Gebruikerscommissie – 29 September 2016

Network security monitoring for ICS

Ing. Hendrik Derre

Network security monitoring for ICS

“You don’t know what you can’t see”

Network security monitoring for ICS

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Network security monitoring for ICS

What is Network security monitoring (NSM)?

*“The **collection**, **detection**, **analysis**, and **escalation** of indications and warnings to detect and respond to intrusions. NSM is a way to find intruders on your network and do something about them before they damage your enterprise.”*

-The practice of network security monitoring

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NSM key concepts:

“prevention eventually fails”

- Focuses on collection of information
- Focuses on the adversary, not the vulnerability
- Cyclical process

- **People**… The most important part of NSM

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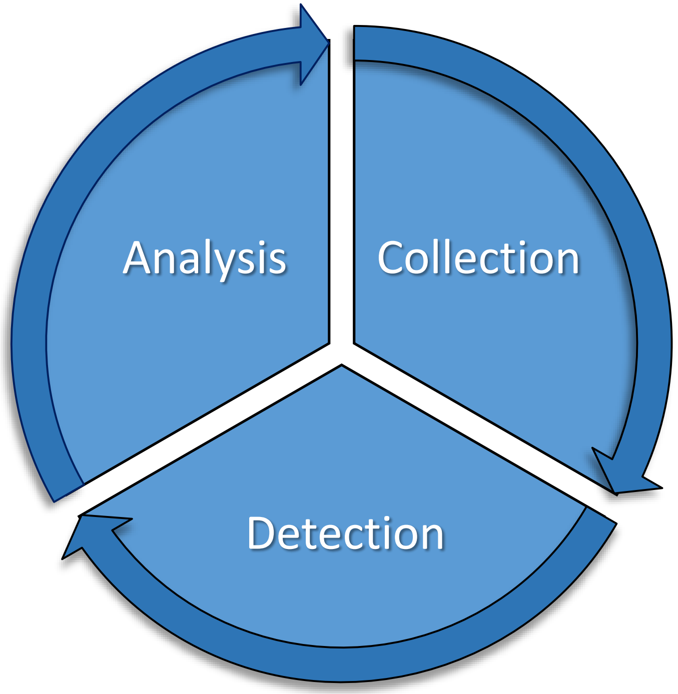
The Network Security Monitoring Cycle:



Three Phase Model:

1. Collection Phase
2. Detection Phase
3. Analysis Phase

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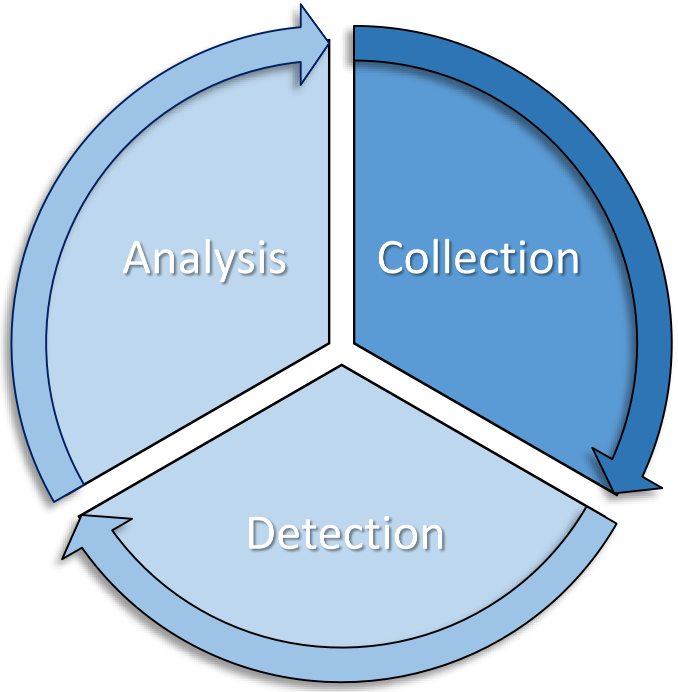

Phase 1: Collection

- Most important step
- Several types of data
  - Full content data
  - Session data
  - Packet string data
  - …
- Initially, one of the more labour-intensive parts

