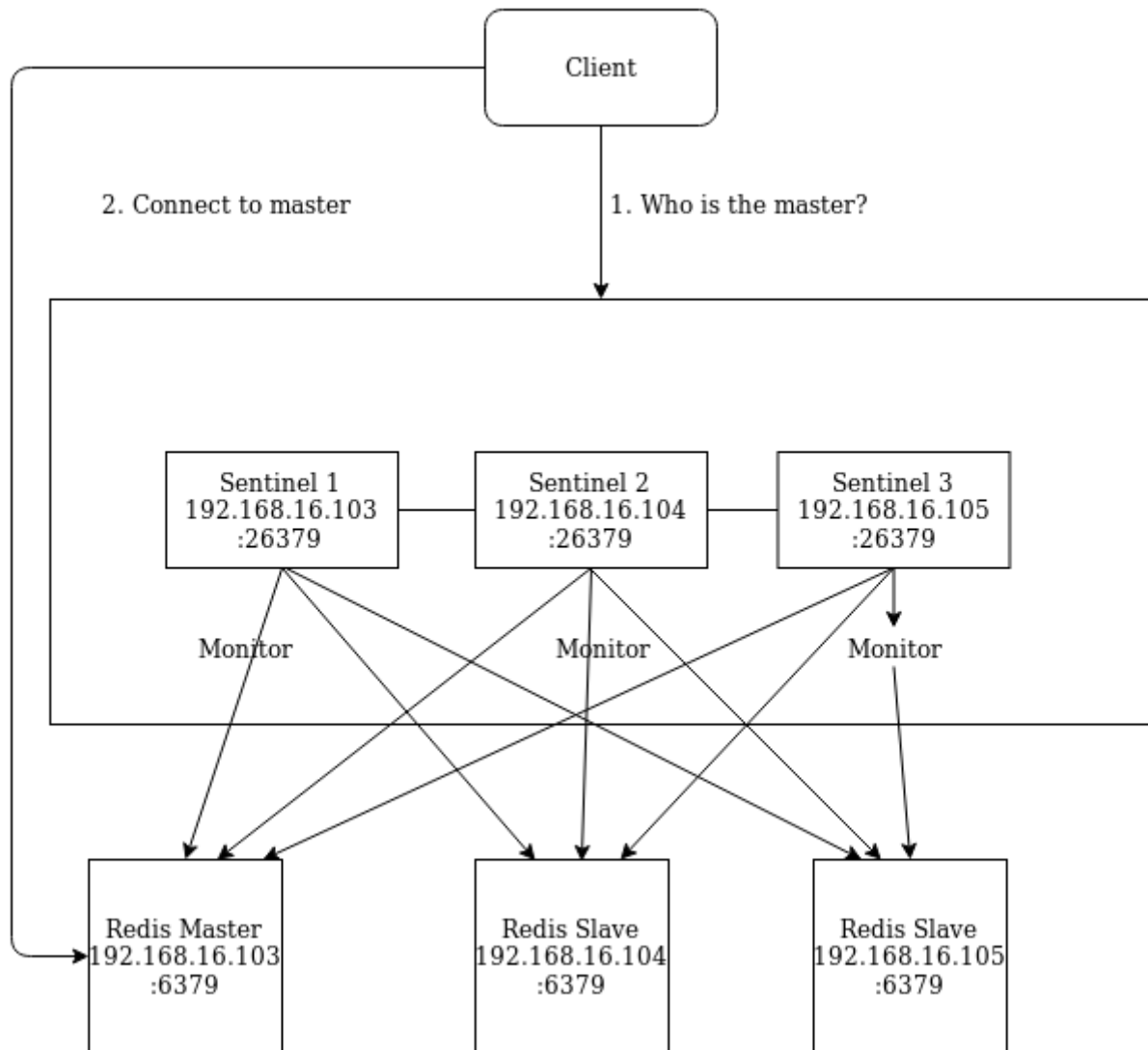


### A. Redis Cluster dengan 3 node



1. Run command **vagrant up** dengan Vagrantfile yang sudah tersedia.

```
|Vagrant.configure("2") do |config|  
  
config.vm.define "node_1" do |node_1|  
node_1.vm.box = "bento/ubuntu-16.04"  
node_1.vm.hostname = "node-1"  
  
node_1.vm.provider "virtualbox" do |vb|  
vb.gui = false  
vb.name = "node_1"  
vb.memory = "1024"  
end
```

```

node_1.vm.network "private_network", ip: "192.168.16.103"
node_1.vm.provision "shell", path: "provision/node.sh", privileged: false

end

config.vm.define "node_2" do |node_2|
  node_2.vm.box = "bento/ubuntu-16.04"
  node_2.vm.hostname = "node-2"

  node_2.vm.provider "virtualbox" do |vb|
    vb.gui = false
    vb.name = "node_2"
    vb.memory = "1024"
  end

  node_2.vm.network "private_network", ip: "192.168.16.104"
  node_2.vm.provision "shell", path: "provision/node.sh", privileged: false

end

config.vm.define "node_3" do |node_3|
  node_3.vm.box = "bento/ubuntu-16.04"
  node_3.vm.hostname = "node-3"

  node_3.vm.provider "virtualbox" do |vb|
    vb.gui = false
    vb.name = "node_3"
    vb.memory = "1024"
  end

  node_3.vm.network "private_network", ip: "192.168.16.105"
  node_3.vm.provision "shell", path: "provision/node.sh", privileged: false

end
end

```

Vagrantfile akan melakukan provisioning:

- Update ubuntu repository
- Install build-essential, tcl, malloc
- Install redis

```

sudo apt-get update
sudo apt-get install build-essential tcl
