

# naslite

Network Attached Storage Server Operating System



## **NASLite+ In a Nutshell**

**A Guide to Repurposing The STB1030N Set Top Box  
and Embedding The NASLite+ for USB Flash Server OS**

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## Revision History

Revision 1.0 June 10, 2005

## Introduction

In this short guide, I'll describe a step-by-step process that can be used to embed NASLite+ for USB Flash. The unit that I'll be converting is a Nutshell Pro by the now defunct Cedar Systems. I found this Nutshell Pro on eBay a few months ago for the reasonable price of \$32.00 US delivered to my door.



**STB1030N by GCT-Allwell**



**STB1030N by GCT-Allwell  
(Typical Interior View A)**



**STB1030N by GCT-Allwell  
(Typical Interior View B)**

Most hackers will immediately identify this system as the STB1030N by GCT-Allwell. Huge numbers of STB1030 and STB1030N derivatives have been sold under brands such as Websurfer Pro, Nutshell

Pro, etc. What makes this system appealing is its low power consumption, slim line design, low cost and most importantly, its ability to boot from a DOC.

For those of you that may be wondering, a DOC (DiskOnChip) is a chip that appears to the BIOS as a disk drive. On the STB1030N, the DOC appears as a SCSI disk and may vary in sizes from approximately 4MB up to about 144MB, based on the brand and original purpose. The DOC in the Nutshell Pro is 8Mb in size, so it is plenty large to accommodate NASLite+ for USB Flash.

## Software Considerations

The Nutshell Pro does not support floppy disks but does support USB, so the NASLite+ for USB Flash is a good fit. With some minor hacking, it will work perfectly with the available hardware.

NASLite+ for USB Flash CD-ROM or a downloadable CD-ROM ISO image is available for purchase from the Server Elements ([www.serverelements.com](http://www.serverelements.com)) website.

**NOTE:** *NASLite+ for USB Flash is a commercial product and is not freely distributable. Please do not make or distribute illegal copies. Doing so is not only illegal, but undermines our efforts and further impedes the ability of Server Elements to develop the product.*

## Hardware Considerations

Originally intended as an embedded Windows terminal, the Nutshell Pro does not come with a hard drive. There are provisions for adding a 2.5" laptop drive to the system. If you want to mount a standard 3.5" hard drive however there are no such provisions. Since the ultimate goal is to use a large 3.5" hard drive in our embedded server it will take a little experimentation and ingenuity to tuck a 3.5" hard drive nicely into the slim enclosure.

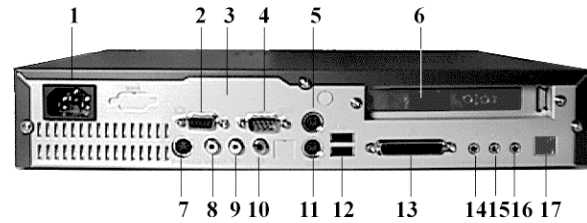
The component cooling requirements will also change once a hard drive is added to the system. Heat generated by the hard drive as well as the increased current draw on the power supply must be dealt with. One has the choice to force airflow with a fan or drill holes on top of the case to allow hot air to escape. I opted for the fan since I think the final product looks better.

## Hardware Specifications

Hardware specifications as listed in the original STB1030N manual are provided for reference only. The actual STB1030N hardware that you have on hand may vary based on purpose and brand. I do believe that GCT-Allwell no longer sells the STB1030N, however, as of this time, a more modern version, the STB3036N is still listed as a supported product on their website.

