All Your Cloud Are Belong to Us – Hunting Compromise in Azure

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The opinions expressed are my own and do not necessarily reflect those of Microsoft Corporation.

Whoami: Nate Warfield (@dk_effect)

- Senior Security Program Manger - MSRC
  - Vulnerability Management for Azure, Windows, Hyper-V
  - Battle tested: MS17-010, WannaCry, NotPetya, Spectre/Meltdown

- cat ~/.bash_history
  - 18 years in Network Engineering; 20 year Grey Hat
  - First hack: BBS over 2400 baud
  - Kaspersky SAS 2018
  - Troopers 18

  - Twitter: @dk_effect
  - GitHub: n0x08

Captain: What happen?

- **Traditional Networking (then)**
- Server exposure was restricted
- Many layers of ACLs + segmentation
- Dedicated deployment teams
- Well-defined patching cadence
- Servers deployed from the ground up
- Only expose required services

- **Cloud Networking (now)**
- Every VM exposed to the Internet
- VM's deploy with predefined firewall
- Anyone with access can expose BadThings
- Patch management decentralized
- VM's inherit the sins of their creators
- NoSQL open to the Internet? #yolo

2017: Somebody set us up the bomb

threatpost | CATEGORIES | FEATURED | PODCASTS | VIDEOS

Welcome > Blog Home > Privacy > Verizon Wireless Internal Credentials, Infrastructure Details Exposed in Amazon

Security

Crypto-coin miners caught t… away in hacked cloud boxes

Manic miners don't even pwn you: The… default creds admins are too lazy to ch…

By Richard Chirgwin 17 Oct 2017 at 05:28

Here's yet another reason to make sure you lock down your clutch of cloud services: cryptocurrency mining.

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Attackers start wiping data from CouchDB and Hadoop databases

After MongoDB and Elasticsearch, attackers are looking for new databas… systems to attack

Someone Hijacking Unsecured MongoDB Databases for Ransom

Tuesday, January 03, 2017 Swati Khandelwal

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Security

Viacom exposes crown jew… world+dog in AWS S3 buck…

Passwords, server schematics and e…

Unsecured ElasticSearch Server Exposed Data on 1,133 NFL Players

By Catalin Cimpanu

Security researchers, and what appears to be at least one hacker, have found an ElasticSearch server left exposed online that was hosting information about 1,133 National Football League (NFL) players and agents.

CNN tech | BUSINESS | CULTURE | GADGETS | FUTURE | STARTUPS

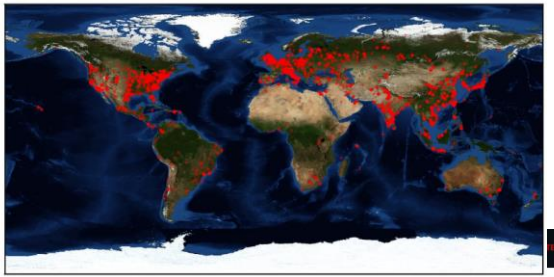
Cyber-Safe

Data of almost 200 million voters leaked online by GOP analytics firm

by Selena Larson @selenalarson

Over 36,000 Computers Infected with NSA's DoublePulsar Malware

By Catalin Cimpanu April 21, 2017 05:10 PM



MUST READ WANNACRY RANSOMWARE WAS THE BIGGEST CHALLENGE OF THE YEAR, SAYS CYBERSECURITY CENTRE

Elasticsearch ransomware attacks now number in the thousands

Like the MongoDB ransomware attacks before it, Elasticsearch users are being hammered by ransomware assaults because they were too dumb to practice basic security.

Operator: We get signal

- NoSQL solutions were never intended for Internet exposure
  - "..it is not a good idea to expose the Redis instance directly to the internet"
  - "Allow only trusted clients to access the network interfaces and ports on which MongoDB instances are available."
  - "Elasticsearch installations are not designed to be publicly accessible over the Internet."
- Naturally, people exposed them to the Internet
- To date: MongoDB, CouchDB, Hadoop, Elastic, Redis, CassandraDB
- DB dropped; ransom note added
- 100k+ systems compromised globally
- Azure: 2500+ VM's compromised

