Access Control

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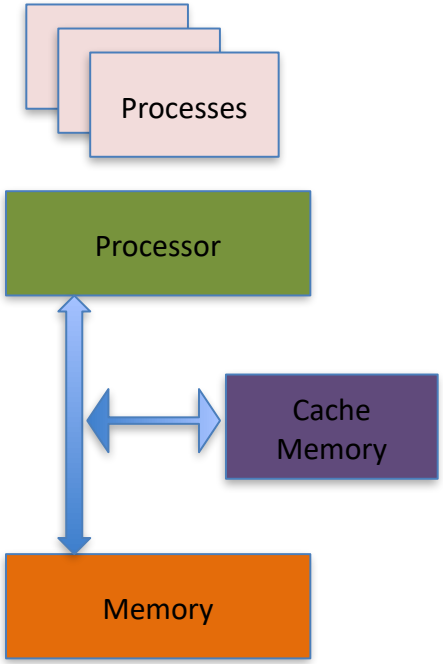
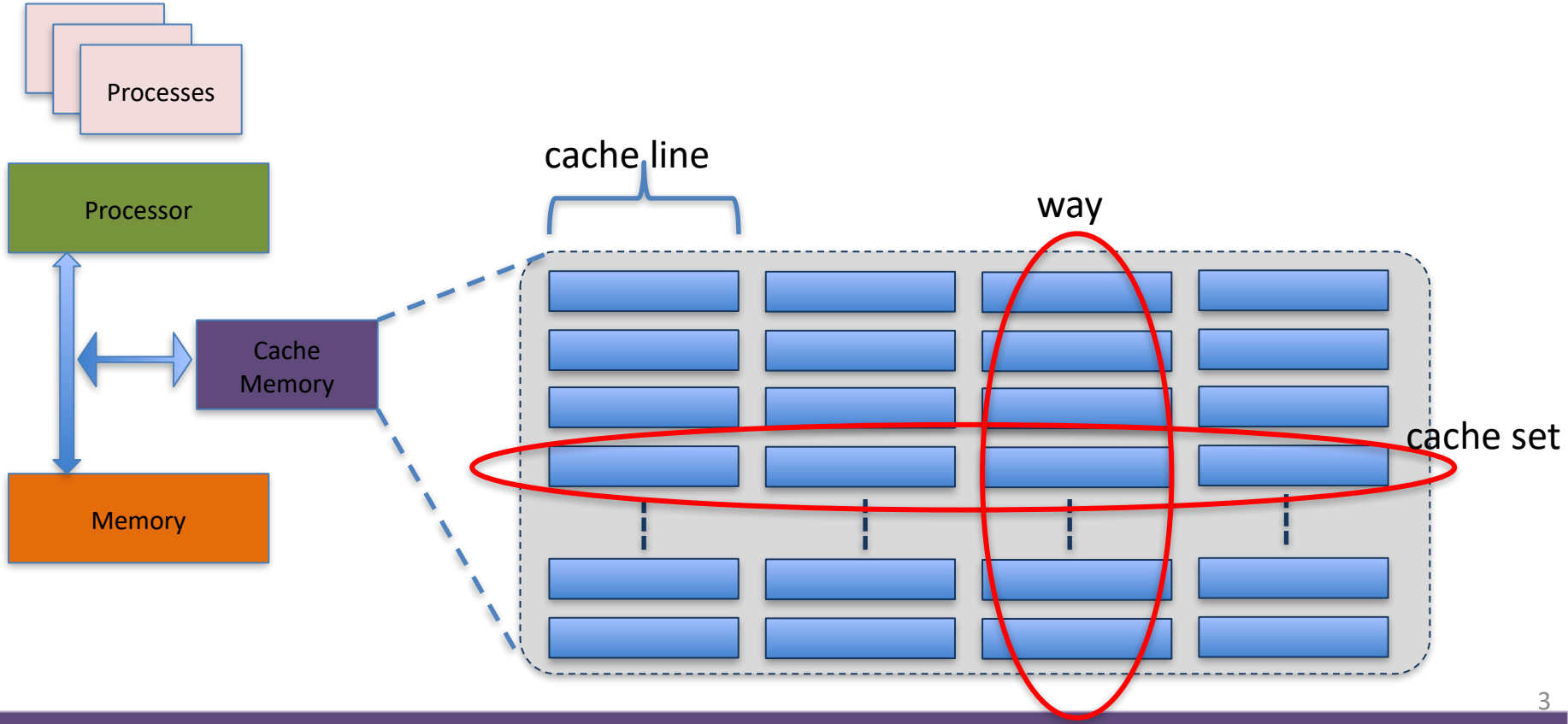
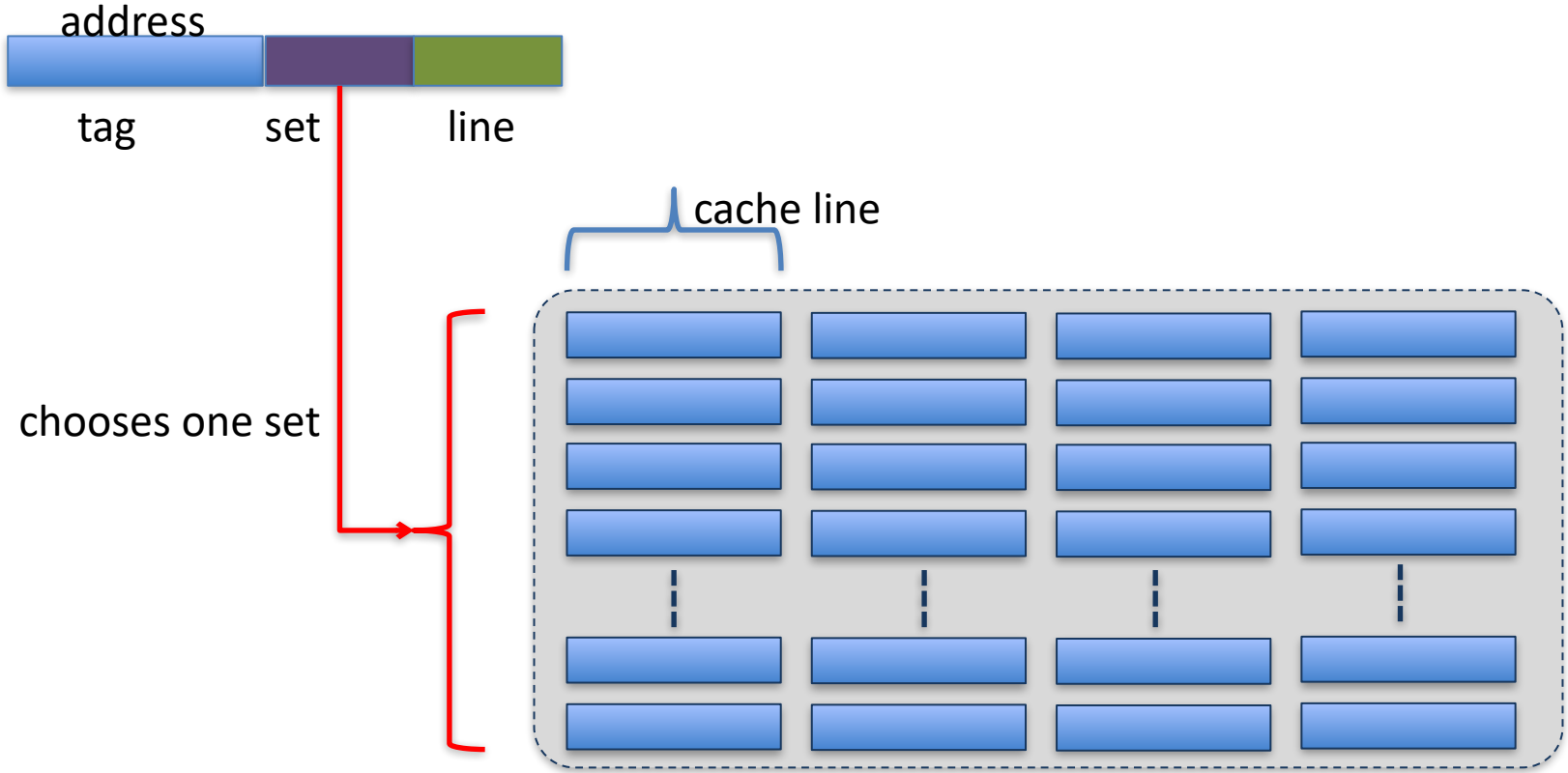
Cache Covert Channel



