Intracom Telecom
Java SE / EE Workshop

Challenges and techniques for handling multiple device type and tens of thousands of network elements simultaneously

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We need to answer questions like these -

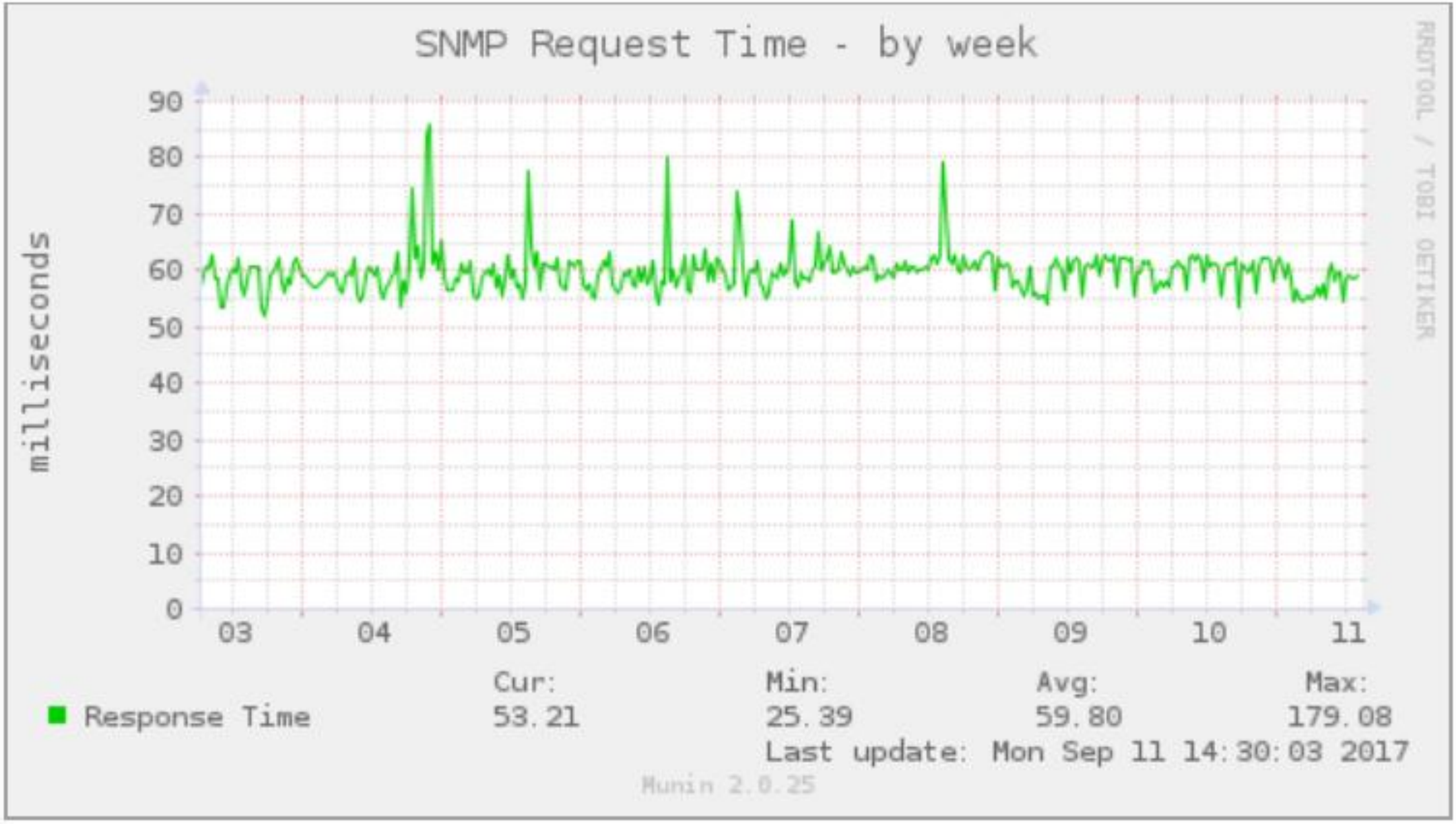
- How many network elements can the NMS manage?
- What are the H/W requirements?
- How much bandwidth is required for network management traffic?

How do we find the answers?