sudo apt-get install libjemalloc-dev

curl -O http://download.redis.io/redis-stable.tar.gz
tar xzvf redis-stable.tar.gz
cd redis-stable
make
make test

```

```
sudo make install
```

```
sudo ufw allow 6379  
sudo ufw allow 26379
```

```
sudo mkdir /opt/redis  
sudo mkdir /opt/redis/redis-stable
```

2. File konfigurasi redis.conf dan sentinel.conf adalah sebagai berikut:

	<b>Node 1 – 192.168.16.103</b>
<b>redis.conf</b>	protected-mode no port 6379 dir . logfile "/opt/redis/redis-stable/redis.log"
<b>sentinel.conf</b>	protected-mode no port 26379 sentinel monitor mymaster 192.168.16.103 6379 2 logfile "/opt/redis/redis-stable/sentinel.log" sentinel down-after-milliseconds mymaster 5000 sentinel failover-timeout mymaster 10000

	<b>Node 2 – 192.168.16.104</b>
<b>redis.conf</b>	protected-mode no port 6379 dir . slaveof 192.168.16.103 logfile "/opt/redis/redis-stable/redis.log"
<b>sentinel.conf</b>	protected-mode no port 26379 sentinel monitor mymaster 192.168.16.103 6379 2 logfile "/opt/redis/redis-stable/sentinel.log" sentinel down-after-milliseconds mymaster 5000 sentinel failover-timeout mymaster 10000

	<b>Node 3 – 192.168.16.105</b>
<b>redis.conf</b>	protected-mode no port 6379 dir . slaveof 192.168.16.103 logfile "/opt/redis/redis-stable/redis.log"
<b>sentinel.conf</b>	protected-mode no port 26379 sentinel monitor mymaster 192.168.16.103 6379 2 logfile "/opt/redis/redis-stable/sentinel.log" sentinel down-after-milliseconds mymaster 5000 sentinel failover-timeout mymaster 10000

