Network Highlighter

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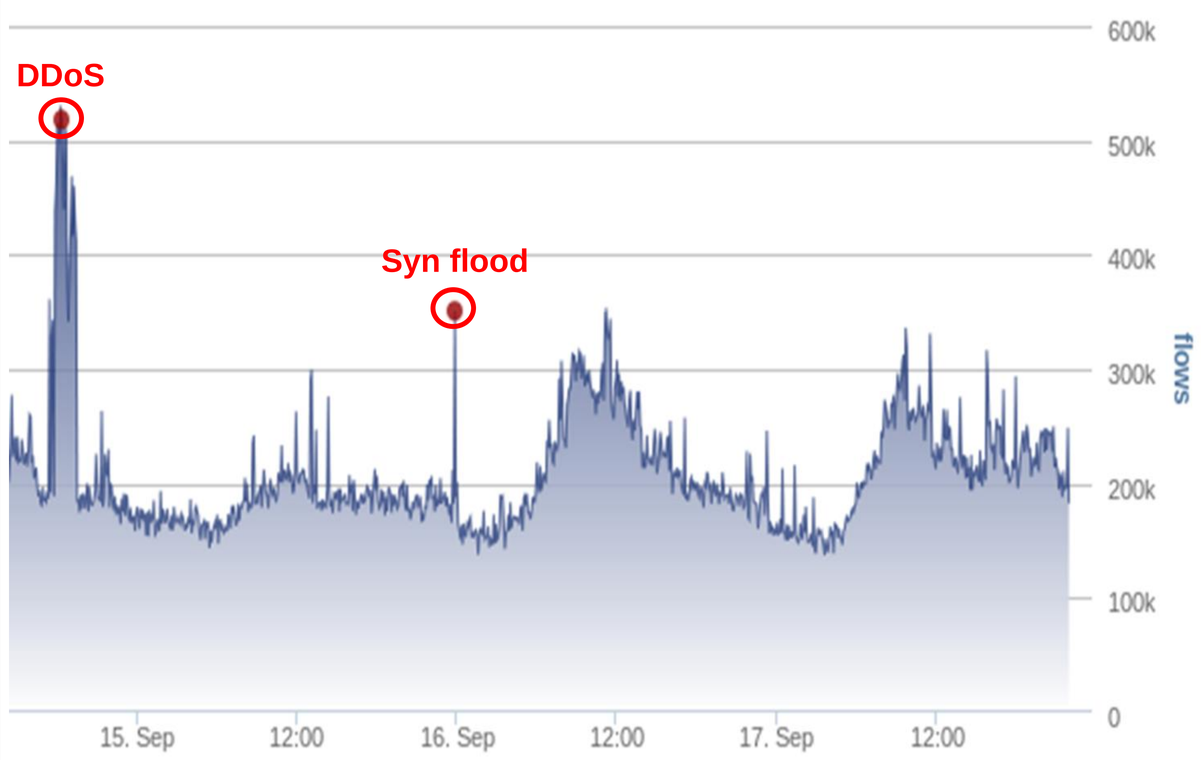
Network Highlighter is fundamental to spot unusual and unknown behaviour



