



# NVIDIA DIGITS DEVBOX USER GUIDE V

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**DIGITS DEVBOX USER GUIDE**



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# Chapter 1.

## INTRODUCTION TO NVIDIA DIGITS DEVBOX

### 1.1. Background

Deep learning is one of the fastest growing segments in the machine learning/artificial intelligence field. It uses algorithms to model high-level abstractions of data in order to gain meaningful insight for practical application. Such data manipulation has application in various fields, such as computer vision, speech recognition and language processing, and audio recognition.

It takes tremendous processing power to efficiently process such huge amounts of data using deep learning algorithms. To that end, NVIDIA has developed an all-in-one, powerful, energy-efficient, cool, and quiet desktide solution, called the NVIDIA® DIGITS(TM) DevBox.



Figure 1 DIGITS DEVBOX

## 1.2. DIGITS DEVBOX Overview

The DIGITS DevBox combines the world's best hardware, software, and systems engineering for deep learning in a powerful solution that can fit under your desk. It is a single desktide machine comprised of:

- ▶ Four NVIDIA GeForce TITAN X GPUs
- ▶ NVIDIA DIGITS software: Interactive Deep Learning GPU Training System
- ▶ Pre-installed Ubuntu 14.04.2
- ▶ Pre-installed deep learning frameworks – Caffe, Torch, Theano, and BIDMach
- ▶ NVIDIA CUDA Deep Learning Neural Network library (cuDNN) v2
- ▶ NVIDIA CUDA Toolkit 7.0

# Chapter 2.

## DIGITS DEVBOX SPECIFICATION

### 2.1. Feature And Architecture Summary

#### CPU

Intel Core i7 processor on an ASUS x99E-WS motherboard with 64 GB DDR4 memory

#### GPU

Four NVIDIA GeForce TITAN X GPUs, installed with NVIDIA qualified drivers

#### Operating System and Software

The system comes with the following software and OS pre-installed on the SATA3 SSD:

- ▶ Ubuntu 14.04.2
- ▶ NVIDIA DIGITS Software
- ▶ Caffe, Torch, Theano, and BIDMach deep learning frameworks
- ▶ NVIDIA CUDA Toolkit 7.0, including the CUDA Deep Learning Neural Network library (cuDNN) v2.

#### Storage

3x3 TB RAID 5 hard disk drives with separate PCIe SSD cache.

### 2.2. Component Specifications

### 2.3. Components

Component	Qty	Description
Motherboard	1	ASUS X99-E WS with 4xPCIe x16 slots. For the full motherboard spec, see <a href="http://dlcdnet.asus.com/pub/ASUS/server/e9552_x99_e_ws_ug_for_web_only.pdf">http://dlcdnet.asus.com/pub/ASUS/server/e9552_x99_e_ws_ug_for_web_only.pdf</a>

Component	Qty	Description
CPU	1	Intel 6-core i7-5930K
RAM	2	2x32 GB DDR4 (Vengeance LPX 32GB (4x8GB) DDR4 DRAM 2133MHz)
GPU	4	GeForce TITAN X, featuring: <ul style="list-style-type: none"> <li>▶ 7 teraflops of single-precision computing power,</li> <li>▶ 336.5 GB/s of memory bandwidth, and</li> <li>▶ 12 GB of memory</li> </ul>
RAID5 Storage(Data)	3	Western Digital RE 3TB 7200 RPM 64MB Cache SATA 6.0Gb/s 3.5"
Storage(cache)	1	SSD M.2 SATA MODULE SAMSUNG XP941 M.2 512GB PCI EXPRESS
Storage(OS)	1	Samsung 850 EVO 250GB 2.5in SATA III Internal SSD
Power Supply	1	EVGA SuperNOVA 1600 T2 Power Supply

## 2.4. Mechanical

Component	Description
Height	18" (458mm)
Width	13" (332mm)
Depth	16.3" (415mm)
Gross Weight	48 lbs

## 2.5. Power

Input	Comments
115 - 240 VAC, 17-10A, (50 - 60 Hz)	<p>The DIGITS DevBox power consumption can reach 1350W (ambient temperature 30° C) with all system resources under a heavy load.</p> <p>Be aware of your electrical source's power capability to avoid overloading the circuit.</p>

## 2.6. Connector Ports

Type	Qty	Description
DisplayPort	4	1 per GeForce TITAN X card
HDMI	4	1 per GeForce TITAN X card
Ethernet	2	RJ45 LAN port- 1 Gbps

Type	Qty	Description
Audio	5	Mini stereo jack audio output
Audio	1	Optical S/PDIF output
USB	10	USB 3.0
eSATA	2	6 Gbps eSATA port

## 2.7. Audio Port Definitions

Port Color	2-channel	4-channel	6-channel	8-channel
Light Blue	Line In	Line In	Line In	Side Speaker
Lime Green	Line Out	Front Speaker	Front Speaker	Front Speaker
Pink	Mic In	Mic In	Mic In	Mic In
Orange	N/A	N/A	Center/ Subwoofer	Center/ Subwoofer
Black	N/A	Rear Speaker	Rear Speaker	Rear Speaker

## 2.8. Lan Port Indicator

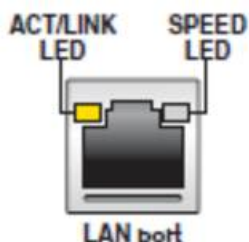


Figure 2 DIGITS DEVBOX LAN

LEDs on each ethernet port indicate the connection status as described in the following tables.

