PT LAB

Pentesting of EIA blockchain

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Penetration testing workflow

Get suitable information

Identification of weak points or vulnerabilities

Searching for exploits (create exploit)

Verify exploit functions

Pentest types

Black box

White box

```
; Group 1 – Prolog Instructions

inc     si      ; optional, variable junk
mov     ax,0E9B ; set key 1
clc     ; optional, variable junk
mov     di,012A ; offset of Start
nop     ; optional, variable junk
mov     cx,0571 ; this many bytes - key 2

; Group 2 - Decryption Instructions
Decrypt:
xor     [di],cx ; decrypt first word with key 2
sub     bx,dx   ; optional, variable junk
xor     bx,cx   ; optional, variable junk
sub     bx,ax   ; optional, variable junk
sub     bx,cx   ; optional, variable junk
nop     ; non-optional junk
xor     dx,cx   ; optional, variable junk
xor     [di],ax ; decrypt first word with key 1
; Group 3 - Decryption Instructions
inc     di      ; next byte
nop     ; non-optional junk
clc     ; optional, variable junk
inc     ax      ; slide key 1
; loop
loop    Decrypt ; until all bytes are decrypted - slide key 2
; random padding up to 39 bytes

Start:

;     Encrypted/decrypted virus body
```

Gray box

```
; Group 1 – Prolog Instructions

inc     si      ; optional, variable junk
mov     ax,0E9B ; set key 1
clc     ; optional, variable junk
mov     di,012A ; offset of Start
nop     ; optional, variable junk
mov     cx,0571 ; this many bytes - key 2

[redacted]

nop     ; non-optional junk
xor     dx,cx   ; optional, variable junk
xor     [di],ax ; decrypt first word with key 1
; Group 3 - Decryption Instructions
inc     di      ; next byte
nop     ; non-optional junk
clc     ; optional, variable junk

[redacted]

Start:

;     Encrypted/decrypted virus body
```

Get right information

- Port scanning
  - */usr/bin/nmap -T4 -sV -sSU -p T1-65535-oA nmapsBC blockchain.***.***.cz*

Port		State (toggle closed [0] | filtered [5])	Service	Reason	Product	Version	Extra info
80	tcp	open	http	syn-ack	Apache httpd		
443	tcp	open	ssl	syn-ack	Apache httpd		SSL-only mode

Port		State (toggle closed [3] | filtered [0])	Service	Reason	Product	Extra info
3000	tcp	open	ssl	syn-ack	Apache httpd	SSL-only mode
7051	tcp	open	unknown	syn-ack		
8051	tcp	open	rocrail	syn-ack		

Limited service identification

Limited exploitation possibilities

Get right information

- Web structure enumeration
  - *gobuster dir -u https://blockchain.***.***.cz -w /usr/share/dirb/wordlists/custom.txt*