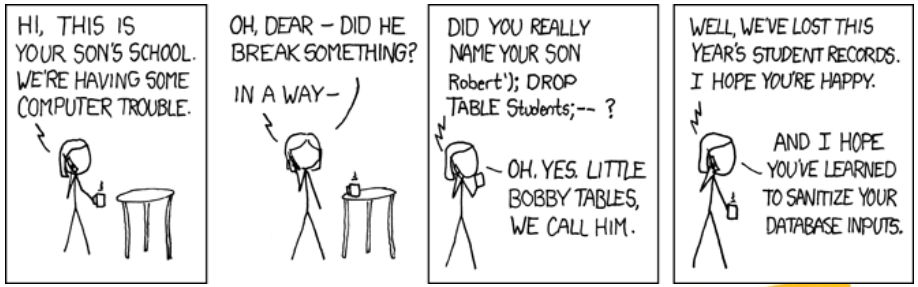


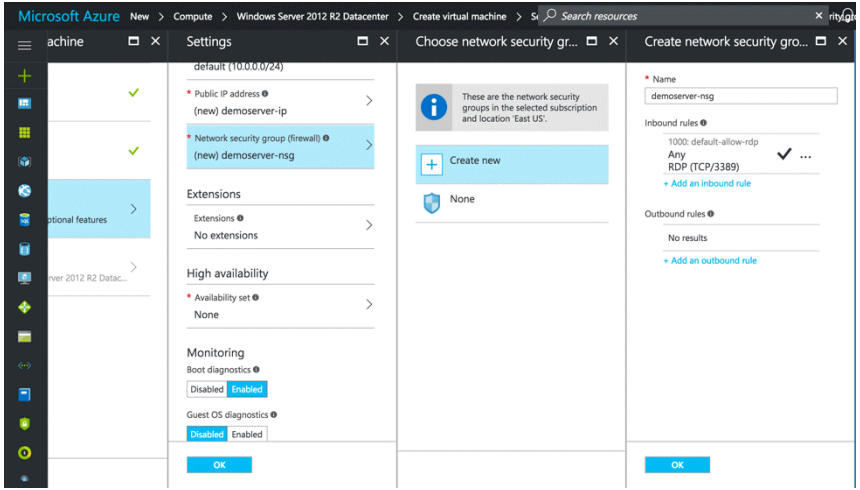
Image Source: https://imgs.xkcd.com/comics/exploits_of_a_mom.png

Hunting NoSQL Compromise in Azure

```
34.232.124.188:topkek112:CouchDB
222.240.80.51:Warning:MongoDB
46.209.77.33:Warning:MongoDB
52.79.189.237:Warning:MongoDB
54.199.163.18:Warning:MongoDB
52.80.95.16:Warning:MongoDB
54.254.171.67:Warning:MongoDB
35.199.43.176:Warning:MongoDB
222.89.251.105:Warning:MongoDB
167.99.27.62:please_read:Elastic
167.114.101.155:Warning:MongoDB
13.58.154.106:Warning:MongoDB
130.215.44.61:Warning:MongoDB
35.201.195.87:Warning:MongoDB
62.210.151.232:Warning:MongoDB
54.176.92.192:NODATA4U_SECUREYOURSHIT:HDFS NameNode
107.20.246.202:PLEASE_READ:MongoDB
118.24.107.131:Warning:MongoDB
111.231.114.33:Warning:MongoDB
35.165.28.9:Warning:MongoDB
52.14.88.76:Warning:MongoDB
110.23.70.30:Warning:MongoDB
```

