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Hacking the future with USB HID

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About Me

- SamratAshok
- Twitter - @nikhil_mitt
- Blog – http://labofapenetrationtester.blogspot.com
- Creator of Kautilya, Mareech and Nishang
- Interested in Offensive Information Security, new attack vectors and methodologies to pwn systems.
- Previous Talks
  - Clubhack'10, Hackfest'11, Clubhack'11, Black hat Abu Dhabi'11, Black Hat Europe'12, Troopers'12, PHDays'12, Black Hat USA'12
- Upcoming Talks
  - Talk at EUSecWest'12
  - Training at GrrCON'12

Agenda

- Human Interface Devices
- Using HIDs in Penetration Tests
- HID of choice – Teensy++
- How we will use Teensy++?
- Windows Family
- Mac OS X Family
- Kautilya
- Attacks Demo (on Windows 8 and Mountain Lion)
- Comparison
- Future of Attacks
- Limitation
- Defence
- Conclusion

Human Interface Devices

- Wikipedia – "*A human interface device or HID is a type of computer device that interacts directly with, and most often takes input from, humans and may deliver output to humans.*"
- Mice, Keyboards and Joysticks are most common HID.
- What could go wrong?

Using HIDs in Penetration Tests

- Human Interface Devices are trusted by Operating Systems.
- Countermeasures like Anti Virus do not care for such devices.
- The way we use it, using HID for offensive security is equivalent to sitting in front of the target system as a user.
- The attack scenarios are large in number and may have severe impact.

HID of choice - Teensy++

- A USB Micro-controller device from pjrc.com
- Storage of about 130 KB.
- We will use Teensy ++ which is an updated version of Teensy.
- A cheap device, costs only $24.
- It uses an Atmel based processor.

HID of choice - Teensy++

- It could be used as Keyboard/Mouse/Joystick.
- The device is easily programmable using C or C type syntax using Arduino Development Environment with Teensyduino plugin.
- The device works with many Operating Systems.
- It is small in size.

How we will use Teensy++?

- As a programmable keyboard.
- We will program the device to do a defined set of activities when it is connected to a system.
- We will utilise the privileges of the currently logged in user and any higher privileges accessible to the user.
- Aim is to mimic a user sitting in front of the target.

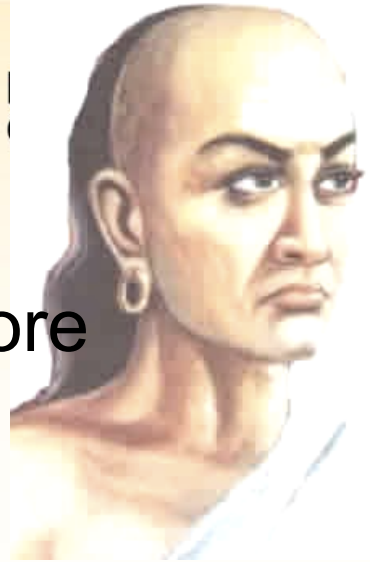
Windows Family

- A user is notified when a new device is connected.
- It takes 20-25 seconds while the driver for the device gets loaded.
- A device can type really fast on Windows machine thanks to large USB keyboard buffer of Windows.
- If PowerShell is used some really powerful things could be done.

OS X Family

- A user is not notified if a USB device is connected.
- It takes 10-15 seconds while the device is detected and loaded.
- The device cannot type very fast.
- Built-in scripting languages make payloads powerful.

Kautilya



- It is a toolkit which aims to make HID more useful in Penetration Tests.
- Named after Chanakya a.k.a. Kautilya.
- Written in Ruby.
- It's a menu drive program which let users select and customize payloads.
- Aims to make HID part of every Penetration tester's tool chest.
- Contains payloads for Windows, Linux and OS X.

Payloads in Kautilya

- Payloads are tested on Teensy without SD Card.
- Pastebin is extensively used for uploads and downloads.
- Payloads are commands, powershell scripts or combination of both.
- Payload execution depends on privilege of user logged in when the device is plugged in.

Attacks Demo (on Windows 8 and Mountain Lion)

- Let us have a look at three attacks on both
  - Download and execute shellcode.
  - Reverse shell using built-in features.
  - DNS TXT Code Execution.

Comparison

Attribute	Windows 8	Mac OS X Mountain Lion
Detection or blocking of USB HIDs	Shows a balloon. Easy to prevent installation of removable devices using Group policies.	No information to user. Not easy to block a device.
Response to a very fast keyboard input	Possible to send input really fast.	Delays must be introduced between the keyboard inputs.
Trust on end user (as we are simulating one)	For sensitive functions a UAC prompt is shown.	Sudo is required for sensitive functions.

Limitations with Teensy

- Limited storage in Teensy. Resolved if you attach a SD card with Teensy.
- Inability to “read” from the system. You have to assume the responses of victim OS and there is only one way traffic.

Limitations with Kautilya

- Many payloads need Administrative privilege.
- Lots of traffic to and from pastebin.
- Inability to clear itself after a single run.
- Some times payloads are not stable.
- For payloads which use executables you manually need to convert and paste them to pastebin.

Future of Attacks

- Improvement in current payloads.
- Use some payloads as libraries so that they can be reused.
- More payloads for Non-Windows platform.
- Implementation of newer payloads.
- Reliable user activity detection.

Defence

- For Windows systems, use Group Policy to "Prevent Installation of Removable Devices".
- For Mac OS X, udev rules may be used.
- Best defence is to physically block USB ports or lock the existing devices to the ports.

Conclusion

- USB HID attacks are real threats and here to stay.
- This is because Operating System trust itself and its users.
- Security ends with trust.

Thank You

- Questions?
- Insults?
- Feedback?

- Kautilya is available at http://code.google.com/p/kautilya/
- Follow me @nikhil_mitt
- http://labofapenetrationtester.blogspot.com/

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