Network Management System Dimensioning

- Simulation of the network in the lab with software (SNMP MIMIC)
- Monitoring tools capturing system measurements (munin)
- Let’s look at 2 reports
  - uni|MS Dimensioning Report
  - munin report

Efficient Collection of Performance Measurements



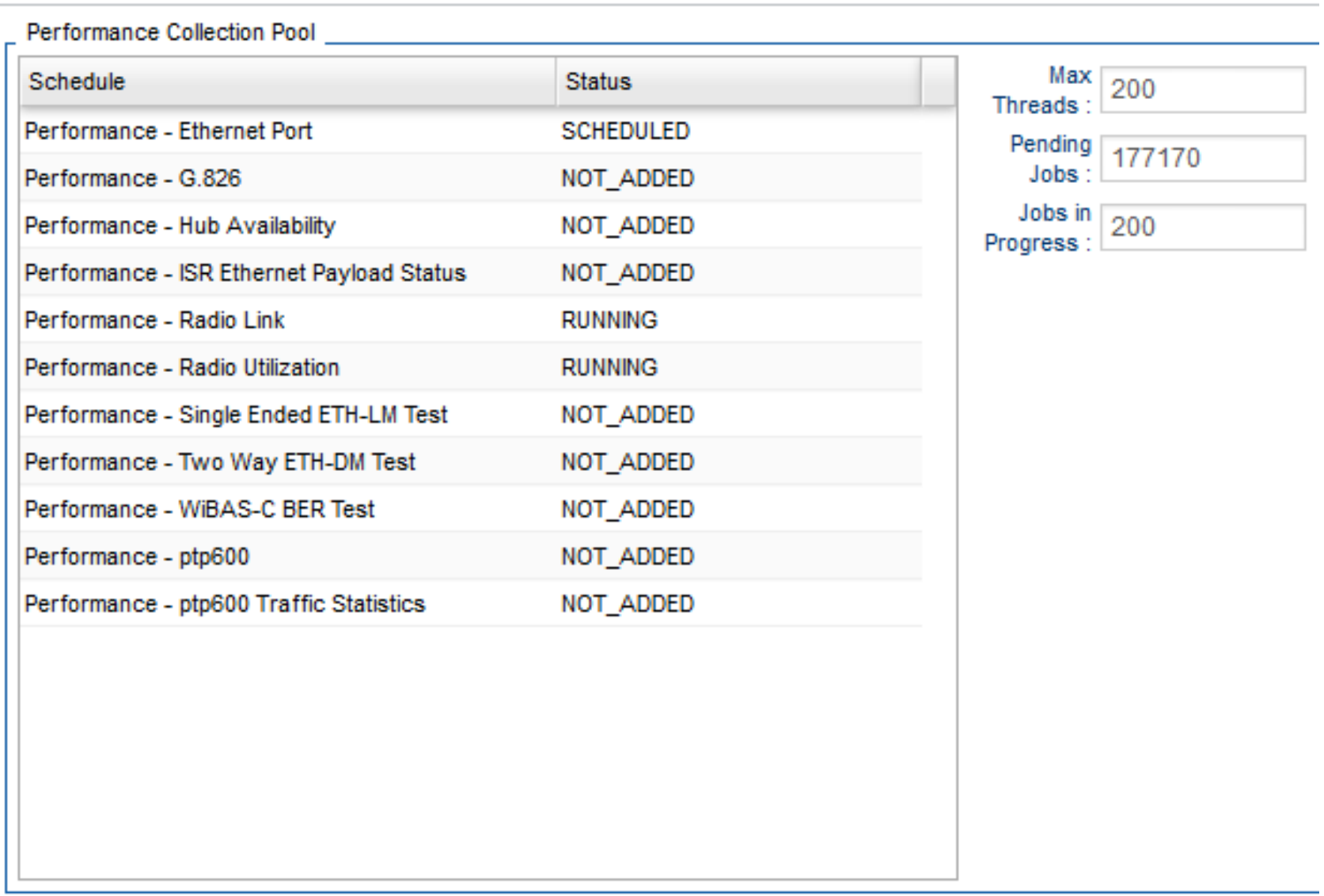
Efficient Collection of Performance Measurements

- The NMS collects up to 0,5 million measurements every 15 minutes
- It uses SNMP and the latency is the field is about 60ms
- So we would need ~8 hours for collection
- How do we solve this problem?