Paramount task of network highlighter

- Security
- Performance/Troubleshooting
- Traffic monitoring

Network behaviour and infrastructure change very fast

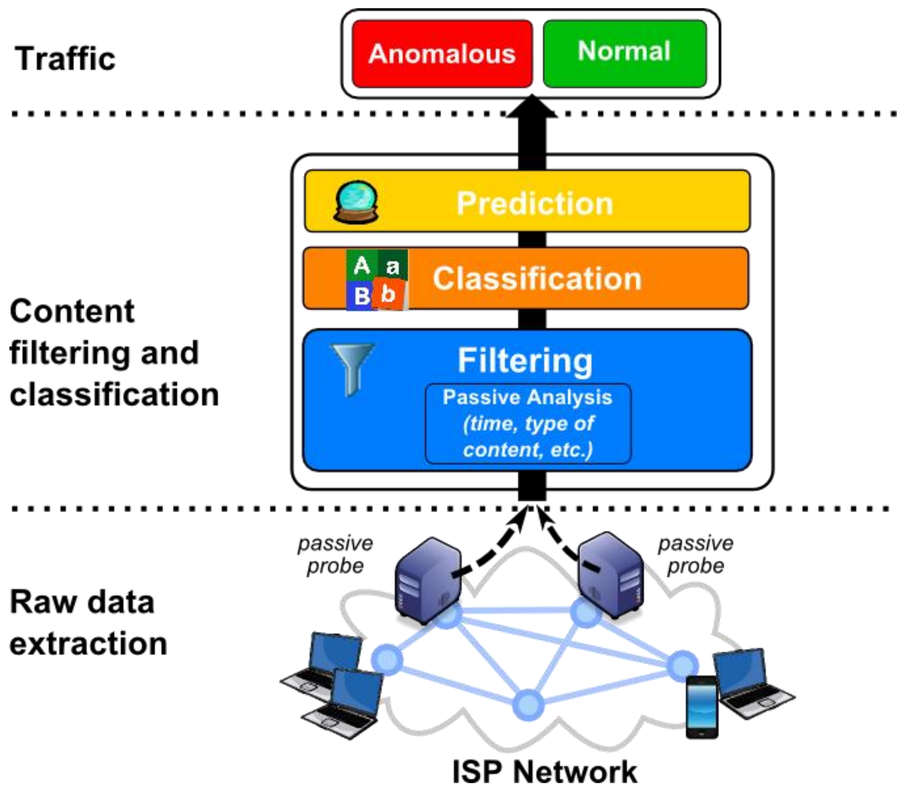
- How to spot anomalies? What is normal and what is not?
- Reactive manual approach completely fails
- Need of automatic tools for anomaly detection in large scale networks
- CDNs/cloud systems make network even more complex: Akamai, YouTube, Amazon

Our proposal is a distributed and comprehensive framework

- To automatically spot anomalous traffic
- To provide administrators with a tool to "understand what is happening" in their networks

