

# The Taming of the Slug



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# “Evolution”



# Revolution: Linksys NSLU2

(a.k.a. "The Slug")

The screenshot shows the Linksys website interface. At the top right, there are links for Downloads, Sitemap, Customer Login, and Registration. The Linksys logo is on the left, with the tagline 'A Division of Cisco'. A search bar is located to the right of the logo. Below the logo, there is a navigation menu with links for United States [Change], PRODUCTS, WHERE TO BUY, SUPPORT, LEARNING CENTER, COMPANY, and PARTNERS. The main content area is titled 'NSLU2' and includes a breadcrumb trail: Home » Products » Wired » Basic Networking » Network Storage » NSLU2. The product features are listed as follows:

- Connects USB 1.1 or 2.0 disk drives and flash disks directly to your network
- Share music, video, or data files with managed access by user name or group
- Integrated file server -- access your files from the Internet
- Built-in disk utilities -- format, backup, and scandisk

At the bottom of the page, there is a 'Buy Now!' button, a 'Printable View' link, and an 'E-Mail this Page' link. A 'Best of Tom's 2004' award seal is also visible in the bottom right corner.

# Slug Details

- CIFS server appliance, web-based admin
- 5.12" x 0.81" x 3.56"
- Two USB 2.0 ports, one 10/100 Ethernet port
- No internal storage
- Recently discontinued (gaak!) but still around
- Based on FLOSS; firmware GPL...

# http://www.nslu2-linux.org/



**NSLU2-Linux**

Search NSLU2-Linux:

Search

**FAQ: Frequently Asked Questions**

**Donations**

**Downloads**

Trac Bug Tracker  
Package Search Engine  
All Recent Wiki Changes

**General**

HowTo Recipes  
Cool Peripherals  
Cool Applications  
Information Pages

[Main »](#)

## HomePage

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"While Linksys does not support any of the alternate firmware available for the NSLU2, we are always delighted to see a product gain such widespread acceptance. Like the similar community that emerged to enhance the WRT54G before it, the creativity and ingenuity of Linksys customers inspires us to continually improve our products."

-- Mike Wagner, Director of Marketing, Linksys.

This is the web presence of the NSLU2-Linux development group and user community. We discuss, develop and modify the firmware and hardware of the Linksys NSLU2, the Synology **DS101**, the Iomega **NAS100d**, the D-Link **DSMG600**, and other ixp4xx-based devices with large attached storage. Purchase a Linksys NSLU2 and join our community if you are interested in doing the same.

Every community has its own set of rules. Here are ours:

1. Never *\*ever\** use the Linksys **EraseAll** tool - it will brick your slug permanently.
2. You will search the wiki first **here** and read the **FAQ** before asking questions.
3. You must read and follow the steps in the README file **precisely** when flashing firmware.
4. Those who ask the questions, update the wiki when they get the answers.
5. Those who complain about the documentation, update the wiki to make it better.
6. Friends don't let friends flash custom firmware without confirmed RedBoot Upgrade Mode access.
7. Friends don't let friends flash custom bootloaders without confirmed JTAG access.

# “Open Slug” Projects

<http://www.nslu2-linux.org/>

<http://www.slug-firmware.net/>

<b>Project</b>	<b>Overview</b>	<b>Packages</b>
Unslung	‘Stock plus’ for beginners	1000
SlugOS	‘Stock plus’ minus web interface	5000
DebianSlug	Debian users	17510
OpenWRT	Linux distro for embedded devices; good for ‘flash only’ solutions	2000

# I Chose Debian Slug (now SlugOS/LE)

<http://www.cyrius.com/debian>

Martin Michlmayr

- > Biography
- > Curriculum Vitae
- > Journal
- > Research
- > Talks
- > Publications
- > Photo Gallery
- > Debian HOWTOs
- > Contact

[Debian HOWTOs](#) > [Debian on NSLU2](#)

