IT290 SEMINAR

DEEP DIVE
A SYSTEM RESOURCE MONITOR

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OVERVIEW

System Resource monitor tool made using Python and PyQt

This utility monitors various metrics of the computer system. It is built using technologies such as Python, Psutil, PyCPUinfo, Distro and Qt5.

REAL TIME

CPU & MEMORY USAGE

PACKET COUNT

OBJECTIVE

CPU

Overall Usage : Percentage and Clock Speeds
Per-Core/thread: Occupancy and duration,Active Clock Speeds
Context Switches, system calls, Interrupts: Counts for software and hardware

MEMORY

Utilization and swapping rate
Usage/Availability: Percentage and size in megabytes
Partition Information: Occupancy and size of physical/logical partitions.

INTERNET

Global Network Statistics: Packet Count and size rate
Upload/download: Packet Count and size
Per-NIC Activity: Transfer rate,Tranmission, Dropped transfers

PROCESSES

Dynamic Process Listing: PIDs, names, terminal , usernames, states, CPU/Memory Usage
Per-Process Details: CPU/Memory usage, context switches, threads
Process Control: Kill, Resume, Terminate, Suspend Options

SYSTEM/HARDWARE

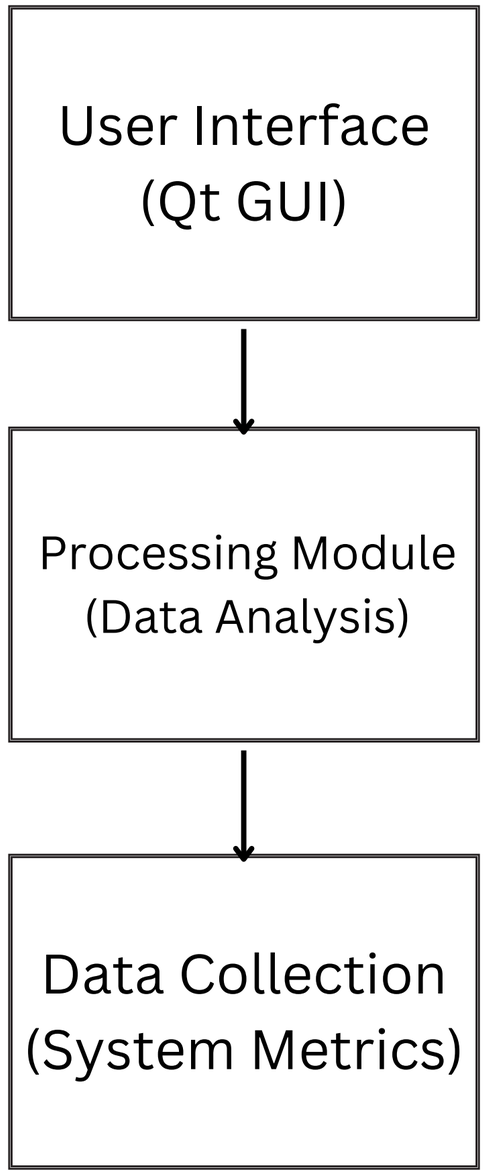
Software: OS, Kernel Names and Versions
Hardware: CPU Name, Vendor, Frequency, Features

VISUALLY REPRESENT REAL-TIME DATA CHANGES FOR CLEAR UNDERSTANDING.

SYSTEM DESIGN

User Interface designed using QT Designer
Collection & Processing of Data done by Python Libraries

Language Used : Python
Libraries Used : Psutil, Os, PyQt5, PyCPUInfo, Distro, Numpy
Working Environment : Any Linux Distro
Requirements : A Linux Environment, Numpy, Psutil, Distro, PyQT5, PyQtGraph, PyCPUinfo, PyQTChart

