

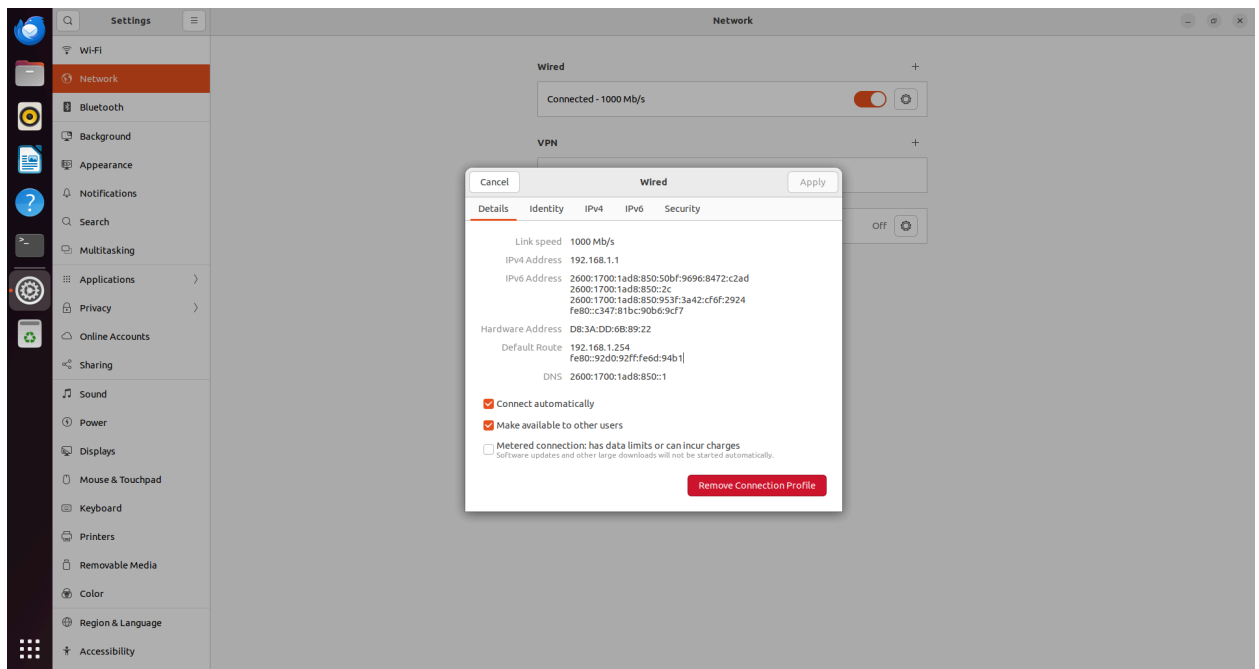
Grafana

Objective: The objective of this lab is to install and configure Grafana on a Raspberry Pi for real-time monitoring of both local system performance and the availability of external domains such as GitHub.com, with inclusion of basic information about my Home Router. This will be achieved by integrating Prometheus as the primary data source for collecting system metrics and utilizing the Blackbox Exporter to monitor the status and response times of specified websites. The final setup will include the creation of Grafana dashboards to visualize data from both sources, providing a comprehensive and interactive monitoring solution.

Equipment: Raspberry Pi 4

Setps:

1. I ran the command **sudo apt update && sudo apt upgrade -y** to make sure my Raspberry Pi is up to date
2. I **made a static IP configuration** on the Raspberry Pi



