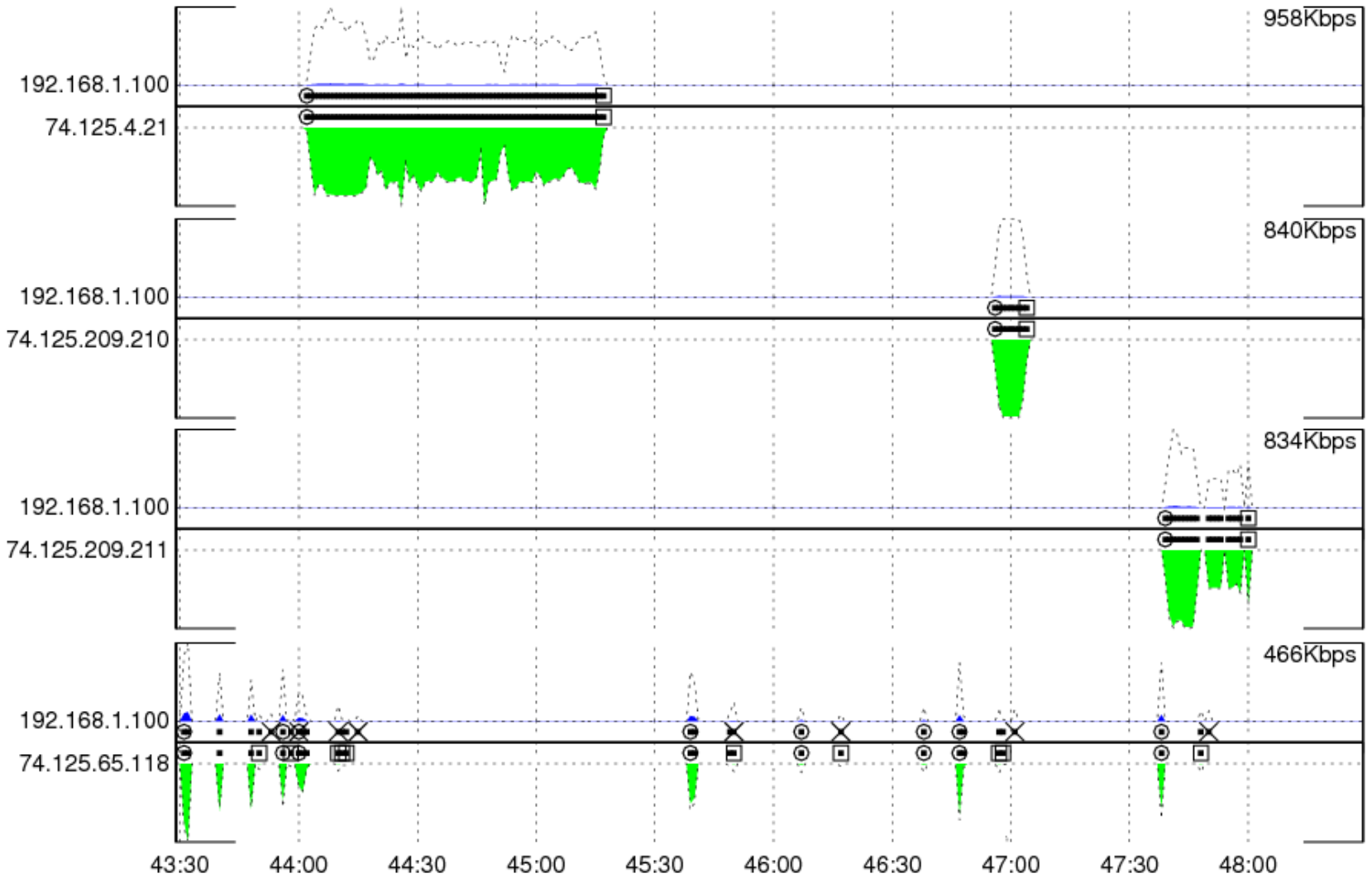
- Internet bandwidth grows by ~40% annually
- Past trends were spurred by audio downloads, then streaming audio, then video clips.
- Now we're seeing adoption of online TV, and high definition video.

- Is video driving current bandwidth increases? Where are we at on the adoption curve? How will it impact my network?

Research plan

- Understand streaming protocols
  - Find features that can identify the protocols
- Look for data to support the research
- Apply the data to the problem