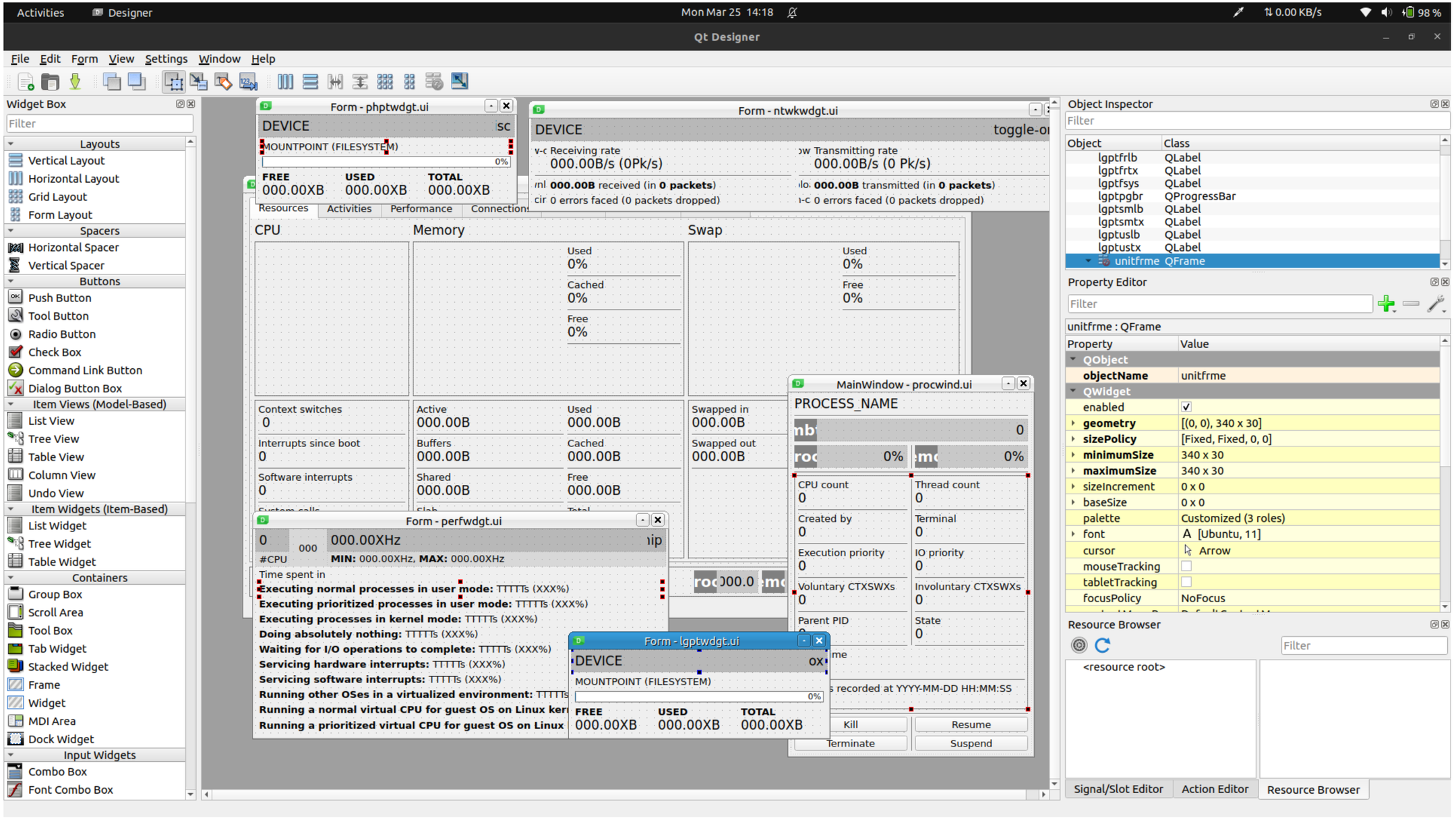


METHODOLOGY

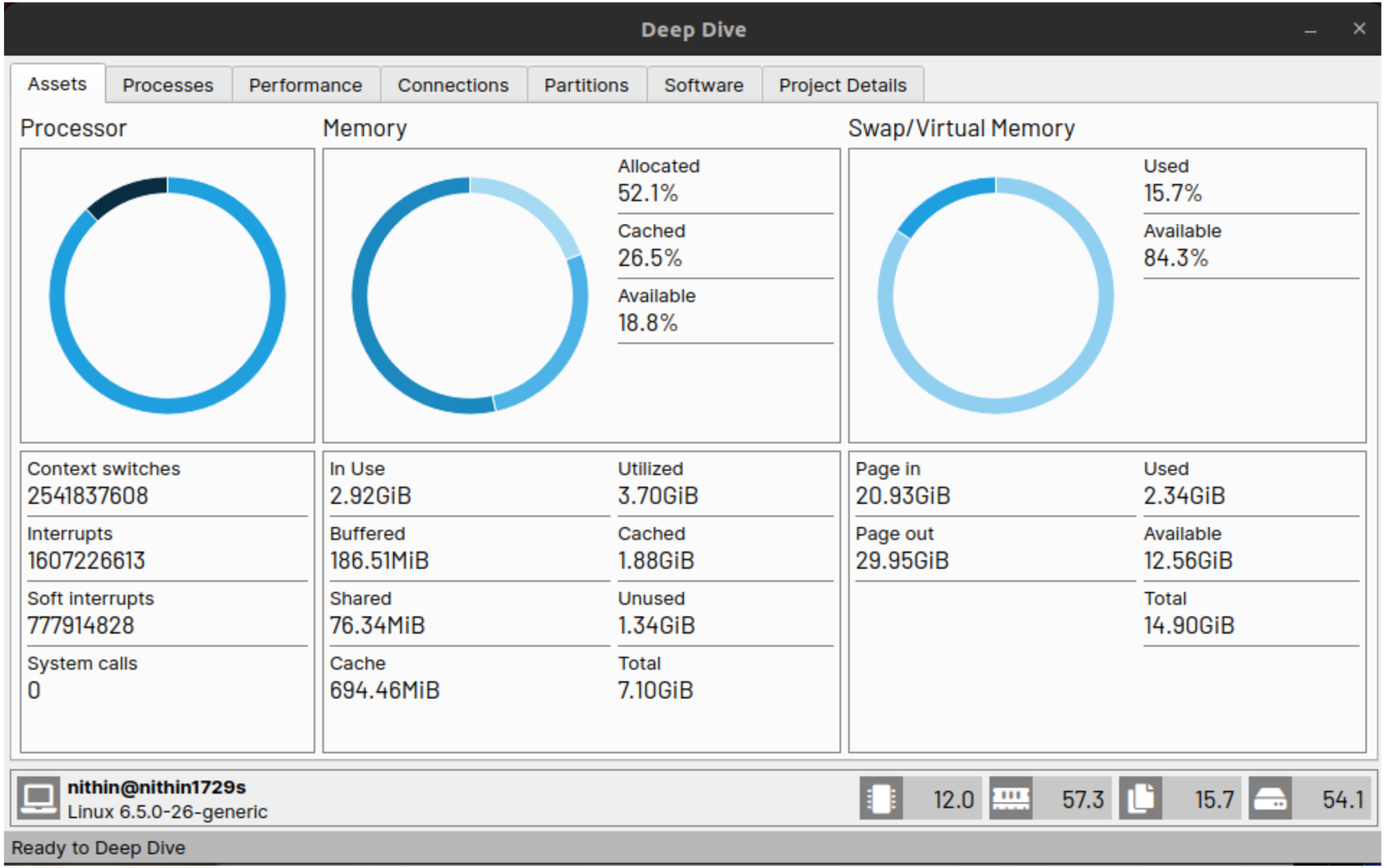
BACKEND

```
while ( application running in an interval of 0.25sec )
{
        Distro.name()
        psutil.boot_time()
        diskioqt.read_count
        get_cpu_info().get("brand_raw")
        get_cpu_info().get("count")
        proc.info["pid"]
        proc.info["name"]
        psutil.cpu_percent()
        time.time()
        ......many more shown in the report
}
```