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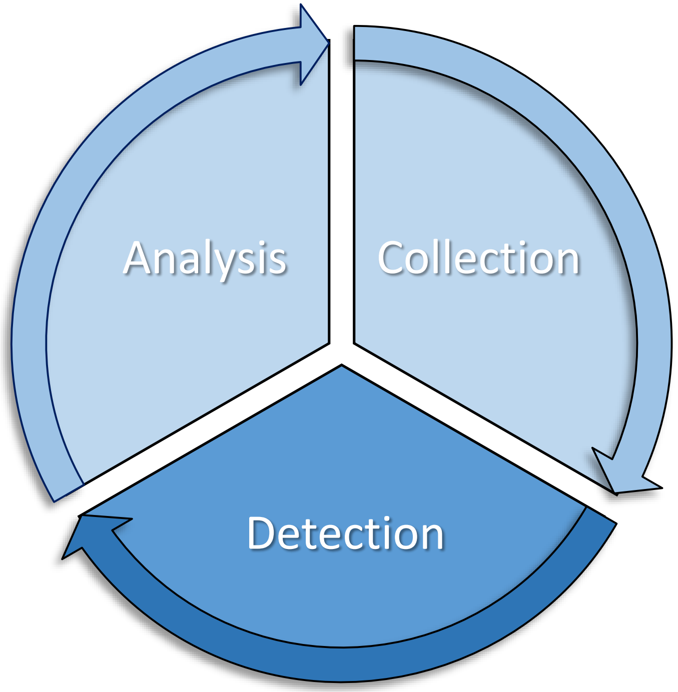

Phase 2: Detection

- Collected data is examined
- **Alerts** are generated based on:
  - Signatures
  - Anomolies
  - Statistically based
- Often function of software
  - ➢ **Intrusion detection Systems (IDS)** (Snort, Bro, Suricata,..)

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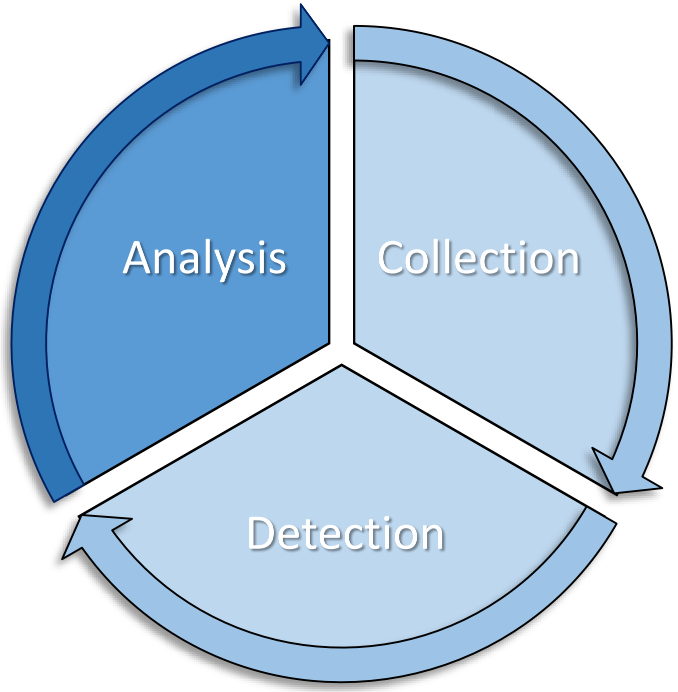

Phase 3: Analysis

- **Human** interprets and investigates alert data
- Analysis tasks:
  - Packet analysis
  - Network forensics
  - Host forensics
  - Malware analysis
  - …
- Feedback for collection and detection phase

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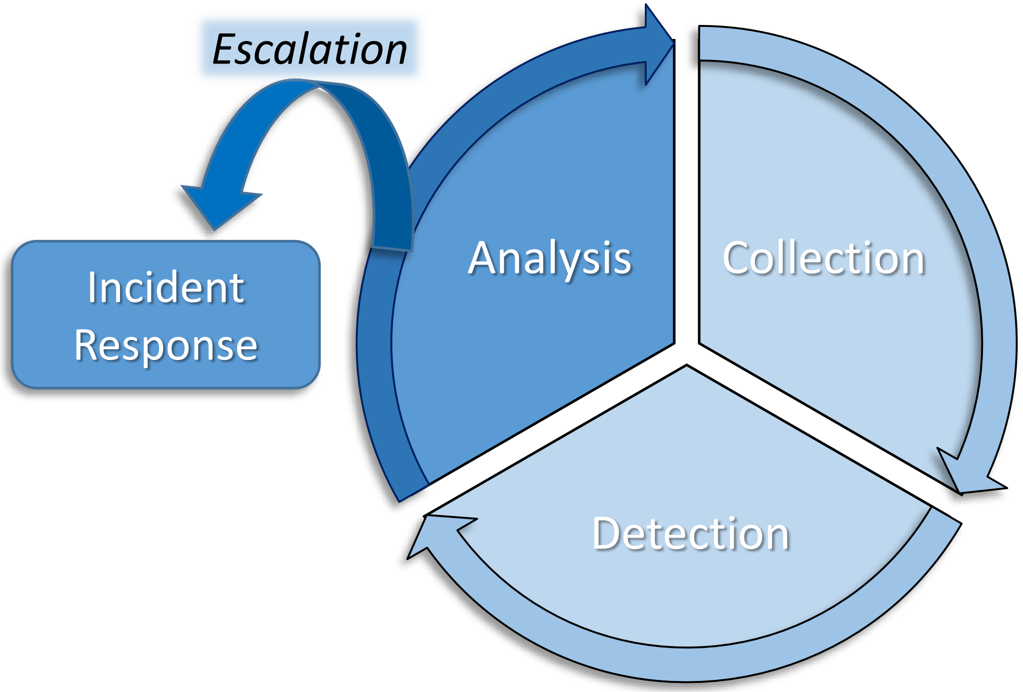

