

TUGAS 3
PEMROGRAMAN JARINGAN - E



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Buatlah program yang mengimplementasikan

1. multi process
2. multi thread
3. multi process asynchronous
4. multi thread asynchronous

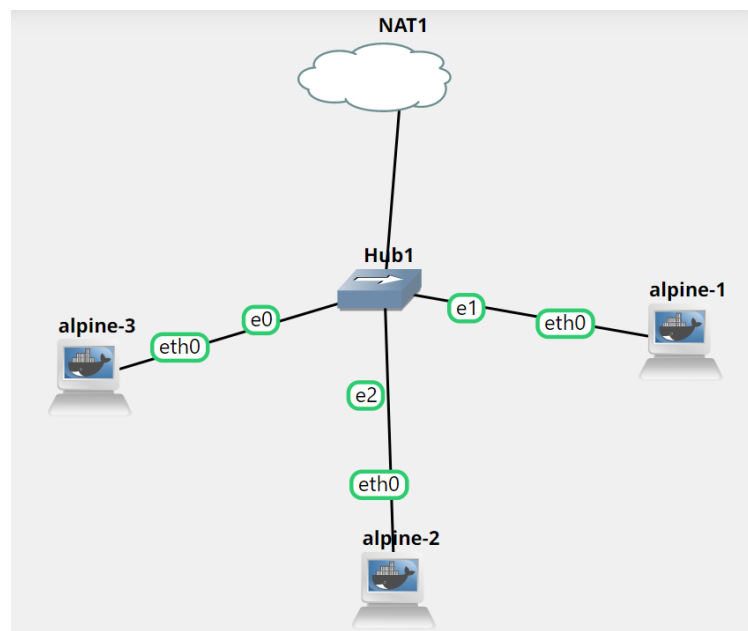
dengan menggunakan protokol transport UDP. kasus dapat didefinisikan sendiri. dan Buatlah arsitektur jaringan anda sendiri di simulator GNS3 buatlah laporan dalam bentuk PDF yang berisikan screenshot dari

1. deskripsi kasus yang dibuat
2. gambar arsitektur jaringan (dalam simulator GNS3)
3. program yang dibuat (1-4)
4. hasil outputnya

Deskripsi kasus:

Terdapat 1 *client* dan 2 server, di mana *client* akan mengunduh 2 *file* gambar dengan *multi process*, *multi thread*, *multi process asynchronous*, dan *multi thread asynchronous*. *Client* melakukan pengiriman *file* gambar ke 2 server tersebut. *File* gambar tersebut masing-masing akan diberikan ke server yang berbeda yaitu server 1 dan server 2. Tujuan dari implementasi program adalah mengetahui waktu yang diperlukan dalam mengirimkan *file*.

Gambar arsitektur jaringan:



alpine-1 sebagai server 1, alpine-2 sebagai server 2, dan alpine-3 sebagai *client*.

Lakukan pencarian *ip address* untuk masing-masing UDP dengan `ifconfig`.

Program yang dibuat:

a. multi_process.py

```
1  from library import download_gambar, get_url_list, kirim_gambar
2  import time
3  import datetime
4  from multiprocessing import Process
5
6  def kirim_semua():
7      texec = dict()
8      urls = get_url_list()
9      temp = 0
10     catat_awal = datetime.datetime.now()
11     for k in urls:
12         download_gambar(urls[k],k)
13         print(f"mendownload {urls[k]}")
14         waktu = time.time()
15         #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi download gambar secara multiprocess
16         UDP_IP_ADDRESS = "192.168.122.214"
17         UDP_IP_ADDRESS2 = "192.168.122.111"
18         if temp == 0:
19             texec[k] = Process(target=kirim_gambar, args=(UDP_IP_ADDRESS,5050,f"{k}.jpg"))
20             temp = temp+1
21         elif temp == 1:
22             texec[k] = Process(target=kirim_gambar, args=(UDP_IP_ADDRESS2,5050,f"{k}.jpg"))
23             texec[k].start()
24     #setelah menyelesaikan tugasnya, dikembalikan ke main process dengan join
25     for k in urls:
26         texec[k].join()
27     catat_akhir = datetime.datetime.now()
28     selesai = catat_akhir - catat_awal
29     print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
30     #fungsi download_gambar akan dijalankan secara multi process
31     if __name__ == '__main__':
32         kirim_semua()
```