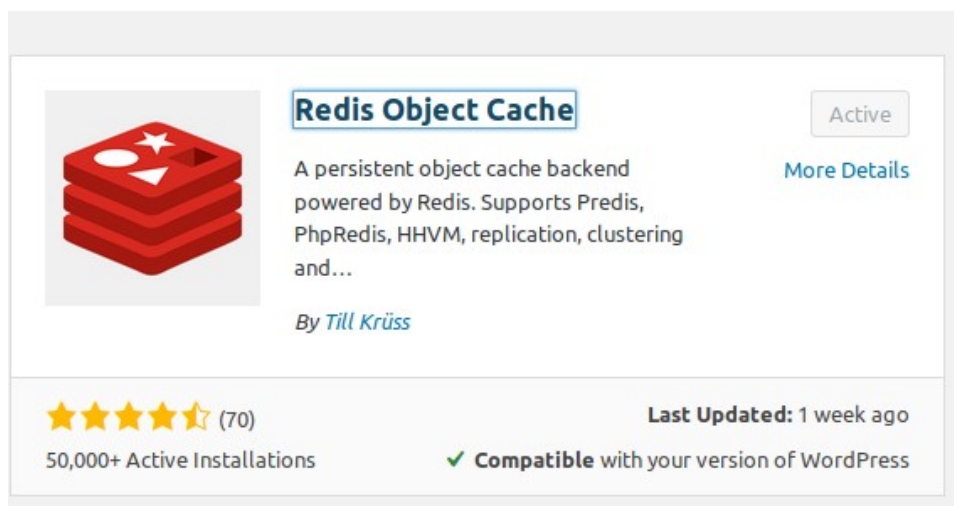
3. Masuk ke folder `redis-stable/src` dan run command **`sudo redis-server ../redis.conf & sudo redis-sentinel ../sentinel.conf`** untuk menyalakan redis server dan sentinel.

## B. Konfigurasi Wordpress menggunakan Redis dan Webserver

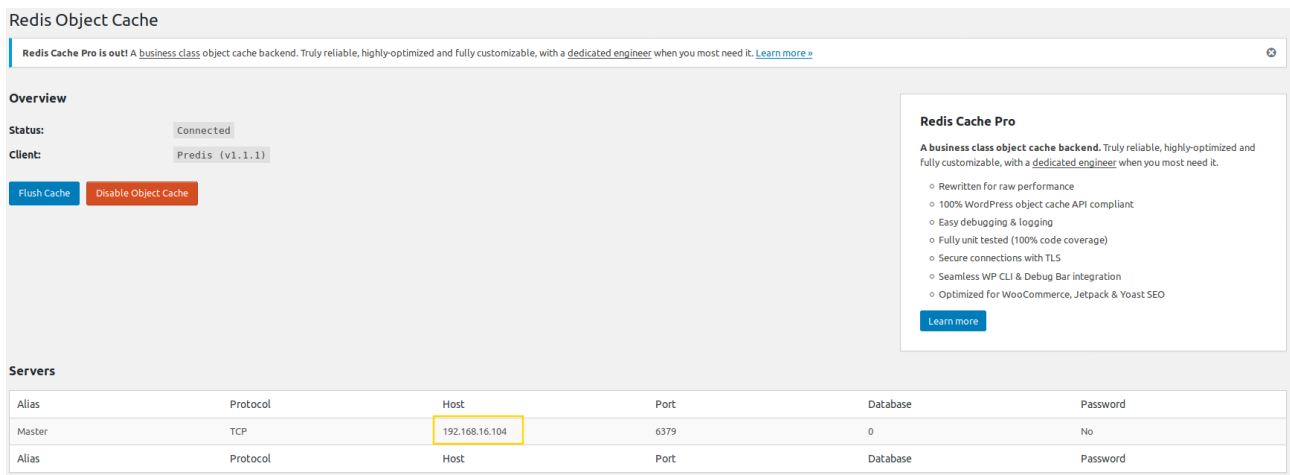
1. Download melalui link <https://wordpress.org/download/>.
2. Extract hasil download, dan letakkan pada direktori `/var/www/wordpress-redis`.
3. Run command **`sudo chown R www-data:www-data wordpress-redis`** agar nginx dapat melakukan write pada direktori tersebut.
4. Buatlah file konfigurasi nginx pada direktori `/etc/nginx/sites-available/wordpress-redis` dengan isi sebagai berikut:

```
server {  
    listen 80;  
    listen [::]:80;  
  
    root /var/www/wordpress-redis;  
  
    index index.php index.html index.htm index.nginx-debian.html;  
  
    server_name wordpress-redis.local;  
  
    location / {  
        try_files $uri $uri/ =404;  
    }  
    location ~ \.php$ {  
        include snippets/fastcgi-php.conf;  
        fastcgi_pass unix:/var/run/php/php7.2-fpm.sock;  
    }  
}
```