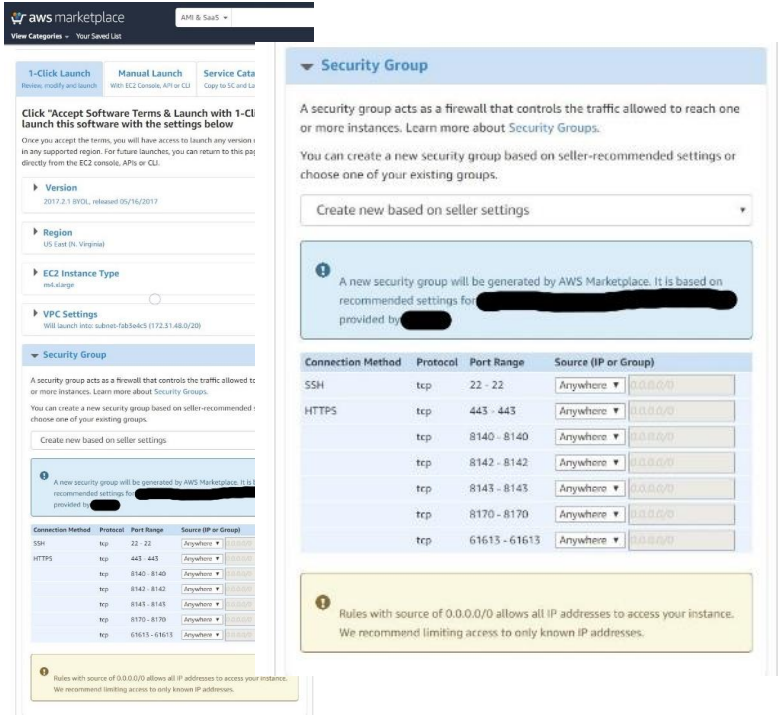
- 2.1 million Internet exposed IPs in Azure
- Port scans are slow; open port != pwned
- Each NoSQL solution runs on different port
- DB names only indication of compromise
- TL;DR – I use Shodan (what, you don't?)
  - Accurate to with 0.14% of in-house solution
  - Rich metadata for each IP
  - DB names are indexed & searchable
  - JSON export allows for automated hunting

Network Security Group (Azure)



- Network Security Group is the VM firewall
- Firewall config hard-coded by VM vendor
- Configurable during deployment (optional)
- 46% of images expose ports by default
- 96% expose more than management
- 562 unique ports exposed in Azure Gallery

AMI Security Groups (AWS)



- Amazon Marketplace Image is 3rd party IaaS
- AWS doesn't expose AMI SG config via API*
  - *Until you deploy it =)
- Feature request filed with AWS
- 11k AMI's in AWS – 5x as many as Azure
- Data indicates many clouds have this problem

Operator: Main screen turn on

- Use master list of all pwned DB names seen globally
- My code was added to Shodan in December 2017
- tag:compromised – automatically tags pwned NoSQL DBs
- 22k VM's found as of 3/6/2018
- Requires Shodan Enterprise API
- ..or..
- https://gist.github.com/n0x08

Default Passwords

- 3rd party IaaS images occasionally contain a default password
- At least it's a strong* PW!: P@sswOrd123
  - *actual PW changed to protect the innocent
- Users always change passwords after installation ;)
- Mostly for services like MySQL, SQL, etc…

```
elliott@khaleesi:~$ shodan stats --facets product tag:database
Top 10 Results for Facet: product
MySQL                                4,550,268
PostgreSQL                             504,495
MongoDB                                 55,661
Elastic                                 36,665
HDFS NameNode                            5,509
CouchDB                                  4,458
Cassandra                                1,424
Apache Hive                              1,261
HBase                                    1,035
IBM DB2 Database Server                    499
```