3. I ran the command `tar xvf node_exporter-1.8.0.linux-arm64.tar.gz` to install node exporter and verified it's working

```
david@davidspl: ~/node_exporter-1.8.0.linux-arm64
$ tar xvf node_exporter-1.8.0.linux-arm64.tar.gz
cd node_exporter-1.8.0.linux-arm64/
node_exporter-1.8.0.linux-arm64/
node_exporter-1.8.0.linux-arm64/NOTICE
node_exporter-1.8.0.linux-arm64/node_exporter
node_exporter-1.8.0.linux-arm64/LICENSE
david@davidspl:~/node_exporter-1.8.0.linux-arm64$ ls
LICENSE  node_exporter  NOTICE
david@davidspl:~/node_exporter-1.8.0.linux-arm64$ ./node_exporter
ts=2025-05-27T19:28:53.887Z caller=node_exporter.go:193 level=info msg="Starting node_exporter" version="(version=1.8.0, branch=HEAD, revision=cadbid1190ad95c6b951758f0ff4c94e5e0ce)"
ts=2025-05-27T19:28:53.887Z caller=node_exporter.go:194 level=info msg="Build context" build_context="(go=go1.22.2, platform=linux/arm64, user=root@8507d3f12650c, date=20240424-13:16:18, tags=unknown)"
ts=2025-05-27T19:28:53.889Z caller=filesystem_common.go:111 level=info collector=filesystem msg="Parsed flag --collector.filesystem.mount-points-exclude" flag="/(dev|proc|run|credentials|.+)sys|var|lib|do
cker/.+|var|lib|containers|storage/.+)|($|/)"
ts=2025-05-27T19:28:53.889Z caller=filesystem_common.go:113 level=info collector=filesystem msg="Parsed flag --collector.filesystem.fs-types-exclude" flag="^(autofs|binfmt_misc|bpf|cgroup2|configfs|debugf
s|devpts|devnpts|fusectl|hugetlbfs|iso9660|nfs|overlay|proc|procfs|pstore|pc_pnfs|securityfs|selinuxfs|squashfs|sysfs|tracefs)$"
ts=2025-05-27T19:28:53.889Z caller=filesystem_common.go:111 level=info collector=diskstats msg="Parsed flag --collector.diskstats.device-exclude" flag="^(z7ram|loop|fd|ch|s|v|vx|d[a-z]|nvme|d+n|d+p)|d+$"
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:111 level=info msg="Enabled collectors"
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=arp
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=bcache
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=bonding
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=btrfs
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=conntrack
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=cpu
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=cgroupfs
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=diskstats
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=dmide
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=edac
ts=2025-05-27T19:28:53.892Z caller=node_exporter.go:118 level=info collector=entropy
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=firechannel
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=filesystem
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=fsnmon
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=infiniband
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=ipvs
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=loadavg
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=mdadm
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=meminfo
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=netclass
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=netdev
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=netstat
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=nfs
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=nfsd
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=nmve
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=os
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=powersupplyclass
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=pressure
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=rapl
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=schedstat
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=selinux