b. multi_process_async.py

```
1  from library import download_gambar, get_url_list, kirim_gambar
2  import time
3  import datetime
4  from multiprocessing import Process, Pool
5
6  def kirim_semua():
7      texec = dict()
8      urls = get_url_list()
9      temp = 0
10     status_task = dict()
11     task_pool = Pool(processes=20) #2 task yang dapat dikerjakan secara simultan, dapat diset sesuai jumlah core
12     catat_awal = datetime.datetime.now()
13     for k in urls:
14         download_gambar(urls[k],k)
15         print(f"mendownload {urls[k]}")
16         UDP_IP_ADDRESS = "192.168.122.214"
17         UDP_IP_ADDRESS2 = "192.168.122.111"
18         if temp == 0:
19             texec[k] = task_pool.apply_async(func=kirim_gambar, args=(UDP_IP_ADDRESS, 5050, f"{k}.jpg"))
20             temp = temp + 1
21         elif temp == 1:
22             texec[k] = task_pool.apply_async(func=kirim_gambar, args=(UDP_IP_ADDRESS2, 5050, f"{k}.jpg"))
23         #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi download gambar secara multiprocess
24         # texec[k] = task_pool.apply_async(func=download_gambar, args=(urls[k],))
25
26     #setelah menyelesaikan tugasnya, dikembalikan ke main process dengan mengambil hasilnya dengan get
27     for k in urls:
28         status_task[k]=texec[k].get(timeout=10)
29
30     catat_akhir = datetime.datetime.now()
31     selesai = catat_akhir - catat_awal
32     print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
33     print("status TASK")
34     print(status_task)
35
36
37     #fungsi download_gambar akan dijalankan secara multi process
38
39     if __name__ == '__main__':
40         kirim_semua()
```

c. multi_thread.py

```
1 from library import download_gambar, get_url_list, kirim_gambar
2 import time
3 import datetime
4 import threading
5
6 def kirim_semua():
7     texec = dict()
8     urls = get_url_list()
9     temp = 0
10    catat_awal = datetime.datetime.now()
11    for k in urls:
12        download_gambar(urls[k], k)
13        print(f"mendownload {urls[k]}")
14        waktu = time.time()
15        #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi download gambar secara multithread
16        UDP_IP_ADDRESS = "192.168.122.214"
17        UDP_IP_ADDRESS2 = "192.168.122.111"
18        if temp == 0:
19            texec[k] = threading.Thread(target=kirim_gambar, args=(UDP_IP_ADDRESS, 5050, f"{k}.jpg"))
20            temp = temp + 1
21        elif temp == 1:
22            texec[k] = threading.Thread(target=kirim_gambar, args=(UDP_IP_ADDRESS2, 5050, f"{k}.jpg"))
23            # texec[k] = threading.Thread(target=download_gambar, args=(urls[k],))
24            texec[k].start()
25
26    #setelah menyelesaikan tugasnya, dikembalikan ke main thread dengan join
27    for k in urls:
28        texec[k].join()
29
30    catat_akhir = datetime.datetime.now()
31    selesai = catat_akhir - catat_awal
32    print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
33
34
35 #fungsi download_gambar akan dijalankan secara multithreading
36
37 if __name__ == '__main__':
38     kirim_semua()
```

d. multi_thread_async.py

```
1 from library import download_gambar, get_url_list, kirim_gambar
2 import time
3 import datetime
4 import concurrent.futures
5
6 def kirim_semua():
7     texec = dict()
8     urls = get_url_list()
9     temp = 0
10    status_task = dict()
11    task = concurrent.futures.ThreadPoolExecutor(max_workers=4)
12    catat_awal = datetime.datetime.now()
13    for k in urls:
14        download_gambar(urls[k], k)
15        print(f"mendownload {urls[k]}")
16        waktu = time.time()
17        UDP_IP_ADDRESS = "192.168.122.214"
18        UDP_IP_ADDRESS2 = "192.168.122.111"
19        if temp == 0:
20            texec[k] = task.submit(kirim_gambar, UDP_IP_ADDRESS, 5050, f"{k}.jpg")
21            temp = temp + 1
22        elif temp == 1:
23            texec[k] = task.submit(kirim_gambar, UDP_IP_ADDRESS2, 5050, f"{k}.jpg")
24        #bagian ini merupakan bagian yang menginstruksikan eksekusi fungsi download gambar secara multithread
25        # texec[k] = task.submit(download_gambar, urls[k])
26
27    #setelah menyelesaikan tugasnya, dikembalikan ke main thread dengan memanggil result
28    for k in urls:
29        status_task[k] = texec[k].result()
30
31    catat_akhir = datetime.datetime.now()
32    selesai = catat_akhir - catat_awal
33    print(f"Waktu TOTAL yang dibutuhkan {selesai} detik {catat_awal} s/d {catat_akhir}")
34    print("hasil task yang dijalankan")
35    print(status_task)
36
37
38 #fungsi download_gambar akan dijalankan secara multithreading
39
40 if __name__ == '__main__':
41     kirim_semua()
```

