



LESSONS LEARNED INSTALLING NI TARGETS ON THE EDGE

FROM ENERGY MANAGEMENT TO SECURITY, WE'LL GO THROUGH A SERIES OF DISCOVERIES
AND TOOLS WE'VE BUILT TO SIMPLIFY AND SECURE ACCESS TO NI TARGETS THROUGH
EXPOSED NETWORKS.



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Technologies





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- 18 YEARS WORKING WITH LABVIEW (PC, RT, FPGA), TESTSTAND, VERISTAND, FLEXLOGGER
- 17 YEARS WORKING FOR NI PARTNERS
- CURRENTLY VICE-PRESIDENT OF ENGINEERING AT NEOSOFT TECHNOLOGIES (CANADA)
- INVOLVED IN SEVERAL OPEN-SOURCE PROJECTS





NEOSOFT TECHNOLOGIES

FOUNDED IN 2000, NI PARTNER SINCE 2008

- SYSTEM INTEGRATION AND RETROFIT – SOFTWARE, MECHANIC AND ELECTRIC ASSEMBLIES
- AUTOMATED TEST SYSTEMS
- DATA ACQUISITION AND CONTROL SYSTEMS
- EMBEDDED RT AND FPGA SYSTEMS
- HARDWARE IN THE LOOP SYSTEMS
- AUTOMATED INSPECTION SYSTEMS



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#OURGIANTSAREFEMALE

LAURIE KIRK

- SECURITY RESEARCHER AT MICROSOFT
- CONFERENCE SPEAKER
- INDUSTRY MENTOR



"THEY OFTEN DO NOT BELIEVE A WOMAN COULD TALK
ABOUT SOMETHING TECHNICAL"