FRONTEND


Activities
Designer
Mon Mar 25 14:18
0.00 KB/s
98 %
Qt Designer
File Edit Form View Settings Window Help
Widget Box
Filter
Layouts
Vertical Layout
Horizontal Layout
Grid Layout
Form Layout
Spacers
Horizontal Spacer
Vertical Spacer
Buttons
Push Button
Tool Button
Radio Button
Check Box
Command Link Button
Dialog Button Box
Item Views (Model-Based)
List View
Tree View
Table View
Column View
Undo View
Item Widgets (Item-Based)
List Widget
Tree Widget
Table Widget
Containers
Group Box
Scroll Area
Tool Box
Tab Widget
Stacked Widget
Frame
Widget
MDI Area
Dock Widget
Input Widgets
Combo Box
Font Combo Box
Form - phptwdgt.ui
DEVICE
MOUNTPOINT (FILESYSTEM)
FREE
USED
TOTAL
000.00XB
Form - ntwkwdgt.ui
DEVICE
Receiving rate
000.00B/s (0Pk/s)
Transmitting rate
000.00B/s (0 Pk/s)
000.00B received (in 0 packets)
000.00B transmitted (in 0 packets)
0 errors faced (0 packets dropped)
Resources
Activities
Performance
CPU
Memory
Swap
Used
0%
Cached
0%
Free
0%
Context switches
Interrupts since boot
Software interrupts
Active
Buffers
Shared
Swapped in
Swapped out
Form - perfwdgt.ui
000.00XHz
#CPU
MIN: 000.00XHz, MAX: 000.00XHz
Time spent in
Executing normal processes in user mode: TTTTs (XXX%)
Executing prioritized processes in user mode: TTTTs (XXX%)
Executing processes in kernel mode: TTTTs (XXX%)
Doing absolutely nothing: TTTTs (XXX%)
Waiting for I/O operations to complete: TTTTs (XXX%)
Servicing hardware interrupts: TTTTs (XXX%)
Servicing software interrupts: TTTTs (XXX%)
Running other OSes in a virtualized environment: TTTTs
Running a normal virtual CPU for guest OS on Linux
Running a prioritized virtual CPU for guest OS on Linux
MainWindow - procwind.ui
PROCESS_NAME
CPU count
Thread count
Created by
Terminal
Execution priority
IO priority
Voluntary CTXSWXs
Involuntary CTXSWXs
Parent PID
State
recorded at YYYY-MM-DD HH:MM:SS
Kill
Resume
Terminate
Suspend
Form - lgptwdgt.ui
DEVICE
MOUNTPOINT (FILESYSTEM)
FREE
USED
TOTAL
000.00XB
Object Inspector
Filter
Object
Class
lgptfrlb QLabel
lgptfrtx QLabel
lgptfsys QLabel
lgptpgbr QProgressBar
lgptsmlb QLabel
lgptsmtx QLabel
lgptuslb QLabel
lgptustx QLabel
unitfrme QFrame
Property Editor
unitfrme : QFrame
Property
Value
QObject
objectName
unitfrme
QWidget
enabled
geometry
[(0, 0), 340 x 30]
sizePolicy
[Fixed, Fixed, 0, 0]
minimumSize
340 x 30
maximumSize
340 x 30
sizeIncrement
0 x 0
baseSize
0 x 0
palette
Customized (3 roles)
font
A [Ubuntu, 11]
cursor
Arrow
mouseTracking
tabletTracking
focusPolicy
NoFocus
Resource Browser
<resource root>
Signal/Slot Editor
Action Editor
Resource Browser

