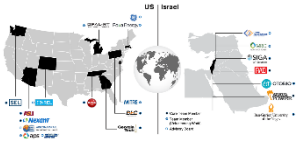
Task 3

Data Collection and Aggregation

Status

19.03.2023

Recap - The Task Overview - Recap

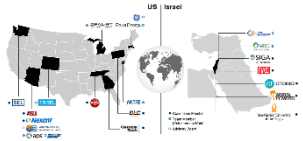


- Task Leader - ASU
- Participants - ASU, BGU, OTORIO, DK Innovation, DLC, Nexant, Delek, Arava
- Task Goal - Provide **reliable & comprehensive IT/OT datasets** that will include Cyber attacks simulated in various of ways and logged 360°
- Task objectives - Lab environments operations, Advisory emulation + Datasets generation

How -

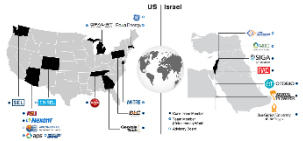
- Setting up multiple lab environments
- Setting up multiple sensors to monitor the network from different aspects
- Setting up RAM² as central logging system + build necessary plugins
- Execute live attack scenarios

Recap - Existing datasets



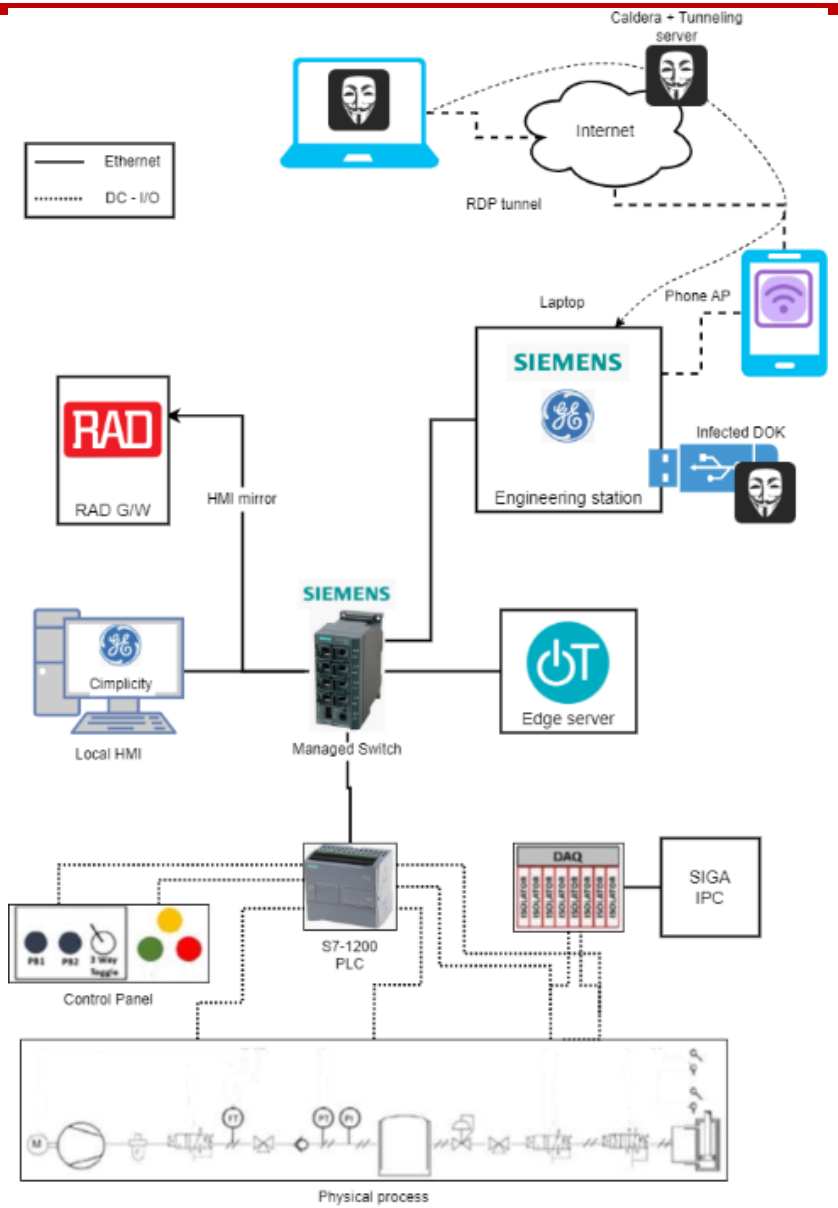
Dataset Name	Sensors Data	Network Data	Electrical Data
OTORIO Labs	X	V	X
Arava Power Dataset	X	X	V
Delek US Dataset	V	X	X
Energy Management	V	X	V
Gas Pipeline & Water Tank	V	X	X
HAI	V	X	X
OPC UA Dataset	X	V	X
Kaggle Faulty Sensor Dataset	V	X	X
Power System Attack Dataset	V	X	V
BATADAL/CISSDataset	V	X	X
EPIC Dataset	V	V	V
WADI Dataset	V	X	X
SWaT Dataset	V	V	X

