This shell script automates system monitoring tasks on a Linux system and generates detailed reports for system administrators. It collects various system metrics, analyzes logs, performs health checks, implements alerting mechanisms, and generates comprehensive reports.

Prerequisites

- Linux operating system (tested on Ubuntu 20.04 LTS)
- Bash shell (version 4.x or higher)
- Required utilities: `top`, `free`, `df`, `netstat`, `systemctl`, `ping`, `mail`

Ensure all necessary commands are installed and accessible from the script environment.

Configuration

- **Log and Report Files:**

    - Logs are stored in `/var/log/system_monitor.log`.
    - Reports are generated in `/tmp/system_report_<timestamp>.txt` format.
- **Thresholds:**

    - Adjust thresholds for CPU (`THRESHOLD_CPU`) and memory (`THRESHOLD_MEM`) usage in percentage to trigger alerts.
    - Default thresholds are set to 90%.
- **Email Notifications:**

    - Specify `ADMIN_EMAIL` to receive alerts. Example: `ADMIN_EMAIL="admin@example.com"`

Usage

1. **Interactive Mode:**

    - Run the script interactively to trigger checks manually and view specific metrics.

Outputs

- **System Report:**
    - The script generates a detailed report in text format (`system_report_<timestamp>.txt`) with sections on:
        - System Metrics (CPU, memory, disk space, network)

```
einfochips@AHMLPT1707:~/day10$ cat /tmp/system_report_20240722-220909.txt
System Report


System Metrics


CPU Usage:
top - 22:09:10 up 11:49,  1 user,  load average: 1.69, 1.21, 1.04
Tasks: 410 total,   1 running, 408 sleeping,   0 stopped,   1 zombie
%Cpu(s):  3.1 us,  2.5 sy,  0.0 ni, 93.7 id,  0.0 wa,  0.0 hi,  0.6 si,  0.0 st
MiB Mem :  15797.7 total,    711.3 free,   8596.8 used,   6489.7 buff/cache
MiB Swap:  15259.0 total,  15257.5 free,      1.5 used.   5965.9 avail Mem


    PID USER      PR  NI    VIRT    RES    SHR S  %CPU  %MEM     TIME+ COMMAND
 264236 einfoch+  20   0   13356   4224   3328 R  11.8   0.0   0:00.05 top
   3728 einfoch+  20   0 6016540 381672 153736 S   5.9   2.4  27:50.33 gnome-shell
 243833 einfoch+  20   0 1131.3g 162588 121928 S   5.9   1.0   0:06.10 code
```

```
Memory Usage:
               total        used        free      shared  buff/cache   available
Mem:            15Gi       8.4Gi       711Mi       901Mi       6.3Gi       5.8Gi
Swap:           14Gi       1.0Mi        14Gi


Disk Space:
Filesystem      Size  Used Avail Use% Mounted on
tmpfs           1.6G  2.6M  1.6G   1% /run
/dev/nvme0n1p1   94G   27G   63G  30% /
tmpfs           7.8G   20M  7.7G   1% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
efivarfs        384K   92K  288K  25% /sys/firmware/efi/efivars
/dev/nvme0n1p4  359G  4.2G  337G   2% /home
/dev/nvme0n1p3  976M  6.1M  970M   1% /boot/efi
tmpfs           1.6G  1.8M  1.6G   1% /run/user/1000


Network Statistics:
Ip:
    Forwarding: 1
    1509174 total packets received
    1 with invalid addresses
    0 forwarded
    0 incoming packets discarded
    1509150 incoming packets delivered
    974837 requests sent out
    20 outgoing packets dropped
    1740 dropped because of missing route
```