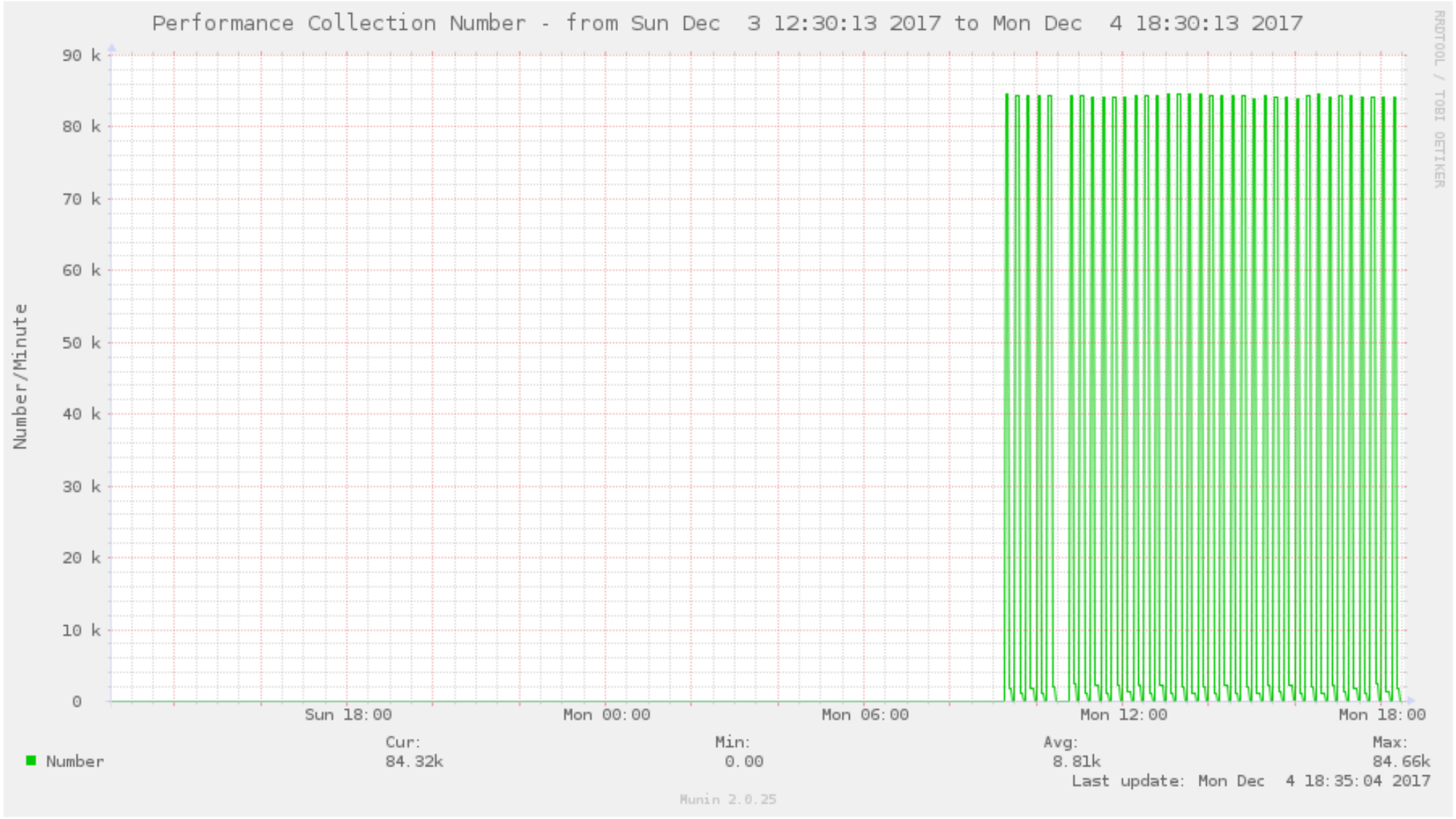
Efficient Collection of Performance Measurements

- Collect performance in parallel rather than sequentially.
- In Java we can use the Thread class for this.
- So would we create 0,5 million thread objects?

Efficient Collection of Performance Measurements



Efficient Collection of Performance Measurements



Efficient Collection of Performance Measurements

- With multithreading
  - 80.000 collections take 1 minute
- Without multithreading
  - 80.000 collections take (80k * 60ms) 80 minutes