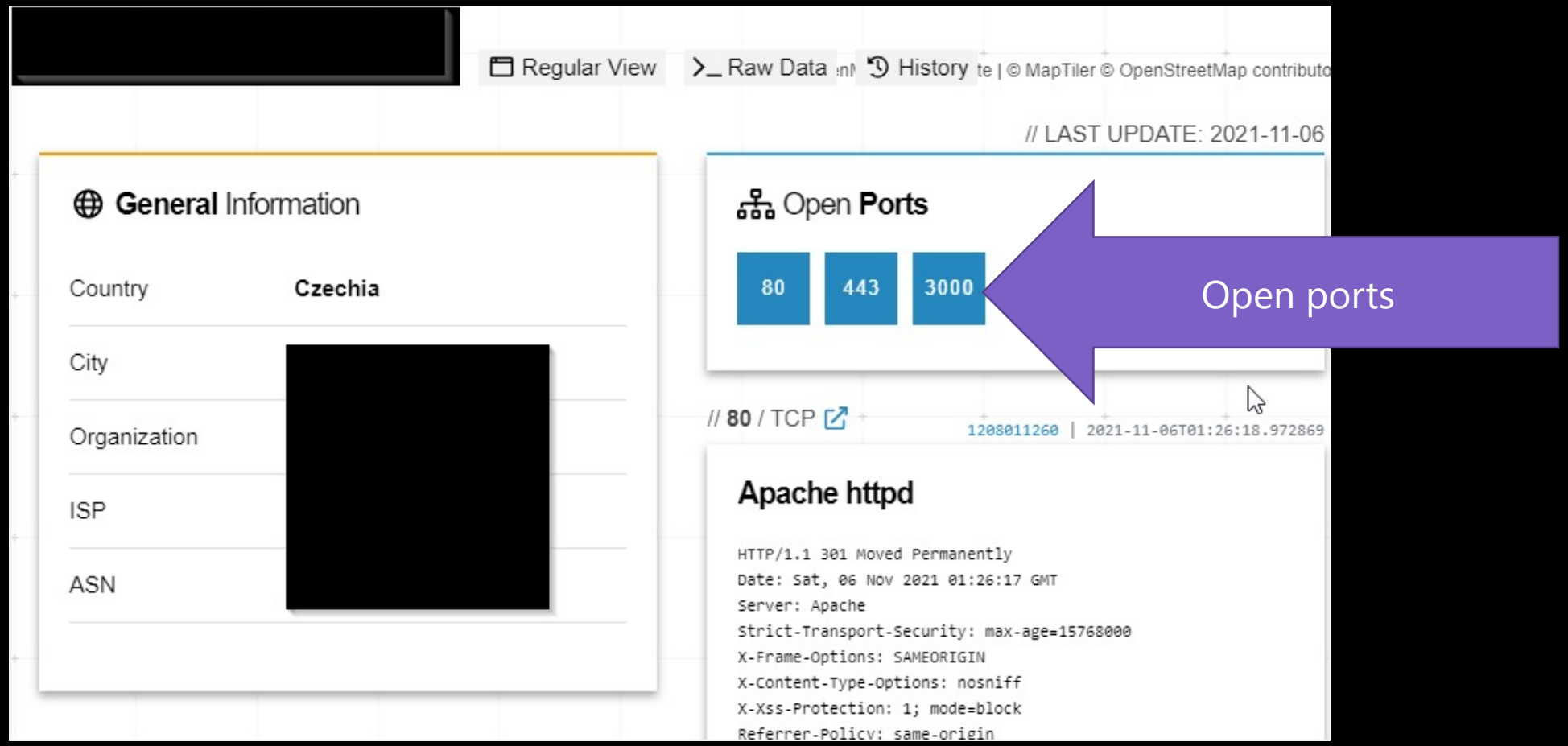
```
[+] User Agent:                  gobuster/3.1.0
[+] Timeout:                     10s
===============================================================
2021/11/08 05:24:59 Starting gobuster in directory enumeration mode
===============================================================
/admin                (Status: 200) [Size: 2561]
/favicon.ico          (Status: 200) [Size: 12862]
/index.html           (Status: 200) [
/server-status        (Status: 403)

===============================================================
```