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=sockstat
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=softnet
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=stat
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=tapestats
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=textfile
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=thermal_zone
ts=2025-05-27T19:28:53.893Z caller=node_exporter.go:118 level=info collector=timex
```

```
192.168.1.19100/metrics x +
← → ↺ Not Secure http://192.168.1.19100/metrics
# HELP go_gc_duration_seconds A summary of the pause duration of garbage collection cycles.
# TYPE go_gc_duration_seconds summary
go_gc_duration_seconds{quantile="0"} 0
go_gc_duration_seconds{quantile="0.25"} 0
go_gc_duration_seconds{quantile="0.5"} 0
go_gc_duration_seconds{quantile="0.75"} 0
go_gc_duration_seconds{quantile="1"} 0
go_gc_duration_seconds_sum 0
go_gc_duration_seconds_count 0
# HELP go_goroutines Number of goroutines that currently exist.
# TYPE go_goroutines gauge
go_goroutines 7
# HELP go_info Information about the Go environment.
# TYPE go_info gauge
go_info{version="go1.22.2"} 1
# HELP go_memstats_alloc_bytes Number of bytes allocated and still in use.
# TYPE go_memstats_alloc_bytes gauge
go_memstats_alloc_bytes 876696
# HELP go_memstats_alloc_bytes_total Total number of bytes allocated, even if freed.
# TYPE go_memstats_alloc_bytes_total counter
go_memstats_alloc_bytes_total 876696
# HELP go_memstats_buck_hash_sys_bytes Number of bytes used by the profiling bucket hash table.
# TYPE go_memstats_buck_hash_sys_bytes gauge
go_memstats_buck_hash_sys_bytes 1.449224e+06
# HELP go_memstats_frees_total Total number of frees.
# TYPE go_memstats_frees_total counter
go_memstats_frees_total 722
# HELP go_memstats_gc_sys_bytes Number of bytes used for garbage collection system metadata.
# TYPE go_memstats_gc_sys_bytes gauge
go_memstats_gc_sys_bytes 1.845104e+06
# HELP go_memstats_heap_alloc_bytes Number of heap bytes allocated and still in use.
# TYPE go_memstats_heap_alloc_bytes gauge
go_memstats_heap_alloc_bytes 876696
# HELP go_memstats_heap_idle_bytes Number of heap bytes waiting to be used.
# TYPE go_memstats_heap_idle_bytes gauge
go_memstats_heap_idle_bytes 1.409024e+06
# HELP go_memstats_heap_inuse_bytes Number of heap bytes that are in use.
# TYPE go_memstats_heap_inuse_bytes gauge
go_memstats_heap_inuse_bytes 2.392064e+06
# HELP go_memstats_heap_objects Number of allocated objects.
# TYPE go_memstats_heap_objects gauge
go_memstats_heap_objects 7976
# HELP go_memstats_heap_released_bytes Number of heap bytes released to OS.
# TYPE go_memstats_heap_released_bytes gauge
go_memstats_heap_released_bytes 1.409024e+06
# HELP go_memstats_heap_sys_bytes Number of heap bytes obtained from system.
# TYPE go_memstats_heap_sys_bytes gauge
go_memstats_heap_sys_bytes 3.801088e+06
# HELP go_memstats_last_gc_time_seconds Number of seconds since 1970 of last garbage collection.
# TYPE go_memstats_last_gc_time_seconds gauge
go_memstats_last_gc_time_seconds 0
# HELP go_memstats_lookups_total Total number of pointer lookups.
# TYPE go_memstats_lookups_total counter
go_memstats_lookups_total 0
# HELP go_memstats_mallocs_total Total number of mallocs.
# TYPE go_memstats_mallocs_total counter
go_memstats_mallocs_total 8698
# HELP go_memstats_mcache_inuse_bytes Number of bytes in use by mcache structures.
# TYPE go_memstats_mcache_inuse_bytes gauge
go_memstats_mcache_inuse_bytes 1280
# HELP go_memstats_mcache_sys_bytes Number of bytes used for mcache structures obtained from system.
# TYPE go_memstats_mcache_sys_bytes gauge
go_memstats_mcache_sys_bytes 15680
# HELP go_memstats_mspan_inuse_bytes Number of bytes in use by mspan structures.
```