e. single_thread.py

```
1 from library import download_gambar, get_url_list, kirim_gambar
2 import time
3 import datetime
4
5 def kirim_semua():
6     urls = get_url_list()
7     temp = 0
8
9     catat = datetime.datetime.now()
10    for k in urls:
11        download_gambar(urls[k], k)
12        print(f"mendownload {urls[k]}")
13        waktu_proses = download_gambar(urls[k])
14        print(f"completed {waktu_proses} detik")
15        UDP_IP_ADDRESS = "192.168.122.214"
16        UDP_IP_ADDRESS2 = "192.168.122.111"
17        if temp == 0:
18            kirim_gambar(UDP_IP_ADDRESS, 5050, f"{k}.jpg")
19            temp = temp + 1
20        elif temp == 1:
21            kirim_gambar(UDP_IP_ADDRESS2, 5050, f"{k}.jpg")
22    selesai = datetime.datetime.now() - catat
23    print(f"Waktu TOTAL yang dibutuhkan {selesai} detik")
24
25 #fungsi download_gambar akan dijalankan secara berurutan
26
27
28 if __name__ == '__main__':
29     kirim_semua()
```

f. library.py

```
1 import logging
2 import requests
3 import socket
4 import os
5 import time
6 import datetime
7
8
9 def get_url_list():
10     urls = dict()
11     urls['kompas'] = 'https://asset.kompas.com/crops/qz_jJxyaZgGboomdCEXsfbSpec=/0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg'
12     #urls['its'] = 'https://www.its.ac.id/wp-content/uploads/2017/10/logo-its-1.png'
13     urls['detik'] = 'https://awscdn.detik.net.id/detik2/images/logo.jpg'
14     #urls['file1'] = 'https://file-examples-com.github.io/uploads/2018/04/file_example_MOV_480_700kB.mov'
15     #urls['file2'] = 'https://file-examples-com.github.io/uploads/2018/04/file_example_MOV_1280_1_4MB.mov'
16     #urls['file3'] = 'https://file-examples-com.github.io/uploads/2017/02/zip_2MB.zip'
17     return urls
18
19
20 def download_gambar(url=None, tuliskefile='image'):
21     waktu_awal = datetime.datetime.now()
22     if url is None:
23         return False
24     ff = requests.get(url)
25     tipe = dict()
26     tipe['image/png'] = 'png'
27     tipe['image/jpeg'] = 'jpg'
28     tipe['image/gif'] = 'gif'
29     tipe['image/jpeg'] = 'jpg'
30     tipe['application/zip'] = 'jpg'
31     tipe['video/quicktime'] = 'mov'
32     # time.sleep(2) #untuk simulasi, diberi tambahan delay 2 detik
33
```

```

34     content_type = ff.headers['Content-Type']
35     logging.warning(content_type)
36     if (content_type in list(tipe.keys())):
37         namafile = os.path.basename(url)
38         ekstensi = tipe[content_type]
39         if (tuliskefile):
40             fp = open(f"{tuliskefile}.{ekstensi}", "wb")
41             fp.write(ff.content)
42             fp.close()
43
44         waktu_process = datetime.datetime.now() - waktu_awal
45         waktu_akhir = datetime.datetime.now()
46         logging.warning(f"writing {tuliskefile}.{ekstensi} dalam waktu {waktu_process} {waktu_awal} s/d {waktu_akhir}")
47         return waktu_process
48     else:
49         return False
50
51 def kirim_gambar(IP_ADDRESS, PORT, filename):
52     print(IP_ADDRESS, PORT, filename)
53     ukuran=os.stat(filename).st_size
54     clientSock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
55
56     fp=open(filename,'rb')
57     k=fp.read()
58     ter kirim=0
59     for x in k:
60         k_bytes=bytes([x])
61         clientSock.sendto(k_bytes,(IP_ADDRESS,PORT))
62         ter kirim=ter kirim+1
63     # print(k_bytes,f"ter kirim {ter kirim} of {ukuran}")
64
65 if __name__ == '__main__':
66     #check fungsi
67     k = download_gambar('https://asset.kompas.com/crops/qz_jJxyaZgGboomdCEXsfbSpec=/0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg')
68     print(k)

```

Hasil output:

- a. Multi process
 - alpine-1 (server 1)

```

tugas 3
alpine-1
alpine-2
alpine-3
192.168.56.102/static/web-ui/server/1/project/002b9bb
('192.168.122.100', 47617) blok 4985 panjang : 1 b'\xc9'
('192.168.122.100', 47617) blok 4986 panjang : 1 b'y'
('192.168.122.100', 47617) blok 4987 panjang : 1 b'r'
('192.168.122.100', 47617) blok 4988 panjang : 1 b'\xe5'
('192.168.122.100', 47617) blok 4989 panjang : 1 b'n'
('192.168.122.100', 47617) blok 4990 panjang : 1 b'\x85'
('192.168.122.100', 47617) blok 4991 panjang : 1 b'K'
('192.168.122.100', 47617) blok 4992 panjang : 1 b'\xa3'
('192.168.122.100', 47617) blok 4993 panjang : 1 b'>'
('192.168.122.100', 47617) blok 4994 panjang : 1 b'a'
('192.168.122.100', 47617) blok 4995 panjang : 1 b'\x98'
('192.168.122.100', 47617) blok 4996 panjang : 1 b'\x15'
('192.168.122.100', 47617) blok 4997 panjang : 1 b'\xed'
('192.168.122.100', 47617) blok 4998 panjang : 1 b'\r'
('192.168.122.100', 47617) blok 4999 panjang : 1 b'\xa1'
('192.168.122.100', 47617) blok 5000 panjang : 1 b'd'
('192.168.122.100', 47617) blok 5001 panjang : 1 b'\xc1'
('192.168.122.100', 47617) blok 5002 panjang : 1 b'\x10'
('192.168.122.100', 47617) blok 5003 panjang : 1 b'\xa1'
('192.168.122.100', 47617) blok 5004 panjang : 1 b'p'
('192.168.122.100', 47617) blok 5005 panjang : 1 b'\xa5'
('192.168.122.100', 47617) blok 5006 panjang : 1 b'g'
('192.168.122.100', 47617) blok 5007 panjang : 1 b'\xa4'
('192.168.122.100', 47617) blok 5008 panjang : 1 b'\xa5'
('192.168.122.100', 47617) blok 5009 panjang : 1 b'\xa5'
('192.168.122.100', 47617) blok 5010 panjang : 1 b'\xff'
('192.168.122.100', 47617) blok 5011 panjang : 1 b'\x00'
('192.168.122.100', 47617) blok 5012 panjang : 1 b'\xf2'
('192.168.122.100', 47617) blok 5013 panjang : 1 b'\xe5'
('192.168.122.100', 47617) blok 5014 panjang : 1 b'\xc6'
('192.168.122.100', 47617) blok 5015 panjang : 1 b'S'
('192.168.122.100', 47617) blok 5016 panjang : 1 b'\xc1'
('192.168.122.100', 47617) blok 5017 panjang : 1 b'\x04'

```

- alpine-2 (server 2)

```

('192.168.122.100', 34116) blok 527 panjang : 1 b'\x10'
('192.168.122.100', 34116) blok 528 panjang : 1 b'\x81'
('192.168.122.100', 34116) blok 529 panjang : 1 b'\xf7'
('192.168.122.100', 34116) blok 530 panjang : 1 b'@'
('192.168.122.100', 34116) blok 531 panjang : 1 b'\xec'
('192.168.122.100', 34116) blok 532 panjang : 1 b'\xb2'
('192.168.122.100', 34116) blok 533 panjang : 1 b'\xbe'
('192.168.122.100', 34116) blok 534 panjang : 1 b'\xea'
^ZTraceback (most recent call last):
  File "serverb.py", line 13, in <module>
    data, addr = serverSock.recvfrom(1024)
KeyboardInterrupt

/home/Pemrograman_Jaringan_E/progjar3/ans # ls
library.py      multi_thread.py      serverb.py
multi_process.py multi_thread_async.py single_thread.py
multi_process_async.py servera.py            ts2.jpg
/home/Pemrograman_Jaringan_E/progjar3/ans # cd ..
/home/Pemrograman_Jaringan_E/progjar3 # mkdir aw
/home/Pemrograman_Jaringan_E/progjar3 # cd aw
/home/Pemrograman_Jaringan_E/progjar3/aw # nano library.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano multi_process.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano multi_process_async.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano multi_thread.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano multi_thread_async.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano servera.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano serverb.py
/home/Pemrograman_Jaringan_E/progjar3/aw # nano single_thread.py
/home/Pemrograman_Jaringan_E/progjar3/aw # ls
library.py      multi_thread.py      serverb.py
multi_process.py multi_thread_async.py single_thread.py
multi_process_async.py servera.py
/home/Pemrograman_Jaringan_E/progjar3/aw # python3 serverb.py

```

- alpine-3 (client)

```

/home/Pemrograman_Jaringan_E/progjar3/aw # python3 multi_process.py
WARNING:root:image/jpeg
WARNING:root:writing kompas.jpg dalam waktu 0:00:00.090149 2021-06-29 16:31:46.376120 s/d 2021-06-29 16:31:46.466273
mendownload https://asset.kompas.com/crops/qz_jXyaZgGboomdCEXsfbSpec=0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg
192.168.122.214 5050 kompas.jpg
WARNING:root:image/jpeg
WARNING:root:writing detik.jpg dalam waktu 0:00:00.243037 2021-06-29 16:31:46.469577 s/d 2021-06-29 16:31:46.712618
mendownload https://awscdn.detik.net.id/detik2/images/logo.jpg
192.168.122.111 5050 detik.jpg
Waktu TOTAL yang dibutuhkan 0:00:00.556447 detik 2021-06-29 16:31:46.376116 s/d 2021-06-29 16:31:46.932563

```

Waktu yang dibutuhkan 0.556447 detik.