Forbidden

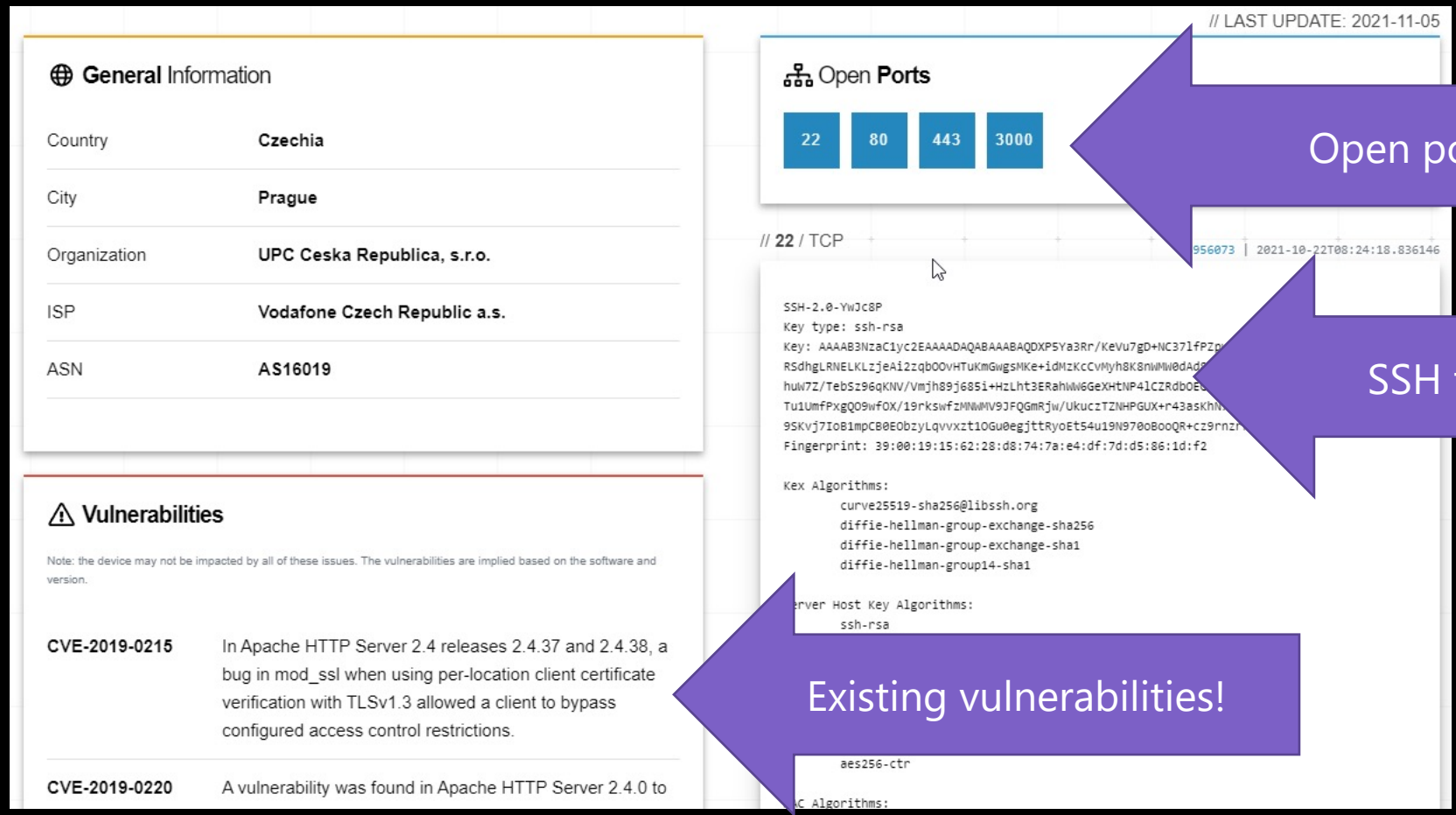
Get right information

- Public sources



Get right information

- Public sources



Weak points? Vulnerabilities?

- Blockchain „physical“ server

⚠ Vulnerabilities

Note: the device may not be impacted by all of these issues. The vulnerabilities are implied based on the software and version.

CVE-2019-0215	
CVE-2019-0220	A vulnerability was found in Apache HTTP Server 2.4.0 to 2.4.38. When the path component of a request URL contains multiple consecutive slashes ('/'), directives such as LocationMatch and RewriteRule must account for duplicates in regular expressions while other aspects of the servers processing will implicitly collapse them.
CVE-2020-1927	In Apache HTTP Server 2.4.0 to 2.4.41, redirects configured with mod_rewrite that were intended to be self-referential might be fooled by encoded newlines and redirect instead to an an unexpected URL within the request URL.
CVE-2019-0217	In Apache HTTP Server 2.4 release 2.4.38 and prior, a race condition in mod_auth_digest when running in a threaded server could allow a user with valid credentials to authenticate using another username, bypassing configured access control restrictions.
CVE-2019-0197	was not the first request on a connection could lead to a misconfiguration and crash. Server that never enabled the h2 protocol or that only enabled it for https: and did not set "H2Upgrade on" are unaffected by this issue.