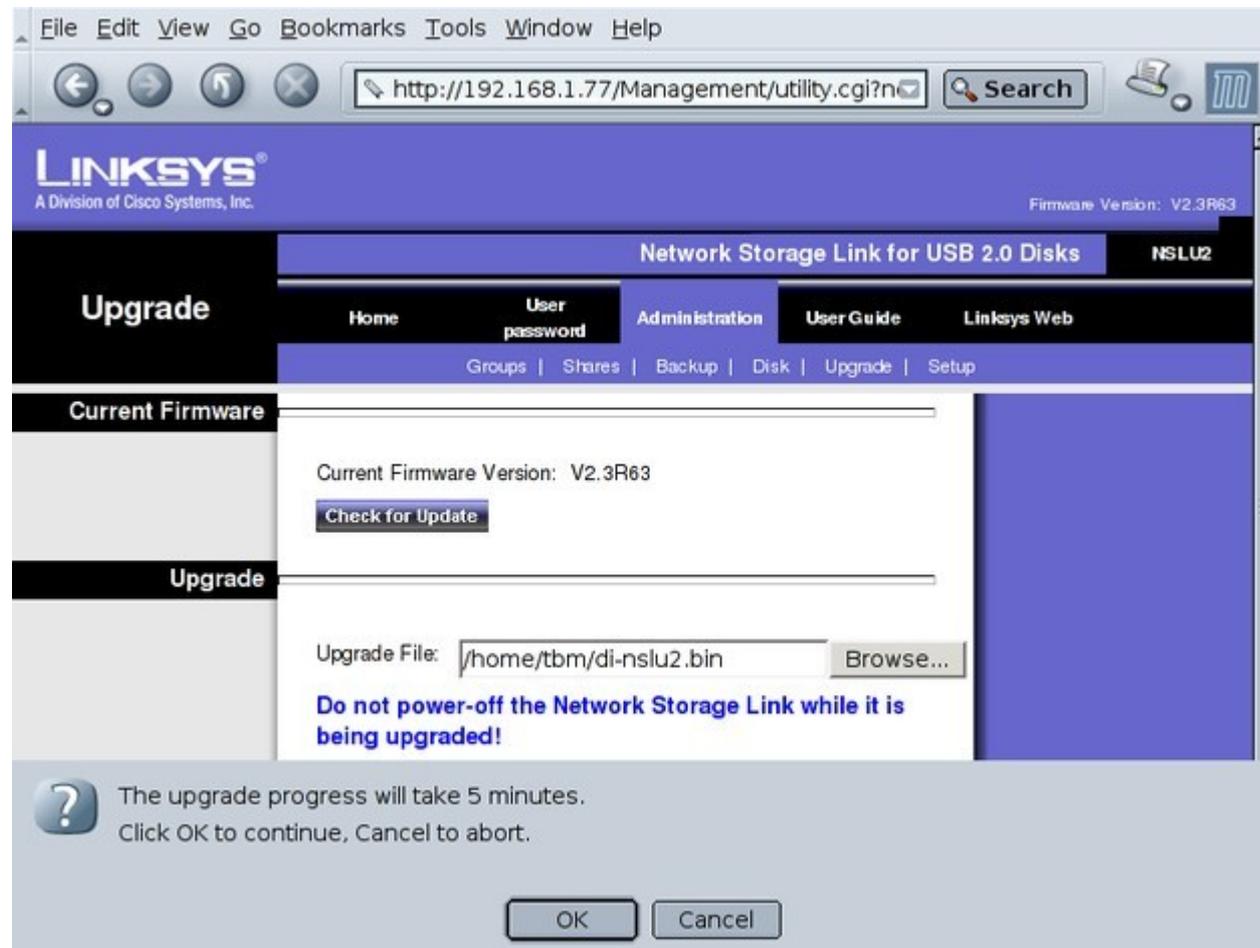
## Debian on the Linksys NSLU2

The NSLU2 from Linksys is a small, sub \$100 device that can be used for a variety of tasks. NSLU2 stands for Network Storage Link for USB 2.0 Disk Drives, a description which pretty much summarizes the original purpose of this device. However, the NSLU2 (or Slug, as it's often referred to) can be used for other tasks if you use a more powerful firmware for it. Since the device offers two USB ports, it's possible to connect a USB disk and run a full Debian system on it.

The NSLU2 is nowadays fully supported by Debian. In the following, I will describe what is needed to get Debian running on your NSLU2. Please note that this page only provides information on running a full-blown Debian system on the NSLU2 on an external USB drive. If you're looking for a firmware to be put in the flash of the NSLU2 (such as Unslung or OpenSlug) or other information on this device, please go to the [NSLU2-Linux project](#) (in particular, check out the [firmware matrix](#)).