Watch Three YouTube Videos



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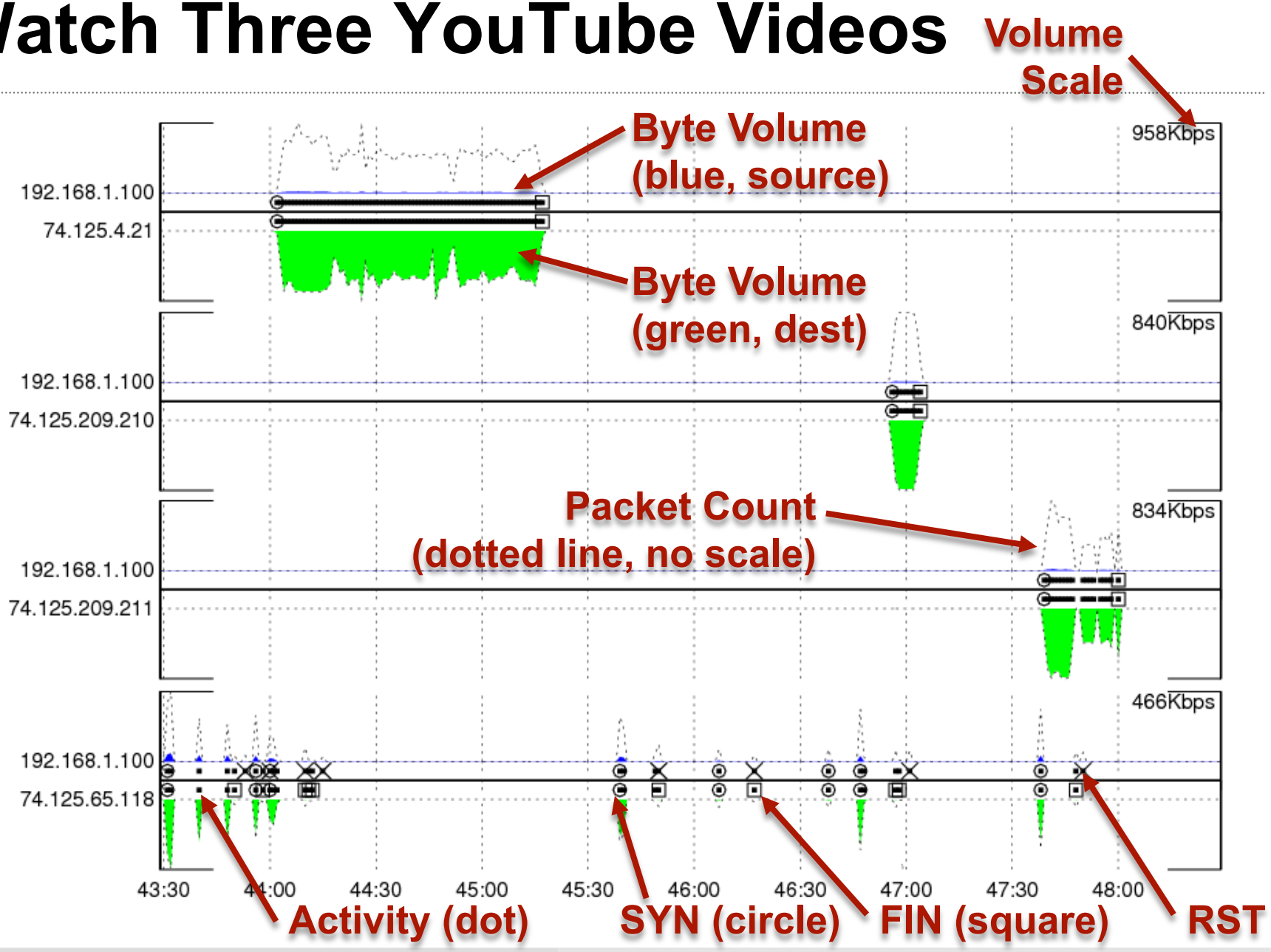