Activity/Link LED	
Status	Description
Off	No link
Orange	Linked
Orange (blinking)	Data activity
Orange (blinking then steady)	Ready to wake

Speed LED	
Status	Description
Off	10 Mbps connection
Orange	100 Mbps connection
Green	1 Gbps connection

# Chapter 3.

## SETUP AND MAINTENANCE

This section explains how to set up and maintain the DIGITS Devbox.

### 3.1. Setting Up the DIGITS DEVBOX

### 3.2. What's in the Box

Be sure to inspect each piece of equipment shipped in the packing box. If anything is missing or damaged, contact NVIDIA.

What's included with your NVIDIA DIGITS DevBox:

- ▶ NVIDIA DIGITS DevBox
- ▶ Power Cable
- ▶ Three (3) hard disk drives
- ▶ DisplayPort-to-DVI adapter
- ▶ Welcome Card

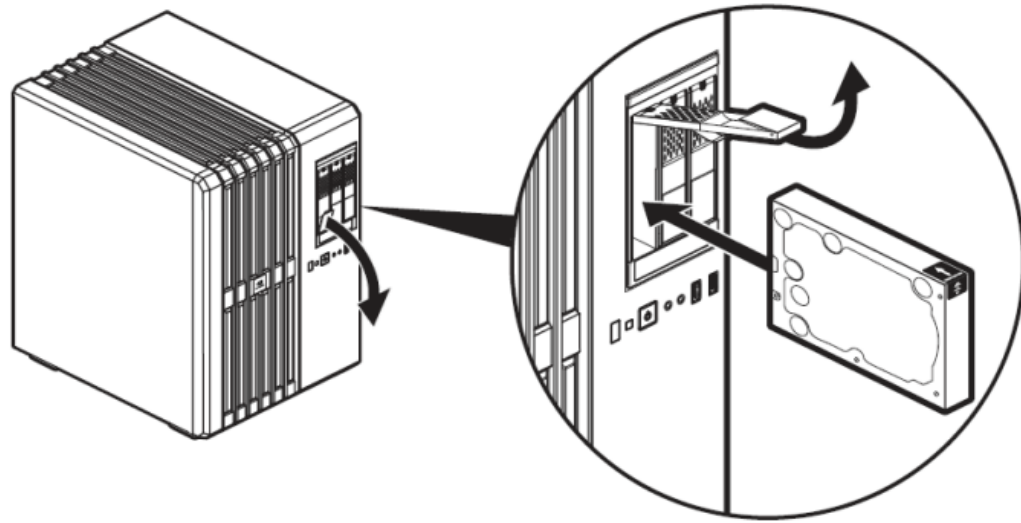
### 3.3. QuickStart Setup

The three hard disk drives are packaged separately from the system.

**You must install all three hard disk drives into the system prior to powering up the DIGITS DevBox.**

#### Installing the Hard Disks

1. Flip open the three latches on the front of the DevBox.
2. Insert the three hard disk drives into the slots.



**Figure 3 Inserting Drives**

3. Close the latches to secure.

To ensure that the hard disks are seated properly:

- ▶ Lower the latches just to the point where you need to push them closed.
- ▶ Push the hard disks to make sure they are securely seated.
- ▶ Push the latches down all the way until they snap in place.



**Figure 4 Secure Drive Latch**

The DevBox is now ready to power up.