Severity CVSS Version 3.x | CVSS Version 2.0

CVSS 3.x Severity and Metrics:

NVD **NIST:** NVD **Base Score:** 7.5 HIGH

Severity CVSS Version 3.x | CVSS Version 2.0

CVSS 3.x Severity and Metrics:

NVD **NIST:** NVD **Base Score:** 4.2 MEDIUM

Weak points? Vulnerabilities?

- Blockchain NODE application

Severity	Confidence			
	Certain	Firm	Tentative	Total
High	0	0	0	0
Medium	0	0	0	0
Low	0	0	1	1
Information	7	3	0	10

Weak points? Vulnerabilities?

- Blockchain NODE

1. Vulnerable JavaScript dependency

Next

Summary

Severity:	**Low**
Confidence:	**Tentative**
Host:	**https://blockchain.fai.utb.cz**
Path:	**/admin/js/chunk-vendors.f2cefa99.js**

Issue detail

We observed a vulnerable JavaScript library.

We detected **vue** version **2.6.10**, which has the following vulnerability:

- Bump vue-server-renderer's dependency of serialize-javascript to 2.1.2
  https://github.com/vuejs/vue/releases/tag/v2.6.11

Weak points? Vulnerabilities?

- Blockchain NODE –vue version 2.6.10

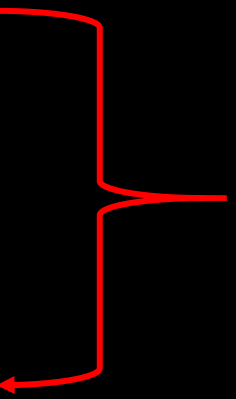
Structure of target + initial attack vectors

Server or VM with Linux OS (mostly) – OS vulnerabilities?

Bunch of docker containers – docker vulnerabilities?

Docker “applications” – vulnerabilities focused to “apps”

Frontends? – web server and app vulnerability



EIA
Blockchain

Server Exploits?

- Attacks focused to server OS/hypervisor
  - OS mostly Linux – various versions – updates needed!

Vmware » Esxi » 7.0 Update 1b * * : Security Vulnerabilities

Cpe Name:*cpe:2.3:o:vmware:esxi:7.0:update_1b:*:*:*:*:*:**

CVSS Scores Greater Than: 0 1 2 3 4 5 6 7 8 9

Sort Results By : CVE Number Descending CVE Number Ascending CVSS Score Descending Number Of Exploits Descending

Copy Results Download Results

#	CVE ID	CWE ID	# of Exploits	Vulnerability Type(s)	Publish Date	Update Date	Score	Gained Access Level	Access	Complexity	Authentication	Conf.	Integ.	Avail.
1	CVE-2020-4005	269			2020-11-20	2021-07-21	7.2	None	Local	Low	Not required	Complete	Complete	Complete
VMware ESXi (7.0 before ESXi70U1b-17168206, 6.7 before ESXi670-202011101-SG, 6.5 before ESXi650-202011301-SG) contains a privilege-escalation vulnerability that exists in the way certain system calls are being managed. A malicious actor with privileges within the VMX process only, may escalate their privileges on the affected system. Successful exploitation of this issue is only possible when chained with another vulnerability (e.g. CVE-2020-4004)														
2	CVE-2021-21994	287		Bypass	2021-07-13	2021-07-16	6.8	None	Remote	Medium	Not required	Partial	Partial	Partial
SFCB (Small Footprint CIM Broker) as used in ESXi has an authentication bypass vulnerability. A malicious actor with network access to port 5989 on ESXi may exploit this issue to bypass SFCB authentication by sending a specially crafted request.														
3	CVE-2021-21995	125			2021-07-13	2021-07-16	5.0	None	Remote	Low	Not required	None	None	Partial
OpenSLP as used in ESXi has a denial-of-service vulnerability due a heap out-of-bounds read issue. A malicious actor with network access to port 427 on ESXi may be able to trigger a heap out-of-bounds read in OpenSLP service resulting in a denial-of-service condition.														
4	CVE-2020-4004	416		Exec Code	2020-11-20	2020-12-03	4.6	None	Local	Low	Not required	Partial	Partial	Partial
VMware ESXi (7.0 before ESXi70U1b-17168206, 6.7 before ESXi670-202011101-SG, 6.5 before ESXi650-202011301-SG), Workstation (15.x before 15.5.7), Fusion (11.x before 11.5.7) contain a use-after-free vulnerability in the XHCI USB controller. A malicious actor with local administrative privileges on a virtual machine may exploit this issue to execute code as the virtual machine's VMX process running on the host.														