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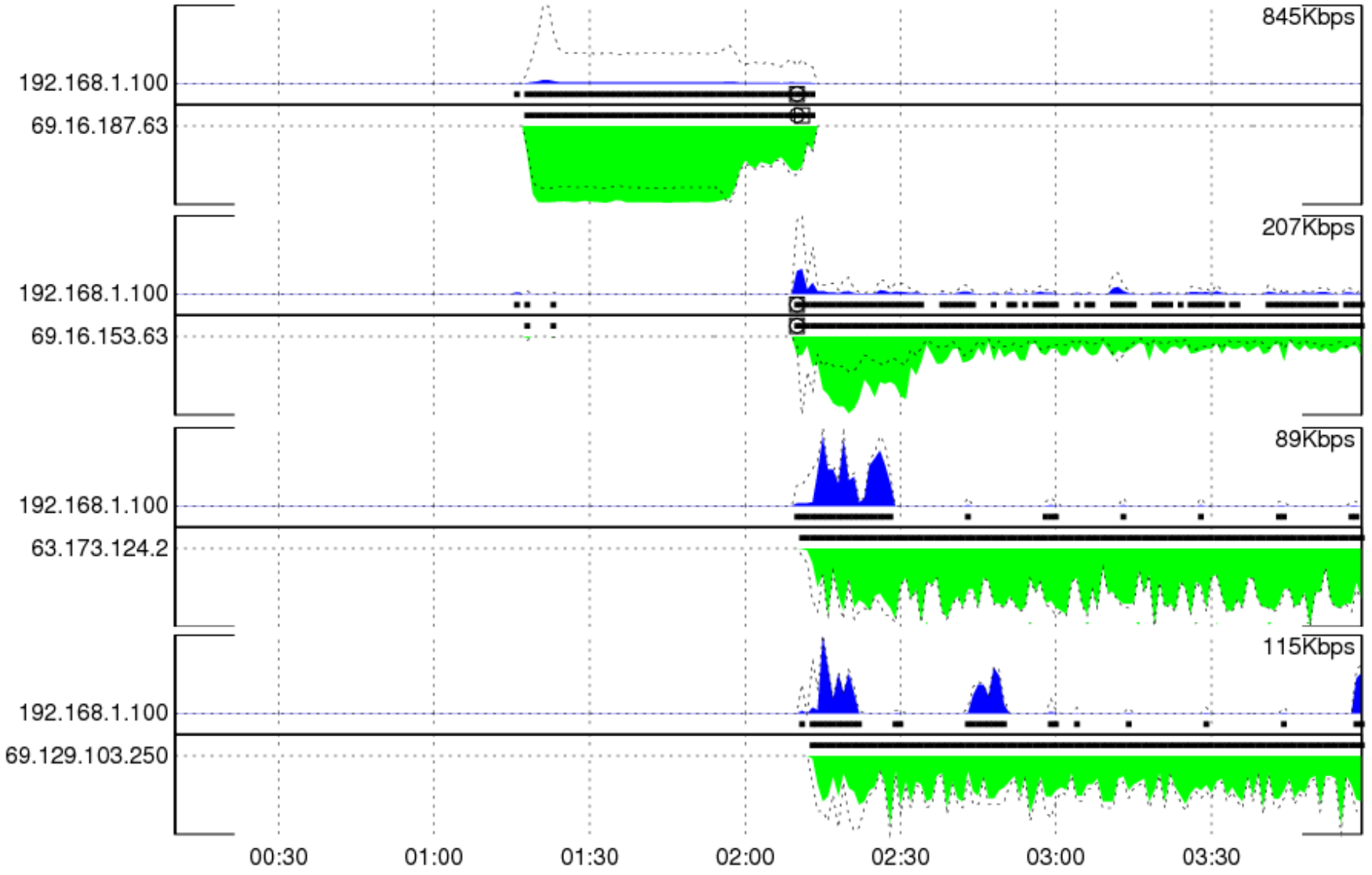