5. Tambahlan konfigurasi **`127.0.0.1 wordpress-redis.local`** pada file `/etc/hosts`. Run command **`sudo service nginx start`**, lalu buka **`wordpress-redis.local`** melalui web browser.
6. Lanjutkan instalasi wordpress dengan mengisi *credentials* database.
7. Buka menu **plugin**, lalu search Redis Object Cache. Install plugin tersebut.



8. Buka menu **settings** → **Redis**, lalu aktifkan Redis Object Cache.



Buka file `/var/www/wordpress-redis/wp-config.php` untuk menambahkan host address Redis, dengan cara berikut:

```
define( 'WP_REDIS_CLIENT', 'predis' );
define( 'WP_REDIS_SENTINEL', 'mymaster' );

define( 'WP_REDIS_SERVERS', [
    'tcp://192.168.16.103:26379',
    'tcp://192.168.16.104:26379',
    'tcp://192.168.16.105:26379',
] );
```

9. Buatlah post yang banyak.

### C. Konfigurasi Wordpress tanpa Redis dan Webserver

1. Download melalui link <https://wordpress.org/download/> .
2. Extract hasil download, dan letakkan pada direktori `/var/www/wordpress`.
3. Run command **sudo chown R www-data:www-data wordpress** agar nginx dapat melakukan write pada direktori tersebut.
4. Buatlah file konfigurasi nginx pada direktori `/etc/nginx/sites-available/wordpress` dengan isi sebagai berikut:

```
server {
    listen 80;
    listen [::]:80;

    root /var/www/wordpress;

    index index.php index.html index.htm index.nginx-debian.html;

    server_name wordpress.local;

    location / {
        try_files $uri $uri/ =404;
    }
    location ~ \.php$ {
        include snippets/fastcgi-php.conf;
        fastcgi_pass unix:/var/run/php/php7.2-fpm.sock;
    }
}
```

```
}  
}  
}
```

5. Tambahlan konfigurasi **127.0.0.1 wordpress.local** pada *file /etc/hosts*. Run command **sudo service nginx start**, lalu buka **wordpress.local** melalui *web browser*.
6. Lanjutkan instalasi wordpress dengan mengisi *credentials* database.
7. Buatlah post yang banyak.

#### D. Load test menggunakan JMeter

Load test dilakukan menggunakan Jmeter terhadap kedua web Wordpress. Kedua web Wordpress memiliki data yang sama agar adil.

1. 50 koneksi selama 10 detik

Wordpress tanpa redis memiliki rata-rata sample time 91 ms.