b. Multi thread

- alpine-1 (server 1)

```

('192.168.122.100', 52690) blok 3606 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3607 panjang : 1 b'\x81'
('192.168.122.100', 52690) blok 3608 panjang : 1 b'\x04'
('192.168.122.100', 52690) blok 3609 panjang : 1 b'\xa0'
('192.168.122.100', 52690) blok 3610 panjang : 1 b'\xb'
('192.168.122.100', 52690) blok 3611 panjang : 1 b'\xc'
('192.168.122.100', 52690) blok 3612 panjang : 1 b'\xd'
('192.168.122.100', 52690) blok 3613 panjang : 1 b'\xe'
('192.168.122.100', 52690) blok 3614 panjang : 1 b'\xf'
('192.168.122.100', 52690) blok 3615 panjang : 1 b'\x1'
('192.168.122.100', 52690) blok 3616 panjang : 1 b'\x1'
('192.168.122.100', 52690) blok 3617 panjang : 1 b'\x1'
('192.168.122.100', 52690) blok 3618 panjang : 1 b'\x1'
('192.168.122.100', 52690) blok 3619 panjang : 1 b'\x1'
('192.168.122.100', 52690) blok 3620 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3621 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3622 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3623 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3624 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3625 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3626 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3627 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3628 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3629 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3630 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3631 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3632 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3633 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3634 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3635 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3636 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3637 panjang : 1 b'\xc7'
('192.168.122.100', 52690) blok 3638 panjang : 1 b'\xc7'

```

- alpine-2 (server 2)

```

('192.168.122.100', 39155) blok 677 panjang : 1 b'\x05'
('192.168.122.100', 39155) blok 678 panjang : 1 b'\x80'
('192.168.122.100', 39155) blok 679 panjang : 1 b'\xb0'
('192.168.122.100', 39155) blok 680 panjang : 1 b'\xe0'
('192.168.122.100', 39155) blok 681 panjang : 1 b'2'
('192.168.122.100', 39155) blok 682 panjang : 1 b'\n'
('192.168.122.100', 39155) blok 683 panjang : 1 b'\x8c'
('192.168.122.100', 39155) blok 684 panjang : 1 b'\xa2'
('192.168.122.100', 39155) blok 685 panjang : 1 b'\xe4'
('192.168.122.100', 39155) blok 686 panjang : 1 b'\xf2'
('192.168.122.100', 39155) blok 687 panjang : 1 b'\xd9'
('192.168.122.100', 39155) blok 688 panjang : 1 b'#'
('192.168.122.100', 39155) blok 689 panjang : 1 b'\xd7'
('192.168.122.100', 39155) blok 690 panjang : 1 b'\xe3'
('192.168.122.100', 39155) blok 691 panjang : 1 b'\xe1'
('192.168.122.100', 39155) blok 692 panjang : 1 b'F'
('192.168.122.100', 39155) blok 693 panjang : 1 b'\x8d'
('192.168.122.100', 39155) blok 694 panjang : 1 b'\x86'
('192.168.122.100', 39155) blok 695 panjang : 1 b'\xe8'
('192.168.122.100', 39155) blok 696 panjang : 1 b','
('192.168.122.100', 39155) blok 697 panjang : 1 b'\xb2'
('192.168.122.100', 39155) blok 698 panjang : 1 b'2'
('192.168.122.100', 39155) blok 699 panjang : 1 b'\x10'
('192.168.122.100', 39155) blok 700 panjang : 1 b'\xc1'
('192.168.122.100', 39155) blok 701 panjang : 1 b'\xc0'
('192.168.122.100', 39155) blok 702 panjang : 1 b'x'
('192.168.122.100', 39155) blok 703 panjang : 1 b'\xcf'
('192.168.122.100', 39155) blok 704 panjang : 1 b'\xfa'
('192.168.122.100', 39155) blok 705 panjang : 1 b'\x05'
('192.168.122.100', 39155) blok 706 panjang : 1 b'\xb6'
('192.168.122.100', 39155) blok 707 panjang : 1 b'\xd0'
('192.168.122.100', 39155) blok 708 panjang : 1 b'a'
('192.168.122.100', 39155) blok 709 panjang : 1 b'Q'

```

- alpine-3 (*client*)

```

/home/Pemrograman_Jaringan_E/progjar3/aw # python3 multi_thread.py
WARNING:root:image/jpeg
WARNING:root:writing kompas.jpg dalam waktu 0:00:00.450151 2021-06-29 16:35:08.130830 s/d 2021-06-29 16:35:08.580985
mendownload https://asset.kompas.com/crops/qz_j0xyaZgGgboomdCEXsfbSpec=/0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg
192.168.122.214 5050 kompas.jpg
WARNING:root:image/jpeg
WARNING:root:writing detik.jpg dalam waktu 0:00:01.379061 2021-06-29 16:35:08.581512 s/d 2021-06-29 16:35:09.960577
mendownload https://awscdn.detik.net.id/detik2/images/logo.jpg
192.168.122.111 5050 detik.jpg
Waktu TOTAL yang dibutuhkan 0:00:01.877814 detik 2021-06-29 16:35:08.130827 s/d 2021-06-29 16:35:10.008641

```

Waktu yang dibutuhkan 1.877814 detik.