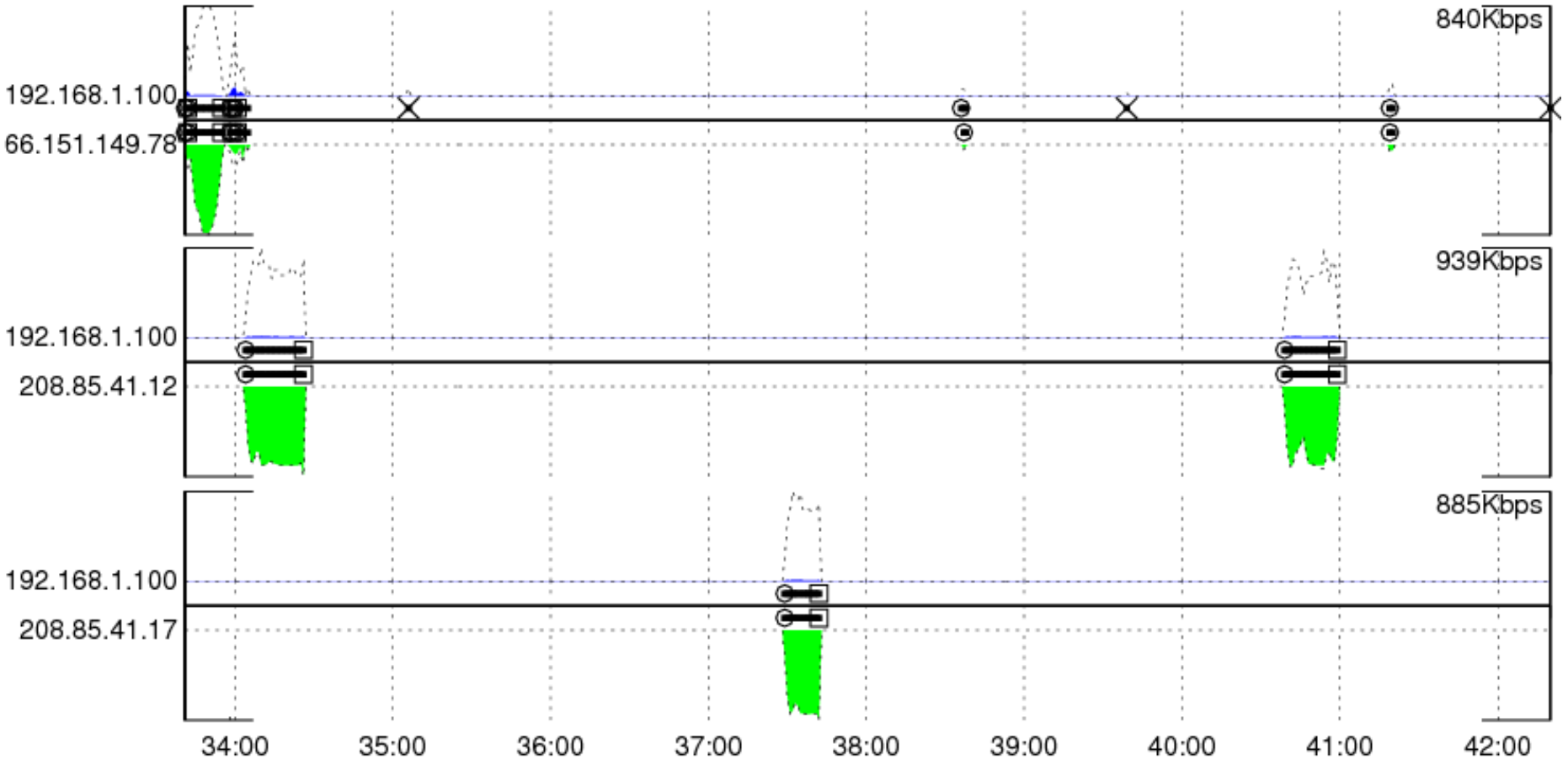
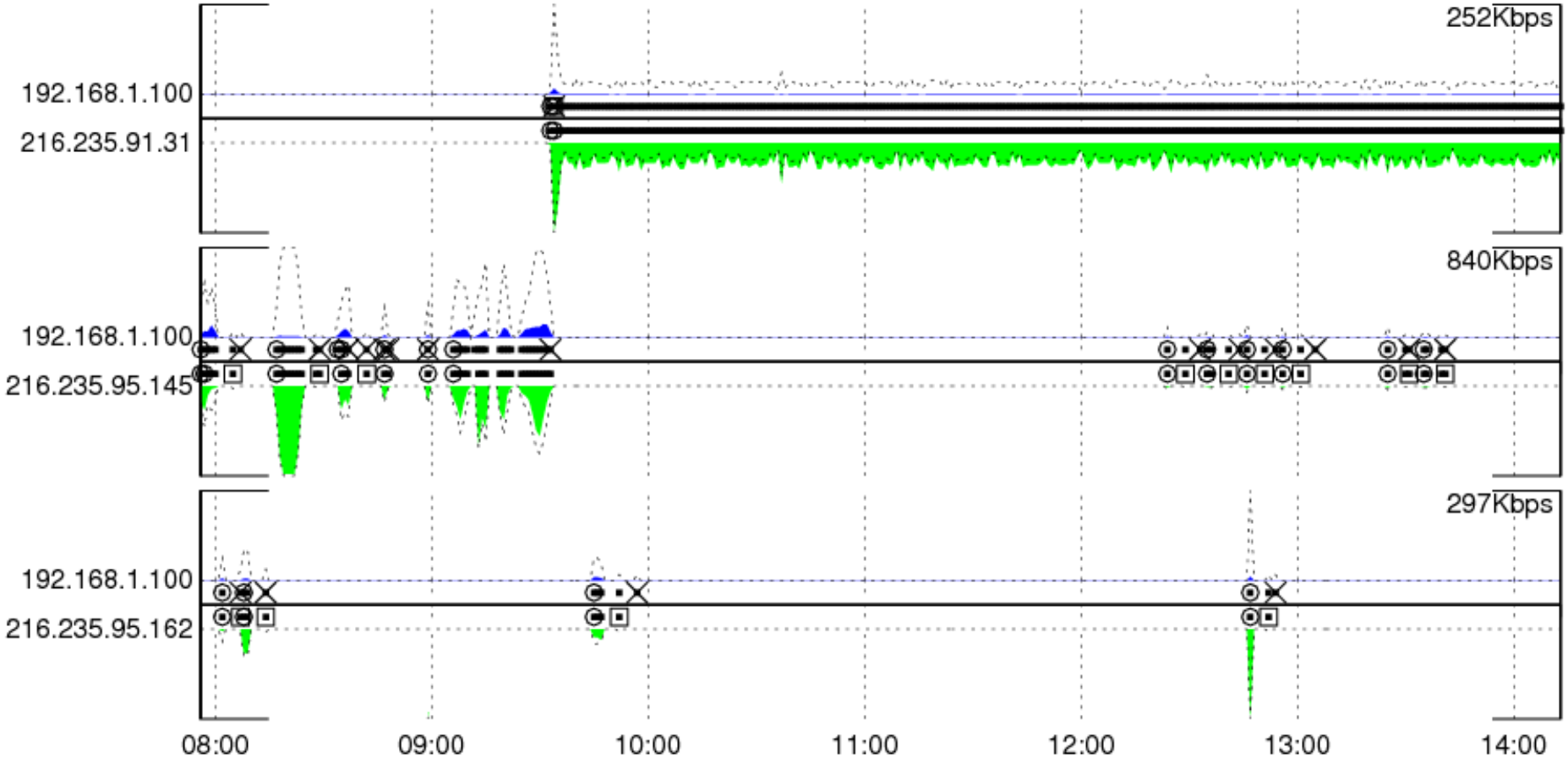