  E.g.: Capture sudden change in CDN (YouTube, Facebook, etc.) traffic patterns

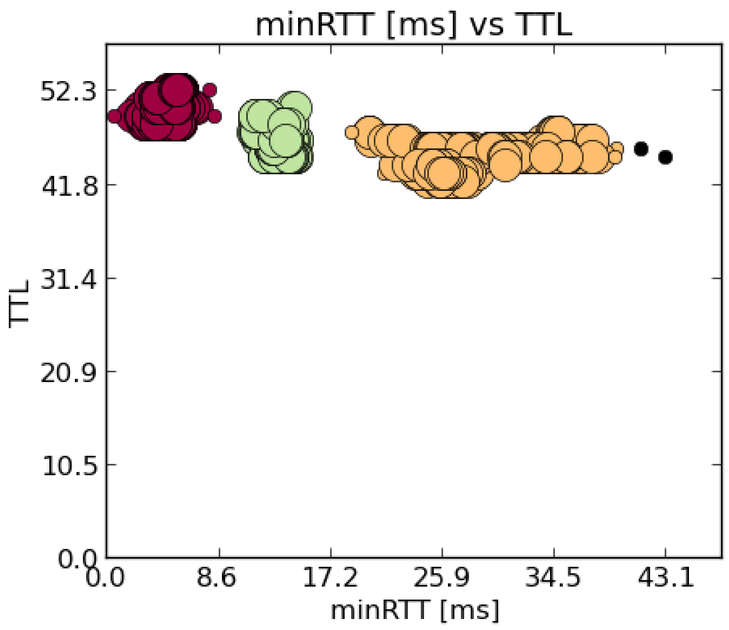
Our network highlighter workflow

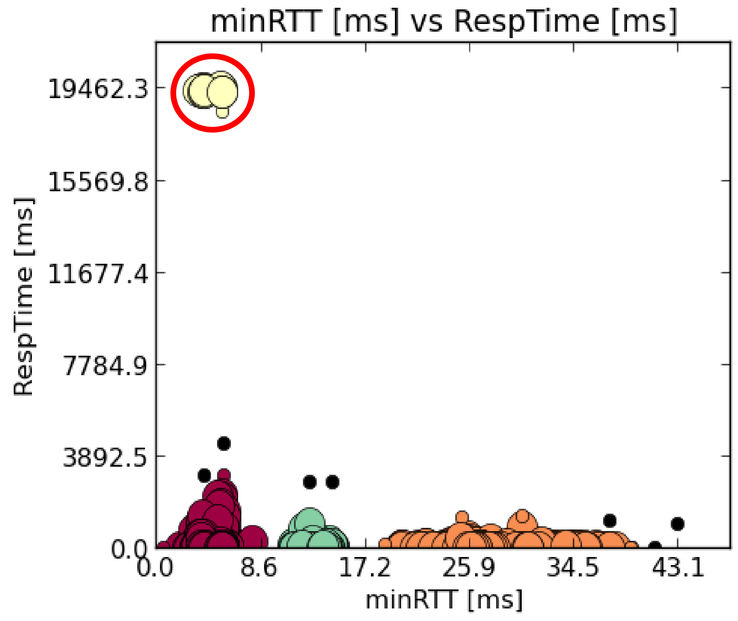


Anomalous	Security issue, performance problem, unusual redirect, etc.
Normal	useful to build baselines and normal traffic patterns
Prediction	Kalman filter, Linear/Gaussian Regression
Classification	Data mining and Clustering techniques: DBScan, Multidimensional Subspacing, Ad-Hoc clustering algorithms
Filtering (Feature extractor)	IP address, RTT, TTL, Port Number, service, device, etc.

Preliminary Results on YouTube infrastructure

Clustering Technique

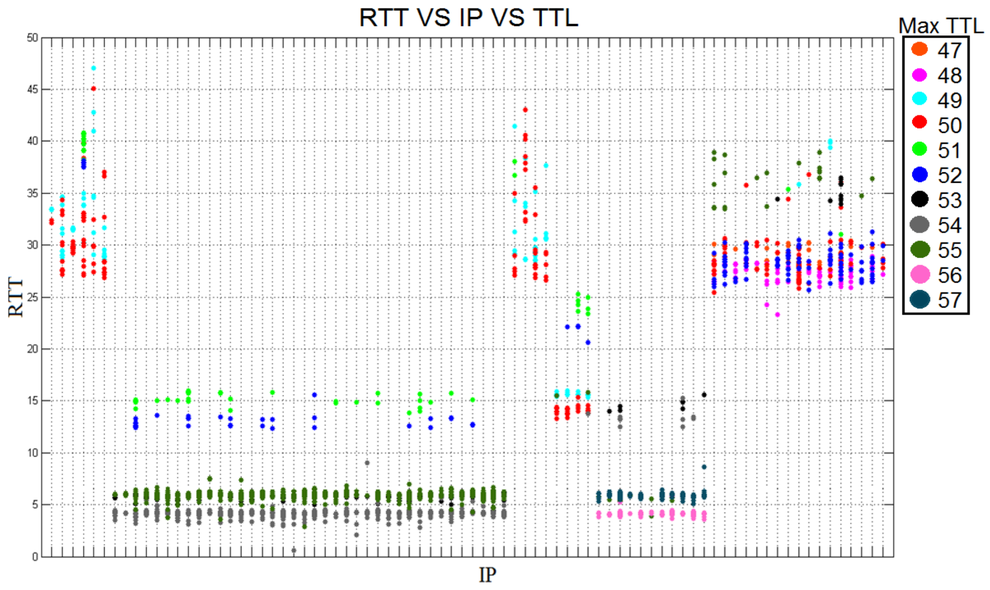




✓ Three different clusters
✗ A single IP address can be present in two clusters

✓ Four distinct clusters
✓ A single client creates an outlier cluster
✗ The outlier cause a wrong normalization
✗ Automatic crosscheck still needed

Multi-Dimensional Visual Technique



✓ Easier to detect server classic behaviour
✗ Harder to identify anomalies

Classic clustering techniques are not adequate for network modelling, new ad-hoc solutions have to be developed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