- Log Analysis (recent syslog entries)

```
Jul 22 22:09:00 AHMLPT1707 systemd[261590]: Finished Exit the Session.
Jul 22 22:09:00 AHMLPT1707 systemd[261590]: Reached target Exit the Session.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: user@0.service: Deactivated successfully.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: Stopped User Manager for UID 0.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: Stopping User Runtime Directory /run/user/0...
Jul 22 22:09:00 AHMLPT1707 systemd[1]: run-user-0.mount: Deactivated successfully.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: user-runtime-dir@0.service: Deactivated successfully.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: Stopped User Runtime Directory /run/user/0.
Jul 22 22:09:00 AHMLPT1707 systemd[1]: Removed slice User Slice of UID 0.
Jul 22 22:09:01 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:01.331344252+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=ttdb5fwh3xp3ylv10k85wk9xh task.id=uk6aq7t8yc5cbfv2clc9ukdxd
Jul 22 22:09:01 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:01.358583761+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=g27acxbxqv2qm8xnnu2m4hpks task.id=ftld7hgiuvyqmgqotuvj9qcqq
Jul 22 22:09:01 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:01.368909517+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=jl7vb8l4v6bi13pi06o0gtz5do task.id=kkelszmczh5y7s4nmlx10sw4x
Jul 22 22:09:01 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:01.376593575+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=ttdb5fwh3xp3ylv10k85wk9xh task.id=dcuc6kq0mvtcmkjy1e389xe27
Jul 22 22:09:01 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:01.86781283o+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=g27acxbxqv2qm8xnnu2m4hpks task.id=u0dvprhj5r7kl2x6x1528yibh
Jul 22 22:09:06 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:06.311469229+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=ttdb5fwh3xp3ylv10k85wk9xh task.id=ft9wcycybnn9fdelbo7gotrn6
Jul 22 22:09:06 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:06.318486172+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=ttdb5fwh3xp3ylv10k85wk9xh task.id=b9e1coxer0la4h254j3gx9f5u
Jul 22 22:09:06 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:06.325550758+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=jl7vb8l4v6bi13pi06o0gtz5do task.id=cylagvlz1x03kdmsneug7x0o6
Jul 22 22:09:06 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:06.332789156+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=g27acxbxqv2qm8xnnu2m4hpks task.id=y3v2nwgyj466hf9wogduhdqml
Jul 22 22:09:06 AHMLPT1707 docker.dockerd[1508]: time="2024-07-22T22:09:06.856324148+05:30" level=error msg="fatal task error" error="mkdir /var/lib/docker: read-only file system" module=node/agent/taskma
nager node.id=y0q7ihkyw3by47zssqui6egjs service.id=g27acxbxqv2qm8xnnu2m4hpks task.id=r3ltrjzw7s4hl7090hlbvpgut
Jul 22 22:09:07 AHMLPT1707 teams-for-linux_teams-for-linux.desktop[7553]: [DEBUG] GetSystemIdleState => IdleTimeout: 300s, IdleTimeoutPollInterval: 10s, ActiveCheckPollInterval: 2s, IdleTime: 0s, IdleStat
e: 'active'
```

- Health Checks (service statuses, connectivity tests)

```
Health Checks

Service Status:
× apache2.service - The Apache HTTP Server
    Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
    Active: failed (Result: exit-code) since Mon 2024-07-22 10:19:19 IST; 11h ago
      Docs: https://httpd.apache.org/docs/2.4/
       CPU: 44ms

Jul 22 10:19:19 AHMLPT1707 apachectl[792]: AH00558: apache2: Could not reliably determine the server's fully qualified domain name, using 127.0.1.1. Set the 'ServerName' directive globally to suppress thi
s message
Jul 22 10:19:19 AHMLPT1707 apachectl[792]: (98)Address already in use: AH00072: make_sock: could not bind to address [::]:80
Jul 22 10:19:19 AHMLPT1707 apachectl[792]: (98)Address already in use: AH00072: make_sock: could not bind to address 0.0.0.0:80
Jul 22 10:19:19 AHMLPT1707 apachectl[792]: no listening sockets available, shutting down
Jul 22 10:19:19 AHMLPT1707 apachectl[792]: AH00015: Unable to open logs
Jul 22 10:19:19 AHMLPT1707 apachectl[738]: Action 'start' failed.
Jul 22 10:19:19 AHMLPT1707 apachectl[738]: The Apache error log may have more information.
Jul 22 10:19:19 AHMLPT1707 systemd[1]: apache2.service: Control process exited, code=exited, status=1/FAILURE
Jul 22 10:19:19 AHMLPT1707 systemd[1]: apache2.service: Failed with result 'exit-code'.
Jul 22 10:19:19 AHMLPT1707 systemd[1]: Failed to start The Apache HTTP Server.

Connectivity Tests:
PING google.com (172.217.160.238) 56(84) bytes of data.
64 bytes from del03s09-in-f14.1e100.net (172.217.160.238): icmp_seq=1 ttl=60 time=20.3 ms
64 bytes from del03s09-in-f14.1e100.net (172.217.160.238): icmp_seq=2 ttl=60 time=119 ms
64 bytes from del03s09-in-f14.1e100.net (172.217.160.238): icmp_seq=3 ttl=60 time=68.9 ms

--- google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 20.287/69.557/119.445/40.483 ms

Alerts

einfochips@AHMLPT1707:~/day10$
```

- Alerts (if thresholds are exceeded)

Customization

- **Adding Services:**

  - Extend the script to check the status of additional services by adding more `systemctl` commands under `perform_health_checks()`.

- **Enhancing Alerts:**

  - Customize email subjects and content in `check_alerts()` to include more detailed information.