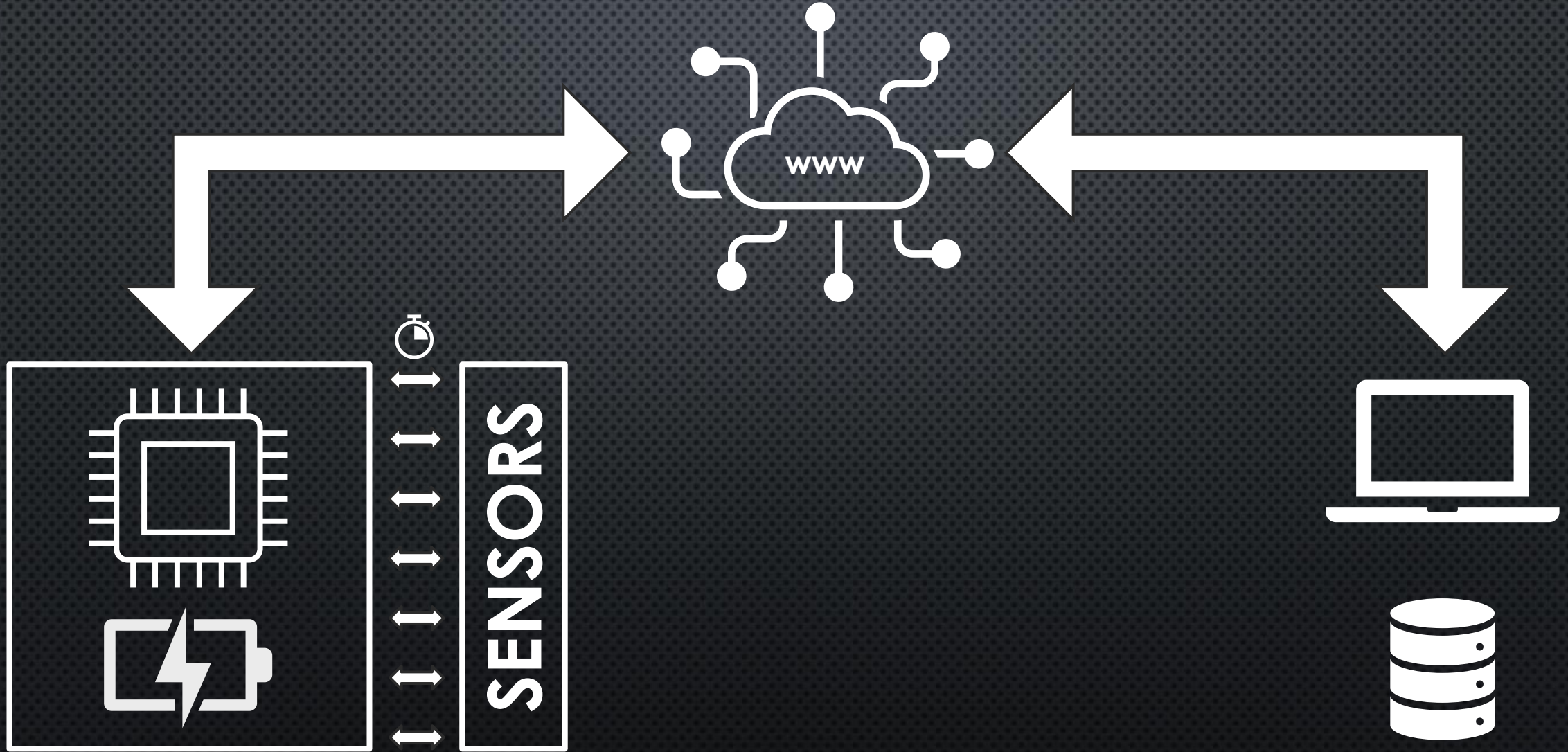


SUMMARY

- DYNAMIC DNS
- VPN
- FIREWALL
- ENERGY MANAGEMENT
- PHYSICAL LOCKS



BASE PROJECT





BASE PROJECT - REQUIREMENTS

WE SHOULD BE ABLE TO:

- COMMUNICATE WITH THE TARGET OVER THE INTERNET
- SECURE AND ENCRYPT COMMUNICATION
- PREVENT UNATTENDED ACCESS
- PRESERVE BATTERY ENERGY AS MUCH AS POSSIBLE



DISCLAIMER

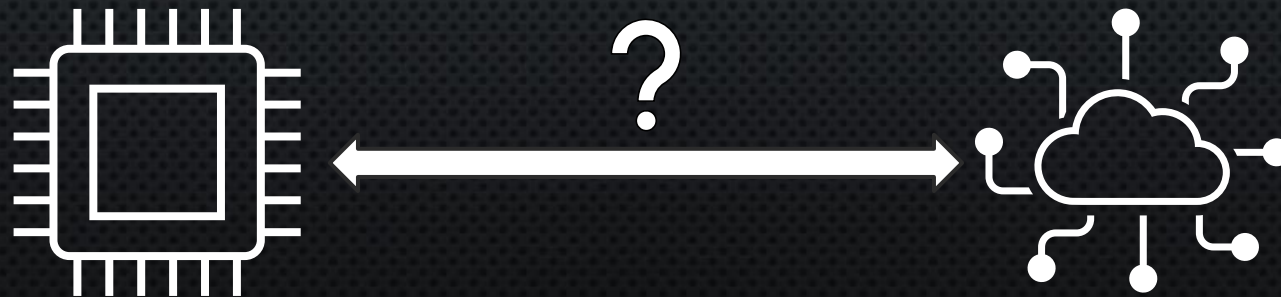
ALMOST ALL THIS IS NOT POSSIBLE BY
DEFAULT WITH NI LINUXRT TARGETS



DYNAMIC DNS - PROBLEM

HOW TO ACCESS THE TARGET OVER THE INTERNET ?

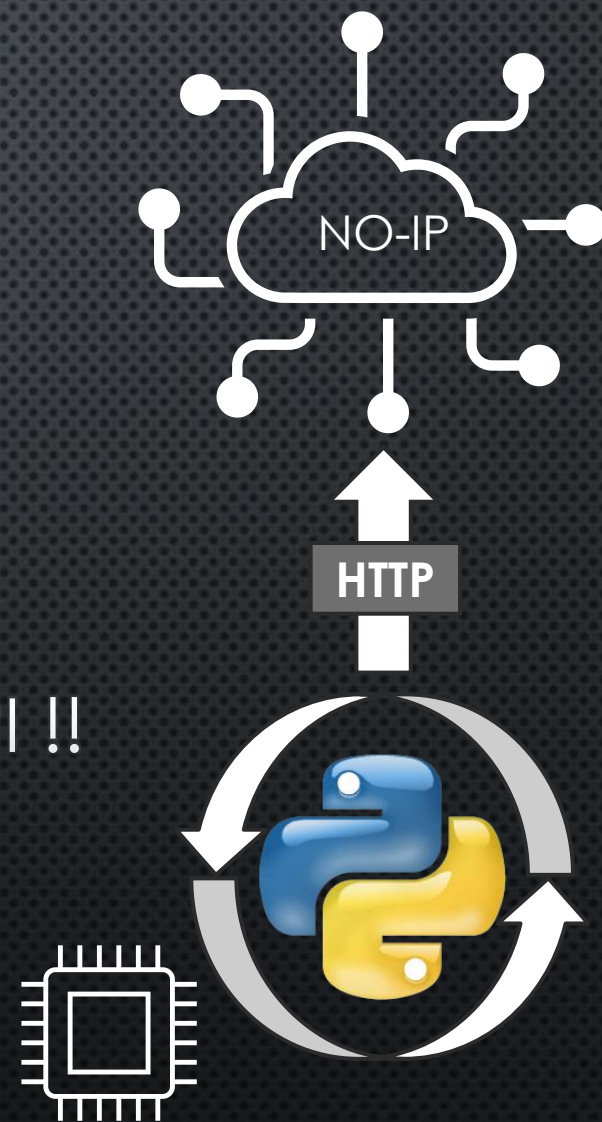
- KNOW THE PUBLIC IP OF A TARGET
- REGISTER TO A DYNAMIC DNS SERVICE: ACCESS TO YOUR TARGET THANKS TO A URL





