Network Highlighter

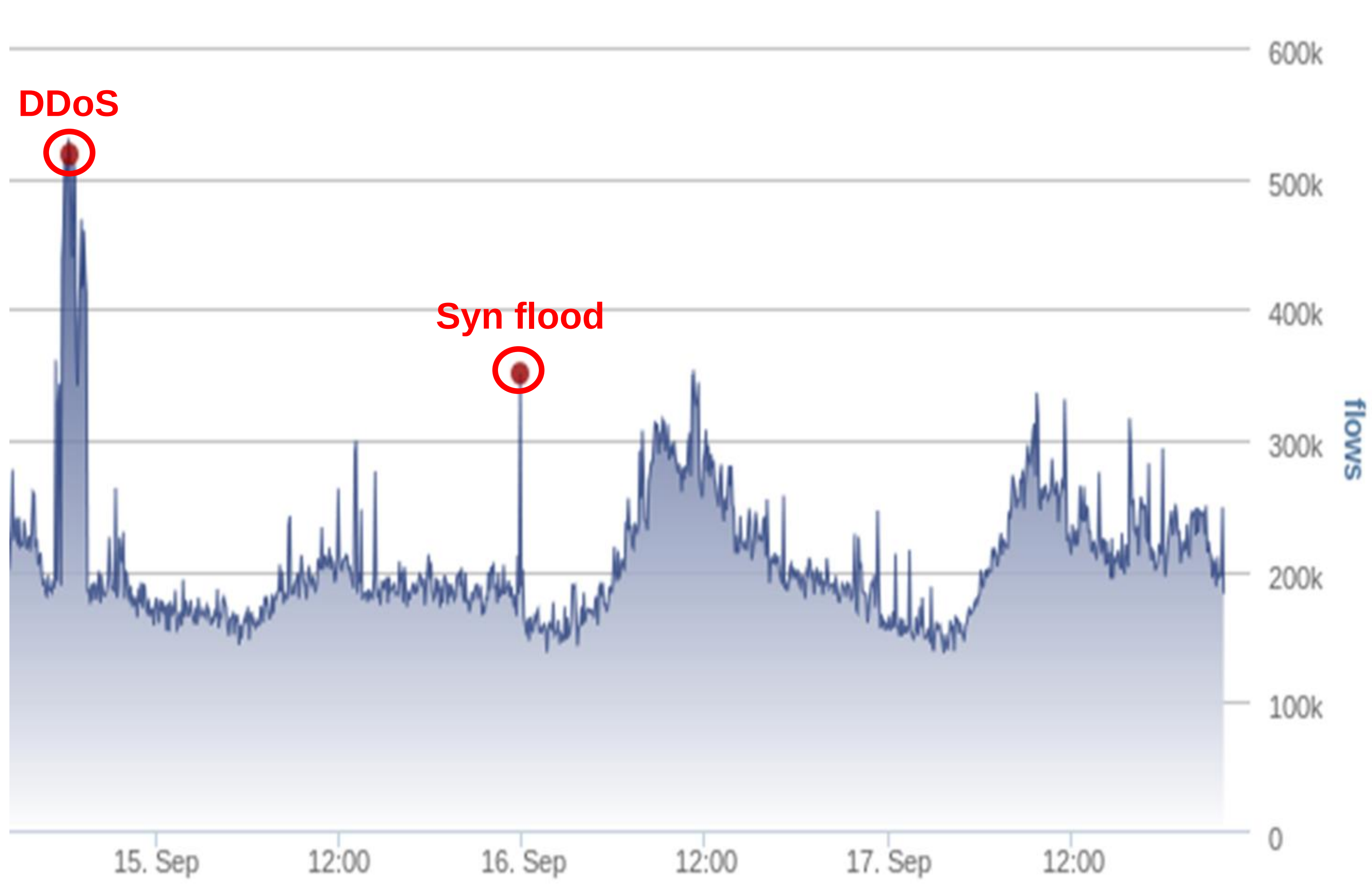
POLITECNICO DI TORINO

# Network Highlighter

mPlane

NARUS

## 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**

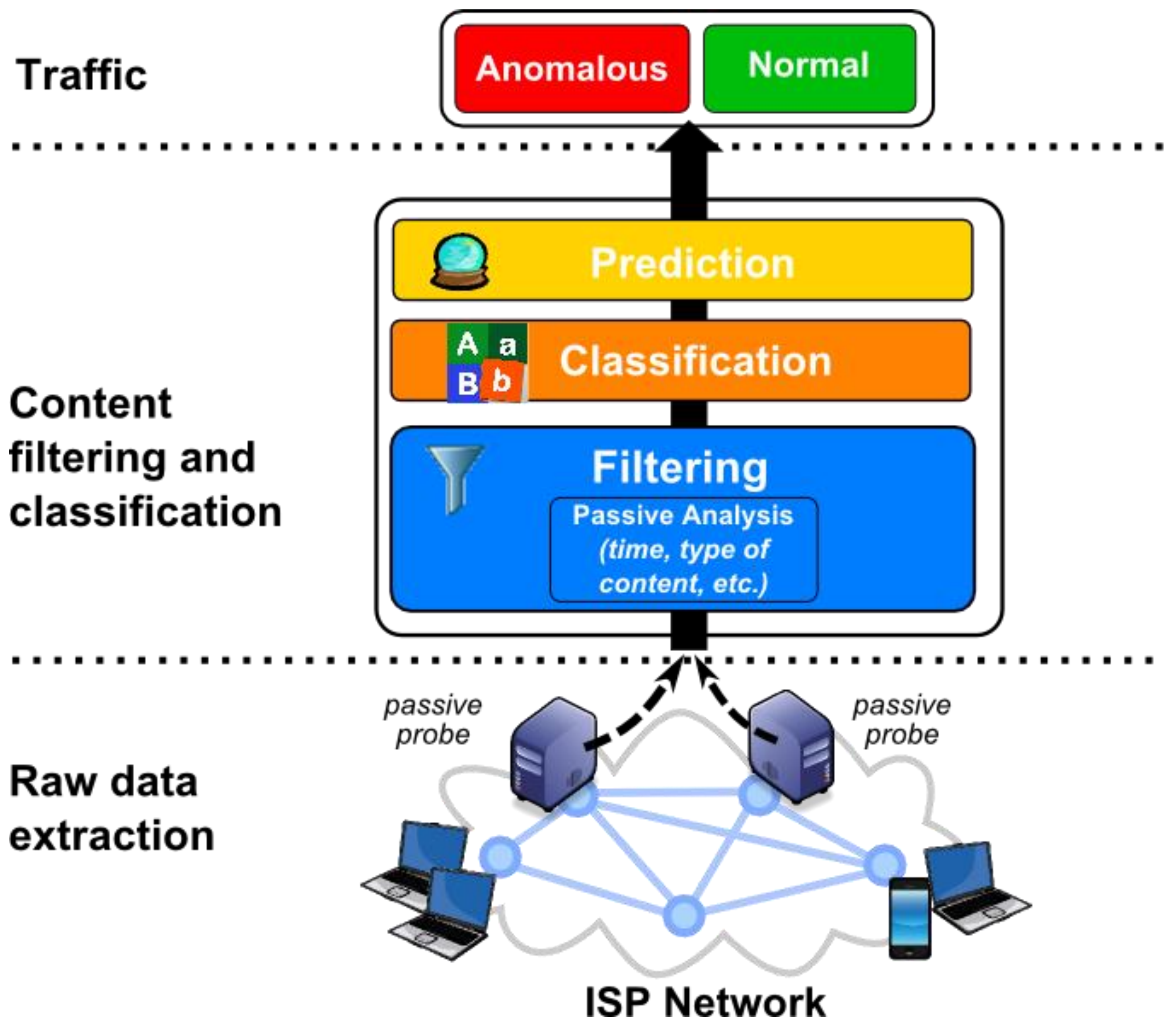
- How to spot anomalies? What is normal and what is not?
- Reactive manual approach completely fails
- Need of automatic tools for anomaly detection in large scale networks
- CDNs/cloud systems make network even more complex: Akamai, YouTube, Amazon