c. Multi process asynchronous

- alpine-1 (server 1)

```

tugas-3 x alpine-1 x alpine-2
← → C Not secure | 192.168.56.102/static/web-ui/server/1/project/002b
('192.168.122.100', 39281) blok 3961 panjang : 1 b'\x90'
('192.168.122.100', 39281) blok 3962 panjang : 1 b'\r'
('192.168.122.100', 39281) blok 3963 panjang : 1 b'\xbe'
('192.168.122.100', 39281) blok 3964 panjang : 1 b'\x'
('192.168.122.100', 39281) blok 3965 panjang : 1 b'\xa7'
('192.168.122.100', 39281) blok 3966 panjang : 1 b'\xd1'
('192.168.122.100', 39281) blok 3967 panjang : 1 b'\x9a'
('192.168.122.100', 39281) blok 3968 panjang : 1 b'+'
('192.168.122.100', 39281) blok 3969 panjang : 1 b'""'
('192.168.122.100', 39281) blok 3970 panjang : 1 b'\xe5'
('192.168.122.100', 39281) blok 3971 panjang : 1 b'\x94'
('192.168.122.100', 39281) blok 3972 panjang : 1 b')'
('192.168.122.100', 39281) blok 3973 panjang : 1 b'\xb3'
('192.168.122.100', 39281) blok 3974 panjang : 1 b'K'
('192.168.122.100', 39281) blok 3975 panjang : 1 b'E'
('192.168.122.100', 39281) blok 3976 panjang : 1 b'\xcc'
('192.168.122.100', 39281) blok 3977 panjang : 1 b'\xdf'
('192.168.122.100', 39281) blok 3978 panjang : 1 b'\xa5'
('192.168.122.100', 39281) blok 3979 panjang : 1 b'3'
('192.168.122.100', 39281) blok 3980 panjang : 1 b'\xee'
('192.168.122.100', 39281) blok 3981 panjang : 1 b'.'
('192.168.122.100', 39281) blok 3982 panjang : 1 b'o'
('192.168.122.100', 39281) blok 3983 panjang : 1 b'l'
('192.168.122.100', 39281) blok 3984 panjang : 1 b'\x18'
('192.168.122.100', 39281) blok 3985 panjang : 1 b'\x04'
('192.168.122.100', 39281) blok 3986 panjang : 1 b'\xa3'
('192.168.122.100', 39281) blok 3987 panjang : 1 b'|'
('192.168.122.100', 39281) blok 3988 panjang : 1 b'7'
('192.168.122.100', 39281) blok 3989 panjang : 1 b'\x19'
('192.168.122.100', 39281) blok 3990 panjang : 1 b'\xcb'
('192.168.122.100', 39281) blok 3991 panjang : 1 b')'
('192.168.122.100', 39281) blok 3992 panjang : 1 b'\xf8'
('192.168.122.100', 39281) blok 3993 panjang : 1 b'\xfa'

```

- alpine-2 (server 2)

```

tugas-3 x alpine-1 x alpine-2
← → C Not secure | 192.168.56.102/static/web-ui/server/1/project/002b9bb1-cb32-452b-8269-38d931
('192.168.122.100', 36390) blok 246 panjang : 1 b'-'
('192.168.122.100', 36390) blok 247 panjang : 1 b'""'
('192.168.122.100', 36390) blok 248 panjang : 1 b'e'
('192.168.122.100', 36390) blok 249 panjang : 1 b'e'
('192.168.122.100', 36390) blok 250 panjang : 1 b'e'
('192.168.122.100', 36390) blok 251 panjang : 1 b'""'
('192.168.122.100', 36390) blok 252 panjang : 1 b'-'
('192.168.122.100', 36390) blok 253 panjang : 1 b'\xff'
('192.168.122.100', 36390) blok 254 panjang : 1 b'\xc0'
('192.168.122.100', 36390) blok 255 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 256 panjang : 1 b'\x11'
('192.168.122.100', 36390) blok 257 panjang : 1 b'\x08'
('192.168.122.100', 36390) blok 258 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 259 panjang : 1 b'\xc8'
('192.168.122.100', 36390) blok 260 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 261 panjang : 1 b'\xc8'
('192.168.122.100', 36390) blok 262 panjang : 1 b'\x03'
('192.168.122.100', 36390) blok 263 panjang : 1 b'\x01'
('192.168.122.100', 36390) blok 264 panjang : 1 b'""'
('192.168.122.100', 36390) blok 265 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 266 panjang : 1 b'\x02'
('192.168.122.100', 36390) blok 267 panjang : 1 b'\x11'
('192.168.122.100', 36390) blok 268 panjang : 1 b'\x01'
('192.168.122.100', 36390) blok 269 panjang : 1 b'\x03'
('192.168.122.100', 36390) blok 270 panjang : 1 b'\x11'
('192.168.122.100', 36390) blok 271 panjang : 1 b'\x01'
('192.168.122.100', 36390) blok 272 panjang : 1 b'\xff'
('192.168.122.100', 36390) blok 273 panjang : 1 b'\xc4'
('192.168.122.100', 36390) blok 274 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 275 panjang : 1 b'\x1c'
('192.168.122.100', 36390) blok 276 panjang : 1 b'\x00'
('192.168.122.100', 36390) blok 277 panjang : 1 b'\x01'
('192.168.122.100', 36390) blok 278 panjang : 1 b'\x00'

