Wireless Real-Time Monitoring

TEK5110- Building Mobile and Wireless Networks
Department of Technology Systems
University of Oslo

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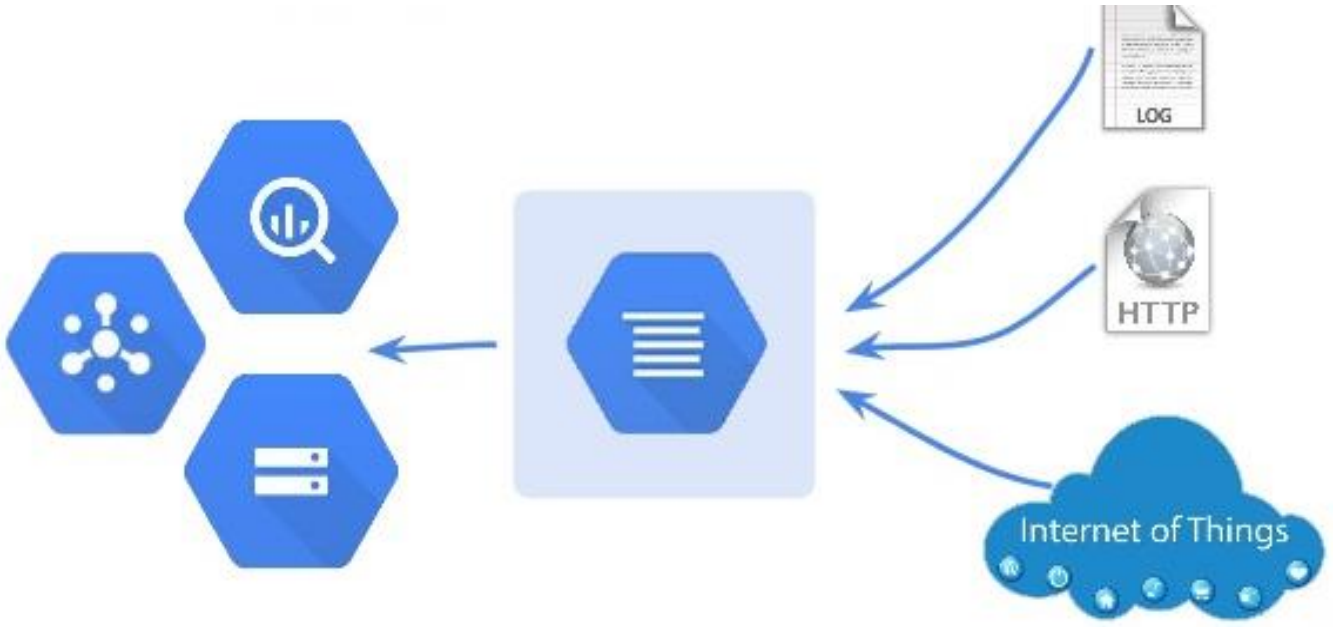
Why Monitoring Wireless?

1. Monitor wireless
2. Extract information
3. Make proper decision



Monitoring Solutions

- Open source
  - Elastic stack (Elasticsearch, Logstash, Kibana)
- Proprietary
  - EyeSaaS, Cisco Meraki