**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

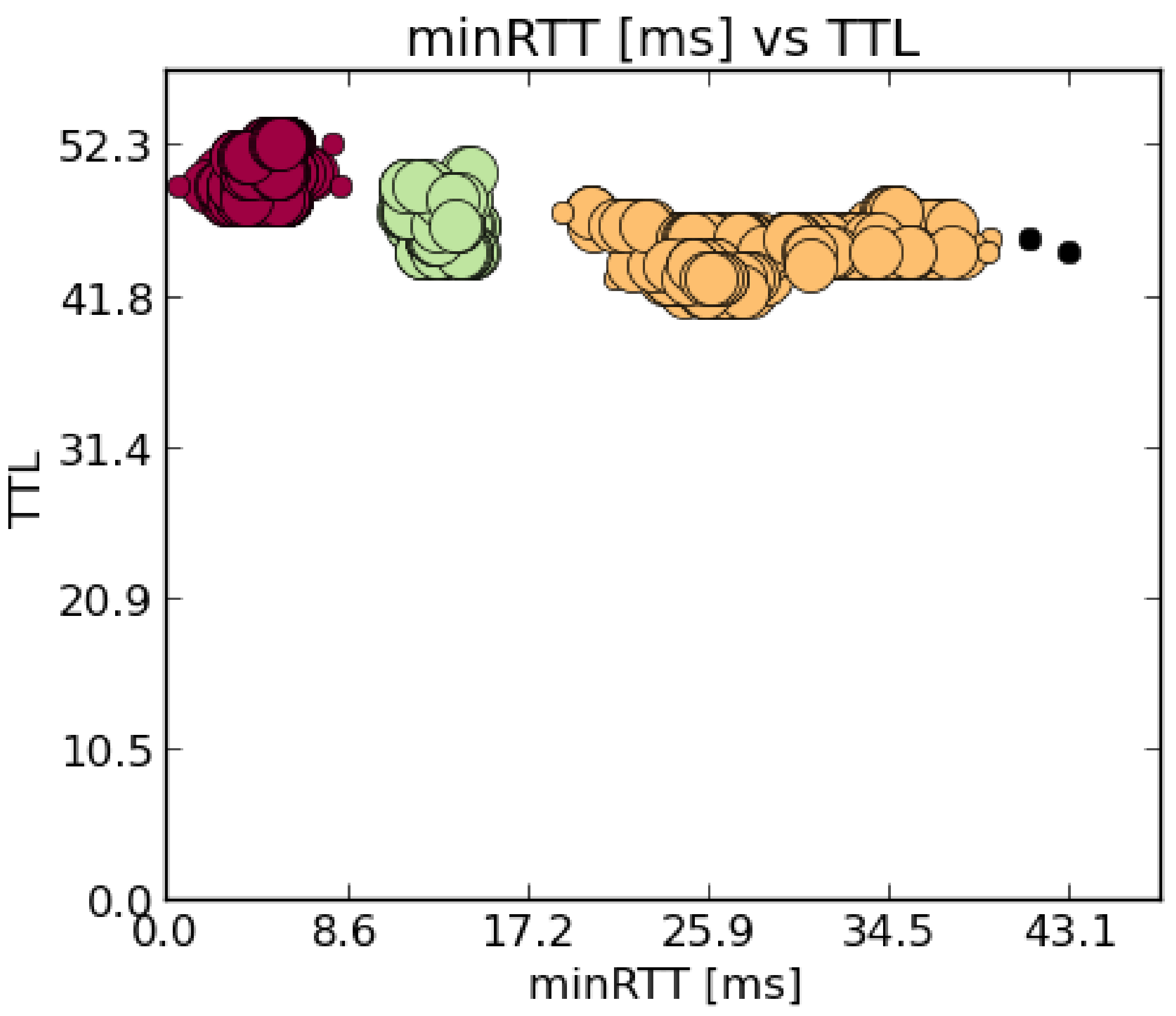


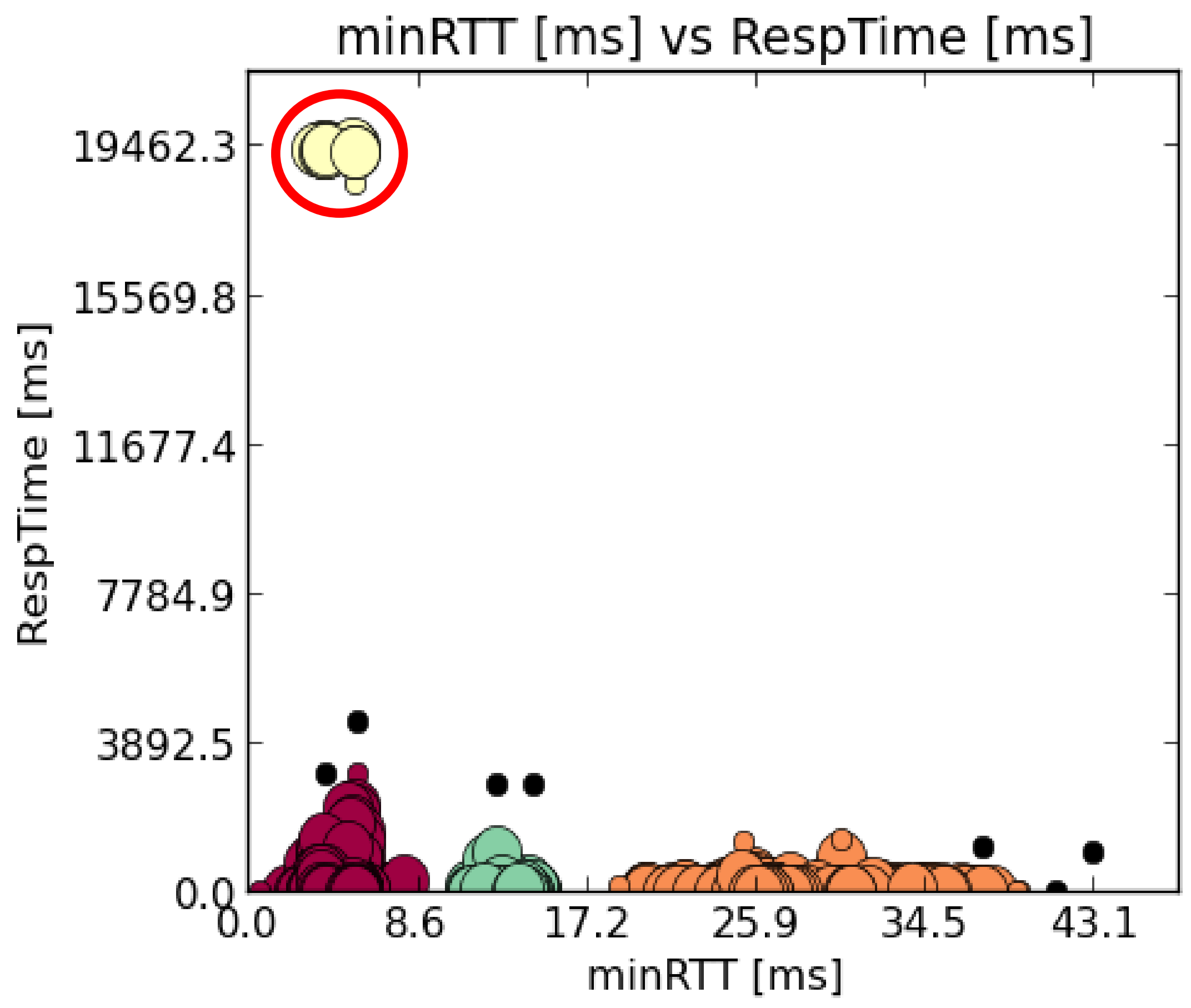
| | |
|---|---|
| Anomalous | Security issue, performance problem, unusual redirect, etc. |
| Normal | useful to build baselines and normal traffic patterns |