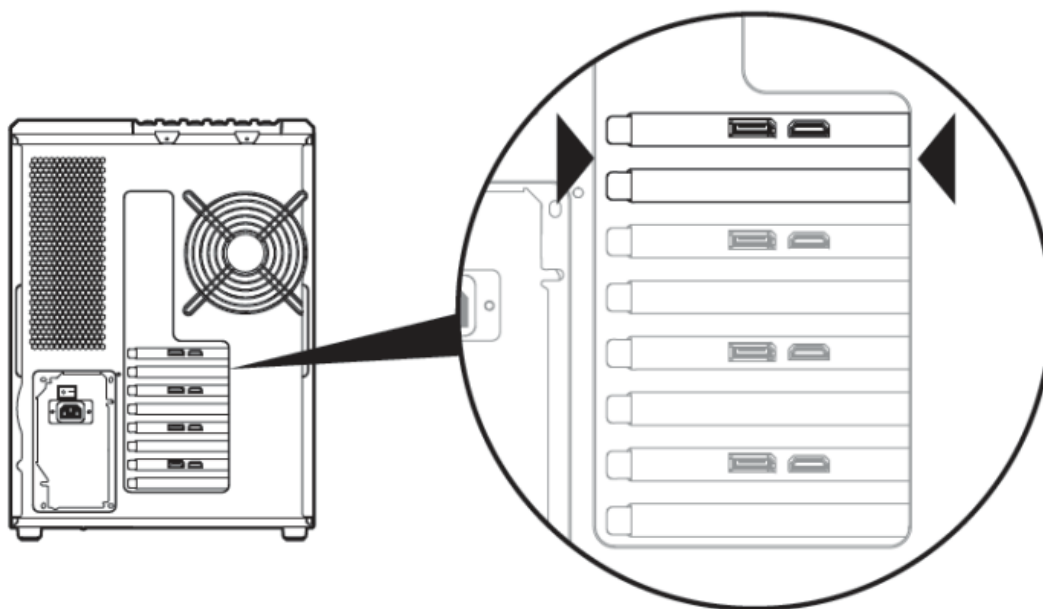
### Powering Up the DIGITS DevBox

1. Connect the power cable supplied to the power connector of the DIGITS DevBox.
2. Plug the power adapter into an appropriately rated electrical outlet. The DIGITS DevBox power consumption can reach 1350W under a heavy, multi-GPU workload.

Be sure the DevBox is connected to an adequately rated circuit to avoid overloading the circuit.

3. Connect the keyboard and mouse (not included).
4. Connect the monitor (not included).

Depending on your monitor, connect it to either the DisplayPort or HDMI connector of the graphics card located at the “top” position in the DevBox.



**Figure 5 Display Connector**

5. Connect a network cable.
6. Press and release the power button on the DIGITS DevBox.

### Initial Setup

The first time you power on the DevBox and enter Ubuntu, there are a few system setup steps to go through, such as agreeing to the NVIDIA cuDNN and CUDA software licenses agreements, specifying your time zone, and setting up your system user name and password. After that, the Welcome screen appears while the system processes the initialization. This may take a few minutes. Wait for this step to complete, and then you can log in to the system and start using the DevBox.

After logging in, the Ubuntu desktop appears and contains shortcuts to DIGITS DevBox Software Release Notes, the DIGITS DevBox User Guide, DIGITS Tutorial, and the NVIDIA DIGITS software.

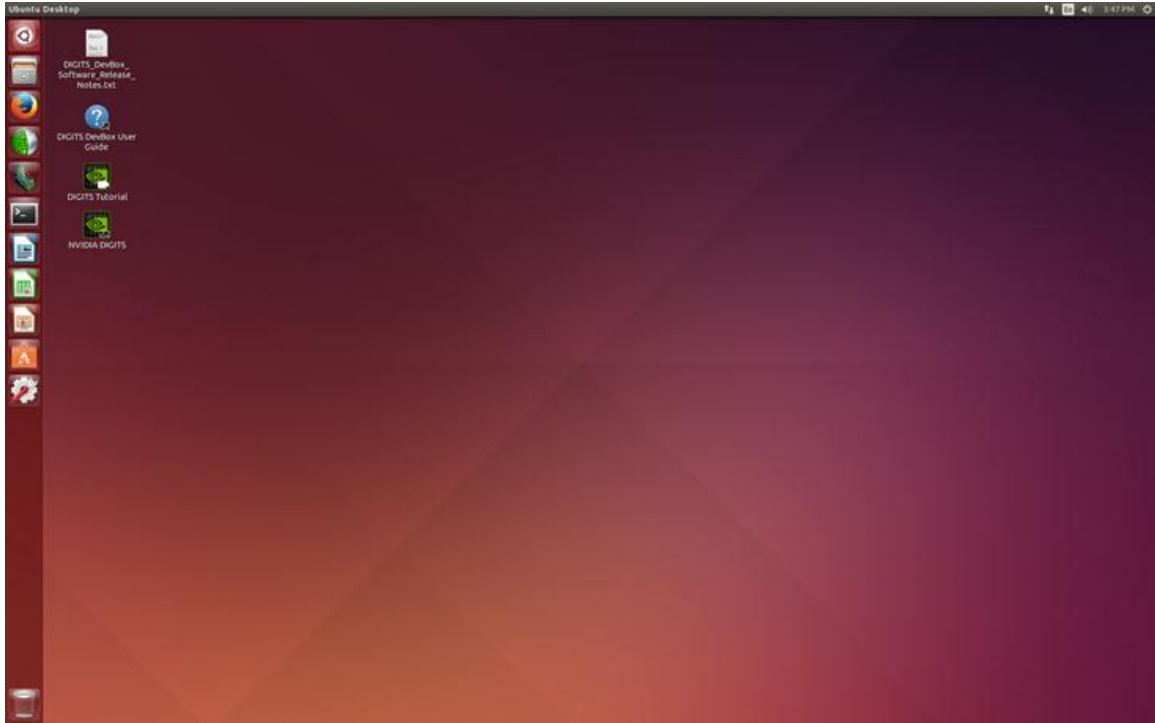


Figure 6 Ubuntu Desktop

### Using the Software

Double-click the NVIDIA DIGITS icon to launch the software.



Figure 7 DIGITS UI ICON

The DIGITS software opens to the Home screen.