Docker Exploits?

- Depends of version – update solve many problems

Docker » Docker : Security Vulnerabilities

CVSS Scores Greater Than: 0 1 2 3 4 5 6 7 8 9
Sort Results By : CVE Number Descending CVE Number Ascending CVSS Score Descending Number Of Exploits Descending
Copy Results Download Results

#	CVE ID	CWE ID	# of Exploits	Vulnerability Type(s)	Publish Date	Update Date	Score	Gained Access Level	Access	Complexity	Authentication	Conf.	Integ.	Avail.
1	CVE-2014-9357	264		Exec Code	2014-12-16	2018-10-09	10.0	None	Remote	Low	Not required	Complete	Complete	Complete
Docker 1.3.2 allows remote attackers to execute arbitrary code with root privileges via a crafted (1) image or (2) build in a Dockerfile in an LZMA (.xz) archive, related to the chroot for archive extraction.														
2	CVE-2019-5736	78		Exec Code	2019-02-11	2021-07-01	9.3	None	Remote	Medium	Not required	Complete	Complete	Complete
runc through 1.0-rc6, as used in Docker before 18.09.2 and other products, allows attackers to overwrite the host runc binary (and consequently obtain host root access) by leveraging the ability to execute a command as root within one of these types of containers: (1) a new container with an attacker-controlled image, or (2) an existing container, to which the attacker previously had write access, that can be attached with docker exec. This occurs because of file-descriptor mishandling, related to /proc/self/exe.														
3	CVE-2014-9356	22		Dir. Trav. Bypass	2019-12-02	2019-12-11	8.5	None	Remote	Low	Not required	None	Complete	Partial
Path traversal vulnerability in Docker before 1.3.3 allows remote attackers to write to arbitrary files and bypass a container protection mechanism via a full pathname in a symlink in an (1) image or (2) build in a Dockerfile.														
4	CVE-2014-0048	20			2020-01-02	2020-08-31	7.5	None	Remote	Low	Not required	Partial	Partial	Partial
An issue was found in Docker before 1.6.0. Some programs and scripts in Docker are downloaded via HTTP and then executed or used in unsafe ways.														
5	CVE-2014-6407	59		Exec Code	2014-12-12	2014-12-15	7.5	None	Remote	Low	Not required	Partial	Partial	Partial
Docker before 1.3.2 allows remote attackers to write to arbitrary files and execute arbitrary code via a (1) symlink or (2) hard link attack in an image archive in a (a) pull or (b) load operation.														

Docker apps and frontend Exploits?

- Many updates during whole year
- Hard to detect vulnerable component

Severity:	**Low**
Confidence:	**Tentative**
Host:	**https://blockchain.fai.utb.cz**
Path:	**/admin/js/chunk-vendors.f2cefa99.js**

Issue detail

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Additional vulnerabilities – open ports