| | |
|---|---|
| Prediction | Kalman filter, Linear/Gaussian Regression |
| Classification | Data mining and Clustering techniques: DBScan, Multidimensional Subspacing, Ad-Hoc clustering algorithms |
| Filtering<br>(Feature extractor) | IP address, RTT, TTL, Port Number, service, device, etc. |

## Preliminary Results on YouTube infrastructure

### Clustering Technique

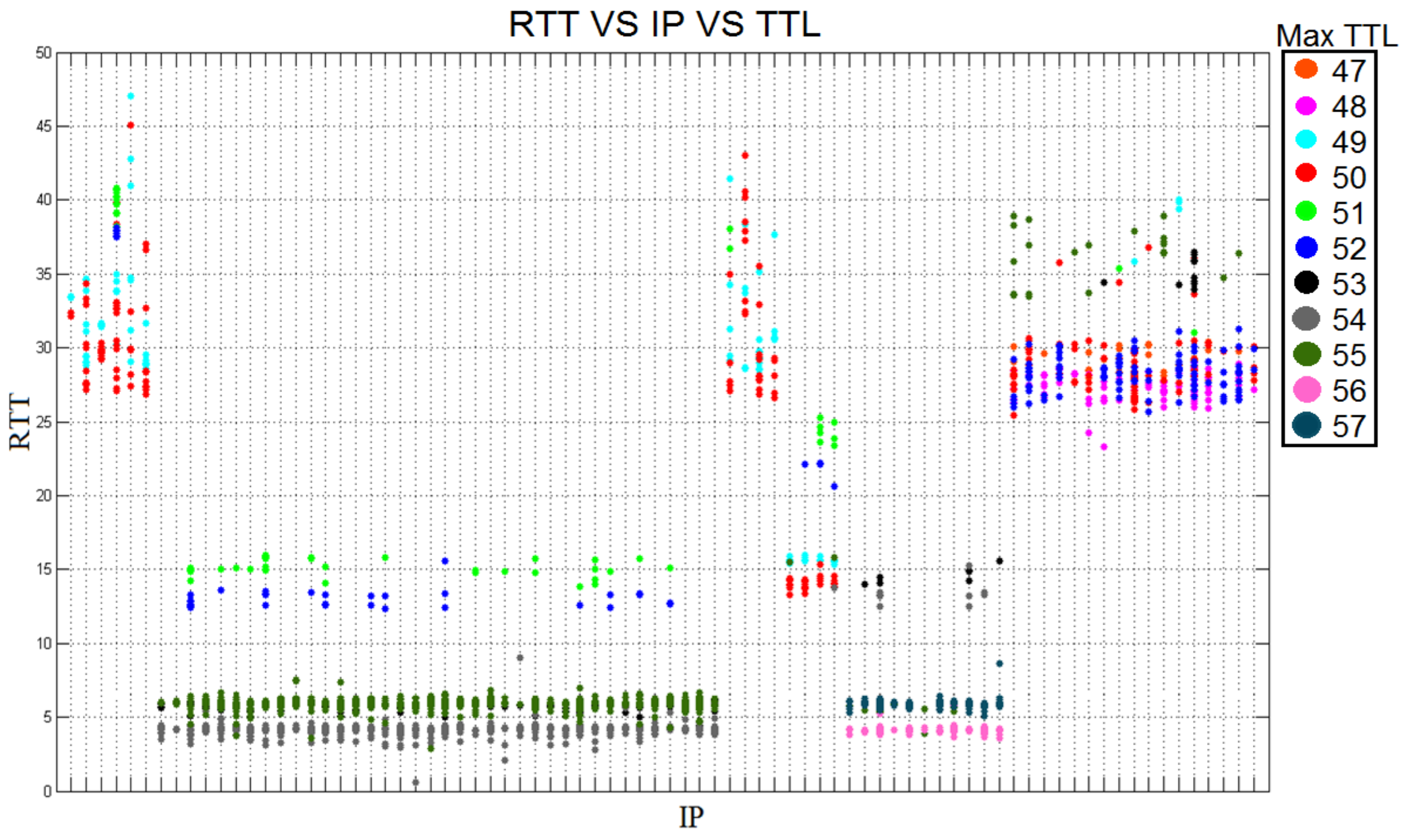




✓ Three different clusters
✗ A single IP address can be present in two clusters