DYNAMIC DNS - SOLUTION

- PYTHON SCRIPT RUNNING IN THE BACKGROUND (AS A SERVICE)
- EACH DYNAMIC DNS PROVIDER HAS ITS OWN API !!
- LEVERAGE **NO-IP** DYNAMIC DNS HTTP API





ENCRYPTED COMMUNICATION - PROBLEM

- FIND A WAY TO ENCRYPT COMMUNICATIONS OVER ETHERNET
- SOLUTIONS PER PROTOCOL (TLS / DTLS)
- MODIFY YOUR APPLICATION TO INCLUDE SECURITY
- DEAL WITH CERTIFICATES

=> SEEMS PRETTY COMPLICATED !



ENCRYPTED COMMUNICATION - SOLUTION

LET'S USE A VPN !

- OPENVPN AVAILABLE: HEAVY !
- WIREGUARD: LIGHTWEIGHT ! BUT... DOESN'T WORK OUT OF THE BOX
- ADDS AN ETHERNET INTERFACE : ENCRYPT EVERYTHING THAT GOES THROUGH
- FOR FREE : RESTRICTED ACCESS !



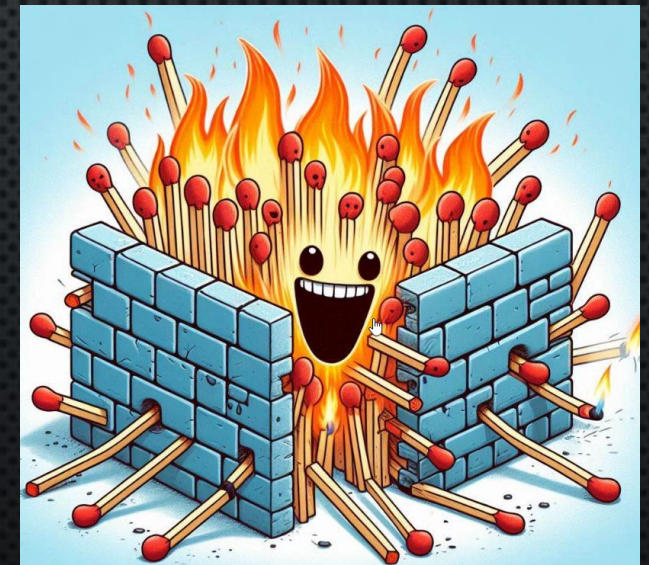


FIREWALL - PROBLEM

HOW TO BLOCK ALL CONNECTIONS EXCEPT REQUIRED ONES ?

FIREWALL !

- THERE IS ONE AND IT IS ACTIVE BY DEFAULT !
BUT ... IT DOESN'T BLOCK ANYTHING !!
- NOT EASY TO SETUP
- CAN LOCK YOU OUT OF THE DEVICE





FIREWALL – SOLUTION: LET'S MAKE IT EASY

wg-1.tlp - admin@10.137.10.126:22 - Bitvise xterm

Select applications to allow through the firewall:

- [*] MAX Hardware Identification
- [] Ethernet Target Device Discovery
- [*] LabVIEW RT Deploying and Debugging
- [] NI Service Locator
- [] LabVIEW Web Server
- [*] NI VISA Server
- [] FTP Server
- [] Synchronization (NTP, SNTP)
- [*] Network Shared Variables
- [] SMTP
- [] HTTP
- [] DataSocket (DSTP)
- [] Web Monitoring and Configuration
- [*] LabVIEW Remote Front Panels
- [] LabVIEW VI Server
- [] LabVIEW FPGA Compile Farms
- [] NI ENET-232, NI ENET-485
- [] NI GPIB-ENET/100, NI GPIB-ENET/1000

v(+) 94%

< OK > <Cancel>

Enter custom TCP ports (comma-separated), if required.
Port ranges are accepted (1800:1900):

5600,6000:6005

< OK > <Cancel>

Enter custom UDP ports (comma-separated), if required.
Port ranges are accepted (1800:1900):

55300,56000,63000:64000

< OK > <Cancel>





ENERGY CONSUMPTION - PROBLEM

HOW TO MAKE THE BATTERY LAST AS LONG AS POSSIBLE?