Listen to Three Songs on Pandora



Listen to Live365



Some useful general features

- Overall Bandwidth
- File Delivery protocols vs. Streaming protocols
  - TCP flag patterns
- Use of Content Distribution Networks
- Service port (e.g, HTTP or Shockwave)

Search for data sources

Criteria

- Ongoing data feeds
- Large scale trends across many network types

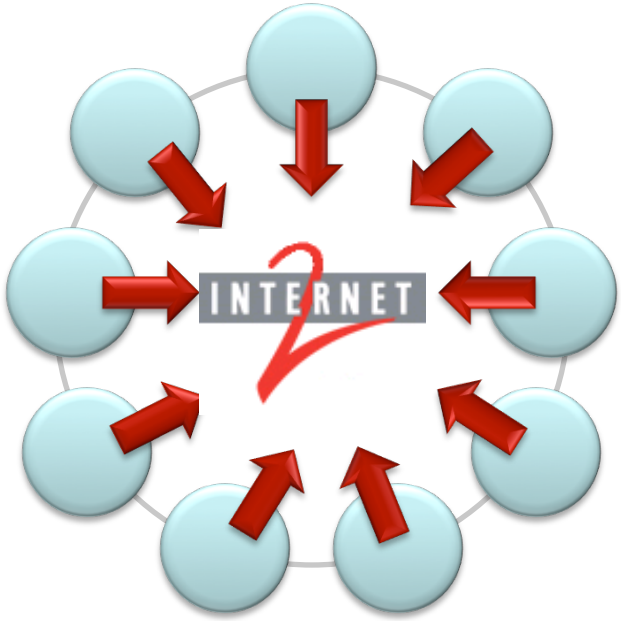
Some Possibilities

- Internet2
- MAWI
- DITL

Data Sources - Internet2

The Internet2 Observatory

- NetFlow v5 in flow-tools format
- Sampled 1:100
- 9 collection points
- Anonymized: lower 11 bits set to 0



http://www.internet2.edu/observatory/archive/proposal-process.html

Data Sources - MAWI

Measurement and Analysis on the WIDE Internet

- Sample point F
- 150Mbps link
- 15 minute snapshot each day
- Unsampled
- Anonymized

Other Data Sources

DITL

Backscatter data

Storm Center Daily Feed

[DatCat]

Challenges: Anonymization

Creates a data silo

Prevents linking in any other IP data sets

- DNS Data
- Geolocation / ownership data
- Blacklists

Not necessarily bad for our research

- Many providers use content distro networks
- Key features are address-independent

Challenges from anonymization are well understood

Challenges: Sampling

It's often unavoidable

Short term results are unpredictable

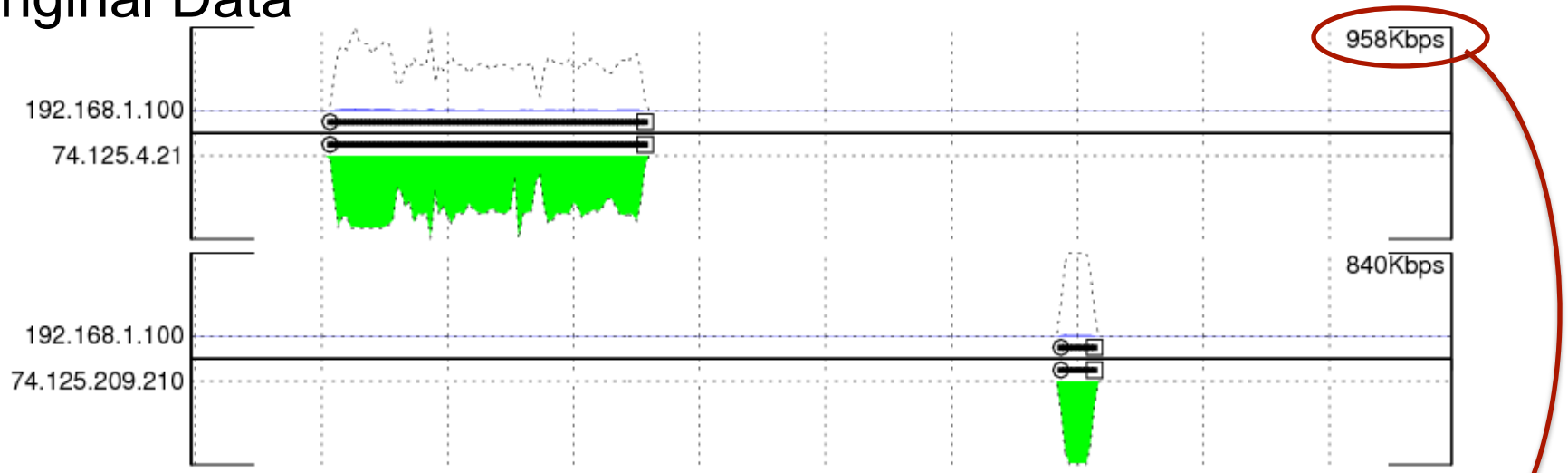
Very significant for our research

- We're very interested in bandwidth utilization
- Mitigated somewhat because we're looking at high volumes