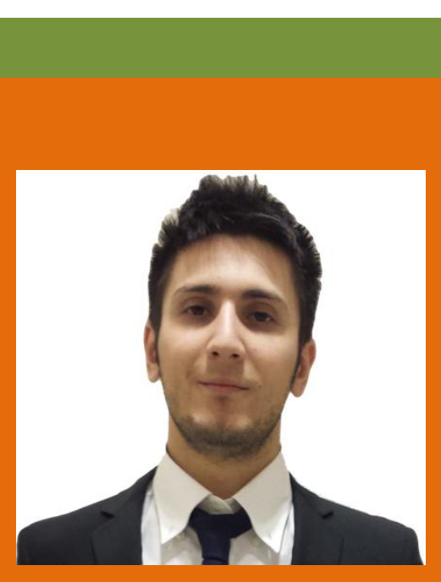
✓ Four distinct clusters
✓ A single client creates an outlier cluster
✗ The outlier cause a wrong normalization
✗ Automatic crosscheck still needed

### Multi-Dimensional Visual Technique



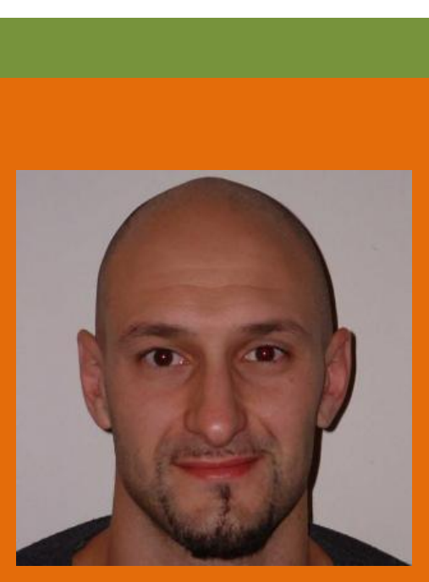
✓ Easier to detect server classic behaviour
✗ Harder to identify anomalies

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

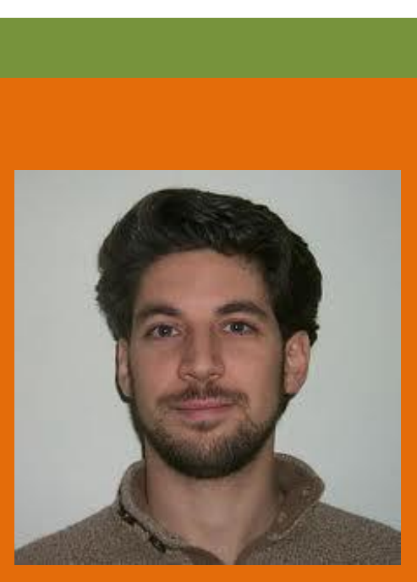

Danilo Giordano

Stefano Traverso

Luigi Grimaudo


Mario Baldi

Elena Baralis


Marco Mellia