Threat hunting like a BOSS: CVE-2018-6789

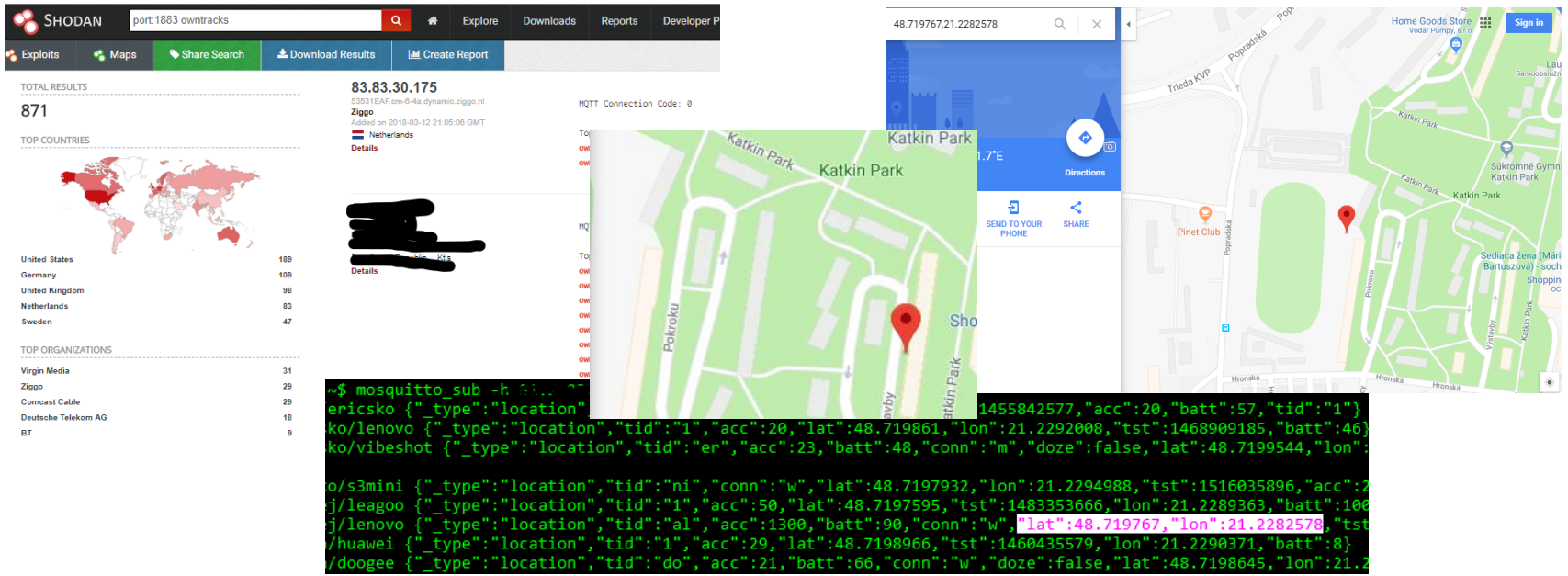
- Exim mail server RCE; Azure had 1237 VMs exposed
- ‘shodan download product:exim org:microsoft’
- Common Platform Enumeration field FTW
- ‘shodan parse --fields ip_str,cpe’
- VMs found: 1221
- Total time: 5 minutes

```
@MININT-H66832A:~$ shodan parse --fields ip_str,cpe exim_march.json.gz
254.204    cpe:/a:exim:exim:4.89_1
109.147    cpe:/a:exim:exim:4.82
60.113     cpe:/a:exim:exim:4.89_1
.24.172    cpe:/a:exim:exim:4.89_1
147.17     cpe:/a:exim:exim:4.89_1
125.235    cpe:/a:exim:exim:4.89_1
107.248    cpe:/a:exim:exim:4.87
154.229    cpe:/a:exim:exim:4.87
.212.236   cpe:/a:exim:exim:4.86_2
148.162    cpe:/a:exim:exim:4.89_1
250.10     cpe:/a:exim:exim:4.89_1
.147.99    cpe:/a:exim:exim:4.76
200.39     cpe:/a:exim:exim:4.89_1
```

Every (MQTT) step you take…

- MQTT – publish/subscribe message protocol
- Used by IoT, Facebook Messanger, many more
- Azure & AWS offer MQTT-based solutions
- Internet exposure +25% in last year

…I'll be tracking you



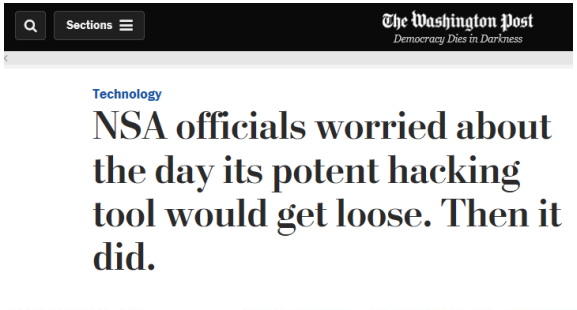
Cats: How are you gentlemen!!

We view this as keeping our oath to protect and defend against enemies foreign and domestic. TheShadowBrokers has is having little of each as our auction was an apparent failure. Be considering this our form of protest.