View Results in Table									
Name:		Wordpress View Results in Table							
Comments:									
Write results to file / Read from file									
Filename		Browse...		Log/Display Only:		<input type="checkbox"/> Errors <input checked="" type="checkbox"/> Successes		Configure	
Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	09:07:54.264	Wordpress Thr...	Wordpress HTT...	155	✓	98848	120	80	33
2	09:07:54.351	Wordpress Thr...	Wordpress HTT...	116	✓	98848	120	53	3
3	09:07:54.547	Wordpress Thr...	Wordpress HTT...	85	✓	98848	120	33	1
4	09:07:54.730	Wordpress Thr...	Wordpress HTT...	98	✓	98848	120	39	0
5	09:07:54.974	Wordpress Thr...	Wordpress HTT...	85	✓	98848	120	32	0
6	09:07:55.163	Wordpress Thr...	Wordpress HTT...	84	✓	98848	120	32	0
7	09:07:55.355	Wordpress Thr...	Wordpress HTT...	88	✓	98848	120	35	1
8	09:07:55.547	Wordpress Thr...	Wordpress HTT...	87	✓	98848	120	32	0
9	09:07:55.745	Wordpress Thr...	Wordpress HTT...	88	✓	98848	120	35	0
10	09:07:55.943	Wordpress Thr...	Wordpress HTT...	85	✓	98848	120	32	1
11	09:07:56.134	Wordpress Thr...	Wordpress HTT...	89	✓	98848	120	35	0
12	09:07:56.331	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	32	1
13	09:07:56.530	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	32	1
14	09:07:56.728	Wordpress Thr...	Wordpress HTT...	93	✓	98848	120	32	1
15	09:07:56.929	Wordpress Thr...	Wordpress HTT...	84	✓	98848	120	32	0
16	09:07:57.128	Wordpress Thr...	Wordpress HTT...	120	✓	98848	120	38	0
17	09:07:57.327	Wordpress Thr...	Wordpress HTT...	96	✓	98848	120	38	0
18	09:07:57.526	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	32	1
19	09:07:57.727	Wordpress Thr...	Wordpress HTT...	100	✓	98848	120	35	1
20	09:07:57.926	Wordpress Thr...	Wordpress HTT...	92	✓	98848	120	39	0
21	09:07:58.129	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	32	0
22	09:07:58.327	Wordpress Thr...	Wordpress HTT...	85	✓	98848	120	32	1
23	09:07:58.529	Wordpress Thr...	Wordpress HTT...	87	✓	98848	120	34	1
24	09:07:58.726	Wordpress Thr...	Wordpress HTT...	89	✓	98848	120	32	1
25	09:07:58.929	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	33	1
26	09:07:59.128	Wordpress Thr...	Wordpress HTT...	88	✓	98848	120	35	1
27	09:07:59.330	Wordpress Thr...	Wordpress HTT...	85	✓	98848	120	32	1
28	09:07:59.526	Wordpress Thr...	Wordpress HTT...	86	✓	98848	120	33	1
29	09:07:59.726	Wordpress Thr...	Wordpress HTT...	112	✓	98848	120	33	0
30	09:07:59.926	Wordpress Thr...	Wordpress HTT...	83	✓	98848	120	31	0
31	09:08:00.127	Wordpress Thr...	Wordpress HTT...	88	✓	98848	120	34	0
32	09:08:00.328	Wordpress Thr...	Wordpress HTT...	87	✓	98848	120	33	1
33	09:08:00.526	Wordpress Thr...	Wordpress HTT...	84	✓	98848	120	32	1
34	09:08:00.727	Wordpress Thr...	Wordpress HTT...	84	✓	98848	120	31	1
35	09:08:00.928	Wordpress Thr...	Wordpress HTT...	94	✓	98848	120	32	0
<input type="checkbox"/> Scroll automatically?		<input type="checkbox"/> Child samples?		No of Samples 50		Latest Sample 88		Average 91	
								Deviation 12	

Wordpress menggunakan redis memiliki rata-rata sampling time 127 ms.