Main Board Processor	x86 Pentium Media GXM 233MHz - 300 MHz
Memory	2 x DIMM up to 256 MB
Smart Temperature Control	LM75 supports variety temperature control
VGA on board	IGS 2010 1MB RAM VGA up to 1024x768 @ 256 colors
TV-Out	On Board, Direct NTSC/PAL output Scart Support (Optional)
Audio	16 bit 3D surround Sound Onboard
LAN	Intel 82558 10/100Mbps Wake-On-LAN
IR Interface	Yes (Optional)
Flash Disk	DOC 4MB to 144MB or Disk on Module
Expansion Slot	1 x PCI/ISA shared
OnBoard IDE	1 x Ultra DMA33 1 x Ultra DMA33
Floppy Disk Drive	No
I/O Connectors	1S, 1P, 2 x USB, PS/2 Mouse, PS/2 Keyboard
BIOS	Award BIOS, DMI, PnP Green
Chassis Size (LxWxH)	34 x 27.4 x 6 cm
Power Supply	45W, 5V, 12V
Software Support	Microsoft Win95, 98, NT, WinCE, RTOS QNX, Citrix, Linux
Front Panel	Power switch, 3 LED, IR Window
Drive Bay	1 x 2.5" hidden (optional)
Rear Panel	S-Video/Composite Video, SCART TV, VGA, Audio Left/Right, Line out, Speaker, MIC, 2 USB, Com1, PS/2 Keyboard/Mouse, Printer, Ethernet LAN port

### STB1030N Hardware Specifications



1. AC POWER
2. VGA PORT
3. SCART (optional)
4. RS232 (COM1)
5. PS/2 Mouse
6. Exp. Slot (Modem)
7. S-Video
8. Composite Video
9. Audio-Out (L)
10. Audio-Out (R)
11. PS2 Keyboard
12. 2 X USB PORT
13. Printer Port
14. Line-Out
15. Line-In
16. Microphone
17. RJ-45 LAN port

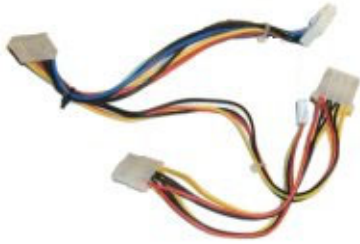
## Power Connector Modification

In order to install our operating system on the DOC, we need to boot from an alternate media such as a hard drive or a CD-ROM. The first thing that one will notice is that the STB1030N does not have any disk drive power connectors. Power from the power supply goes directly to the motherboard without any auxiliary connectors.

What I did to resolve that was to scavenge a damaged old power supply and cut the necessary cable and hard drive power connectors. I soldered the cable leads of the new hard drive power connectors to the leads of the existing motherboard power connector cable. The cable leads are color coded, so make sure that yellow, goes to yellow, red goes to red and black goes to black as necessary.



**Existing Power Connector Cable**



**Modified Power Connector Cable**

Before using your newly completed power connector, it is a good idea to test it and make sure all leads are correctly connected. You can use a multimeter or whatever other method you favor to verify proper continuity,

When comfortable with the cable's operation, you can restore the connection between the power supply and the motherboard.

## Preparing the DOC for Software Installation

Installing the software on the DOC is fairly easy provided you can get into the BIOS and temporarily change the boot order. Attach a keyboard and a monitor and boot your STB1030N. As usual, pressing the **Delete** key during boot should get you into the BIOS configuration screens. Once there, make sure you can change the boot order to the device you intend to use. Do not make the change yet. Just exit and shut the system down.

In order to configure my DOC, I opted to use a custom bootable CD-ROM, that I made especially for that purpose. The specific utilities that I used are as follows:

- Fdisk
- Format
- Syslinux

To make the CD-ROM, I simply took an old Windows 98 boot disk, added the format binary as well as the DOS version of syslinux to it. I then used that same floppy disk as a boot image for NERO to create my bootable CD-ROM.

You don't necessarily have to use a CD-ROM for that task. A bootable hard drive with the required tools can also do the job.

Next, I connected the CD-ROM drive to the STB1030N's IDE controller and attached the newly modified power cable.

Now, we can boot the system, and enter the BIOS configuration screens. Change the boot order to CD-ROM (or your boot device), save the settings and reboot.

Make sure the bootable CD-ROM disk is in the drive during reboot. If all was done correctly, you should see Windows 98 (DOS) booting. When asked if you want CD-ROM support, answer YES since you'll need to mount your NASLite+ for USB Flash source CD-ROM in the next few steps.

At the DOS prompt, check to make sure that you can view the **C** drive. Provided the CD-ROM drive is mounted as drive **D**, the **C** drive should be your DOC. If not, then use Fdisk to partition the DOC. After ensuring the DOC is in fact available as drive **C**, it is safe to format using **format c:**.