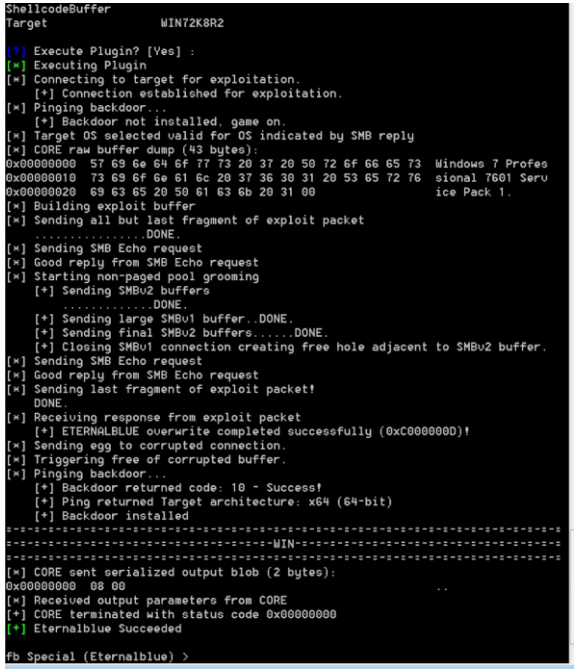
--ShadowBrokers, April 8th 2017

Cats: You are on the way to destruction

- [REDACTED] weaponized an SMBv1 exploit (EternalBlue)
- [REDACTED] added it to their Metasploit clone
- [REDACTED] lost control of this tool
- Microsoft patched in March 2017 via MS17-010
- ShadowBrokers dropped 0-day on April 14th, 2017 (MS17-010 +31 days)
- No sane person would expose SMB to the Internet…..



Finding DoublePulsar in Azure



- Only 14k VM's exposing TCP/445
- Initially undetectable by Shodan
- Detection via unused SMB error code (0x51)
- Manually scanned all IP's exposing TCP/445
- Low number of implants (<50)
- That means everyone patched!!!


MISSION ACCOMPLISHED

Cats: You have no chance to survive make your time

- WannaCry hit on May 12, 2017
- Azure exposed SMB: 14,480 VMs
- Targeted unpatched MS17-010
- Initial infection via Internet-exposed SMB port
- 230k+ systems in 150 countries affected
- Comparatively low-tech
- Propagated via EternalBlue

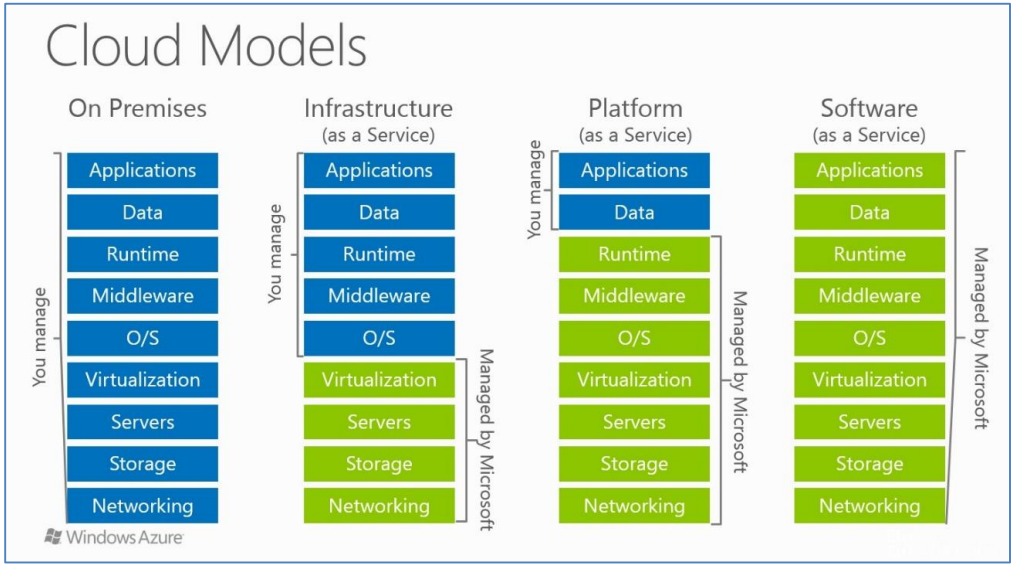
- NotPetya hit on June 27, 2017
- Azure exposed SMB: 16,750 VMs (+13.55%)
- Specifically targeted Ukraine
- Initial infection via trojaned MEDocs software
- Blast radius increased by VPN links to Ukraine
- Comparatively high-tech
- Propagated via psexec, mimikatz, MS17-010

Your IaaS security *is your responsibility*

- Ever hear about Express Route and Direct Connect?
  - “Microsoft Azure ExpressRoute lets you extend your on-premises networks into the Microsoft cloud….”
  - “Direct Connect makes it easy to establish a dedicated network connection from your premises to AWS.”
- That sounds like a VPN! (spoiler alert: it is)
- How are you managing ACL’s on P2P cloud connections?
- Is your cloud *actually* isolated from on-premises network?
- Do your IT policies extend to your cloud subscriptions?
  - Who is patching your IaaS servers?