**View Results in Table**

Name: Wordpress Redis View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☒ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	09:09:55.163	Thread Group ...	HTTP Request	130	✓	107801	126	51	1
2	09:09:55.369	Thread Group ...	HTTP Request	126	✓	107801	126	44	1
3	09:09:55.563	Thread Group ...	HTTP Request	133	✓	107801	126	43	0
4	09:09:55.763	Thread Group ...	HTTP Request	130	✓	107801	126	43	0
5	09:09:55.964	Thread Group ...	HTTP Request	127	✓	107801	126	43	0
6	09:09:56.165	Thread Group ...	HTTP Request	124	✓	107801	126	44	0
7	09:09:56.365	Thread Group ...	HTTP Request	123	✓	107801	126	41	0
8	09:09:56.564	Thread Group ...	HTTP Request	124	✓	107801	126	43	1
9	09:09:56.763	Thread Group ...	HTTP Request	122	✓	107801	126	44	1
10	09:09:56.966	Thread Group ...	HTTP Request	140	✓	107801	126	48	0
11	09:09:57.161	Thread Group ...	HTTP Request	123	✓	107801	126	43	1
12	09:09:57.363	Thread Group ...	HTTP Request	126	✓	107801	126	44	0
13	09:09:57.562	Thread Group ...	HTTP Request	121	✓	107801	126	42	0
14	09:09:57.762	Thread Group ...	HTTP Request	122	✓	107801	126	43	1
15	09:09:57.962	Thread Group ...	HTTP Request	125	✓	107801	126	45	0
16	09:09:58.161	Thread Group ...	HTTP Request	127	✓	107801	126	43	1
17	09:09:58.362	Thread Group ...	HTTP Request	125	✓	107801	126	43	1
18	09:09:58.563	Thread Group ...	HTTP Request	123	✓	107801	126	43	1
19	09:09:58.762	Thread Group ...	HTTP Request	120	✓	107801	126	41	0
20	09:09:58.963	Thread Group ...	HTTP Request	124	✓	107801	126	44	0
21	09:09:59.161	Thread Group ...	HTTP Request	124	✓	107801	126	45	1
22	09:09:59.361	Thread Group ...	HTTP Request	124	✓	107801	126	44	1
23	09:09:59.563	Thread Group ...	HTTP Request	123	✓	107801	126	43	0
24	09:09:59.763	Thread Group ...	HTTP Request	122	✓	107801	126	42	0
25	09:09:59.965	Thread Group ...	HTTP Request	128	✓	107801	126	47	0
26	09:10:00.163	Thread Group ...	HTTP Request	126	✓	107801	126	46	0
27	09:10:00.362	Thread Group ...	HTTP Request	127	✓	107801	126	43	1
28	09:10:00.562	Thread Group ...	HTTP Request	120	✓	107801	126	41	1
29	09:10:00.761	Thread Group ...	HTTP Request	121	✓	107801	126	43	1
30	09:10:00.963	Thread Group ...	HTTP Request	135	✓	107801	126	49	0
31	09:10:01.163	Thread Group ...	HTTP Request	136	✓	107801	126	46	0
32	09:10:01.361	Thread Group ...	HTTP Request	159	✓	107801	126	57	1
33	09:10:01.561	Thread Group ...	HTTP Request	134	✓	107801	126	47	1
34	09:10:01.761	Thread Group ...	HTTP Request	150	✓	107801	126	51	1
35	09:10:01.963	Thread Group ...	HTTP Request	136	✓	107801	126	51	0

☐ Scroll automatically? ☐ Child samples? No of Samples 50 Latest Sample 123 Average 137 Deviation 8

2. 203 koneksi selama 10 detik

Wordpress tanpa redis memiliki rata-rata sample time 106 ms.