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Difficulties for NSM:

- Encrypted networks
- Widespread Nat
- Devices moving between network segments
- Extreme traffic volume
- Privacy concerns

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- Devices moving between network segments
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➡ ***Issues that most ICS do not face!***

NETWORK SECURITY MONITORING FOR ICS

Getting started with Network Security Monitoring

AGENTSCHAP INNOVEREN & ONDERNEMEN

howest De Hogeschool West-Vlaanderen Lid van de Associatie Universiteit Gent

KU LEUVEN

UNIVERSITEIT GENT

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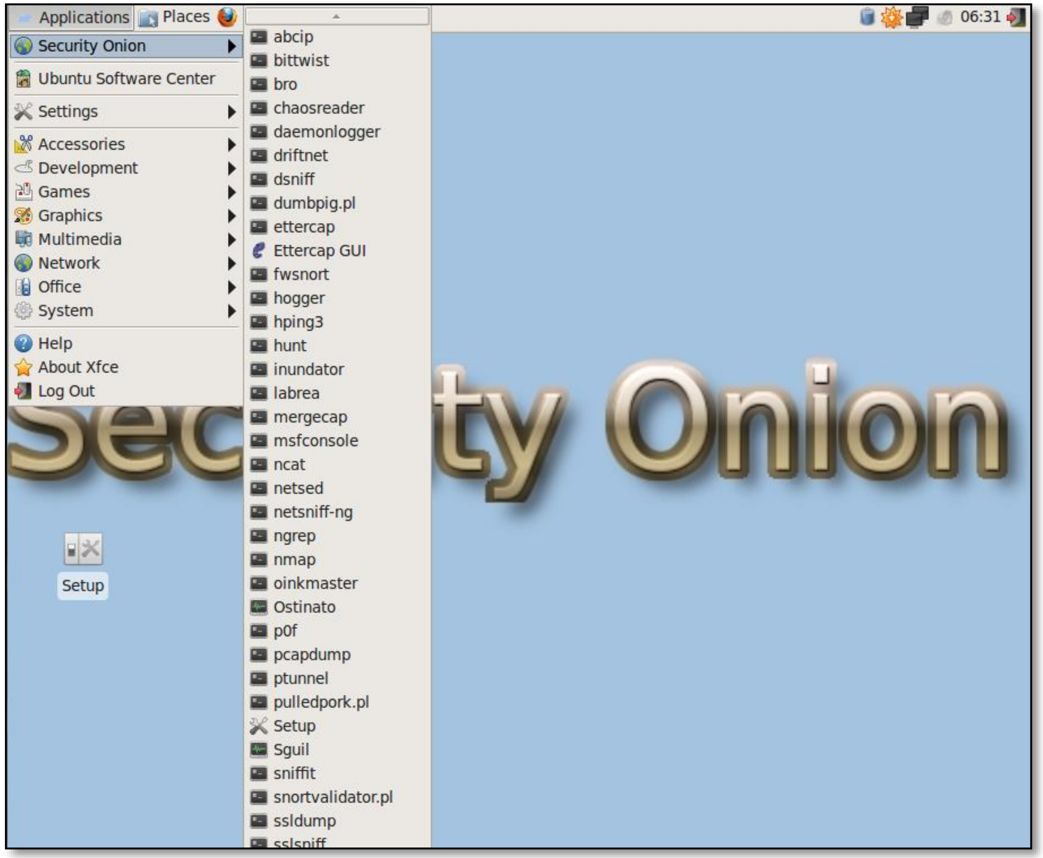
NETWORK SECURITY MONITORING FOR ICS

Security Onion

Security Onion is a Linux distro for IDS (Intrusion Detection) and NSM (Network Security Monitoring).