4. I ran the command `tar xvf prometheus-2.52.0.linux-arm64.tar.gz` to download prometheus to extract all info about the Raspberry Pi & nano the config file to add the Raspberry Pi

```
david@davidspl: ~/prometheus-2.52.0.linux-arm64
s: hostResponse-content-disposition=attachment; filename=prometheus-2.52.0.linux-arm64.tar.gz&response-content-type=application/octet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.109.133, 185.199.110.133, 185.199.111.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)|185.199.109.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 98427893 (94M) [application/octet-stream]
Saving to: 'prometheus-2.52.0.linux-arm64.tar.gz'

prometheus-2.52.0.linux-arm64.tar.gz 100%[=====] 93.87M 17.4MB/s in 5.0s

2025-05-27 14:33:04 (18.8 MB/s) - 'prometheus-2.52.0.linux-arm64.tar.gz' saved [98427893/98427893]

david@davidspl: $ tar xvf prometheus-2.52.0.linux-arm64.tar.gz
cd prometheus-2.52.0.linux-arm64
prometheus-2.52.0.linux-arm64/
prometheus-2.52.0.linux-arm64/LICENSE
prometheus-2.52.0.linux-arm64/prontool
prometheus-2.52.0.linux-arm64/console_libraries/
prometheus-2.52.0.linux-arm64/console_libraries/prom.lib
prometheus-2.52.0.linux-arm64/console_libraries/menu.lib
prometheus-2.52.0.linux-arm64/prometheus
prometheus-2.52.0.linux-arm64/consols/
prometheus-2.52.0.linux-arm64/consols/node-overview.html
prometheus-2.52.0.linux-arm64/consols/prometheus.html
prometheus-2.52.0.linux-arm64/consols/prometheus-overview.html
prometheus-2.52.0.linux-arm64/consols/index.html.example
prometheus-2.52.0.linux-arm64/consols/node-disk.html
prometheus-2.52.0.linux-arm64/consols/node-cpu.html
prometheus-2.52.0.linux-arm64/consols/prometheus-overview.html
prometheus-2.52.0.linux-arm64/prometheus.yml
prometheus-2.52.0.linux-arm64/NOTICE

david@davidspl: ~/prometheus-2.52.0.linux-arm64 $ ./prometheus
ts=2025-05-27T19:33:55.293Z caller=main.go:573 level=info msg="No time or size retention was set so using the default time retention" duration=15d
ts=2025-05-27T19:33:55.293Z caller=main.go:617 level=info msg="Starting Prometheus Server" mode=server version="(version=2.52.0, branch=HEAD, revision=879d80922a27c37df502e7315fad8ce10a986d)"
ts=2025-05-27T19:33:55.293Z caller=main.go:622 level=info build_context="(go=go1.22.3, platform=linux/arm64, user=root@1b4f4c206e41, date=20240508-21:59:01, tags=netgo,builtinsassets,stringLabels)"
ts=2025-05-27T19:33:55.293Z caller=main.go:624 level=info fd_limits="(soft=1048576, hard=1048576)"
ts=2025-05-27T19:33:55.293Z caller=main.go:625 level=info vm_limits="(soft=unlimited, hard=unlimited)"
ts=2025-05-27T19:33:55.300Z caller=web.go:568 level=info component=web msg="Start listening for connections" address=0.0.0.0:9090
ts=2025-05-27T19:33:55.302Z caller=main.go:1129 level=info msg="Starting TSDB ..."
ts=2025-05-27T19:33:55.310Z caller=tsdb.go:313 level=info component=web msg="Listening on" address=[::]:9090
ts=2025-05-27T19:33:55.312Z caller=tsdb.go:316 level=info component=web msg="TLS is disabled." http2=false address=[::]:9090