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☒ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	09:59:11.634	Thread Group ...	HTTP Request	93	✓	98848	120	38	0
2	09:59:11.684	Thread Group ...	HTTP Request	86	✓	98848	120	31	0
3	09:59:11.731	Thread Group ...	HTTP Request	95	✓	98848	120	32	0
4	09:59:11.782	Thread Group ...	HTTP Request	98	✓	98848	120	39	0
5	09:59:11.831	Thread Group ...	HTTP Request	101	✓	98848	120	33	1
6	09:59:11.878	Thread Group ...	HTTP Request	104	✓	98848	120	43	1
7	09:59:11.928	Thread Group ...	HTTP Request	109	✓	98848	120	36	0
8	09:59:11.977	Thread Group ...	HTTP Request	105	✓	98848	120	48	0
9	09:59:12.026	Thread Group ...	HTTP Request	99	✓	98848	120	35	0
10	09:59:12.075	Thread Group ...	HTTP Request	120	✓	98848	120	42	0
11	09:59:12.127	Thread Group ...	HTTP Request	112	✓	98848	120	48	1
12	09:59:12.173	Thread Group ...	HTTP Request	109	✓	98848	120	35	0
13	09:59:12.221	Thread Group ...	HTTP Request	108	✓	98848	120	49	0
14	09:59:12.270	Thread Group ...	HTTP Request	94	✓	98848	120	36	0
15	09:59:12.319	Thread Group ...	HTTP Request	102	✓	98848	120	34	1
16	09:59:12.368	Thread Group ...	HTTP Request	117	✓	98848	120	44	1
17	09:59:12.418	Thread Group ...	HTTP Request	105	✓	98848	120	43	0
18	09:59:12.467	Thread Group ...	HTTP Request	95	✓	98848	120	38	0
19	09:59:12.515	Thread Group ...	HTTP Request	88	✓	98848	120	34	0
20	09:59:12.564	Thread Group ...	HTTP Request	100	✓	98848	120	31	0
21	09:59:12.613	Thread Group ...	HTTP Request	101	✓	98848	120	44	0
22	09:59:12.662	Thread Group ...	HTTP Request	90	✓	98848	120	34	0
23	09:59:12.711	Thread Group ...	HTTP Request	104	✓	98848	120	31	0
24	09:59:12.760	Thread Group ...	HTTP Request	104	✓	98848	120	46	0
25	09:59:12.809	Thread Group ...	HTTP Request	90	✓	98848	120	33	0

☐ Scroll automatically? ☐ Child samples? No of Samples 203 Latest Sample 105 Average 100 Deviation 21

Wordpress menggunakan redis memiliki rata-rata sampling time 1369 ms.

**View Results in Table**

Name: Wordpress Redis View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
46	09:13:47.287	Thread Group ...	HTTP Request	894	✓	107801	126	711	1
47	09:13:47.239	Thread Group ...	HTTP Request	998	✓	107801	126	770	1
48	09:13:47.335	Thread Group ...	HTTP Request	923	✓	107801	126	741	0
49	09:13:47.384	Thread Group ...	HTTP Request	974	✓	107801	126	815	0
50	09:13:47.435	Thread Group ...	HTTP Request	950	✓	107801	126	789	1
51	09:13:47.482	Thread Group ...	HTTP Request	978	✓	107801	126	799	0
52	09:13:47.530	Thread Group ...	HTTP Request	964	✓	107801	126	800	1
53	09:13:47.580	Thread Group ...	HTTP Request	1028	✓	107801	126	814	1
54	09:13:47.678	Thread Group ...	HTTP Request	971	✓	107801	126	796	1
55	09:13:47.628	Thread Group ...	HTTP Request	1034	✓	107801	126	850	1
56	09:13:47.776	Thread Group ...	HTTP Request	990	✓	107801	126	812	1
57	09:13:47.727	Thread Group ...	HTTP Request	1046	✓	107801	126	827	1
58	09:13:47.825	Thread Group ...	HTTP Request	1088	✓	107801	126	869	0
59	09:13:47.923	Thread Group ...	HTTP Request	1007	✓	107801	126	836	1
60	09:13:47.874	Thread Group ...	HTTP Request	1083	✓	107801	126	878	1
61	09:13:47.971	Thread Group ...	HTTP Request	1013	✓	107801	126	881	1
62	09:13:48.021	Thread Group ...	HTTP Request	1023	✓	107801	126	848	1
63	09:13:48.119	Thread Group ...	HTTP Request	1101	✓	107801	126	907	0
64	09:13:48.167	Thread Group ...	HTTP Request	1071	✓	107801	126	906	1
65	09:13:48.071	Thread Group ...	HTTP Request	1200	✓	107801	126	974	0
66	09:13:48.218	Thread Group ...	HTTP Request	1072	✓	107801	126	854	0
67	09:13:48.266	Thread Group ...	HTTP Request	1034	✓	107801	126	861	0
68	09:13:48.363	Thread Group ...	HTTP Request	1112	✓	107801	126	965	1
69	09:13:48.463	Thread Group ...	HTTP Request	1074	✓	107801	126	918	2
70	09:13:48.413	Thread Group ...	HTTP Request	1128	✓	107801	126	947	1

☐ Scroll automatically? ☐ Child samples? No of Samples 203 Latest Sample 2228 **Average 1309** Deviation 583

3. 303 koneksi selama 10 detik

Wordpress tanpa redis memiliki rata-rata sample time 564 ms.