RESULTS


Deep Dive
Assets
Processes
Performance
Connections
Partitions
Software
Project Details
Processor
Memory
Allocated
52.1%
Cached
26.5%
Available
18.8%
Swap/Virtual Memory
Used
15.7%
Available
84.3%
Context switches
2541837608
Interrupts
1607226613
Soft interrupts
777914828
System calls
0
In Use
2.92GiB
Utilized
3.70GiB
Buffered
186.51MiB
Cached
1.88GiB
Shared
76.34MiB
Unused
1.34GiB
Cache
694.46MiB
Total
7.10GiB
Page in
20.93GiB
Used
2.34GiB
Page out
29.95GiB
Available
12.56GiB
Total
14.90GiB
nithin@nithin1729s
Linux 6.5.0-26-generic
12.0
57.3
15.7
54.1
Ready to Deep Dive

Deep Dive

Assets | Processes | Performance | Connections | Partitions | Software | Project Details

Processes — 388 processes

PID	Process Name	Terminal	Creator	State	CPU %	Memory %	Thread #
1	systemd	None	root	sleeping	0.0	0.1	1
2	kthreadd	None	root	sleeping	0.0	0.0	1
3	rcu_gp	None	root	idle	0.0	0.0	1
4	rcu_par_gp	None	root	idle	0.0	0.0	1
5	slub_flushwq	None	root	idle	0.0	0.0	1
6	netns	None	root	idle	0.0	0.0	1
11	mm_percpu_wq	None	root	idle	0.0	0.0	1
12	rcu_tasks_kthread	None	root	idle	0.0	0.0	1
13	rcu_tasks_rude_kthread	None	root	idle	0.0	0.0	1
14	rcu_tasks_trace_kthread	None	root	idle	0.0	0.0	1
15	ksoftirqd/0	None	root	sleeping	0.0	0.0	1
16	rcu_preempt	None	root	idle	0.3	0.0	1
17	migration/0	None	root	sleeping	0.0	0.0	1
18	idle_inject/0	None	root	sleeping	0.0	0.0	1
19	cpuhp/0	None	root	sleeping	0.0	0.0	1
20	cpuhp/2	None	root	sleeping	0.0	0.0	1
21	idle_inject/2	None	root	sleeping	0.0	0.0	1
22	migration/2	None	root	sleeping	0.0	0.0	1
23	ksoftirqd/2	None	root	sleeping	0.0	0.0	1