ts=2025-05-27T19:33:55.327Z caller=web.go:616 level=info component=tsdb msg="Replaying on-disk memory mappable chunks if any"
ts=2025-05-27T19:33:55.327Z caller=web.go:703 level=info component=tsdb msg="On-disk memory mappable chunks replay completed" duration=7.889µs
ts=2025-05-27T19:33:55.327Z caller=web.go:711 level=info component=tsdb msg="Replaying WAL, this may take a while"
ts=2025-05-27T19:33:55.329Z caller=web.go:703 level=info component=tsdb msg="WAL segment loaded" segment=0 maxSegment=0
ts=2025-05-27T19:33:55.329Z caller=web.go:820 level=info component=tsdb msg="WAL replay completed" checkpoint_replay_duration=177.665µs wal_replay_duration=1.947909ms wbl_replay_duration=463ns chunk_snap
shot_load_duration=0s mmap_chunk_replay_duration=7.889µs total_replay_duration=2.215944ms
ts=2025-05-27T19:33:55.343Z caller=main.go:1150 level=info fs_type=EXT4_SUPER_MAGIC
ts=2025-05-27T19:33:55.343Z caller=main.go:1153 level=info msg="TSDB started"
ts=2025-05-27T19:33:55.343Z caller=main.go:1335 level=info msg="Loading configuration file" filename=prometheus.yml
ts=2025-05-27T19:33:55.346Z caller=main.go:1372 level=info msg="Completed loading of configuration file" filename=prometheus.yml totalDuration=2.590103ms db_storage=4.889µs remote_storage=5.629µs web_hand
ler=1.778µs query_engine=3.403µs scrape=1.405766ms scrape_sd=98.648µs notify=75.203µs notify_sd=34.62µs rules=3.926µs tracing=24.704µs
ts=2025-05-27T19:33:55.346Z caller=manager.go:1114 level=info msg="Server is ready to receive web requests."
ts=2025-05-27T19:33:55.346Z caller=manager.go:103 level=info component="rule manager" msg="Starting rule manager..."
```

```
david@davidspl: ~/prometheus-2.52.0.linux-arm64
GNU nano 6.2 prometheus.yml
# - "first_rules.yml"
# - "second_rules.yml"

# A scrape configuration containing exactly one endpoint to scrape:
# Here it's Prometheus itself.
scrape_configs:
  # The job name is added as a label 'job=job_name' to any timeseries scraped from this config.
  - job_name: 'prometheus'
    # metrics_path defaults to '/metrics'
    # scheme defaults to 'http'.

    static_configs:
      - targets: ['localhost:9090']

  - job_name: 'raspberrypi'
    static_configs:
      - targets: ['192.168.1.191:9001']

  - job_name: 'blackbox_http'
    metrics_path: /probe
    params:
      module: [http_2xx]
    static_configs:
      - targets:
          - https://google.com
          - https://github.com
    relabel_configs:
      - source_labels: [__address__]
        target_label: __param_target
      - source_labels: [__param_target]
        target_label: instance
      - target_label: __address__
        replacement: localhost:9115

  - job_name: 'blackbox_icmp'
    metrics_path: /probe
    params:
      module: [icmp]
    static_configs:
      - targets:
          - 192.168.1.254 # AT&T Router
          - 192.168.1.2 # Windows Computer
    relabel_configs:
      - source_labels: [__address__]
        target_label: __param_target
      - source_labels: [__param_target]
        target_label: instance
      - target_label: __address__
        replacement: localhost:9115
```