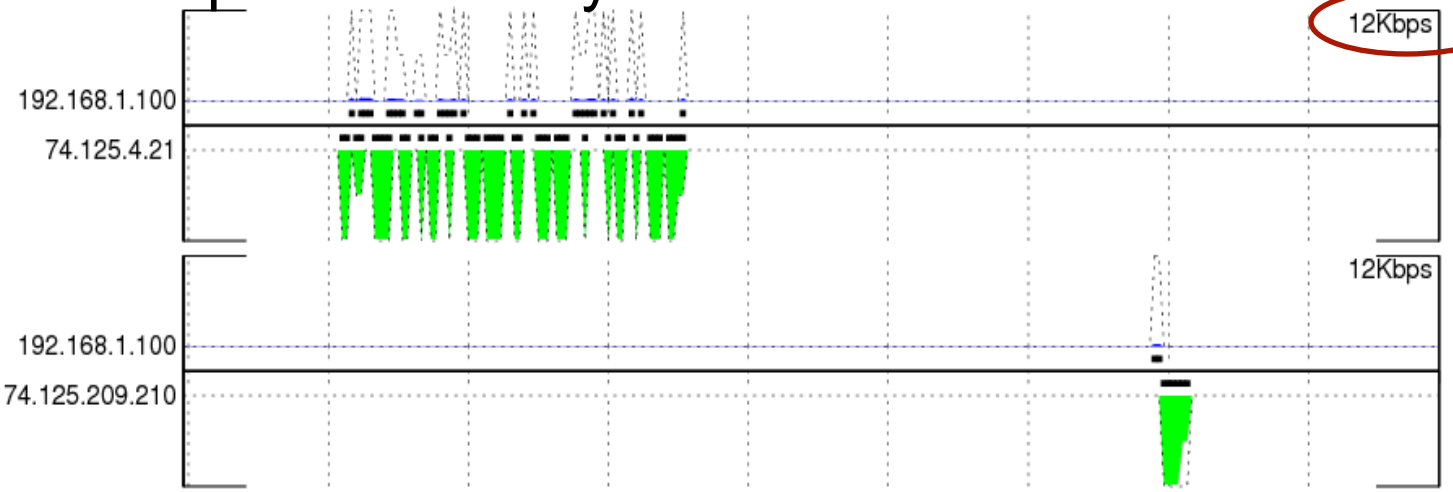
Let's take a closer look

Watch Three YouTube Videos:

Original Data



Data Sampled Artificially at 1:100



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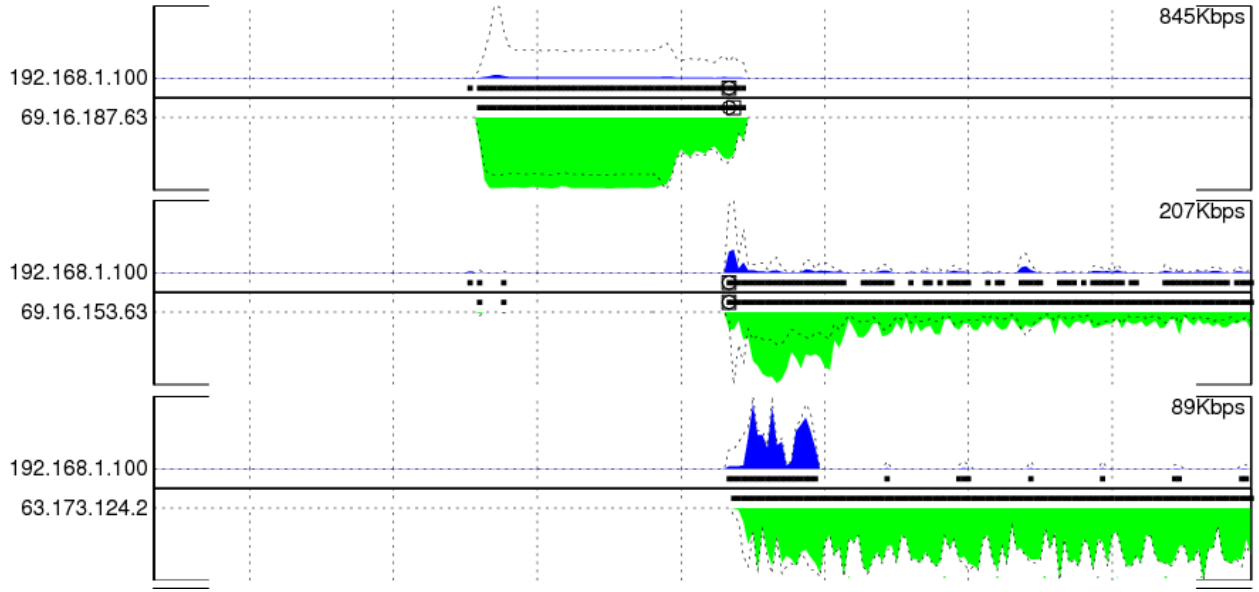
Original Data