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Linux 6.5.0-26-generic

5.9 | 58.4 | 15.7 | 54.1

Ready to Deep Dive

PID #74

cpuhp/9

#74

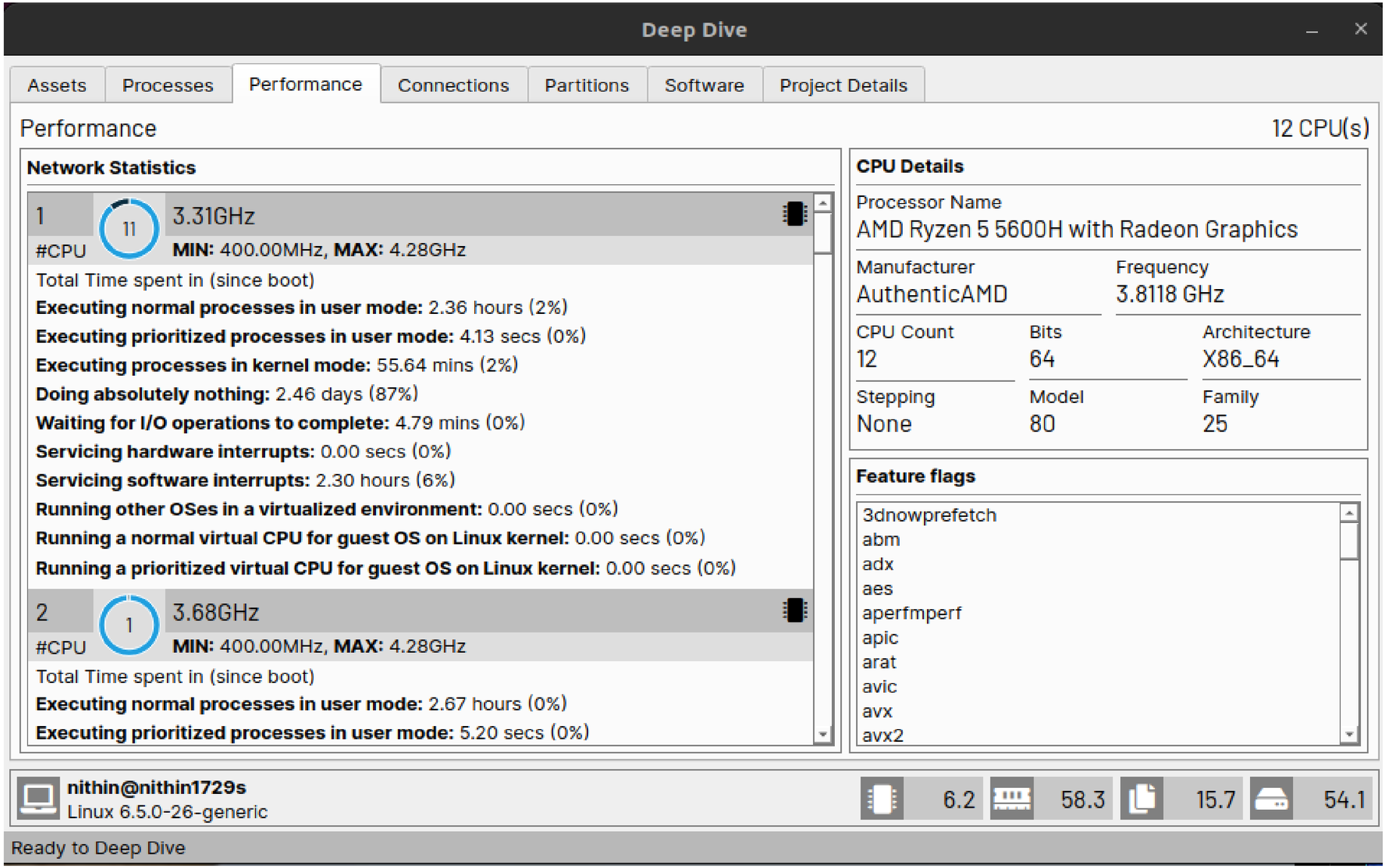
0.0% | 0.0%

CPU # 9	Thread # 1
Created by root	Terminal None
Execution priority 0	IO priority 0
Voluntary CTXSWXs 232	Involuntary CTXSWXs 232
Parent PID 2	Process State Sleeping

Start time
2024-03-24, 21:21:54

Metrics acquired on 2024-03-28, 10:48:06.