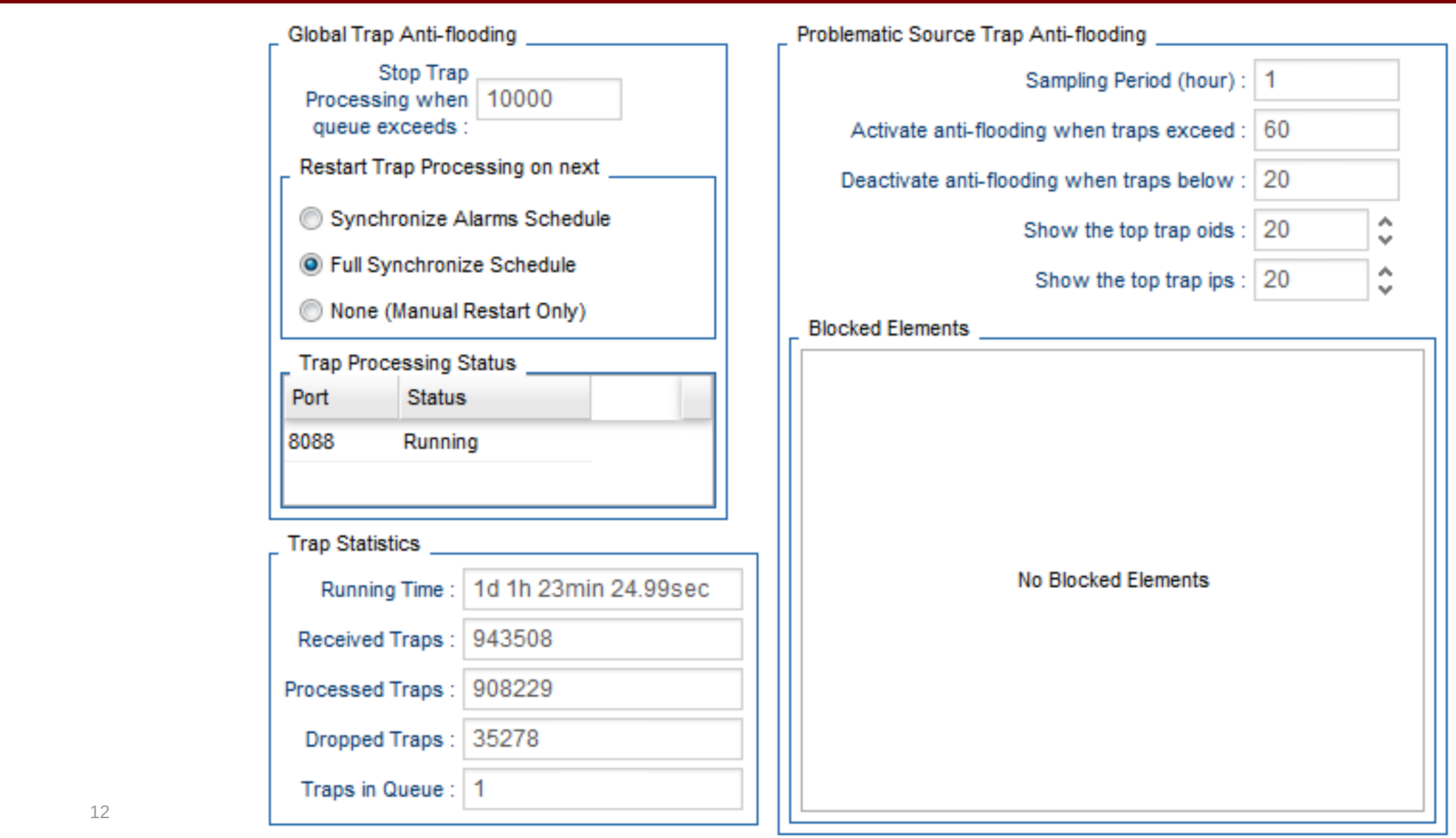
Trap Anti Flooding

- Elements send SNMP traps (notifications) to the NMS
- Trap examples are (ETH Link down, Temperature high)
- The trap rate can be unpredictable
- How can we protect the NMS from trap flooding?