**View Results in Table**

Name: View Results in Table

Comments:

Write results to file / Read from file

Filename   Log/Display Only: ☐ Errors ☐ Successes

Sample #	Start Time	Thread Name	Label	Sample Time(ms)	Status	Bytes	Sent Bytes	Latency	Connect Time(...)
1	09:56:45.301	Thread Group ...	HTTP Request	107	✓	98848	120	41	1
2	09:56:45.336	Thread Group ...	HTTP Request	99	✓	98848	120	31	0
3	09:56:45.367	Thread Group ...	HTTP Request	130	✓	98848	120	50	0
4	09:56:45.401	Thread Group ...	HTTP Request	130	✓	98848	120	47	0
5	09:56:45.433	Thread Group ...	HTTP Request	107	✓	98848	120	40	0
6	09:56:45.466	Thread Group ...	HTTP Request	143	✓	98848	120	79	0
7	09:56:45.500	Thread Group ...	HTTP Request	151	✓	98848	120	68	0
8	09:56:45.533	Thread Group ...	HTTP Request	136	✓	98848	120	53	0
9	09:56:45.565	Thread Group ...	HTTP Request	143	✓	98848	120	80	1
10	09:56:45.631	Thread Group ...	HTTP Request	141	✓	98848	120	80	0
11	09:56:45.600	Thread Group ...	HTTP Request	179	✓	98848	120	96	0
12	09:56:45.664	Thread Group ...	HTTP Request	172	✓	98848	120	90	0
13	09:56:45.697	Thread Group ...	HTTP Request	184	✓	98848	120	114	0
14	09:56:45.730	Thread Group ...	HTTP Request	165	✓	98848	120	97	1
15	09:56:45.763	Thread Group ...	HTTP Request	189	✓	98848	120	124	0
16	09:56:45.830	Thread Group ...	HTTP Request	175	✓	98848	120	108	0
17	09:56:45.796	Thread Group ...	HTTP Request	217	✓	98848	120	132	1
18	09:56:45.862	Thread Group ...	HTTP Request	214	✓	98848	120	140	0
19	09:56:45.895	Thread Group ...	HTTP Request	241	✓	98848	120	154	0
20	09:56:45.928	Thread Group ...	HTTP Request	214	✓	98848	120	131	0
21	09:56:45.994	Thread Group ...	HTTP Request	214	✓	98848	120	129	0
22	09:56:45.961	Thread Group ...	HTTP Request	262	✓	98848	120	176	0
23	09:56:46.060	Thread Group ...	HTTP Request	214	✓	98848	120	131	1
24	09:56:46.027	Thread Group ...	HTTP Request	256	✓	98848	120	162	1
25	09:56:46.093	Thread Group ...	HTTP Request	244	✓	98848	120	161	1

☐ Scroll automatically? ☐ Child samples? No of Samples 303 Latest Sample 884 **Average 564** Deviation 231

Wordpress menggunakan redis memiliki rata-rata sampling time 3600 ms.





```
→ wordpress-redis redis-cli -h 192.168.16.103
192.168.16.103:6379> info replication
# Replication
role:master
connected_slaves:1
slave0:ip=192.168.16.105,port=6379,state=online,offset=997611,lag=0
master_replid:1d78c7ba8cfb3a25cd3e5b55803207b4e366eee5
master_replid2:c85c3c1cc765793d7ff803981c9f8eb949cc9e5d
master_repl_offset:997611
second_repl_offset:987080
repl_backlog_active:1
repl_backlog_size:1048576
repl_backlog_first_byte_offset:1
repl_backlog_histlen:997611
192.168.16.103:6379> |
```