Kill | Resume
Terminate | Suspend


Deep Dive
Assets
Processes
Performance
Connections
Partitions
Software
Project Details
Performance
12 CPU(s)
Network Statistics
1
11
3.31GHz
#CPU
MIN: 400.00MHz, MAX: 4.28GHz
Total Time spent in (since boot)
Executing normal processes in user mode: 2.36 hours (2%)
Executing prioritized processes in user mode: 4.13 secs (0%)
Executing processes in kernel mode: 55.64 mins (2%)
Doing absolutely nothing: 2.46 days (87%)
Waiting for I/O operations to complete: 4.79 mins (0%)
Servicing hardware interrupts: 0.00 secs (0%)
Servicing software interrupts: 2.30 hours (6%)
Running other OSes in a virtualized environment: 0.00 secs (0%)
Running a normal virtual CPU for guest OS on Linux kernel: 0.00 secs (0%)
Running a prioritized virtual CPU for guest OS on Linux kernel: 0.00 secs (0%)
2
1
3.68GHz
#CPU
MIN: 400.00MHz, MAX: 4.28GHz
Total Time spent in (since boot)
Executing normal processes in user mode: 2.67 hours (0%)
Executing prioritized processes in user mode: 5.20 secs (0%)
CPU Details
Processor Name
AMD Ryzen 5 5600H with Radeon Graphics
Manufacturer
AuthenticAMD
Frequency
3.8118 GHz
CPU Count
12
Bits
64
Architecture
X86_64
Stepping
None
Model
80
Family
25
Feature flags
3dnowprefetch
abm
adx
aes
aperfmperf
apic
arat
avic
avx
avx2
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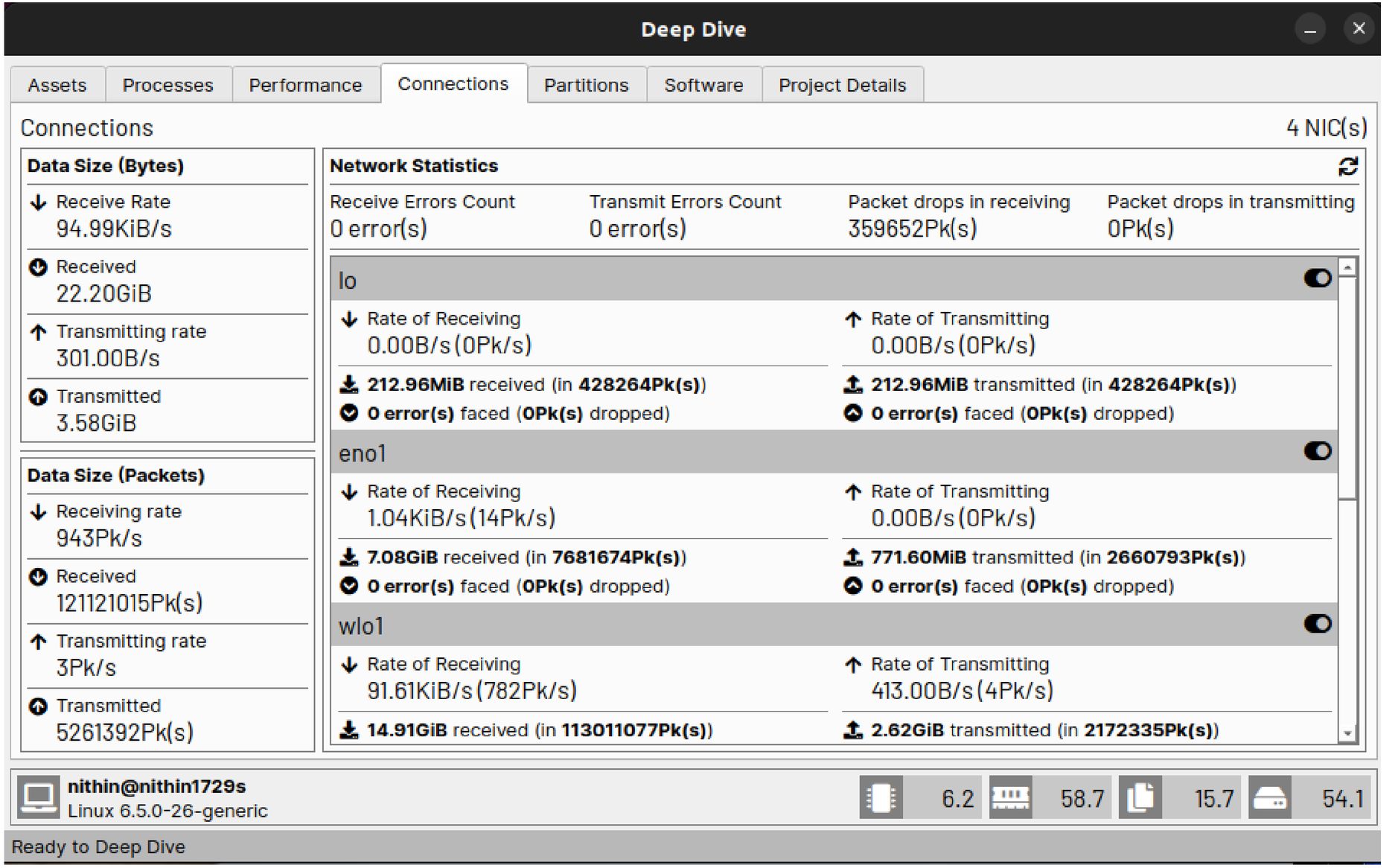
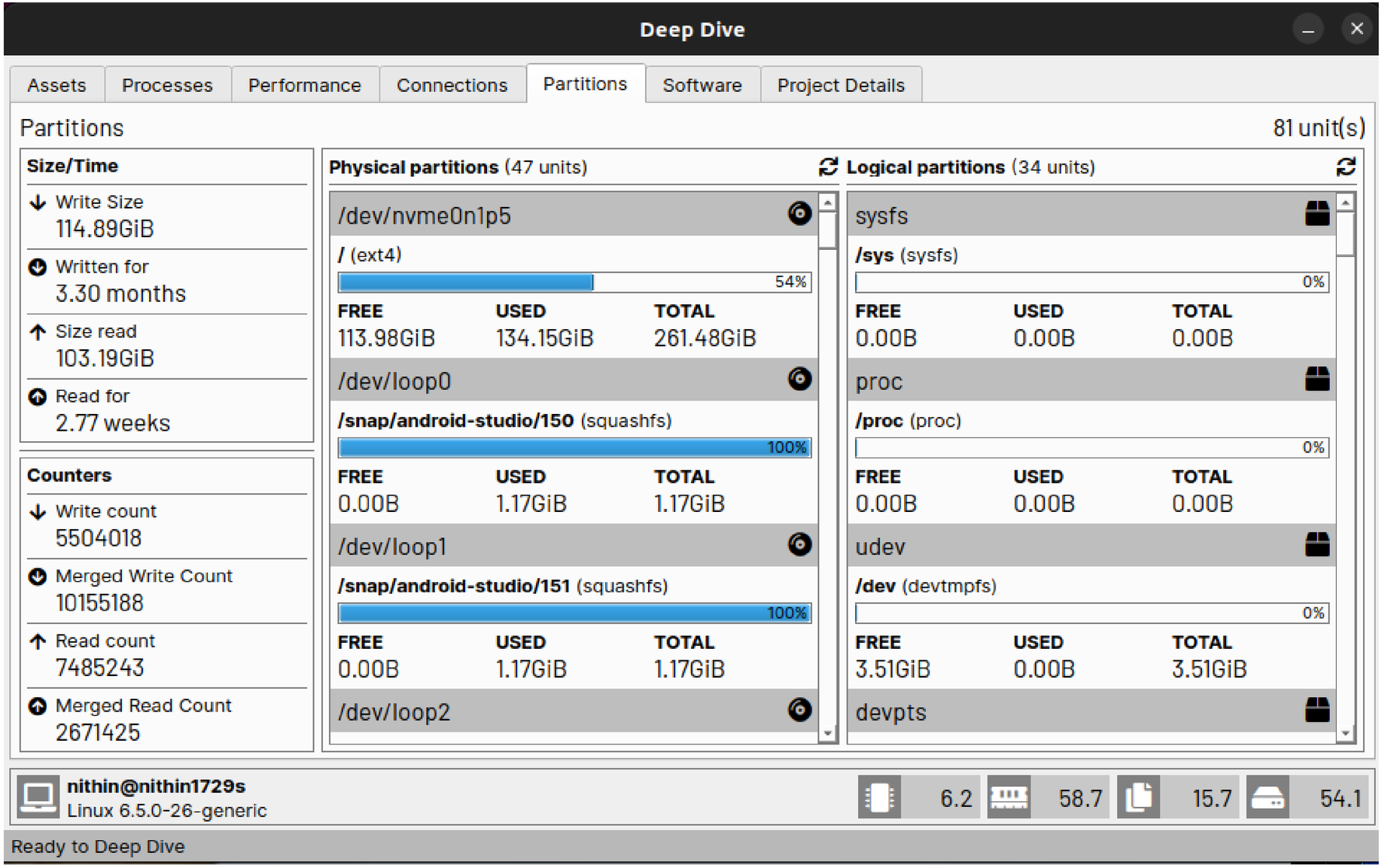
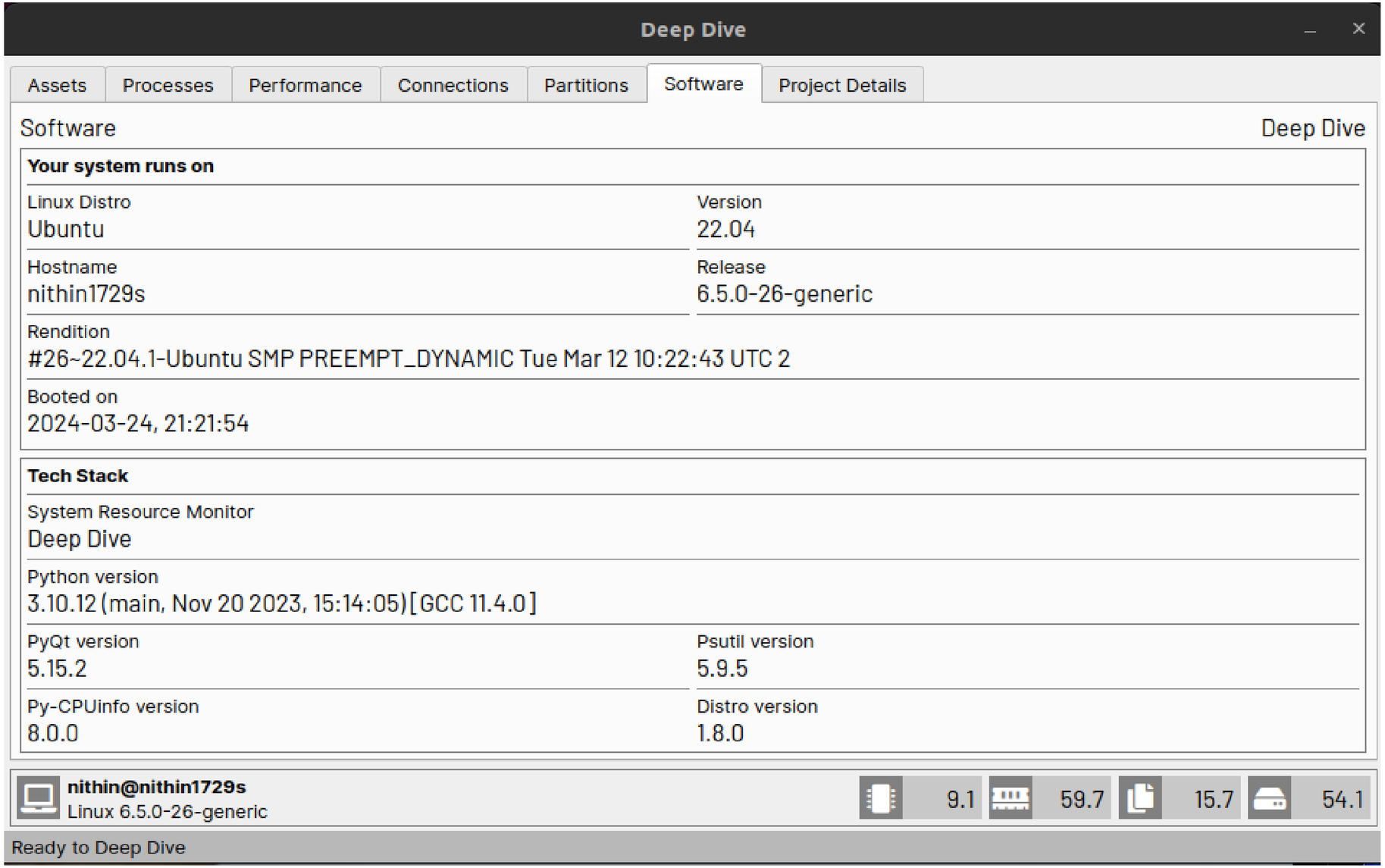
Linux 6.5.0-26-generic
6.2
58.3
15.7
54.1
Ready to Deep Dive