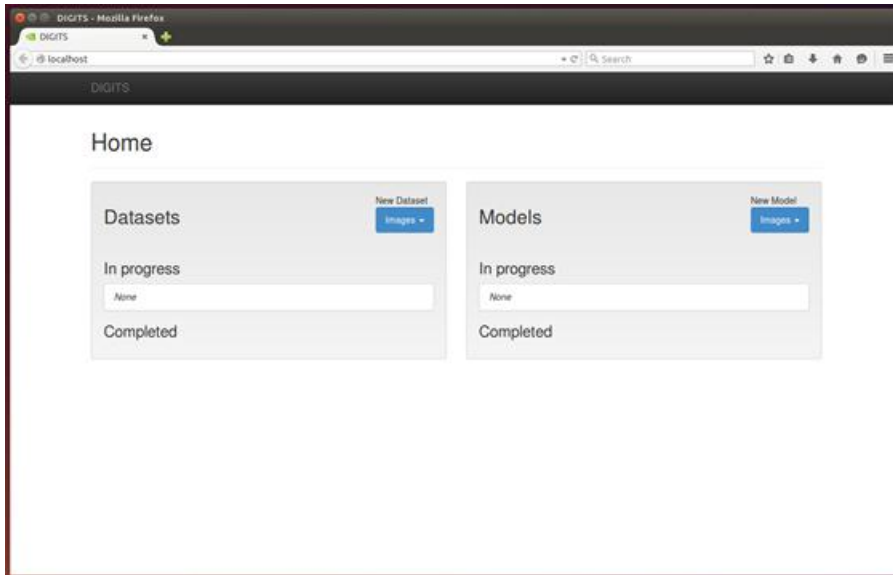


Figure 8 DIGITS UI

For an explanation of the software, double-click the DIGITS Tutorial icon to launch the tutorial video.

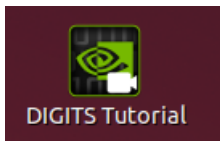


Figure 9 DIGITS Tutorial

## 3.4. Software Updates

### Automatic Updates

You will be notified automatically of software updates when they are available. Click the notification balloon and follow the prompts to update the software.

### Manual Updates

You can also check for updates yourself by opening the System Settings window.



Figure 10 System Settings

Double-click **Software & Updates** to open the corresponding dialog where you can set up your update schedule or check for updates immediately.

### 3.5. Configuring Multiple Displays

To use two displays:

1. Connect both displays to the GPU in the top position of the DevBox.
2. Turn on the Devbox and log in.

The two displays will be activated automatically.

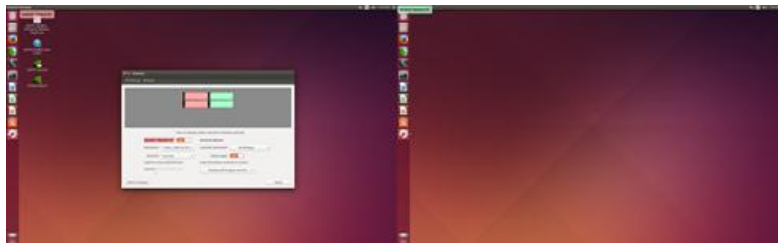


Figure 11 Two Displays

The desktop controls appear on the primary display.

3. To adjust the display configuration, such as switching primary displays or changing monitor positions, open the System Settings window, then double-click **Displays**.



Figure 12 Displays System Settings

The Displays window opens where you can make your display changes.

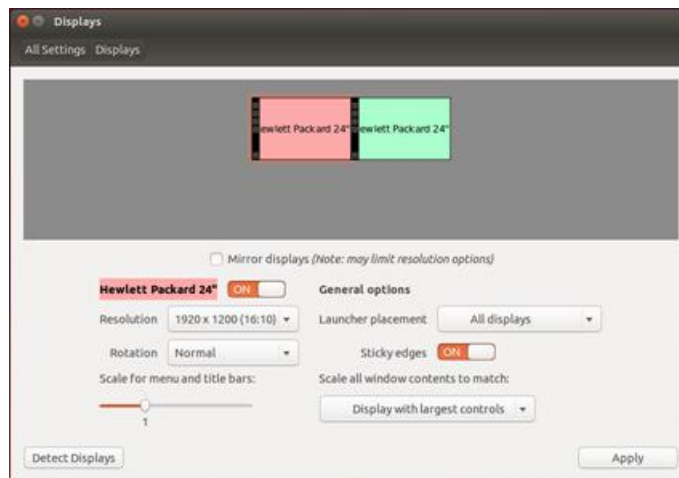


Figure 13 Displays Settings

## 3.6. Accessing DIGITS Remotely

You can easily connect to the DIGITS DevBox and run the DIGITS software over your network by opening a browser and entering ***http://host name*** (where "host name" is the host name for your DevBox) or the IP address for your DevBox.