With a successful format, the next step is to install the Linux boot loader. That is done by executing **syslinux c:**. If the boot loader was successfully installed, you should see the file **LDLINUX.SYS** when you view the DOC contents by executing **dir c:**. If that file is there, then the most difficult part of the preparation is now complete and the DOC is ready for software installation.

## Software Installation

With DOC preparation successfully completed, it's time to install our NAS operating system. As previously mentioned, NASLite+ for USB Flash is the best candidate for this application, therefore, the NASLite+ for USB Flash distribution CD-ROM should go into the CD-ROM drive next.

The files that need to be copied to the DOC are located in the **DATA** folder of the CD-ROM. Copy all

files from that folder directly to the root folder of your DOC, visible as the **C** drive.

The DOC should now contain the following files:

- **NASLITE.01**
- **NASLITE.02**
- **NASLITE.MSG**
- **NASLITE.SCR**
- **SYSLINUX.CFG**
- **LDLINUX.SYS**

That should do it. Turn the STB1030N off and disconnect the CD-ROM by detaching the power and IDE cables.

## Booting NASLite+ for USB Flash

It's time to test our newly embedded NASLite+ for USB Flash. Provided everything went as planned and we have gotten this far without any unresolved issues or problems, our embedded OS should boot as necessary.

Turn the STB1030N back on and enter the BIOS. Change the boot order back to the original state – Boot SCSI first. Save settings and exit.

After the STB1030N reboots, you should see the NASLite splash screen. That's a good sign, meaning you have successfully configured and installed the operating system on the DOC.

It's time to install the storage drive, so shut the STB1030N down and disconnect the monitor, keyboard, power, etc.

## Storage Hard Drive Installation

I'm sure that there are many ways a 3.5" hard drive can be installed into the STB1030N's slim line enclosure, but I think that the following approach is probably as easy and as effective as it gets. It requires a bare minimum of parts, tools or effort.



**Hard Drive and Mounting Hardware**

The hard drive mounting hardware consists of 2 standard brass posts, 2 standard computer case screws and a expansion slot cover plate with 2 holes drilled to match the standard hard drive mounting holes.



**Complete Hard Drive Mounting Assembly**

I'm sure that by looking at the above image, it's clear on how the hard drive mounts into the STB1030N case. The raiser card will have to be removed from the motherboard bus slot in order for the hard drive to fit. After installing the expansion slot cover plate and connecting the IDE cable to the motherboard, mount the hard drive in place as shown below.



**Hard Drive Mounted In Place  
(Side View)**





**Hard Drive Mounted In Place  
(Front View)**



**Hard Drive Mounted In Place  
(Rear View)**

In my case, I left the hard drive raised 1/8" above the motherboard bus slot in order to facilitate better airflow on the underside of the drive, but that's up to you. You may opt to mount it in a way such that the drive actually rests on motherboard bus slot.

Make sure the drive jumpers are set to single master and attach the IDE and power cables to the hard drive. You should now be done with the storage hard drive installation.

## System Cooling

It is no secret that the number one reason for hard drive failures is excessive heat, so the new drive will require a fair amount of cooling due to the tight quarters inside the STB1030N enclosure. For that reason, yet another modification is necessary. As with the mounting of the hard drive, there are many ways one can facilitate proper cooling. I opted to use a fan and force air into the case immediately above the CPU thus eliminating the need for a dedicated CPU cooling fan.



**Fan Mounted to Enclosure Cover**

I scavenged the fan from the same damaged power supply that the hard drive power connectors came from. It was in good working order so using it made sense. If necessary, one can get a new fan for as little as a couple of bucks.

The positioning of the fan is important. The enclosure cover has a number of cooling vent holes. The fan should be mounted below those, however, one should consider the physical size and position of the RAM and allow for proper clearance. In my case, I had to offset the fan 1/2" from the center. The fan is mounted to the cover with spacer washers to allow 1/8" clearance. That way inside air will be drawn in addition to the outside air. That clearance should prevent starving of the fan and ultimately result in higher airflow velocity.

The connector for the fan can be any that you have on hand. I used a pass through power connector since that's what I had in the junk bin. That's it for cooling.