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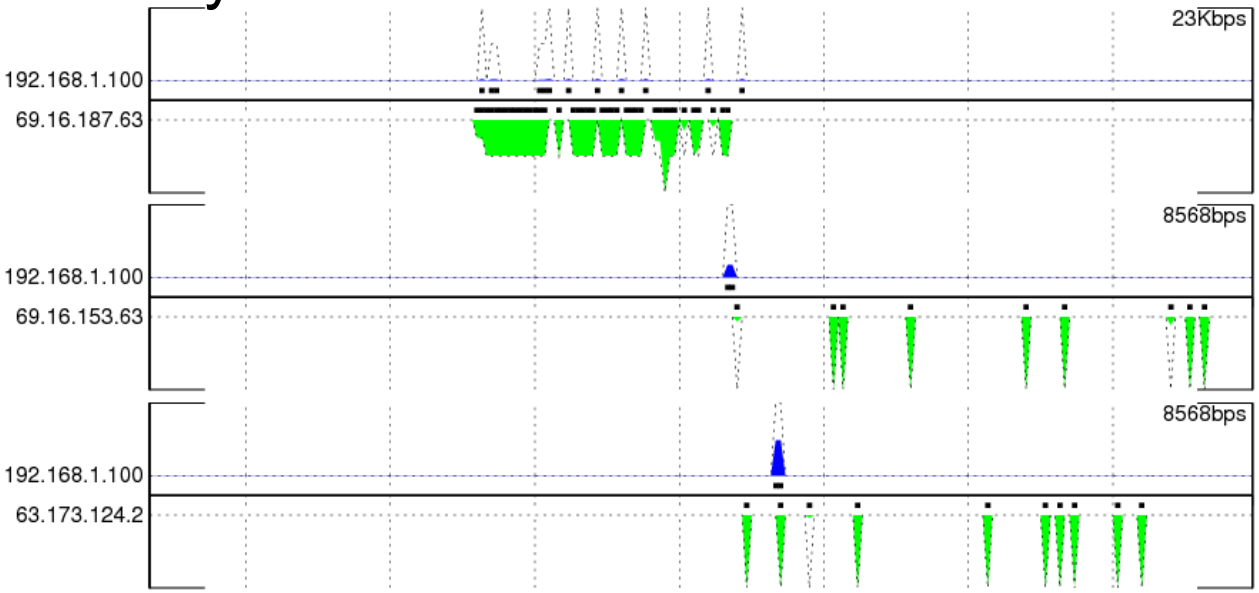
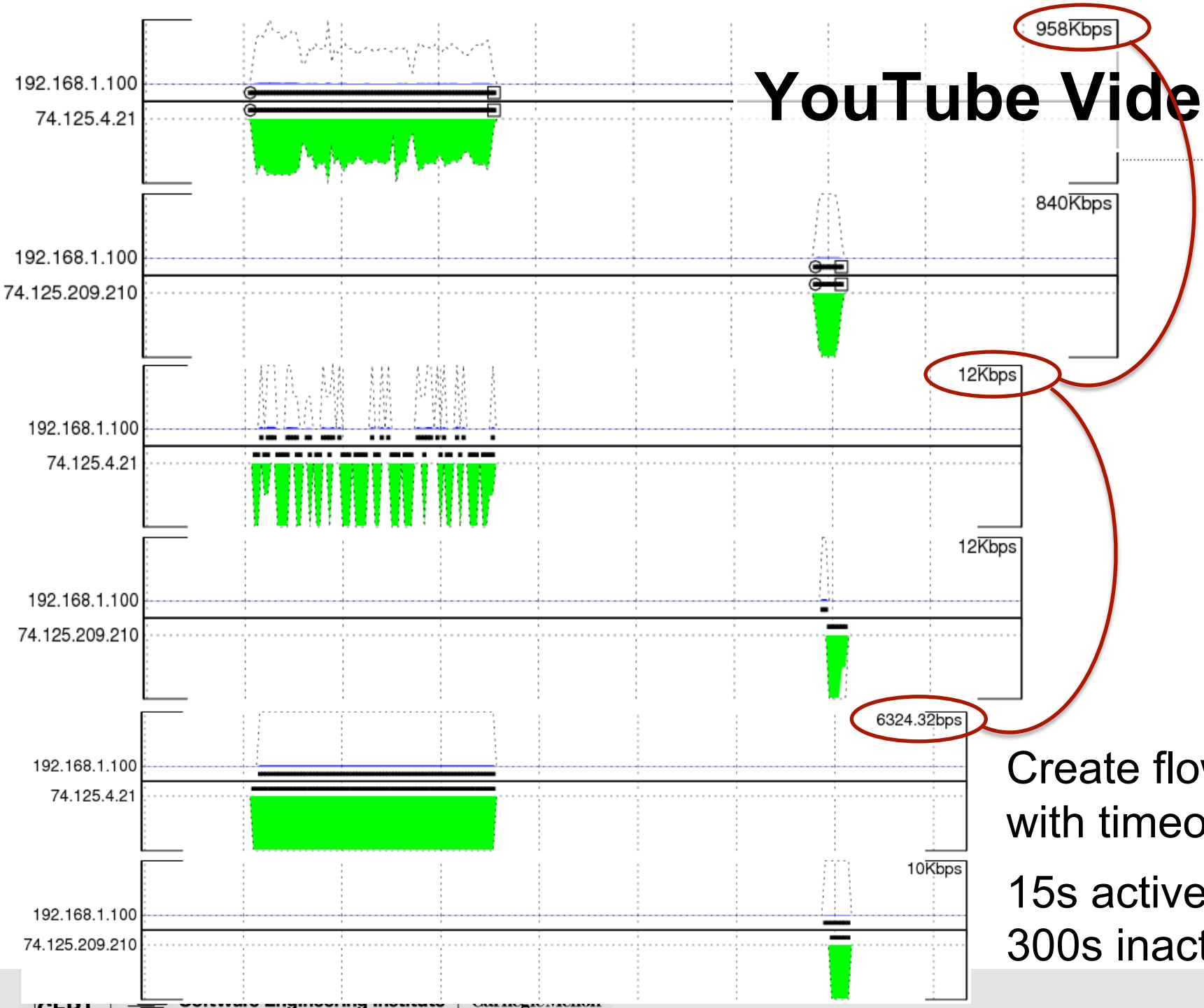


Challenges: Flow

To this point, we've been essentially working with packets.

Let's take a look at the impact of applying flow aggregation and timeouts.