```

- alpine-3 (client)

```

/home/Programan_Jaringan_E/progjar3/aw # python3 multi_process_async.py
WARNING:root:image/jpeg
WARNING:root:writing kompas.jpg dalam waktu 0:00:00.352647 2021-06-29 16:34:07.005241 s/d 2021-06-29 16:34:07.357892
mendownload https://asset.kompas.com/crops/qz_jjxyaZgGboomdCEXsfBSpec=/0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg
192.168.122.214 5050 kompas.jpg
WARNING:root:image/jpeg
WARNING:root:writing detik.jpg dalam waktu 0:00:00.621627 2021-06-29 16:34:07.358250 s/d 2021-06-29 16:34:07.979880
mendownload https://awscdn.detik.net.id/detik2/images/logo.jpg
192.168.122.111 5050 detik.jpg
Waktu TOTAL yang dibutuhkan 0:00:01.041508 detik 2021-06-29 16:34:07.005232 s/d 2021-06-29 16:34:08.046740
status TASK
{'kompas': None, 'detik': None}

```

Waktu yang dibutuhkan 1.041508 detik.

d. Multi thread asynchronous

- alpine-1 (server 1)

```
tugas-3 x alpine-1 x alpine
← → ↻ Not secure | 192.168.56.102/static/web-ui/server/1/project/002b9
('192.168.122.100', 51853) blok 3985 panjang : 1 b'\x85'
('192.168.122.100', 51853) blok 3986 panjang : 1 b'\xd1'
('192.168.122.100', 51853) blok 3987 panjang : 1 b'\xc4'
('192.168.122.100', 51853) blok 3988 panjang : 1 b'\xe9'
('192.168.122.100', 51853) blok 3989 panjang : 1 b'z'
('192.168.122.100', 51853) blok 3990 panjang : 1 b'\x97'
('192.168.122.100', 51853) blok 3991 panjang : 1 b'\xe1'
('192.168.122.100', 51853) blok 3992 panjang : 1 b'\xdc'
('192.168.122.100', 51853) blok 3993 panjang : 1 b'\x15'
('192.168.122.100', 51853) blok 3994 panjang : 1 b'\x95'
('192.168.122.100', 51853) blok 3995 panjang : 1 b'\xf4'
('192.168.122.100', 51853) blok 3996 panjang : 1 b'\xec'
('192.168.122.100', 51853) blok 3997 panjang : 1 b'\xa3'
('192.168.122.100', 51853) blok 3998 panjang : 1 b'9'
('192.168.122.100', 51853) blok 3999 panjang : 1 b'\x02'
('192.168.122.100', 51853) blok 4000 panjang : 1 b'\'\'
('192.168.122.100', 51853) blok 4001 panjang : 1 b'\x89'
('192.168.122.100', 51853) blok 4002 panjang : 1 b'\xa4'
('192.168.122.100', 51853) blok 4003 panjang : 1 b'\x12'
('192.168.122.100', 51853) blok 4004 panjang : 1 b'\xd0'
('192.168.122.100', 51853) blok 4005 panjang : 1 b'c'
('192.168.122.100', 51853) blok 4006 panjang : 1 b'\xa3'
('192.168.122.100', 51853) blok 4007 panjang : 1 b'\xb9'
('192.168.122.100', 51853) blok 4008 panjang : 1 b'\x98'
('192.168.122.100', 51853) blok 4009 panjang : 1 b'F'
('192.168.122.100', 51853) blok 4010 panjang : 1 b'\xb1'
('192.168.122.100', 51853) blok 4011 panjang : 1 b'\'\'
('192.168.122.100', 51853) blok 4012 panjang : 1 b'\x98'
('192.168.122.100', 51853) blok 4013 panjang : 1 b'\xaa'
('192.168.122.100', 51853) blok 4014 panjang : 1 b'f'
('192.168.122.100', 51853) blok 4015 panjang : 1 b'!'
('192.168.122.100', 51853) blok 4016 panjang : 1 b'j'
('192.168.122.100', 51853) blok 4017 panjang : 1 b'\x02'
```