Meptagon Lab ID

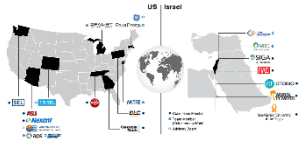


Process	? (Subprocess / air pressure)
Vendors	Siemens, GE, Microsoft
High level architecture	S7-1200 PLC talks to GE Cimplicity HMI using Modbus protocol
Attack scenario 1	Engineering laptop got infected by a malicious DOK
Attack scenario 2	Attacker did various IT exploitation and gathered information about the OT
Attack scenario 3	Attacker performed a MITM attack on the OT network and fixed values in the HMI
Testing environment	Meptagon physical lab + OTORIO laptops
Data sources	Full PCAPs, Tag values, Event logs, SNMP traps, Asset inventory

Architecture

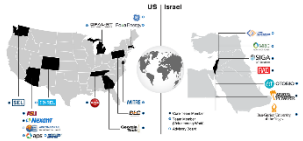


Attack scenario - IT



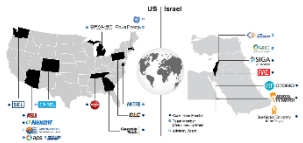
- Engineering machine accidently connects to the hotspot….
- USB was connected to the station to download a new Cimplicity project, infected with setup.exe file
- User executed the setup.exe file which cause him connect with a reverse HTTP shell to Command and Control server in the cloud
- The attacker has executed some scans, added user for backdoor and executed a file that create an RDP tunnel with the C&C server
- The tunnel allowed the attacker to connect port 7676 on its C&C server and the connection opened an RDP session to victim - NAT bypassing
- The attacker connected with RDP to the victim

Attack scenario - OT



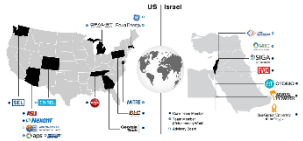
- MITM modbus (ARP Based) project were moved to the victim via RDP
- The attacker executed MITM attack between the HMI device and the PLC on the OT network
- The attacker manipulated the HMI and PLC:
  - Made several tries of changing both the HMI and PLC values
  - Successfully “Lied” to the HMI about a static value even though it changed
- The attacker finished the session

Attack scenario



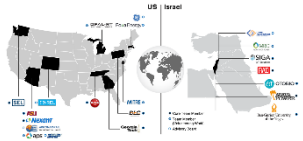
A	B	C	D	E
Time	What happened	Notes		
~10:00	Arrived on site and started connecting laptops	Pre-requisites		
10:55	Started PCAP on Edge	Verified that snmp traps from scalance are working		
11:04	Started port mirroring of the PLC (port 5)			
12:03	S7 Monitoring started			
12:04	Clear logs Eng.			
12.06	Wireshark statrted eng.			
12:06	PCAP srated on HMI			
12:15	moved to hmi setpoints mode (process has stoped for sec)			
12:20	moved to manual mode (HMI)			
12:43	starting HMI again			
12:48	Increased physical switch speed to 3 and 6			
12:50	decreased to 2.5 6.5			
13:53	WIFI connected to victim + DOK inserted			
13:55	setup.exe ran + connected to Caldera			
13:56-14:05	S7 scan,Network share discovery, Admin created, DCE_RPC scar	Various IT/OT attacks		
14:13	Dropped reverse tunnel on the victim			
14:14	RDP session started			
14:17	Siga tech. opened the valve (physical maintainance op.)			
14:21	RDP session started			
14:26	RDP strted			
14:28	ARP poisioning on both PLC and HMI	Start of Main OT attack		
14:29	HMI copy from the share			
14:30	"Lie to the HMI that the values are SP 1 and 100 (l and H)	HMI false data injection		
14:37	Change the HMI			
14:41	Siga tech. increased level (Physical change maitainance)			
14:56	Starting shutting down everything	End of scenarios		

What was collected



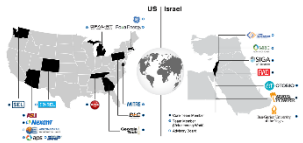
- PCAPs file from
  - VICTIM machine (Engineering station)
  - HMI
  - PLC via port mirror from SCALANCE switch
  - OTORIO Edge device
- Events log -
  - VICTIM (Engineering station) monitored with sysmon
  - HMI - windows event log
- TAGS -
  - PLC tag values over time
- SNMP traps
- Asset inventory CSV

What can we do with that?



- Analyze!
  - Try to correlate the different data sources together
  - Build new detection methods
- Open Source / Present in conferences
  - Gather more feedback and partners
- Commercialize
  - Offer the data in a commercial package
  - (Too basic?)

Next Steps



- Get Feedback from you!
  - Going back for additional collection?
- Additional labs!