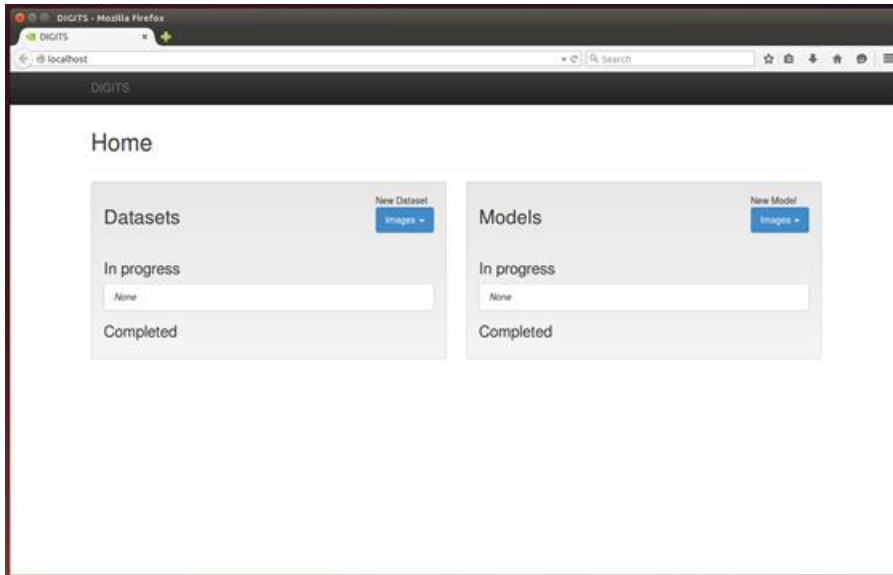


Figure 14 DIGITS UI

## 3.7. Performing a factory reset

Contact your NVIDIA support group if you need to re-image the OS on the DevBox.

## 3.8. Rebuilding the RAID 5 Array

If one of the disk drives from the RAID 5 array fails, you need to replace the failed drive with a new one and then rebuild the array to re-generate the lost data on the newly added drive.

The LEDs for each disk drive in the array indicate the general state of the corresponding disk.



Figure 15 Icy Dock

A blue light indicates the disk is powered up properly, while a blank LED indicates the disk is not working.

You can also verify the health of the array by clicking the Ubuntu search icon and then entering “disks” in the search bar.

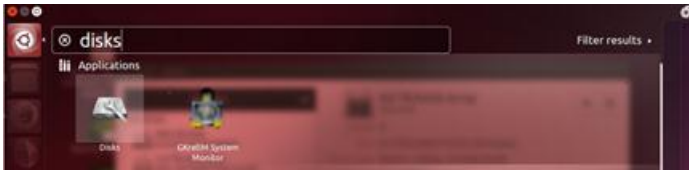


Figure 16 Desktop Search

The Disks window shows the degraded state of the array.

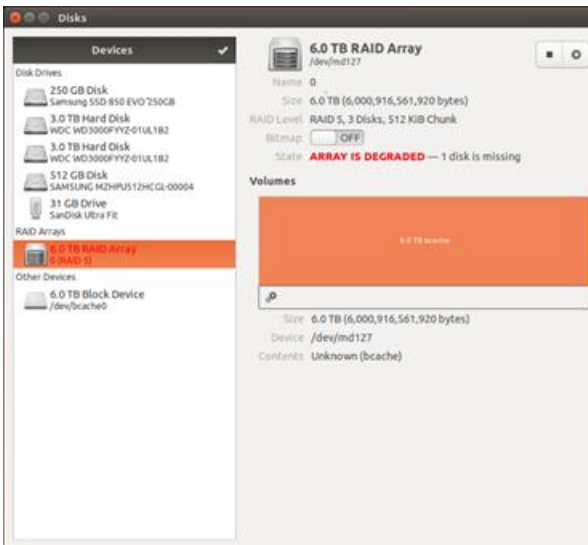


Figure 17 Disks View

### How to Replace one of the RAID 5 Hard Disks

To replace one of the RAID 5 hard disk, do the following:

1. Power down the DevBox.
2. On the front of the DevBox, flip open the latch for the hard disk that you want to replace.

Opening the latch is a two-step process.

- First pull down on the tab to unlock the latch:



Figure 18 Icy Dock Latch View

- Then swing the latch up:



Figure 19 Icy Dock Open

As you swing the latch all the way up, the hard disk unseats itself.

3. Grab the hard disk and pull it straight out.



**Figure 20 Pull Hard Disk**

4. Insert the replacement hard disk into the slot.
5. Close the latch to secure.

To ensure that the hard disk is inserted properly:

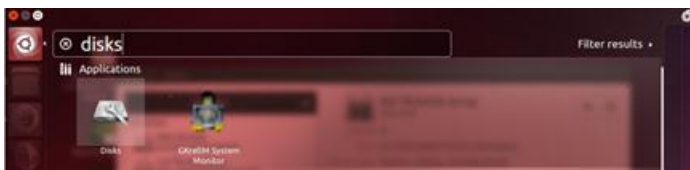
- ▶ Lower the latch just to the point where you need to push it closed.
- ▶ Push the hard disk to make sure it is securely seated.
- ▶ Push the latch down all the way until it snaps in place.

You can now power up your DevBox and rebuild the array as described in the following section.