It's based on Ubuntu and contains:

- Snort,
- Suricata,
- Bro,
- Sguil,
- Squert,
- Snorby,
- ELSA,
- Xplico,
- NetworkMiner,
- and many other **security** tools.



https://github.com/Security-Onion-Solutions/security-onion/wiki/Tools

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https://github.com/bro

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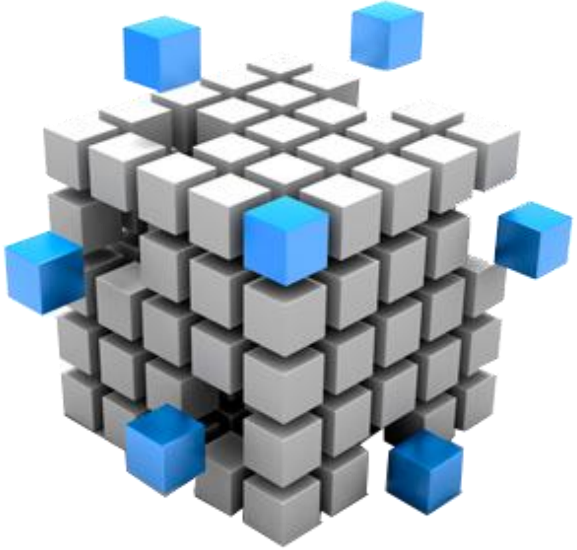
Bro Platform:

- Open-source Real-time network analysis **framework**
  - *Packet Capture*
  - *Protocol Analysers*
  - *Event Engine*
  - *Interfacing*
  - *Programming Language (Bro-Scripts)*



⇒ *Users/analysist build their own deployment*

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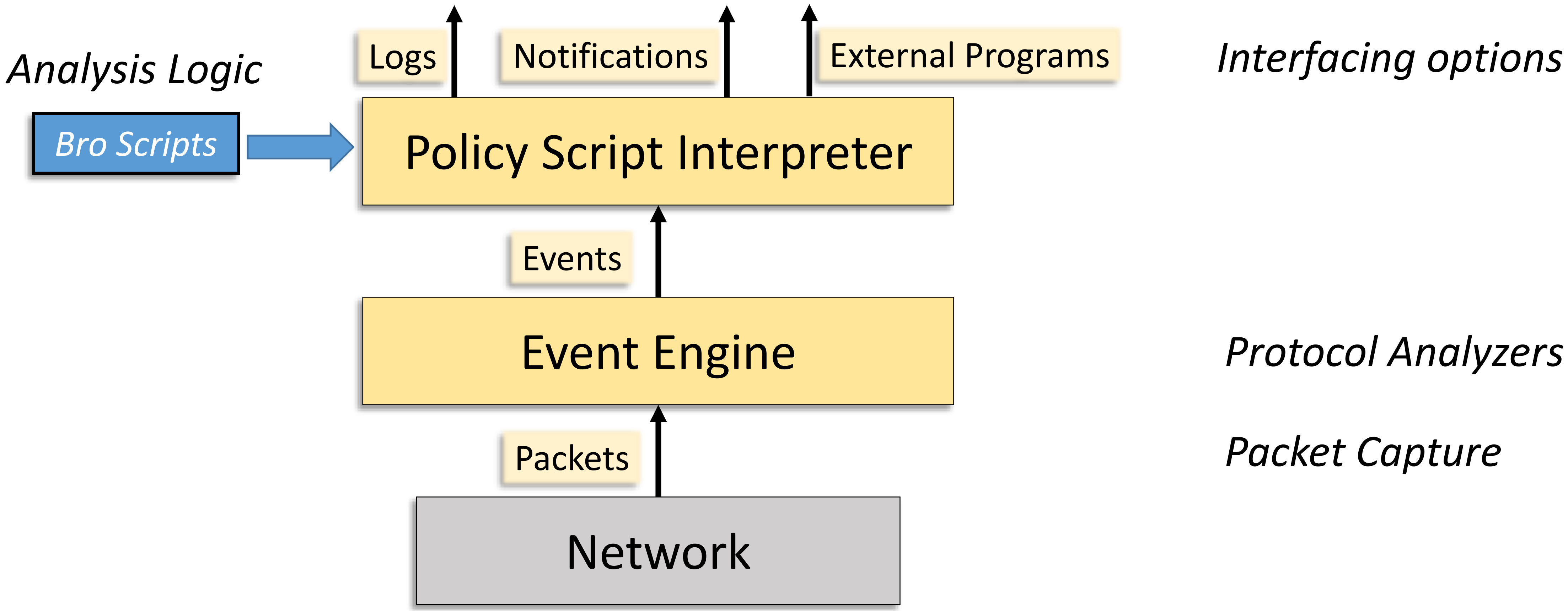
Bro Platform:



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Bro Platform:

Advantages:

⇒*Flexible*

- **In-depth inspection** for suspicious activity
  - Based on signatures
  - Based on Anomaly Detection
- Traffic analysis tasks outside security domain
  - Performance measurements
  - Trouble shooting
- pre-installed and **community** based scripts

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Bro Platform:

Advantages:

⇒*Flexible*

- Build in support for many protocols:
  - *ARP, AYIYA, BackDoor, BitTorrent, ConnSize, DCE_RPC, DHCP, DNS, File, Finger, FTP, Gnutella, GTPv1, HTTP, ICMP, Ident, InterConn, IRC, KRB, Login, MIME, MySQL, NCP, NetBIOS, NTP, PIA, POP3, RADIUS, RDP, RPC, SIP, SNMP, SMB, SMTP, SOCKS, SSH, SSL, SteppingStone, Syslog, TCP, Teredo, UDP, ZIP,…*
  - Modbus & DNP3

- Dynamic protocol Detection

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Bro Platform:

Difficulties:

$\Rightarrow$ *Not Plug and play*

- Deployment needs to be configured for the environment
- User created scripts to leverage the real power of Bro
- Documentation still being developed
- Smaller community then Snort (but growing)

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Bro Platform:

Protocol Logs

Detailed protocol logs for each network protocol; including logs for tunnels, files & more

Notices

Bro-IDS is preconfigured with a variety of signature and anomaly notifications

Actions

Bro programming language is the real power; pivot to external applications, take advanced protocol based decisions & more

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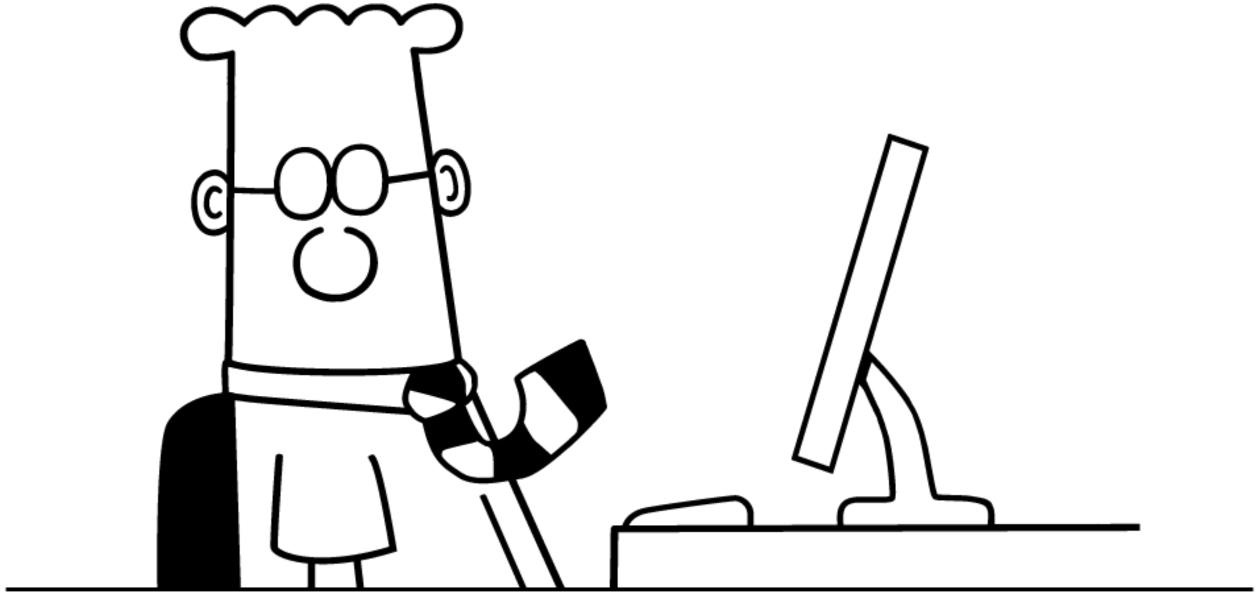

Live Demo

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