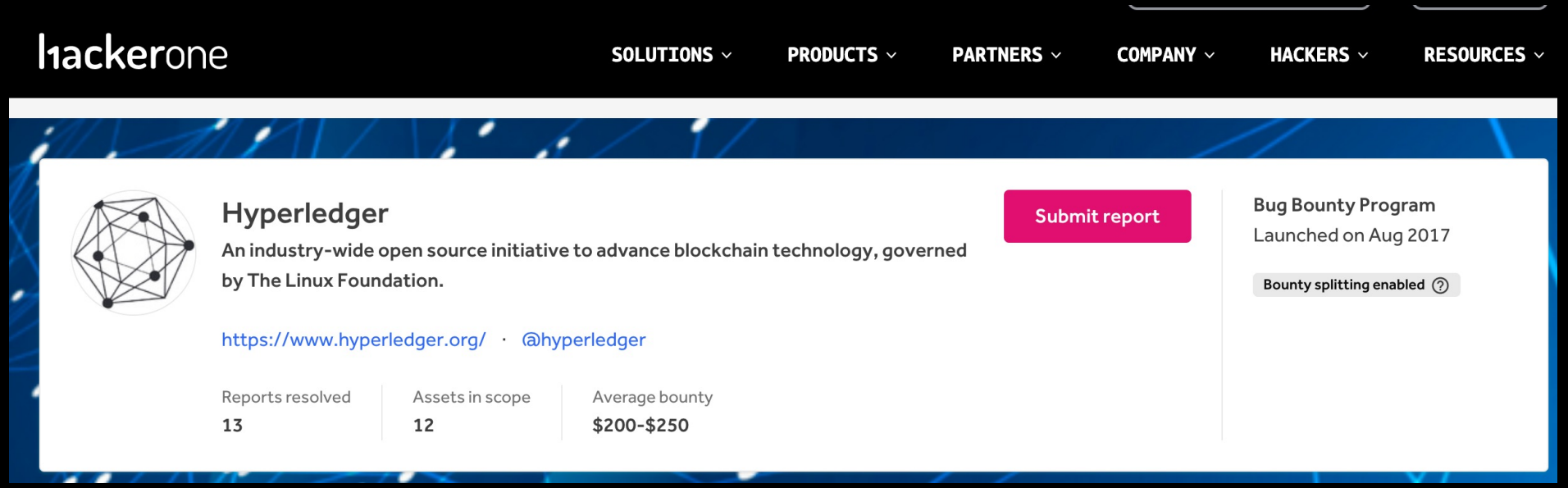
- Only necessary ports open to public NET
- Minimal attack scope

```
IMAGE                                                COMMAND                  CREATED         STATUS          PORTS
de.icr.io/ela-blockchain/ela-apps-notarius:1.3.0     "dotnet ElaBlockchai…"   6 weeks ago     Up 6 weeks      443/tcp, 127.0.0.1:8080->80/tcp
de.icr.io/ela-blockchain/ela-apps-admin:2.2.0        "dotnet ElaBlockchai…"   6 weeks ago     Up 6 weeks      443/tcp, 127.0.0.1:8081->80/tcp
mongo:4                                              "docker-entrypoint.s…"   6 weeks ago     Up 6 weeks      127.0.0.1:27017->27017/tcp
de.icr.io/ela-blockchain/ela-api-gateway:2.1.0       "docker-entrypoint.s…"   6 weeks ago     Up 12 hours     127.0.0.1:3001->3000/tcp
apache/couchdb:3.1.0                                 "tini -- /docker-ent…"   6 weeks ago     Up 6 weeks      4369/tcp, 9100/tcp, 127.0.0.1:7984->5984/tcp
hyperledger/fabric-tools:latest                      "/bin/sh"                4 months ago    Up 4 months
hyperledger/fabric-peer:latest                       "peer node start"        4 months ago    Up 4 months     0.0.0.0:7051->7051/tcp, :::7051->7051/tcp
hyperledger/fabric-peer:latest                       "peer node start"        4 months ago    Up 4 months     7051/tcp, 0.0.0.0:8051->8051/tcp, :::8051->8051/tcp
apache/couchdb:3.1.0                                 "tini -- /docker-ent…"   4 months ago    Up 4 months     4369/tcp, 9100/tcp, 127.0.0.1:6984->5984/tcp
apache/couchdb:3.1.0                                 "tini -- /docker-ent…"   4 months ago    Up 4 months     4369/tcp, 9100/tcp, 127.0.0.1:5984->5984/tcp
hyperledger/fabric-ca:latest                         "sh -c 'fabric-ca-se…"   4 months ago    Up 4 months     127.0.0.1:7054->7054/tcp
```

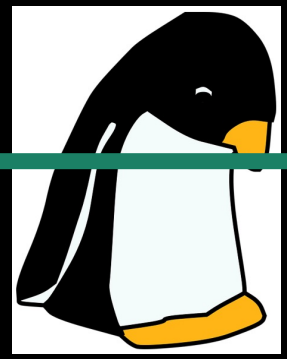
Security improvements

- Very well professional communication with ELA Blockchain
  - Improvement of blockchain security – vulnerability reporting

- Bug bounty program on Hyperledger platform



Conclusion/results



NODE is secure!