# Software Hacking: Flash Debian Bootstrap



# Software Hacking: Debian Installer via ssh

```
ssh installer@192.168.1.77
```

```
Low memory mode
[!] Download installer components

To save memory, only components that are certainly needed
for an install are selected by default. The other
installer components are not all necessary for a basic
install, but you may need some of them, especially certain
kernel modules, so look through the list carefully and
select the components you need.

Note that if you select a component that requires others,
those components will also be loaded.

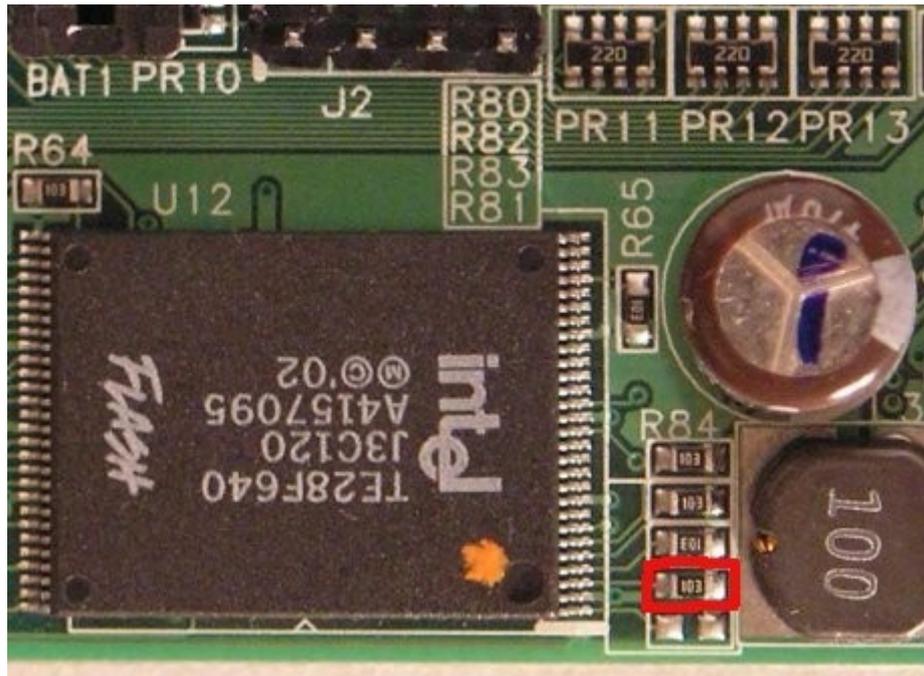
Installer components to load:

[ ] autopartkit: Automatically Partition Hard Drives (unsa
[ ] cdrom-checker: Verify the cd contents

<Go Back>                                <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

# Hardware Hacking: TurboSlug mod Double your bogomips!



266 MHz   
uNSLUng

133 MHz   
uNSLUng

# “Just” a Fileserver

- General-purpose file dump
- Archive of music, centrally stored
- Good news and bad news
  - Mounted filesystem, remote indexing
  - Straightforward but slow
  - Alternatives?

# Roku Soundbridge: I just want to listen to music



# Apple's DAAP Protocol

- Implemented in iTunes
- Proprietary
- De Facto Standard

# DAAP Clients/Servers

- mt-daapd
- iTunes
- Firefly
- Rhythmb
- Banshee
- Amarok
- Tangerine
- etc.

## List of software using Digital Audio Access Protocol

From Wikipedia, the free encyclopedia

This is a list of software implementing the Digital Audio Access Protocol.

Name	Client	Server	Supports 7.0 <sup>[1]</sup>	Platform	Licence
iTunes	Yes	Yes	Yes <sup>[2]</sup>	Mac OS X, Windows 2000 and XP	Proprietary (but free of charge)
Rhythmbox	Yes	Yes	No	Unix-like	GNU General Public Licence
Banshee	Yes	Yes <sup>[3]</sup>	No	Unix-like	MIT
Amarok	Yes	No	No	Unix-like	GNU General Public Licence
Exaile	Yes <sup>[3]</sup>	No	No	Unix-like	GNU General Public Licence
jTunes	Yes	No	No	Independent (Java)	
OurTunes	Yes	No	No	Independent (Java)	Open Source
TunesBrowser	Yes	No	No	Unix-like	
Get It Together	Yes	Yes	No	Independent (Java)	
XBMC	Yes	No	No	Xbox, Windows, Mac OS X 10.5 on Intel machines, Unix-like	GNU General Public Licence
Roku Soundbridge <sup>[4]</sup>	Yes	No	Yes <sup>[1]</sup>	Roku Soundbridge	Hardware
Firefly Media Server	No	Yes	No	Unix-like, Windows, Mac OS X	GNU General Public Licence
daapd	No	Yes	No	Unix-like	
Tangerine	No	Yes	No	Independent (Mono)	
LimeWire	No	Yes	No	Independent (Java)	Nagware and GNU General Public Licence
WiFiTunes	Yes	No	No	Pocket PC 2003, 2003 SE and WM5	
Spydaap	No	Yes	No	Unix-like	GNU General Public Licence

# **Add mt-daapd To Slug**