Elastic Stack

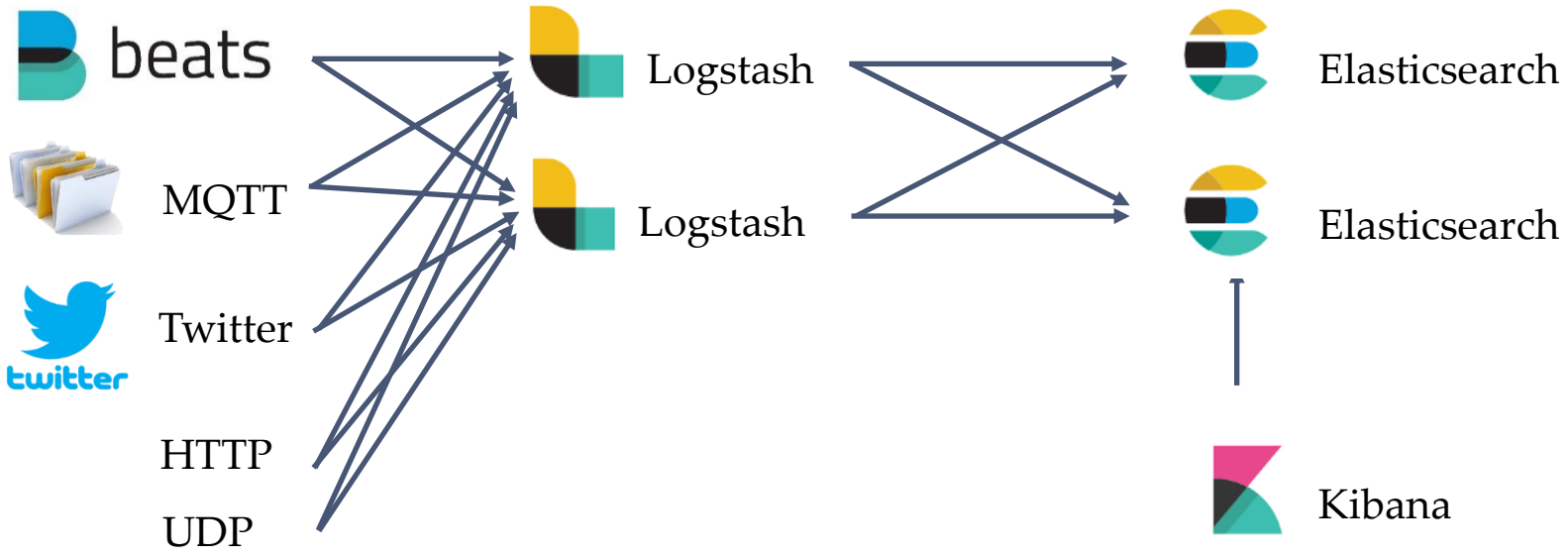
Logstash

Elasticsearch

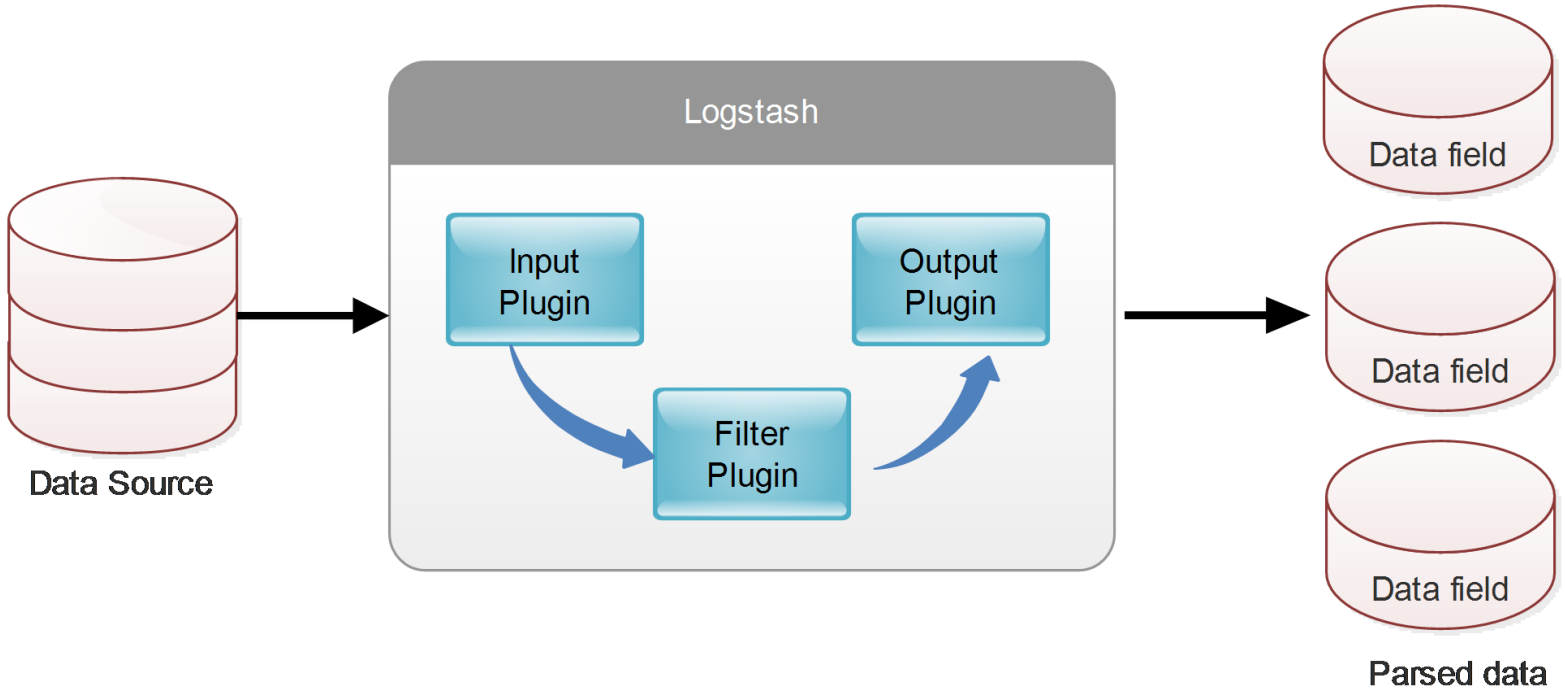
Kibana

Visualiziation and Dashboards

Elastic Architecture

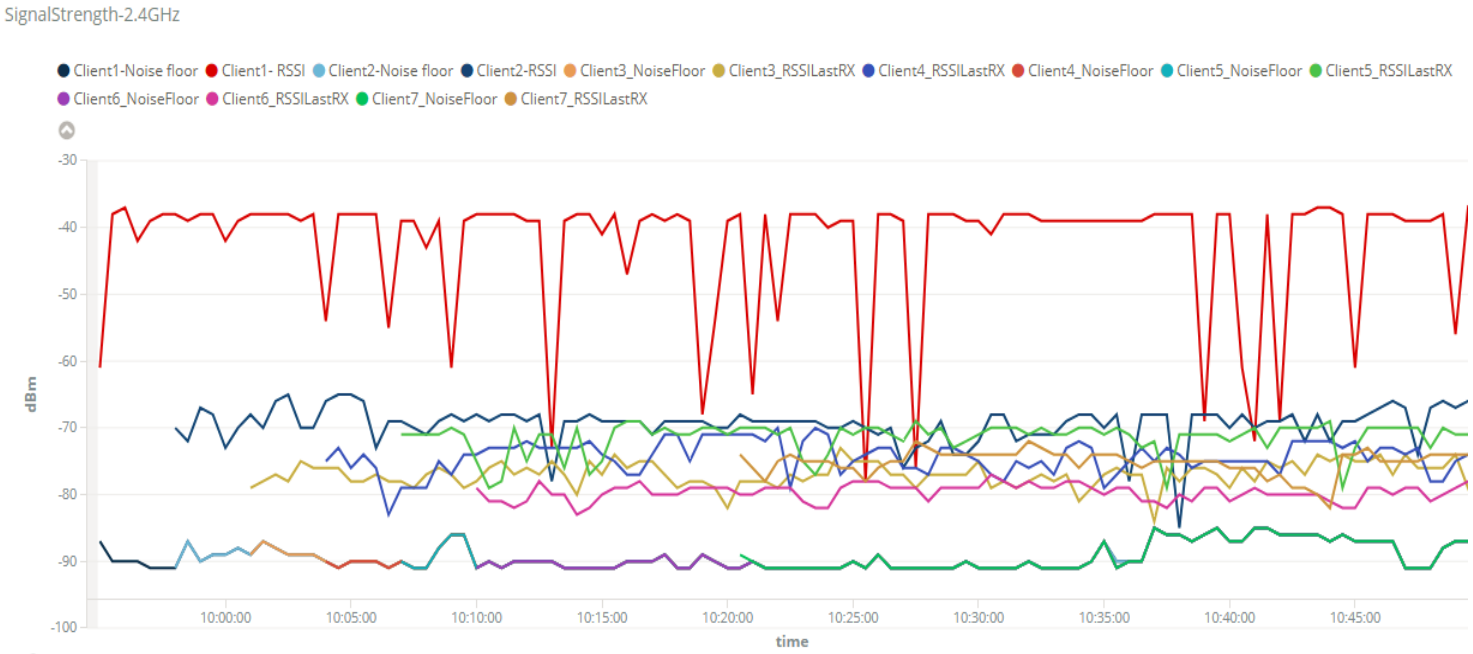


Logstash


Logstash
Input Plugin
Filter Plugin
Output Plugin
Data Source
Data field
Data field
Data field
Parsed data

Monitor Wireless Characteristics

- RSSI
- Noise floor
- Transmit power
- Transmit rate
- Receive rate
- Transmit bytes
- Retransmission
- PER
- Throughput
- ……



Real-Time Monitoring

- Connect your devices to Wi-Fi access point in the class and answer upcoming questions

Wi-Fi
Access Point

Which factors affect SNR on wireless devices?

Does the device position affect RSSI?

Is it possible for a device to reach Shannon capacity?

- $C = w \log_2(1 + SNR)$

How much transmit power does affect receiver signal strength?

- Rx signal strength = TX power + TX antenna gain – path loss + RX antenna gain
- ITU indoor Path loss $L = 20 \log_{10} f + N \log_{10} d + P_f(n) - 28$
  - L = the total path loss. Unit: decibel (dB).
  - f = Frequency of transmission. Unit: megahertz(MHz).
  - d = Distance. Unit: meter (m).
  - N = The distance power loss coefficient.
  - n = Number of floors between the transmitter and receiver.
  - Pf(n) = the floor penetration loss factor.

Variable	Frequency	Residential area	Office area	Commercial area
N	2.4 GHz	28	30	22
Pf(n)	2.4GHz	4n	15+4(n-1)	6+3(n-1)

1- ITU model for indoor attenuation. https://en.wikipedia.org/wiki/ITU_model_for_indoor_attenuation

How much distance does affect receiver signal strength?

Does access point antenna pattern and polarization affect RSSI?

How much RSSI does affect transmit and receive rate?

How does noise affect wireless signal?

SNR, Retransmission and PER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&
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