Cache Covert Channel



Cache Covert Channel

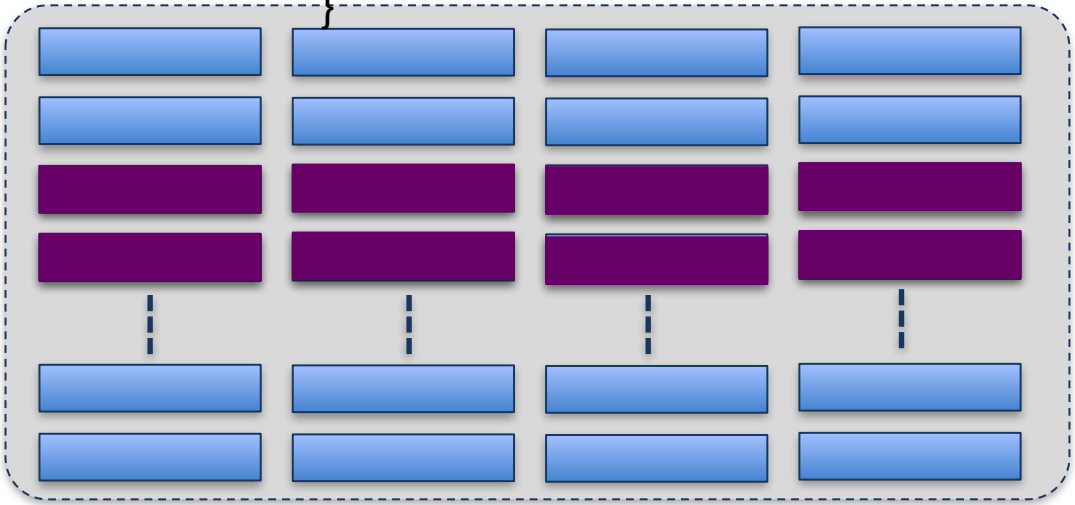


Cache Covert Channel

statistically
time A ~ time B

```
while(1){
    load A1p2; load A2p2
    load A3p2; load A4p2
    load B1p2; load B2p2
    load B3p2; load B4p2
}
```

Process P2



Cache Covert Channel

Process P1

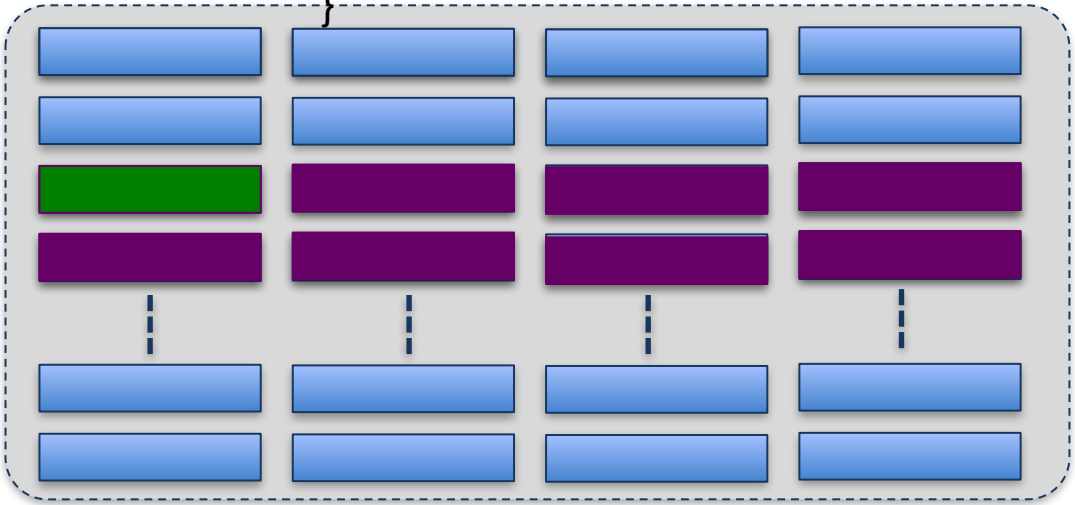
```
If (bit == 1)
    load A_P1
Else
    load B_P1
```

statistically

time A > time B

```
while(1){
    load A1_p2; load A2_p2
    load A3_p2; load A4_p2
    load B1_p2; load B2_p2
    load B3_p2; load B4_p2
}
```