### How to Rebuild RAID 5 Array with new Hard Disk

After you have replaced the degraded or failing RAID 5 disk with a new one, turn on the DevBox and then rebuild the RAID 5 array as follows:

1. At the Ubuntu window, click the search icon and then enter “disks” in the search bar.



**Figure 21 Desktop Search**

The Disks window shows the status of the array.

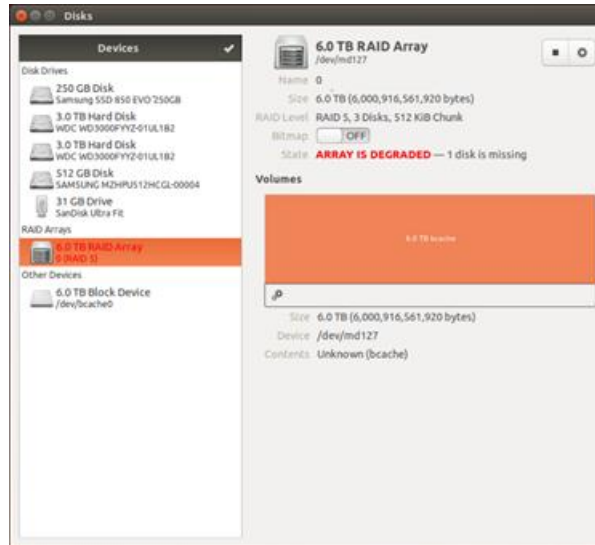


Figure 22 Disks View

2. Click the Settings icon and then click **RAID Disks** from the menu.

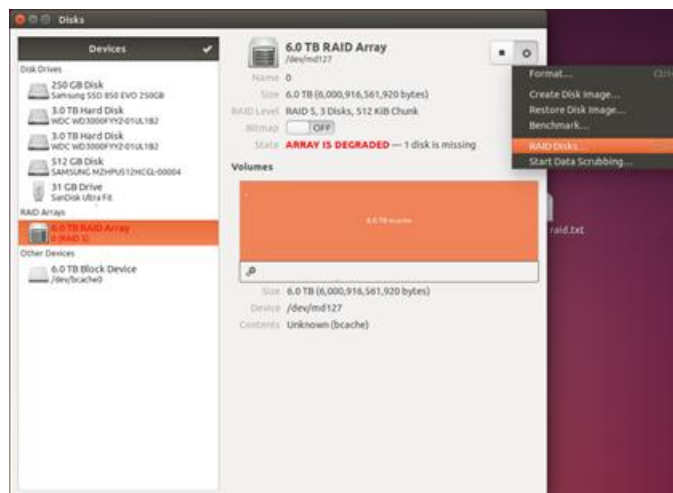


Figure 23 Disks Menu

3. From the RAID Disks window, select the disk to add from the list.

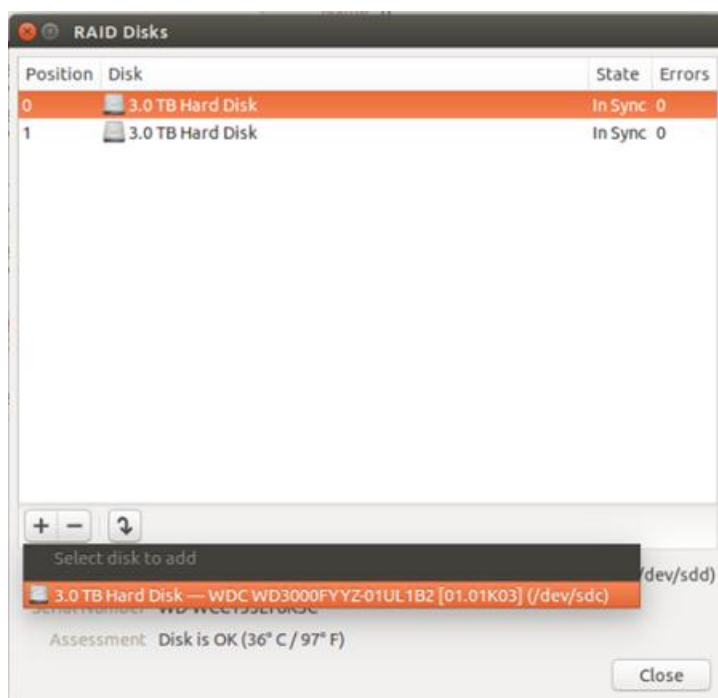


Figure 24 Disks Addition

4. Click **Add** when asked if you are sure you want to add the disk to the array.



Figure 25 Disks Addition Confirmation

5. At the *Authenticate* dialog, enter the password and then click **Authenticate**.

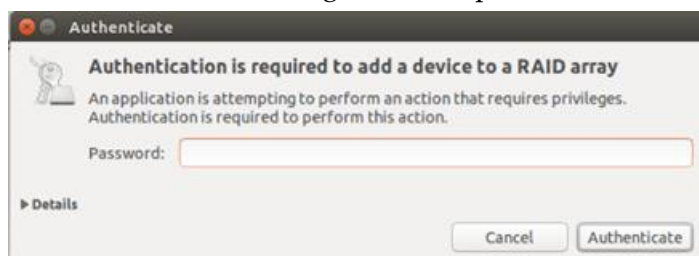


Figure 26 Disks Addition Authentication

After authentication the Disks page will show the recovery progress of the array.