- alpine-2 (server 2)

```
tugas-3 x alpine-1 x alpine-2 x
← → ↻ Not secure | 192.168.56.102/static/web-ui/server/1/project/002b9bb1-cb32-452b-8269-38d931
('192.168.122.100', 51434) blok 667 panjang : 1 b'\xd1'
('192.168.122.100', 51434) blok 668 panjang : 1 b'\xac'
('192.168.122.100', 51434) blok 669 panjang : 1 b'\x00'
('192.168.122.100', 51434) blok 670 panjang : 1 b'c'
('192.168.122.100', 51434) blok 671 panjang : 1 b'o'
('192.168.122.100', 51434) blok 672 panjang : 1 b's'
('192.168.122.100', 51434) blok 673 panjang : 1 b'\x03'
('192.168.122.100', 51434) blok 674 panjang : 1 b'!'
('192.168.122.100', 51434) blok 675 panjang : 1 b'I'
('192.168.122.100', 51434) blok 676 panjang : 1 b'K'
('192.168.122.100', 51434) blok 677 panjang : 1 b'\xb5'
('192.168.122.100', 51434) blok 678 panjang : 1 b'r'
('192.168.122.100', 51434) blok 679 panjang : 1 b'\xc4'
('192.168.122.100', 51434) blok 680 panjang : 1 b'l'
('192.168.122.100', 51434) blok 681 panjang : 1 b'\xea'
('192.168.122.100', 51434) blok 682 panjang : 1 b'o'
('192.168.122.100', 51434) blok 683 panjang : 1 b'!'
('192.168.122.100', 51434) blok 684 panjang : 1 b'\xb1'
('192.168.122.100', 51434) blok 685 panjang : 1 b'v'
('192.168.122.100', 51434) blok 686 panjang : 1 b'='
('192.168.122.100', 51434) blok 687 panjang : 1 b'M'
('192.168.122.100', 51434) blok 688 panjang : 1 b'\xd1'
('192.168.122.100', 51434) blok 689 panjang : 1 b'\x11'
('192.168.122.100', 51434) blok 690 panjang : 1 b'\x12'
('192.168.122.100', 51434) blok 691 panjang : 1 b'\xb1'
('192.168.122.100', 51434) blok 692 panjang : 1 b'g'
('192.168.122.100', 51434) blok 693 panjang : 1 b'D'
('192.168.122.100', 51434) blok 694 panjang : 1 b'\xf4'
('192.168.122.100', 51434) blok 695 panjang : 1 b'\xdf'
('192.168.122.100', 51434) blok 696 panjang : 1 b'\xe7'
('192.168.122.100', 51434) blok 697 panjang : 1 b'\xd4'
('192.168.122.100', 51434) blok 698 panjang : 1 b'\xde'
('192.168.122.100', 51434) blok 699 panjang : 1 b'\xab'
```

- alpine-3 (client)

```
/home/Pemrograman Jaringan_E/progjar3/aw # python3 multi_thread_async.py
WARNING:root:image/jpeg
WARNING:root:writing kompas.jpg dalam waktu 0:00:00.062019 2021-06-29 16:36:12.231327 s/d 2021-06-29 16:36:12.293349
mendownload https://asset.kompas.com/crops/qz_jXyaZgGgboomdCEXsFbSpec-/0x0:998x665/740x500/data/photo/2020/03/01/5e5b52f4db896.jpg
192.168.122.214 5050 kompas.jpg
WARNING:root:image/jpeg
WARNING:root:writing detik.jpg dalam waktu 0:00:01.177573 2021-06-29 16:36:12.293580 s/d 2021-06-29 16:36:13.471159
mendownload https://awscdn.detik.net.id/detik2/images/logo.jpg
192.168.122.111 5050 detik.jpg
Waktu TOTAL yang dibutuhkan 0:00:01.311423 detik 2021-06-29 16:36:12.231324 s/d 2021-06-29 16:36:13.542747
hasil task yang dijalankan
[['kompas', None, 'detik', None]]
```

Waktu yang dibutuhkan 1.311423 detik.

e. Hasil

- alpine-1 (server 1)

```
/home/Pemrograman_Jaringan_E/progjar3/aw # ls
library.py          multi_thread.py      serverb.py
multi_process.py    multi_thread_async.py single_thread.py
multi_process_async.py servera.py            ts1.jpg
/home/Pemrograman_Jaringan_E/progjar3/aw #
```

- alpine-2 (server 2)

```
/home/Pemrograman_Jaringan_E/progjar3/aw # ls
library.py          multi_thread.py      serverb.py
multi_process.py    multi_thread_async.py single_thread.py
multi_process_async.py servera.py            ts2.jpg
/home/Pemrograman_Jaringan_E/progjar3/aw #
```

- alpine-3 (*client*)

```
/home/Pemrograman_Jaringan_E/progjar3/aw # ls
__pycache__         library.py            multi_thread_async.py
detik.jpg            multi_process.py      servera.py
image.jpg            multi_process_async.py serverb.py
kompas.jpg           multi_thread.py        single_thread.py
/home/Pemrograman_Jaringan_E/progjar3/aw #
```

Tautan GitHub: [FXKevinK/Pemrograman_Jaringan_E at Tugas_3 \(github.com\)](https://github.com/FXKevinK/Pemrograman_Jaringan_E_at_Tugas_3)