```
# apt-get install mt-daap
```

# mt-daapd Web-based Admin

The screenshot shows the Firefly Media Server web-based admin interface. The browser window title is "Firefly Media Server - Mozilla Firefox". The address bar shows the URL "http://192.168.1.78:3689/index.html". The page features the Firefly logo and the tagline "The best open-source media server for the Roku SoundBridge and iTunes". A sidebar on the left contains navigation links: "server status", "smart playlists", "configuration", "about firefly", "thanks", and "Links" (with sub-links for "firefly homepage" and "firefly source code"). The main content area is titled "Server Status" and contains a table of service status, a summary box, and a client activity table.

Service	Status	Control
Bonjour	Stopped	
Firefly Media Server	Running	<input type="button" value="Stop Server"/>
File scanner	Idle	<input type="button" value="Start Scan"/> <input type="button" value="Start Full Scan"/>

<b>Uptime</b>	24 minutes, 50 seconds
<b>Songs</b>	8546
<b>Songs Served</b>	0
<b>DB Version</b>	2

Client IP	Action
192.168.1.12	Serving xml-rpc method

# Client Access Example - Rhythmbox

The screenshot shows the Rhythmbox music player window titled "Guadalcanal Diary - Watusi Rodeo (Paused)". The interface includes a menu bar (Music, Edit, View, Control, Help), playback controls (Play, Previous, Next, Repeat, Shuffle, Browse, Visualization), and a progress bar for the current track "Watusi Rodeo" by Guadalcanal Diary from the album "Walking In The Shadow Of The Big Man", which is at 0:20 of 2:40.

The left sidebar shows the Library view with categories: Play Queue, Music, Podcasts, Radio, Stores, Playlists, and Shared. The "Shared" section shows "debian-slug" and "Jeff's Library".

The main area displays a search bar and a list of artists and albums. The "Album" list shows "All 3 albums (51)", including "2x4 (Limited Edition) (24)", "Flip-Flop (11)", and "Walking In The Shadow Of The Big Man ( :".

Below the search area is a table of tracks:

Track	Title	Genre	Artist	Album	Time
1	Trail of Tears	Rock	Guadalca...	Walking In...	2:27
2	Fire From Heaven	Rock	Guadalca...	Walking In...	3:55
3	Sleepers Awake	Rock	Guadalca...	Walking In...	3:13
4	Gilbert Takes the Wheel	Rock	Guadalca...	Walking In...	2:35
5	Ghost on the Road	Rock	Guadalca...	Walking In...	2:56
6	Watusi Rodeo	Rock	Guadalca...	Walking In...	2:40
7	Why do the Heathen ...	Rock	Guadalca...	Walking In...	3:02
8	Pillow Talk	Rock	Guadalca...	Walking In...	2:00
9	Walking in the Shado...	Rock	Guadalca...	Walking In...	4:36
10	Kumbayah	Rock	Guadalca...	Walking In...	3:49

At the bottom left, it says "16 songs, 52 minutes, 47.8 MB". The taskbar at the bottom shows the Rhythmbox icon and the window title "Guadalcanal Diary - ...".

# Results

- Custom appliance  
(File server, DAAP server)
- Debian admin tools  
(ssh, Samba, ftp, nntp, mt-daapd)
- Nearly silent, tiny, reliable
- Low power

# So How Green Are Ya?

- Ameren gory details
  - June-Sept 7.92¢/kWh
  - Oct-May 5.62¢/kWh first 750, 3.78 rest
- Rough estimate
  - PC: \$25.75/year
  - Slug: \$8.39/year
  - \$17.35 savings per year

# Conclusion:

- Slug pays for itself in roughly three years!
- And it was fun!



# Get 'em While They're Hot

View as: [List](#) [ [Customize view](#) ] Sort by: [Best Match](#)

				Price	Shipping to USA
	<a href="#">LINKSYS NETWORK STORAGE LINK USB 2.0 DRIVES NSLU2 NEW!</a>	<b>P</b>	0 Bids <i>=Buy It Now</i>	<b>\$45.99</b>	+\$14.80 \$47.44
	<a href="#">LINKSYS NSLU2 STORAGE NETWORK LINK USB 2.0 DISK DRIVES</a>	<b>P</b>	1 Bid	<b>\$39.99</b>	+\$14.99
	<a href="#">BRAND NEW LINKSYS NSLU2 NETWORK STORAGE LINK USB 2.0 W/</a>	<b>P</b>	0 Bids <i>=Buy It Now</i>	<b>\$47.00</b>	+\$14.70 \$47.40
	<a href="#">Linksys NSLU2 USB 2.0 Hard Drive Network Storage Link</a> Brand New Sealed, Fast Shipping, Trusted USA Seller	<b>P</b>	0 Bids	<b>\$45.00</b>	+\$9.95
	<a href="#">NEW Linksys NSLU2- Network Storage Link for USB 2.0 ...</a>	<b>P</b>	<i>=Buy It Now</i>	<b>\$84.24</b>	Free
	<a href="#">Linksys NSLU2 Network Storage</a>	<b>P</b>	4 Bids	<b>\$26.00</b>	+\$10.00
	<a href="#">LINKSYS NSLU2 STORAGE NETWORK LINK USB 2.0 DISK DRIVES</a>	<b>P</b>	1 Bid	<b>\$39.99</b>	+\$14.99