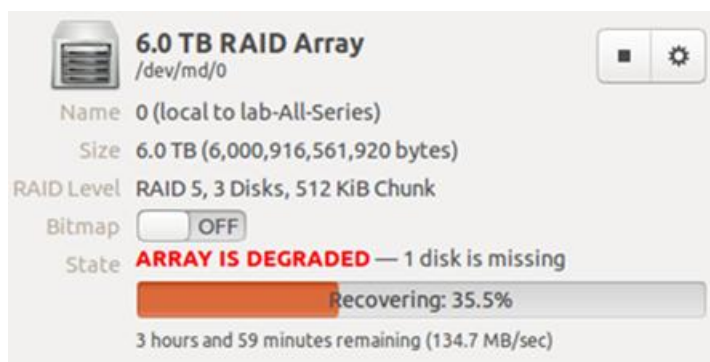


Figure 27 RAID 5 Disks Array Recovery

When completed, the Disks page shows the state of the working array.

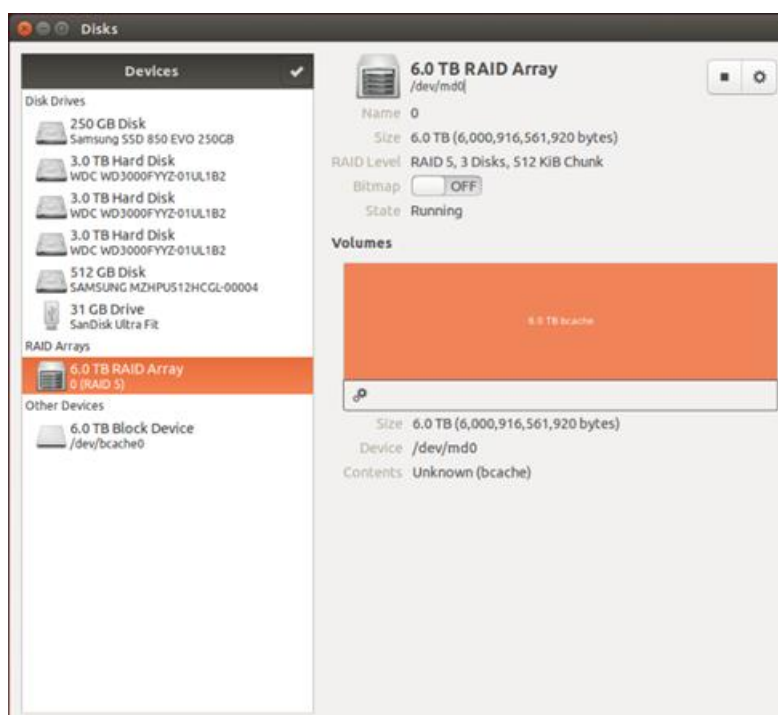


Figure 28 RAID 5 Disks Array Recovered View

# Chapter 4.

## SAFETY

### 4.1. Preface

NVIDIA products are designed to operate safely when installed and used according to the product instructions and general safety practices. The guidelines included in this document explain the potential risks associated with computer operation and provide important safety practices designed to minimize these risks. By carefully following the information contained in this document and the specific instructions provided with your product, you can protect yourself from hazards and create a safer computer work environment.

The product is designed and tested to meet IEC 60950-1, the Standard for the Safety of Information Technology Equipment. This also covers the national implementation of IEC 60950-1 based safety standards around the world e.g. UL 60950-1. These standards reduce the risk of injury from the following hazards:

- ▶ **Electric shock:** Hazardous voltage levels contained in parts of the product
- ▶ **Fire:** Overload, temperature, material flammability
- ▶ **Mechanical:** Sharp edges, moving parts, instability
- ▶ **Energy:** Circuits with high energy levels (240 volt amperes) or potential as burn hazards
- ▶ **Heat:** Accessible parts of the product at high temperatures
- ▶ **Chemical:** Chemical fumes and vapors
- ▶ **Radiation:** Noise, ionizing, laser, ultrasonic waves

Retain and follow all product safety and operating instructions. Always refer to the documentation supplied with your equipment. Observe all warnings on the product and in the operating instructions.

*Read all safety information below and operating instructions before using NVIDIA® DIGITS DevBox™ to avoid injury.*











**WARNING: FAILURE TO FOLLOW THESE SAFETY INSTRUCTIONS COULD RESULT IN FIRE, ELECTRIC SHOCK OR OTHER INJURY OR DAMAGE. ELECTRICAL EQUIPMENT CAN BE HAZARDOUS IF MISUSED. OPERATION OF THIS PRODUCT, OR SIMILAR PRODUCTS, MUST ALWAYS BE SUPERVISED BY AN ADULT. DO NOT ALLOW CHILDREN ACCESS TO THE INTERIOR OF ANY ELECTRICAL PRODUCT AND DO NOT PERMIT THEM TO HANDLE ANY CABLES.**

## 4.2. Important Safety Information

To reduce the risk of bodily injury, electric shock, fire and damage to the equipment, observe all precautions included in this guide.