Deep Dive
Assets
Processes
Performance
Connections
Partitions
Software
Project Details
Connections
4 NIC(s)
Data Size (Bytes)
Receive Rate
94.99KiB/s
Received
22.20GiB
Transmitting rate
301.00B/s
Transmitted
3.58GiB
Data Size (Packets)
Receiving rate
943Pk/s
Received
121121015Pk(s)
Transmitting rate
3Pk/s
Transmitted
5261392Pk(s)
Network Statistics
Receive Errors Count
0 error(s)
Transmit Errors Count
0 error(s)
Packet drops in receiving
359652Pk(s)
Packet drops in transmitting
0Pk(s)
lo
Rate of Receiving
0.00B/s (0Pk/s)
Rate of Transmitting
0.00B/s (0Pk/s)
212.96MiB received (in 428264Pk(s))
0 error(s) faced (0Pk(s) dropped)
212.96MiB transmitted (in 428264Pk(s))
0 error(s) faced (0Pk(s) dropped)
eno1
Rate of Receiving
1.04KiB/s (14Pk/s)
Rate of Transmitting
0.00B/s (0Pk/s)
7.08GiB received (in 7681674Pk(s))
0 error(s) faced (0Pk(s) dropped)
771.60MiB transmitted (in 2660793Pk(s))
0 error(s) faced (0Pk(s) dropped)
wlo1
Rate of Receiving
91.61KiB/s (782Pk/s)
Rate of Transmitting
413.00B/s (4Pk/s)
14.91GiB received (in 113011077Pk(s))
2.62GiB transmitted (in 2172335Pk(s))
nithin@nithin1729s
Linux 6.5.0-26-generic
6.2
58.7
15.7
54.1
Ready to Deep Dive