192.168.1.1:9100/metrics x Prometheus Time Series x +

Not Secure http://192.168.1.1:9090/targets?search=

Prometheus Alerts Graph Status Help

Targets

All scrape pools All Unhealthy Collapse All Filter by endpoint or labels Unknown Unhealthy Healthy

prometheus (1/1 up) show less

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://localhost:9090/metrics	UP	instance="localhost:9090" job="prometheus"	5.637s ago	35.167ms	

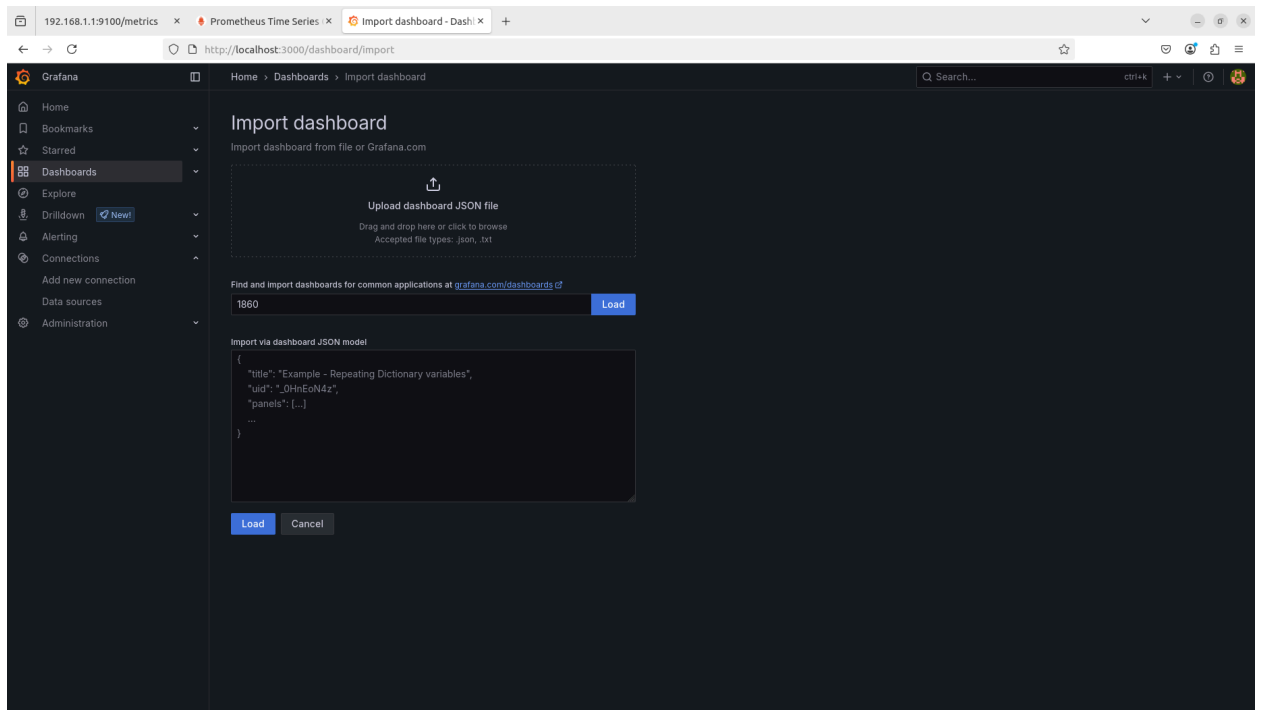
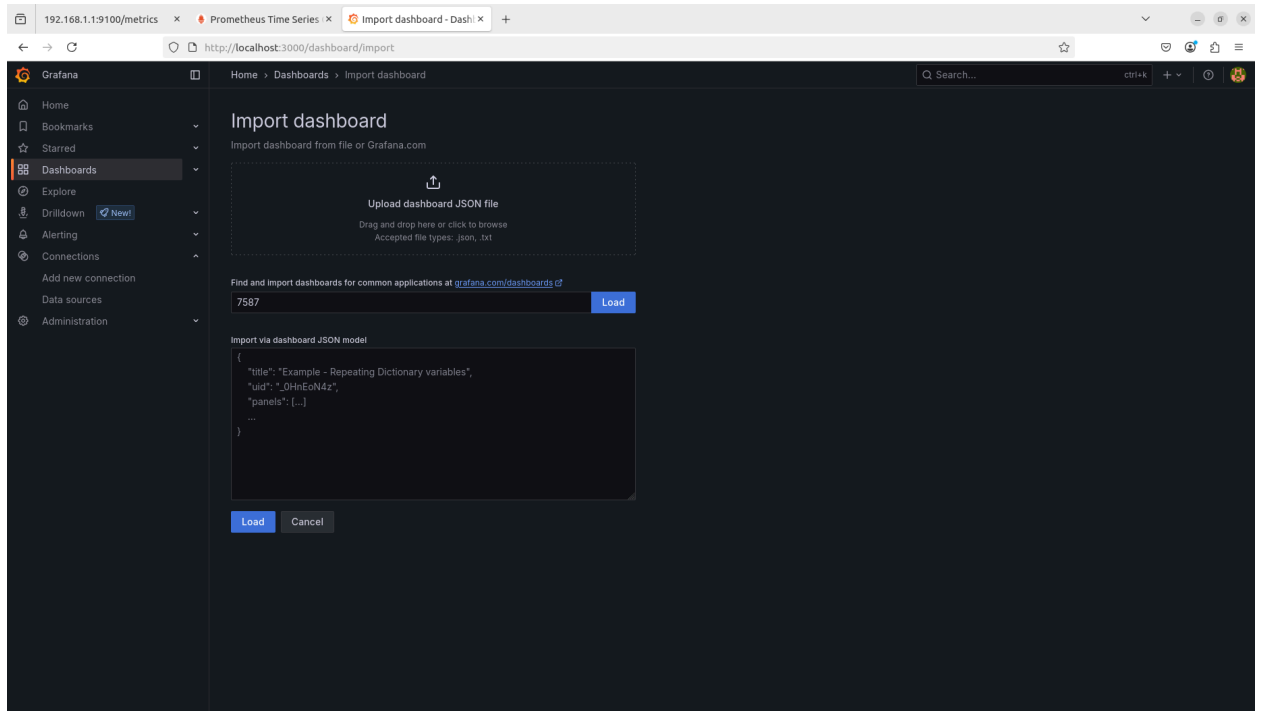
raspberrypi (1/1 up) show less