Process P2



Cache Covert Channel

Process P1

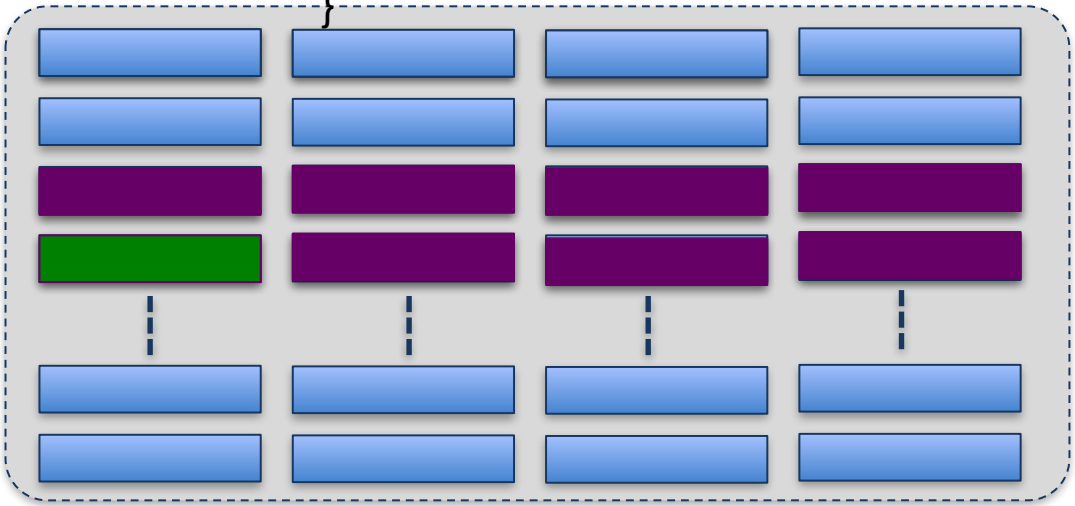
```
If (bit == 1)
    load A_P1
Else
    load B_P1
```

statistically

time A < time B

```
while(1){
    load A1_p2; load A2_p2
    load A3_p2; load A4_p2
    load B1_p2; load B2_p2
    load B3_p2; load B4_p2
}
```

Process P2



Cache Covert Channel

Process P1

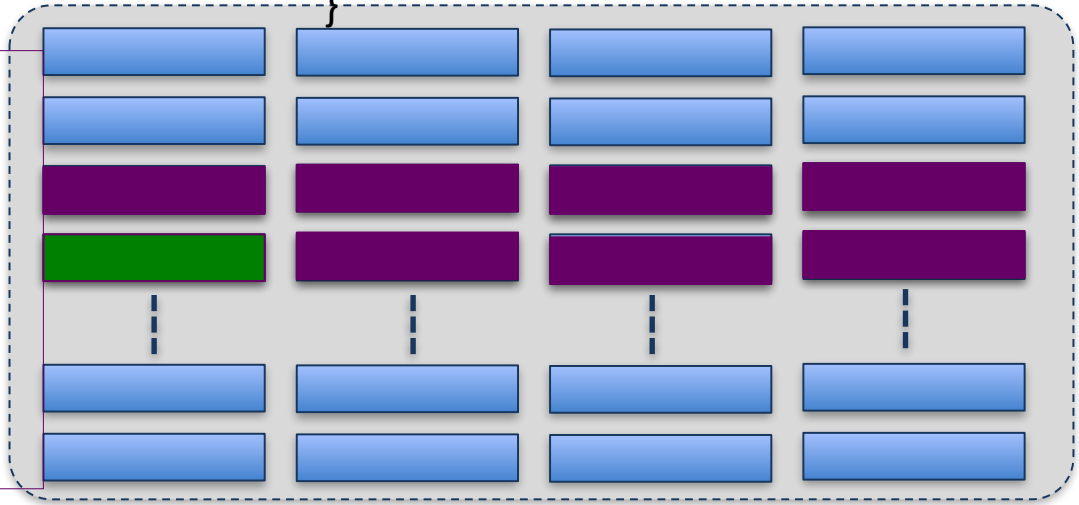
statistically

time A < time B

```
while(1){
    load A1p2; load A2p2
    load A3p2; load A4p2
    load B1p2; load B2p2
    load B3p2; load B4p2
}
```

Process P2

```
bit = message
while(bit[i] != '\0')
    for(some number of iterations)
      If (bit[i] == 1)
        load AP1
      else
        load BP1
```



Covert Channels

- Identifying: Not easy because simple things like the existence of a file, time, etc. could be a source for a covert channel.
- Quantification: communication rate (bps)
- Elimination: Careful design, separation, characteristics of operation (eg. rate of opening / closing a file)