Deep Dive
Assets
Processes
Performance
Connections
Partitions
Software
Project Details
Partitions
81 unit(s)
Size/Time
Write Size
114.89GiB
Written for
3.30 months
Size read
103.19GiB
Read for
2.77 weeks
Counters
Write count
5504018
Merged Write Count
10155188
Read count
7485243
Merged Read Count
2671425
Physical partitions (47 units)
/dev/nvme0n1p5
/ (ext4)
54%
FREE
113.98GiB
USED
134.15GiB
TOTAL
261.48GiB
/dev/loop0
/snap/android-studio/150 (squashfs)
100%
FREE
0.00B
USED
1.17GiB
TOTAL
1.17GiB
/dev/loop1
/snap/android-studio/151 (squashfs)
100%
FREE
0.00B
USED
1.17GiB
TOTAL
1.17GiB
/dev/loop2
Logical partitions (34 units)
sysfs
/sys (sysfs)
0%
FREE
0.00B
USED
0.00B
TOTAL
0.00B
proc
/proc (proc)
0%
FREE
0.00B
USED
0.00B
TOTAL
0.00B
udev
/dev (devtmpfs)
0%
FREE
3.51GiB
USED
0.00B
TOTAL
3.51GiB
devpts
nithin@nithin1729s
Linux 6.5.0-26-generic
6.2
58.7
15.7
54.1
Ready to Deep Dive


Deep Dive
Assets
Processes
Performance
Connections
Partitions
Software
Project Details
Software
Deep Dive
Your system runs on
Linux Distro
Ubuntu
Version
22.04
Hostname
nithin1729s
Release
6.5.0-26-generic
Rendition
#26~22.04.1-Ubuntu SMP PREEMPT_DYNAMIC Tue Mar 12 10:22:43 UTC 2
Booted on
2024-03-24, 21:21:54
Tech Stack
System Resource Monitor
Deep Dive
Python version
3.10.12 (main, Nov 20 2023, 15:14:05) [GCC 11.4.0]
PyQt version
5.15.2
Psutil version
5.9.5
Py-CPUinfo version
8.0.0
Distro version
1.8.0
nithin@nithin1729s
Linux 6.5.0-26-generic
9.1
59.7
15.7
54.1
Ready to Deep Dive

INDIVISUAL CONTRIBUTION

Backend Dev: Nithin S, Ayush Kumar
Frontend Dev: Jay Chavan, Nithin S

FUTURE WORK

Reducing Overhead
Better System Architecture
Integrating Alerts
Historical Data Analysis
Enable Customization
Multi Platform Support

THANK YOU