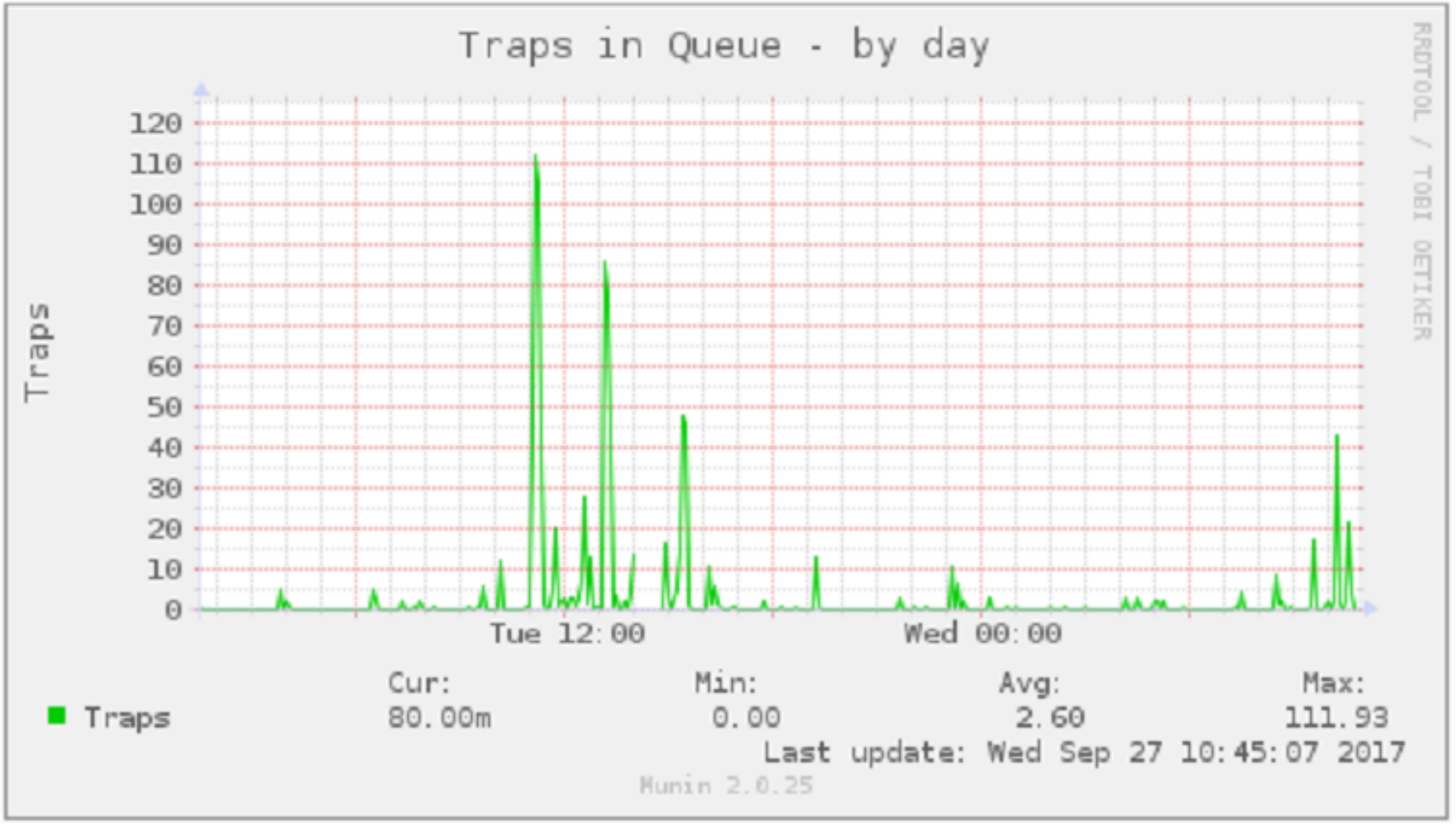
Trap Anti Flooding Mechanisms

1. Place traps in a queue and monitor the queue size
   - A lightweight thread that places traps evenly in a queue
   - A heavyweight trap processing thread is on the other side of each queue
   - When the queue size exceeds the limit, trap processing stops
2. Block problematic sources
   - Keep a count of traps per source per hour
   - When a source exceeds the limit, it is blocked