## Final Assembly and Testing

The STB1030N NAS server is almost ready for deployment. Final assembly consists of the following:

- Removing the original CPU fan from the heat sink.
- Checking all components and connections for proper installation and jumper settings
- Connecting the cooling fan power and closing the enclosure.

IF your STB1030N did not come with a CPU fan, then a low profile heat sink may be necessary in

order to clear the fan we installed to the enclosure cover.



**Completed Embedded NASLite Server**

With the newly modified STB1030N completely together, connect the keyboard, monitor and power. Turn the STB1030N on and make sure all components are working as necessary. Most importantly, make sure the drive and cooling fan are both spinning. In my case, the fan I used makes no noise, so all I hear is airflow and the whine of the hard drive.

Observe the screen and make sure the NASLite operating system is booting. If all is well, you should soon be looking at the Default Administration Mode login screen.

In the unlikely event the system fails to boot or fails to produce a login screen, review the previous sections and ensure that all configuration, modification and installation steps are properly executed.

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NASLite+ (C) 2005 Tony Z. Tonchev (tzt@serverelements.com)
Login as admin to access the NASLite+ Administration Menu.

> Checking System Resources ----- [ SUCCESSFUL ]
> Configuring NASLite+ ----- [ SUCCESSFUL ]
> Mounting Storage Disk-1 ----- [ DISABLED ]
> Mounting Storage Disk-2 ----- [ DISABLED ]
> Mounting Storage Disk-3 ----- [ DISABLED ]
> Mounting Storage Disk-4 ----- [ DISABLED ]
> Launching Services ----- [ DISABLED ]
> Initializing Network ----- [ DISABLED ]
> Administration Mode ----- [ DEFAULTS ]

NASLite login: _
    
```

**NASLite+ for USB Flash  
Default Administration Mode  
Console Login Screen**

If everything appears to be working properly, then simply power the system down and move to the next section.

**NASLite Configuration**

There is one last thing before we are done. The operating system kernel does not support reading or writing directly to the DOC. It is designed to boot from USB Flash and save configuration settings to the same USB Flash. It would be nice if the STB1030N can boot from USB Flash, but unfortunately it couldn't. That's why in order to make things work, we need to boot from the DOC and save configuration settings to a suitable USB Flash device.

Personally, I wouldn't like a large, bright colored prong sticking out behind my new slim line NAS, so the image below shows a good compromise.



**Iomega Mini USB Flash Disk**

This miniature USB Flash disk protrudes only an inch behind the enclosure. Not only that, but it's silver, so you can hardly see it.



**Complete STB1030N with  
Installed USB Flash Disk**

With the USB Flash disk in place, you are now ready to configure and use your embedded NASLite



server. For complete details on configuration, administration and access, refer to the NASLite+ for USB Flash manual available on the distribution CD-ROM.

## Conclusion

The practicality of a device such as the STB1030N based NAS server may be debated, however if you wish to build a low profile, slim line NAS on a budget, it is surely hard to beat. My total cost for the project was \$120 US. That included the Nutshell Pro, NASLite for USB Flash software, the 160GB hard drive and the mini USB Flash disk.

This configuration is also capable of accommodating larger drives, so a 400GB or larger server is most definitely possible.

Another point that's worth mentioning is that the process of "imbedding" the NASLite OS on a DOC is virtually the same as installing it on a Flash Disk or any other bootable device. As long as the configuration media is present in the proper context, NASLite should boot, configure and work as necessary.

I hope that this exercise has proven valuable and provides a small glimpse in alternative configurations possible with the NASLite operating systems.

## Online Resources

The following is a list of online resources that may be of interest. Links and descriptions are as follows:

- <http://www.gctglobal.com/> - GCT-Allwell: Manufacturers of the STB1030N and STB3036N Set Top Boxes
- <http://syslinux.zytor.com/> - Syslinux: Linux boot loader used in this project
- <http://www.serverelements.com/> - Server Elements: Distributors of NASLite for USB Flash Network Attached Storage Server Operating System
- <http://www.m-sys.com/> - M-Systems: Manufacturers of the DiskOnChip flash memory system

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