## 4.3. Symbols on Equipment

Symbol	Meaning
	This symbol in conjunction with any of the following symbols indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details.
	This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.  <b>WARNING:</b> To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.
	This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.  <b>WARNING:</b> To reduce risk of injury from electric shock hazards, do not open this enclosure.
	This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.  <b>WARNING:</b> To reduce the risk of injury from a hot component, allow the surface to cool before touching.
	This symbol indicates that the component exceeds the recommended weight for one individual to handle safely.  <b>WARNING:</b> To reduce the risk of personal injury or damage to the equipment,

Symbol	Meaning
	observe local occupational health and safety require and guidelines for manual material handling.
	<p>The symbol indicates the presence of a sharp edge or object that can cause cuts or other bodily injury.</p> <p><b>WARNING:</b> To prevent cuts or other bodily injury, do not contact sharp edge or object.</p>
	<p>These symbols indicate the presence of mechanical parts that can result in pinching, crushing or other bodily injury.</p> <p><b>WARNING:</b> To avoid risk of bodily injury, keep away from moving parts.</p>
	<p>This symbol indicates the presence of a potential tip over hazard that can result in bodily injury.</p> <p><b>WARNING:</b> To avoid risk of bodily injury, follow all instructions for maintaining stability of the equipment during transport, installation and maintenance.</p>

## 4.4. General Precautions

To reduce the risk of personal injury or damage to the equipment:

- ▶ Shut down the product and disconnect all AC power cords and cables before installation.
- ▶ Do not connect or disconnect any cables when perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- ▶ Never turn on any equipment when there is evidence of fire, water, or structural damage.
- ▶ Place the product away from radiators, heat registers, stoves, amplifiers, or other products that produce heat.
- ▶ Never use the product in a wet location.
- ▶ Avoid inserting foreign objects through openings in the product.
- ▶ Do not use conductive tools that could bridge live parts.
- ▶ Do not make mechanical or electrical modifications to the equipment.
- ▶ Use the product only with approved equipment.
- ▶ Follow all cautions and instructions marked on the equipment. Do not attempt to defeat safety interlocks (where provided).
- ▶ Operate DIGITS DevBox™ in a place where the temperature is always between 5 and 30°C (41 to 86°F).

## 4.5. Precautions for Power Connection

### Power Cords:

To reduce the risk of electric shock or damage to the equipment:

- ▶ Use power cables provided with this product.
- ▶ If you have to change the power cords for any reason, use an approved power cord.
- ▶ You must use a power cord rated for your product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
- ▶ Make sure that the total ampere rating of all products plugged into an extension cord or power strip does not exceed 80 percent of the ampere ratings limit for the extension cord or power strip.
- ▶ The product is equipped with a three-wire electrical grounding-type plug which has a third pin for ground. This plug only fits into a grounded electrical power outlet.
- ▶ Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- ▶ Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- ▶ Do not place objects on AC power cords or cables. Arrange them so that no one may accidentally step on or trip over them.
- ▶ Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug.
- ▶ When possible, use one hand only to connect or disconnect cables.
- ▶ Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications.

### Power Supply

- ▶ Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label. If you have the question about the type of power source to use, contact your authorized service.
- ▶ Connect to a properly wired and grounded electrical outlet, always follow your local/national wiring rules.
- ▶ The socket-outlet shall be installed near the equipment and shall be easily accessible.
- ▶ If want to help protect your system from sudden, transient increases and decreases in electrical power, a surge suppressor, line conditioner and so on could be used.
- ▶ Never force a connector into a port. Check for obstructions on the port. If the connector and port don't join with reasonable ease, they probably don't match. Make

sure that the connector matches the port and that you have positioned the connector correctly in relation to the port.

## 4.6. Precaution for Communication Cable

To reduce the risk of exposure to shock hazard from communication cable:

- ▶ Do not connect communication cable during a lightning storm. There may be a remote risk of electric shock from lightning.
- ▶ Do not connect or use communication cable in a wet location.
- ▶ Disconnect the communication cable before opening a product enclosure, touching or installing internal components.

## 4.7. Power Rating of NVIDIA DIGITS DevBox

Rating input: 115-240VAC, 17-10A, 50/60Hz.

# Chapter 5.

## COMPLIANCE

The NVIDIA DIGITS DevBox is compliant with the regulations listed in this section.

### 5.1. UNITED STATES

Federal Communications Commission (FCC)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including any interference that may cause undesired operation of the device.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Underwriters Laboratories (UL)



### 5.2. CANADA

Industry Canada (IC)

CAN ICES-3(A)/NMB-3(A)

## 5.3. EUROPEAN UNION

European Conformity; Conformité Européenne (CE)



This device complies with the following Directives:

EMC Directive for Class A, I.T.E equipment.

Low Voltage Directive for electrical safety

RoHS Directive for hazardous substances

A copy of the Declaration of Conformity to the essential requirements may be obtained directly from NVIDIA GmbH (Floessergasse 2, 81369 Munich, Germany).

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