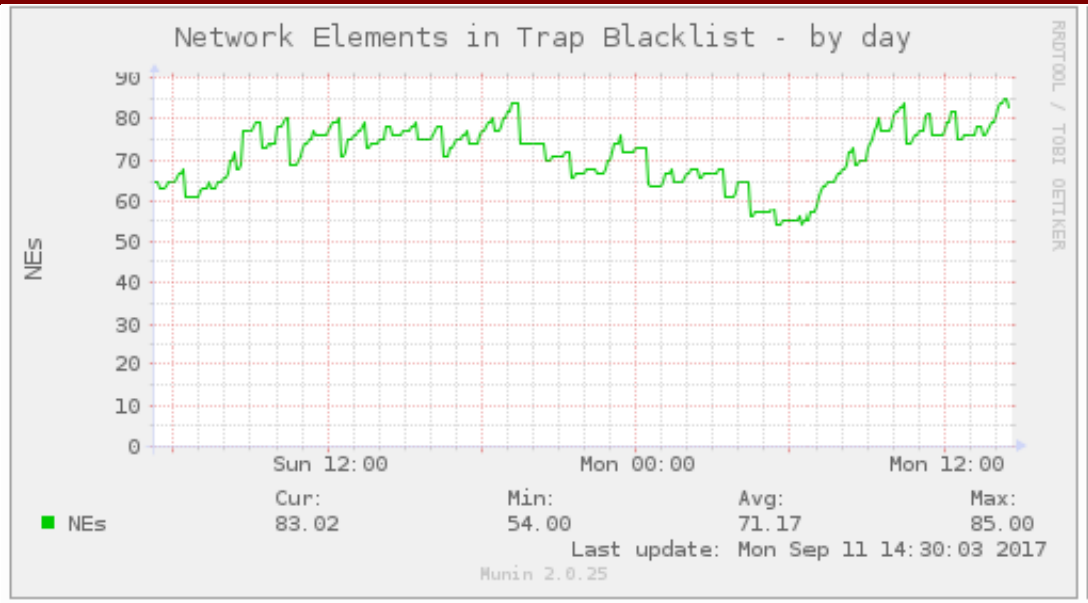
Trap Anti Flooding Mechanisms

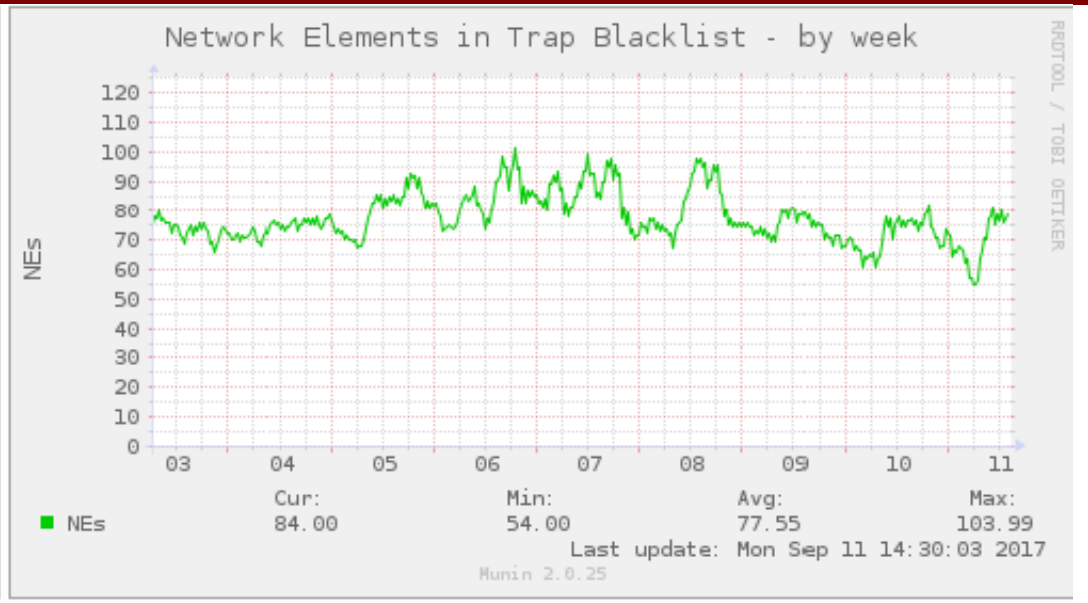


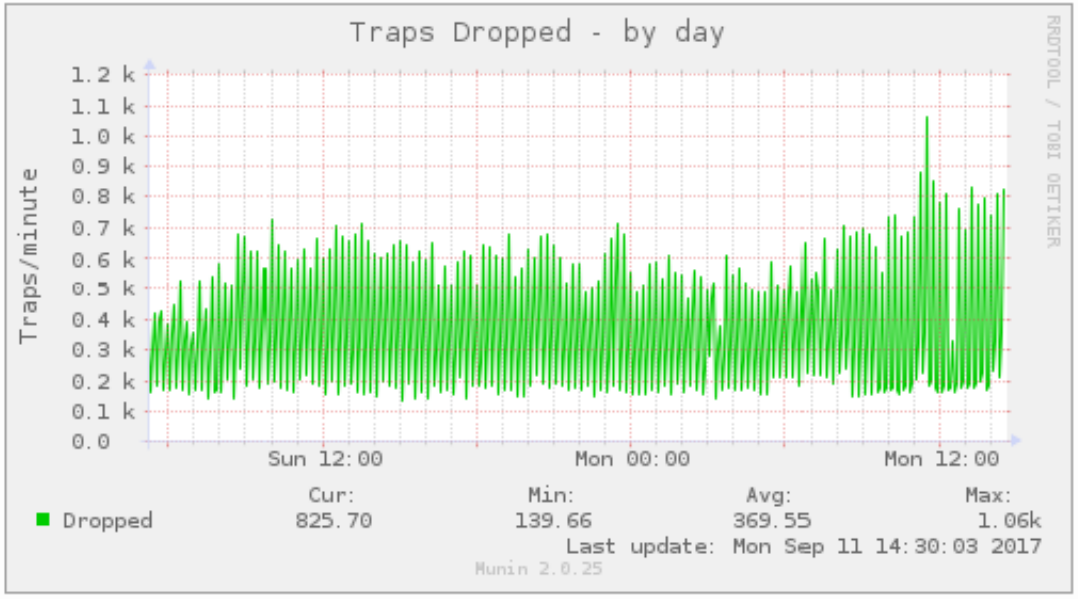
Trap Anti Flooding Queues

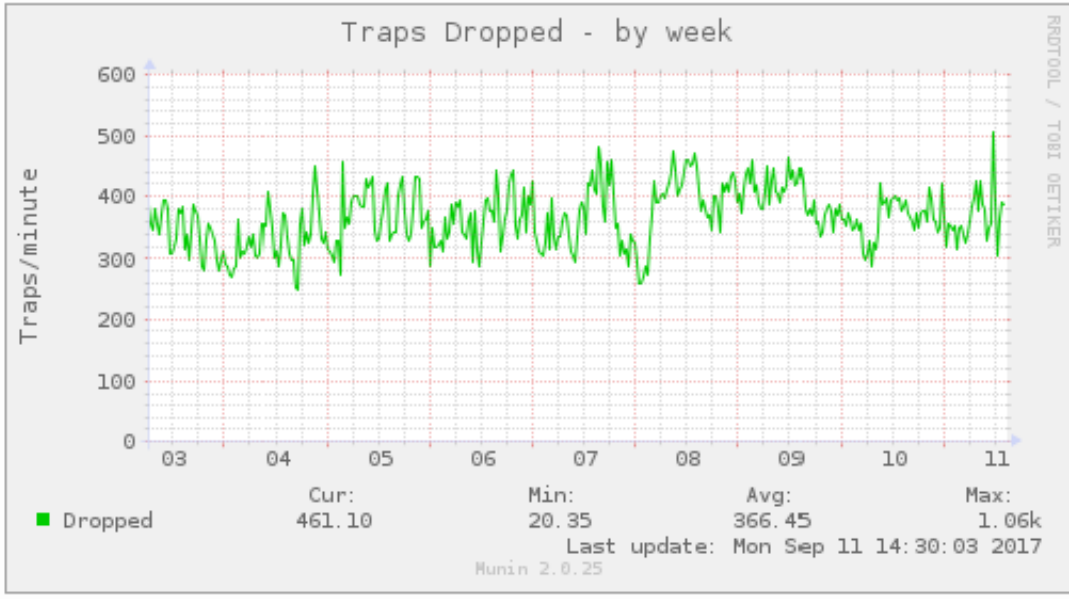


Trap Anti Flooding Blocked Network Elements

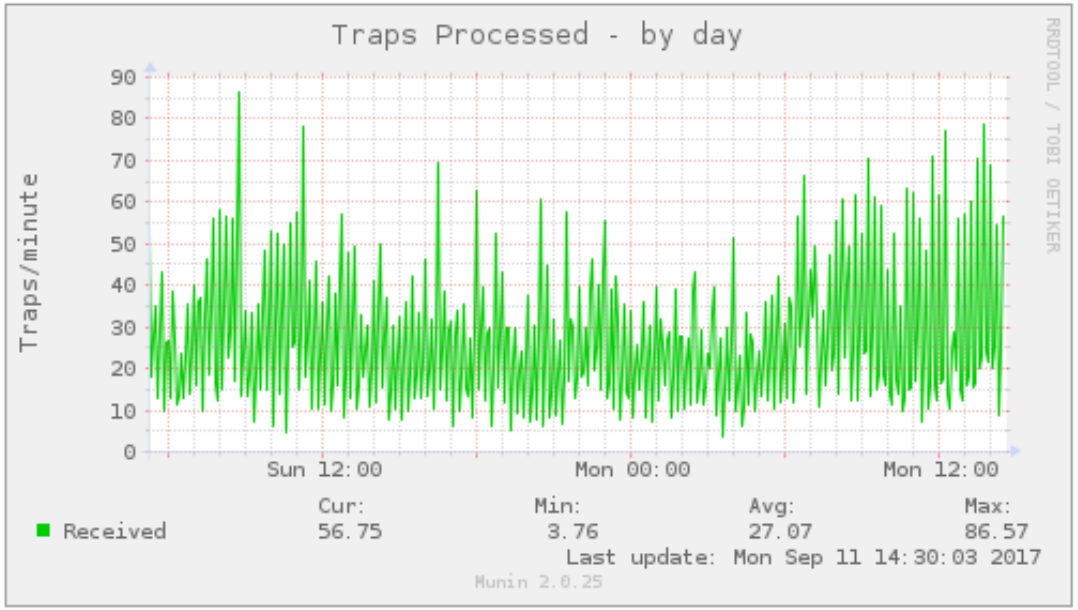


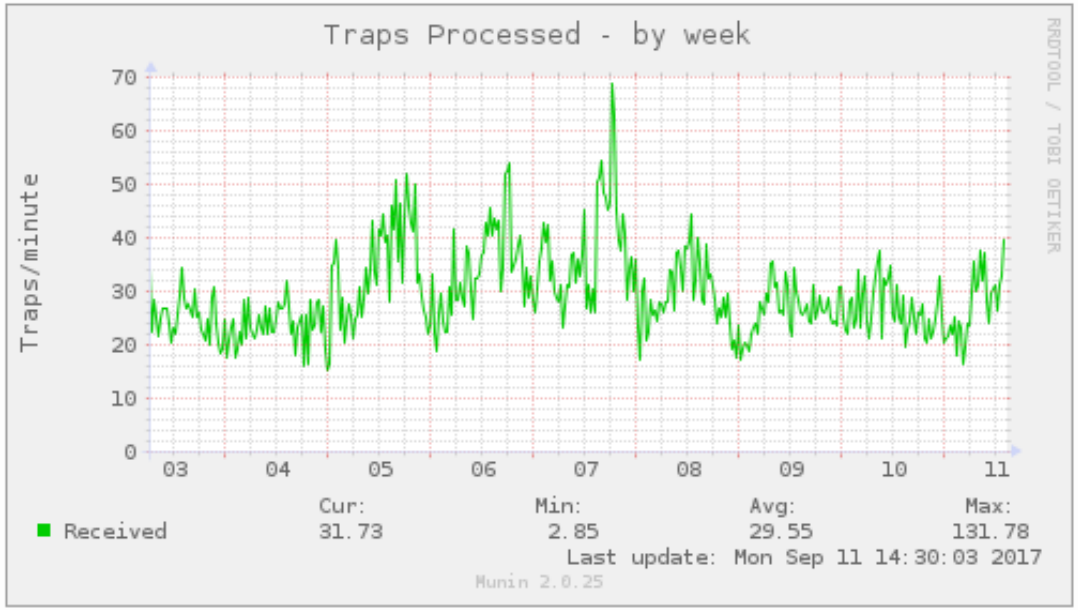


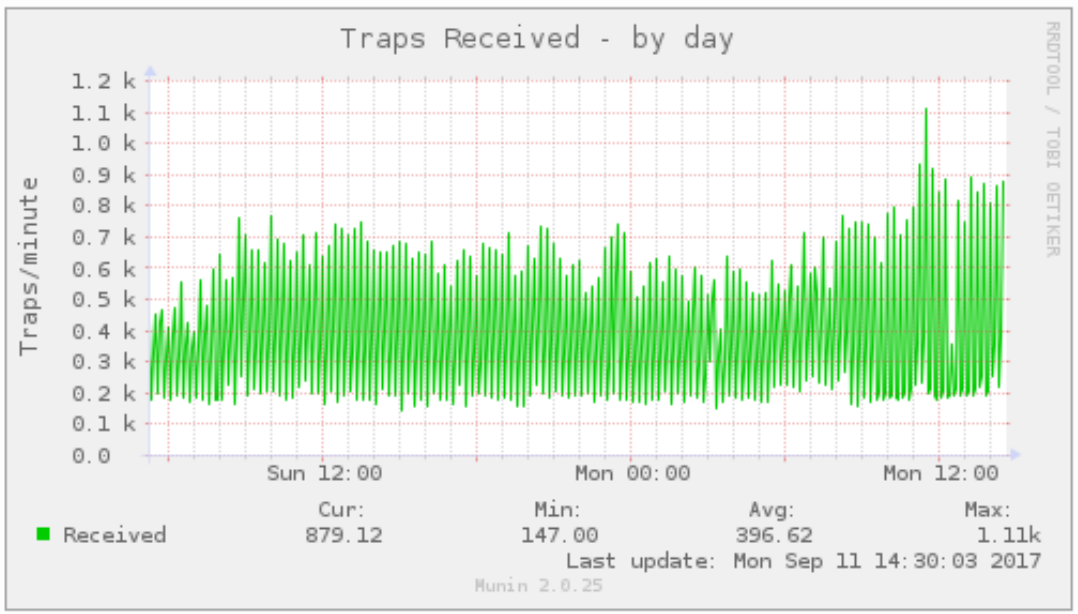


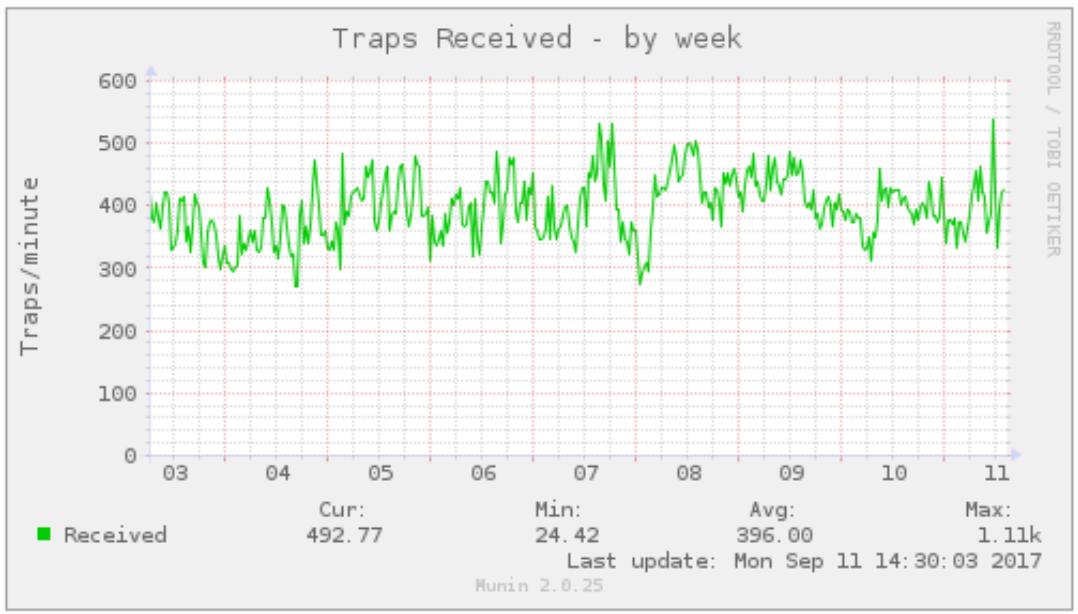


Trap Anti Flooding Traps Received/Processed









Trap Anti Flooding Conclusions from the Field

1% of Network Elements produce 99% of the traps

thank you

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Efficient Collection of Performance Measurements - Calculations

- We manage 40.000 Network Elements
- We collect performance measurements from
  - about 3 Modems per NE
  - about 4 Ethernet Ports per NE
- We collect performance measurements every 15 minutes
- 40.000 * (3 + 4) = 480.000 performance collections evry 15 minutes
- The protocol is SNMP and the average latency time for a request is 60ms
- 480.000 * 60ms = 480 minutes (in the best case scenario 1 SNMP operation per measurement)
- During this 480 minutes is time the CPU is idle waiting for the SNMP request to complete
- What can we do about it?