Regular updates!

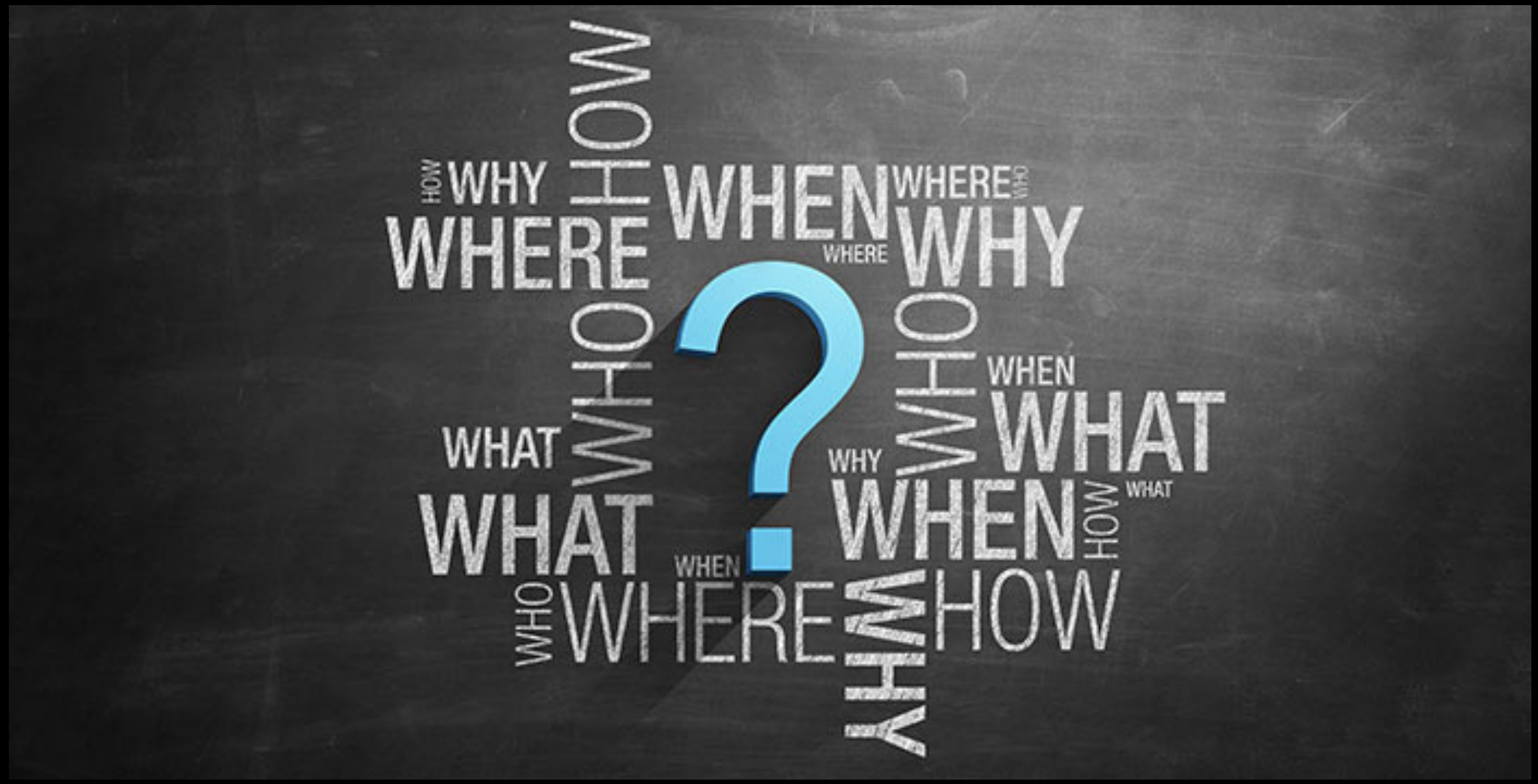
Security improvements!

Superb communication!

Exploitable server OS/hypervisor!

Additional services on server!

Questions>...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