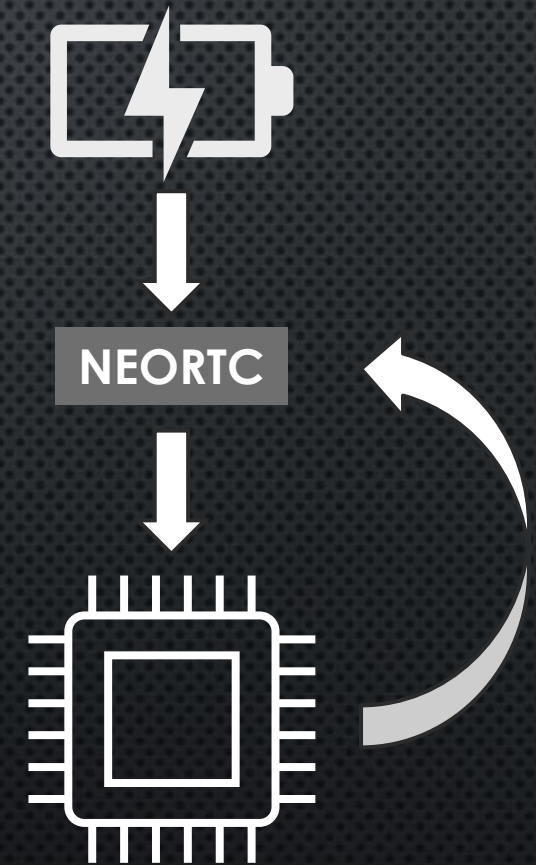
- NI TARGETS ARE ENERGY-HUNGRY !
- NOT POSSIBLE TO PUT A TARGET TO SLEEP !

=> QUANTITY OF ENERGY CANNOT BE DRASTICALLY REDUCED
WHEN THE SYSTEM IS IDLE



ENERGY CONSUMPTION - SOLUTION

- TURN ON/OFF TARGET ON DEMAND
- KEEPS ABSOLUTE TIME IN MEMORY
- PROVIDES TIME ON DEMAND





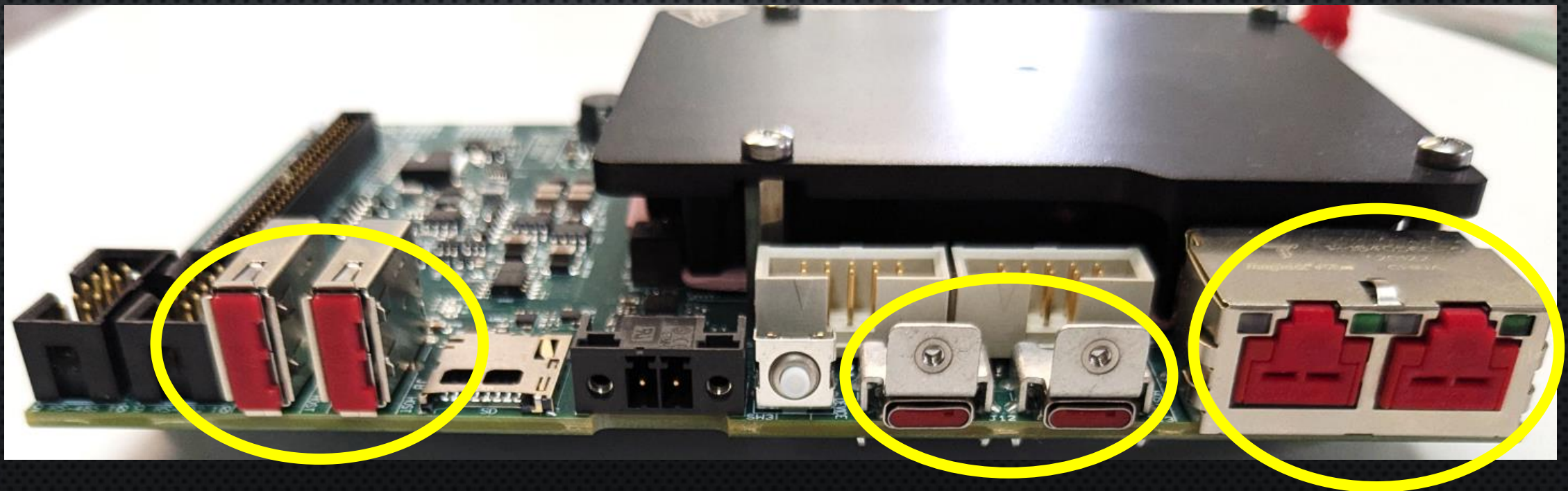
PHYSICAL LOCKS - PROBLEM

PREVENTING PHYSICAL ACCESS TO PORTS



PHYSICAL LOCKS - SOLUTION

- LOCKS PER PORT TYPE
- MASTER KEY





QUESTIONS ?



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