Endpoint	State	Labels	Last Scrape	Scrape Duration	Error
http://192.168.1.1:9100/metrics	UP	instance="192.168.1.1:9100" job="raspberrypi"	7.746s ago	132.288ms	

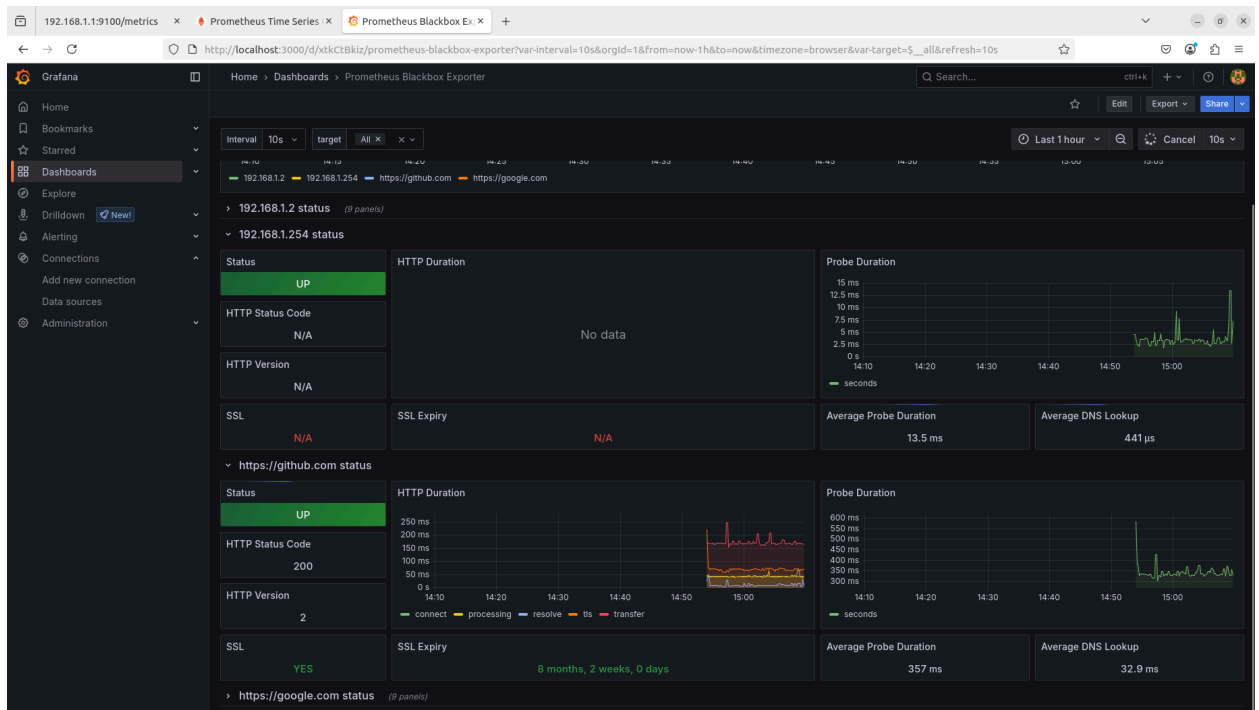
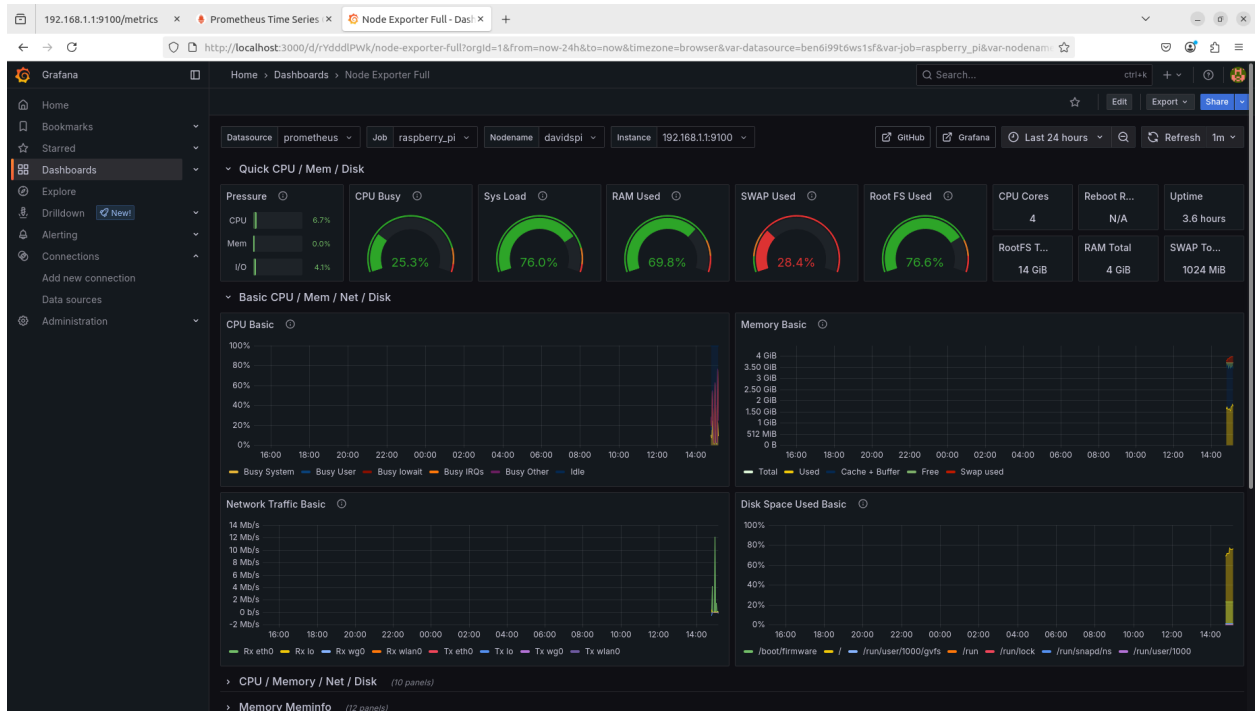
- I ran the command `sudo apt install -y software-properties-common wget apt-transport-https` to install grafana

```
david@davidspt:~$ sudo apt install -y software-properties-common wget apt-transport-https
sudo mkdir -p /etc/apt/keyrings
wget -q -O - https://packages.grafana.com/gpg.key | sudo tee /etc/apt/keyrings/grafana.key > /dev/null
echo "deb [signed-by=/etc/apt/keyrings/grafana.key] https://packages.grafana.com/oss/deb stable main" | sudo tee /etc/apt/sources.list.d/grafana.list
sudo apt update
sudo apt install grafana
Reading package lists... Done
Building dependency tree... 50%
```

6. After installing grafana, **I imported port numbers 9100 & 9090 with their special dashboard codes to display them on my homepage**



7. After importing them I customized my dashboard and I can look at my Raspberry Pi resource usage, websites like GitHub, and basic information about my router (.254)



8. Just to ensure proper connectivity I accessed the dashboard on my Mac