PaaS & SaaS are shared responsibility

- “Patching causes downtime”
- “My cloud provider handles patching”
- PaaS & SaaS can help!
- Understand shared responsibility
- Patching handled by Microsoft
  - SaaS
  - PaaS (if you let us)



Cloud marketplaces are supply chains

- Supply chain attacks are increasingly common
- Cloud marketplaces could be next
- Lots of resources; high value targets
- Minimal validation of 3rd party IaaS VM images
- 3rd party IaaS images are ***OLD***
  - Average Azure Age: **123 days**
  - Average AWS Age: **717 days**
- Updating IaaS VM images is not retroactive

2018: Year of the CryptoMiner

- Cryptomining is the new Ransomware
- NoSQL attack campaign shifted
- Open S3 buckets being attacked
- Any vulnerable system is a target


CoinHive Cryptocurrency Miner Is 6th Most Common Malware, Says Report

Sujha Sundararajan
Nov 14, 2017 at 12:00 UTC

NEWS

Cyber-security solutions provider Check Point Software has said that the threat from cryptocurrency mining malware is rapidly growing.

TREND MICRO | TrendLabs SECURITY INTELLIGENCE Blog
SECURITY NEWS DIRECT FROM THREAT DEFENSE EXPERTS

report, the CoinHive variant became
script program that lurks unseen on
computers to mine monero.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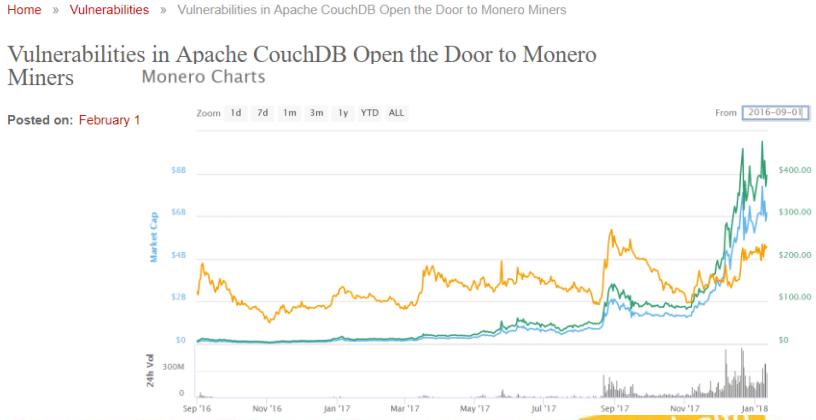
Home » Vulnerabilities » Vulnerabilities in Apache CouchDB Open the Door to Monero Miners

Vulnerabilities in Apache CouchDB Open the Door to Monero Miners

Monero Charts

Posted on: February 1

Zoom 1d 7d 1m 3m 1y YTD ALL From 2016-09-01

Market Cap $8B $6B $4B $2B $0
24h Vol 300M 0
$400.00 $300.00 $200.00 $100.00 $0
Sep '16 Nov '16 Jan '17 Mar '17 May '17 Jul '17 Sep '17 Nov '17 Jan '18


ars TECHNICA BIZ & IT TECH SCIENCE POLICY CARS GAMING & CULTURE FORUMS

THANKS FOR THE HASHES —

Oracle app server hack let one attacker mine $226,000 worth of cryptocoins

Exploit published in December makes cracking unpatched Oracle servers easy.

SEAN GALLAGHER - 1/9/2018, 9:12 AM

Captain: For great justice

- Update your IaaS VMs immediately after deployment
- Review firewall settings before deployment
- For sensitive roles consider building your IaaS Image
- Better visibility into out-of-the-box IaaS VM security
  - Age of IaaS VM image
  - Default firewall policies
  - Version info of daemons/services
- Azure Security Center: Free tier provides recommendations

Questions?

Nate Warfield – @dk_effect

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