

# Advances in Operating Systems Design (CS60038)

## Assignment 1 - Part A

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### Remove AppArmor support

AppArmor support was removed by using the menuconfig option for the Linux kernel version 5.6.9.

To remove it, we unselected it from Security Options ----> AppArmor support

#### Before removing AppArmor support

- In the .config file  
The picture below shows that the CONFIG\_SECURITY\_APPARMOR field is set to yes.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep APPARMOR
CONFIG_SECURITY_APPARMOR=y
CONFIG_SECURITY_APPARMOR_HASH=y
CONFIG_SECURITY_APPARMOR_HASH_DEFAULT=y
# CONFIG_SECURITY_APPARMOR_DEBUG is not set
CONFIG_DEFAULT_SECURITY_APPARMOR=y
```

- Checking AppArmor profiles  
On executing the command `sudo cat /sys/kernel/security/apparmor/profiles` we get a list of all the applications for which AppArmor support is activated.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ sudo cat /sys/kernel/security/apparmor/profiles
snap.snap-store.ubuntu-software-local-file (enforce)
snap.snap-store.ubuntu-software (enforce)
snap.snap-store.snap-store (enforce)
snap.libreoffice.writer (enforce)
snap.snap-store.hook.configure (enforce)
snap.libreoffice.libreoffice (enforce)
snap.libreoffice.math (enforce)
snap.libreoffice.impress (enforce)
snap.libreoffice.draw (enforce)
snap.libreoffice.hook.configure (enforce)
snap-update-ns.snap-store (enforce)
```

#### After removing AppArmor support

- In the .config file  
The picture below shows that the CONFIG\_SECURITY\_APPARMOR field is not set.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep APPARMOR
# CONFIG_SECURITY_APPARMOR is not set
```

- Checking AppArmor profiles and status

If we navigate to the directory /sys/kernel/security we can see that now there is no apparmor directory. Also, on executing aa-status, we get the message that the apparmor module is not loaded.

```
Ashutosh-Vanshita@argha:/sys/kernel/security$ pwd
/sys/kernel/security
Ashutosh-Vanshita@argha:/sys/kernel/security$ ls
evm ima integrity lockdown lsm
Ashutosh-Vanshita@argha:/sys/kernel/security$ aa-status
apparmor module is not loaded.
```

## Remove DCCP Protocol

The DCCP protocol is by default unselected in the Linux kernel version 5.6.9. It can be toggled using Networking support ---> Networking options ---> The DCCP Protocol

With the DCCP Protocol enabled

- In the .config file

The picture below shows that the CONFIG\_IP\_DCCP field is set to yes.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep DCCP
# CONFIG_NETFILTER_XT_MATCH_DCCP is not set
CONFIG_IP_DCCP=y
# DCCP CCIDs Configuration
# CONFIG_IP_DCCP_CCID2_DEBUG is not set
CONFIG_IP_DCCP_CCID3=y
# CONFIG_IP_DCCP_CCID3_DEBUG is not set
CONFIG_IP_DCCP_TFRC_LIB=y
# end of DCCP CCIDs Configuration
# DCCP Kernel Hacking
# CONFIG_IP_DCCP_DEBUG is not set
# end of DCCP Kernel Hacking
```

With the DCCP Protocol disabled

- In the .config file

The picture below shows that the CONFIG\_IP\_DCCP field is not set.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep DCCP
# CONFIG_NETFILTER_XT_MATCH_DCCP is not set
# CONFIG_IP_DCCP is not set
```

## Update default TCP congestion control algorithm to Reno

The default TCP congestion control algorithm was changed to Reno using the menuconfig option for the Linux kernel version 5.6.9.

We do that using Networking support ---> Networking options ---> TCP: advanced congestion control ---> Default TCP congestion control ---> Reno

Before changing the TCP congestion control algorithm (default is Cubic)

- In the .config file  
The picture below shows that the initial default TCP congestion control algorithm is cubic.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep cubic
CONFIG_DEFAULT_TCP_CONG="cubic"
```

- Checking the value of tcp\_congestion\_control in /proc/sys/net/ipv4  
We can see that the default algorithm is set to cubic.

```
Ashutosh-Vanshita@argha:~$ cat /proc/sys/net/ipv4/tcp_congestion_control
cubic
```

After changing the TCP congestion control algorithm to Reno

- In the .config file  
The picture below shows that we have changed the default TCP congestion control algorithm to reno.

```
Ashutosh-Vanshita@argha:~/LinuxKernel$ cat .config | grep reno
CONFIG_DEFAULT_TCP_CONG="reno"
```

- Checking the value of tcp\_congestion\_control in /proc/sys/net/ipv4  
We can see that the default algorithm is now set to reno.

```
Ashutosh-Vanshita@argha:~$ cat /proc/sys/net/ipv4/tcp_congestion_control
reno
```