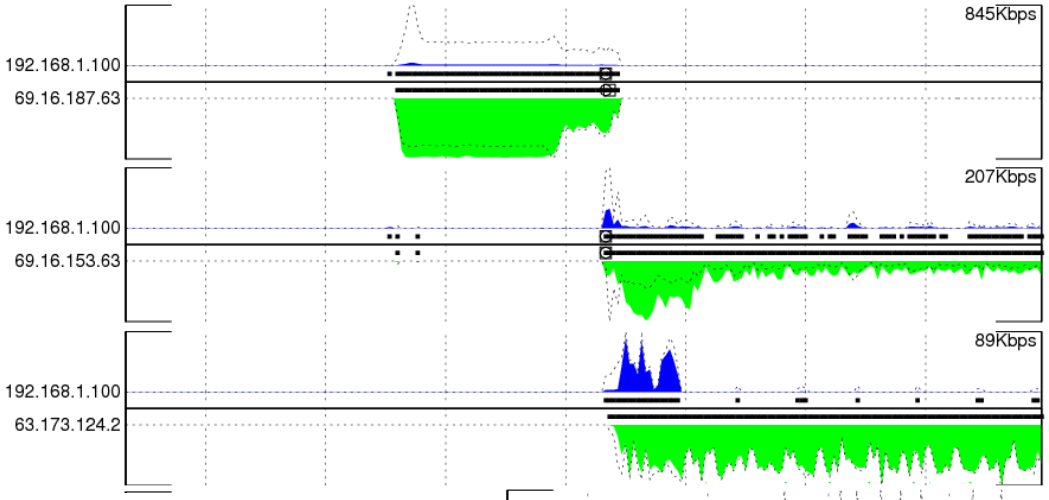
YouTube Videos

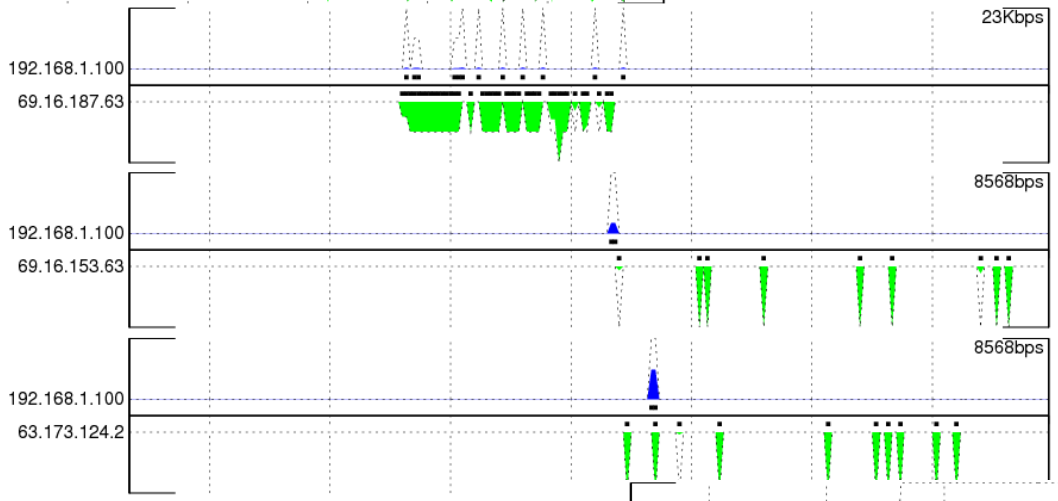


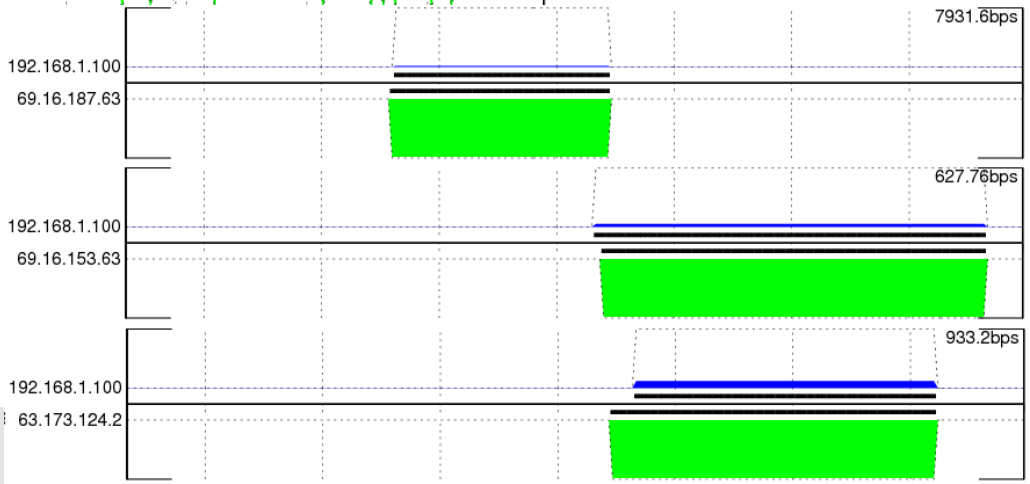
Create flows with timeouts:

15s active
300s inactive

CNN Live







Create flows with timeouts:

15s active
300s inactive

The example, revisited

Is video driving current bandwidth increases? Where are we at on the adoption curve? How will it impact my network?

- We can work around anonymization
- Sampled data makes the problem very challenging
- Working with flow (rather than packets) adds more complexity

Back to the point of the presentation

The question: Is there value in bulk network traces?

The answer: Yes.

A caveat: The data sources have to be tuned to the research

Conclusion

A challenge:

What research do you want to do with bulk network traces?

How can / should we drive bulk network data collection?

Thank You

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