

سیستم عامل Windows:

Single Process:

برنامه مورد نظر: singleProcess.exe

Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
csrss.exe	0.18	2,556 K	7,740 K	804		
winlogon.exe		2,416 K	9,940 K	896		
GoogleCrashHandler.exe		1,824 K	56 K	7916		
GoogleCrashHandler64.exe		1,648 K	48 K	5196		
explorer.exe	0.08	200,092 K	254,264 K	1772	Windows Explorer	Microsoft Corporation
MSASCuiL.exe		1,932 K	9,540 K	9812	Windows Defender notificatio...	Microsoft Corporation
OneDrive.exe		9,400 K	31,164 K	9540	Microsoft OneDrive	Microsoft Corporation
IDMan.exe		9,956 K	30,292 K	10324	Internet Download Manager (I...	Tonec Inc.
Steam.exe	1.08	29,248 K	47,288 K	10520	Steam Client Bootstrapper	Valve Corporation
cmd.exe		2,132 K	3,176 K	6688	Windows Command Process...	Microsoft Corporation
conhost.exe		6,404 K	16,176 K	1304	Console Window Host	Microsoft Corporation
Telegram.exe	0.48	133,336 K	164,016 K	5756	Telegram Desktop	Telegram Messenger LLP
notepad.exe		3,556 K	15,032 K	212	Notepad	Microsoft Corporation
FoxitReader.exe	0.41	83,272 K	99,860 K	9220	Foxit Reader 8.2	Foxit Software Inc.
notepad++.exe		41,888 K	53,084 K	13244	Notepad++ : a free (GNU) so...	Don HO don.h@free.fr
clion64.exe	6.51	1,191,656 K	1,180,560 K	14356	CLion	JetBrains s.r.o.
fsnotifier64.exe		1,520 K	3,152 K	10252	Filesystem events processor	JetBrains s.r.o.
conhost.exe		5,376 K	8,992 K	13344	Console Window Host	Microsoft Corporation
winpty-agent.exe	0.31	2,256 K	6,548 K	13844		
conhost.exe	0.97	4,964 K	10,396 K	16096	Console Window Host	Microsoft Corporation
singleProcess.exe	7.23	7,752 K	9,764 K	14672		
hsscp.exe	0.01	66,236 K	92,440 K	14560	Hss.ClientApplication	AnchorFree Inc.
procexp64.exe	2.18	23,952 K	47,728 K	3228	Sysinternals Process Explorer	Sysinternals - www.sysinter...
mspaint.exe	< 0.01	106,168 K	127,784 K	9196	Paint	Microsoft Corporation
DMedia.exe		1,748 K	8,064 K	2472		

T=0.058 sec

Multi Process:

برنامه مورد نظر: untitled1.exe

Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
System Idle Process	14.33	52 K	8 K	0		
System	0.65	196 K	2,548 K	4		
csrss.exe	< 0.01	1,852 K	4,892 K	700		
wininit.exe		1,304 K	6,020 K	796		
csrss.exe	0.15	2,556 K	7,748 K	804		
winlogon.exe		2,496 K	9,956 K	896		
GoogleCrashHandler.exe		1,824 K	52 K	7916		
GoogleCrashHandler64.exe		1,648 K	48 K	5196		
explorer.exe	0.52	208,364 K	250,308 K	1772	Windows Explorer	Microsoft Corporation
MSASCuiL.exe		1,932 K	9,540 K	9812	Windows Defender notificatio...	Microsoft Corporation
OneDrive.exe		9,496 K	31,208 K	9540	Microsoft OneDrive	Microsoft Corporation
IDMan.exe		9,948 K	30,284 K	10324	Internet Download Manager (L...	Tonec Inc.
Steam.exe	0.98	29,248 K	47,280 K	10520	Steam Client Bootstrapper	Valve Corporation
cmd.exe		2,132 K	3,176 K	6688	Windows Command Process...	Microsoft Corporation
conhost.exe		6,404 K	16,176 K	1304	Console Window Host	Microsoft Corporation
Telegram.exe	0.31	123,880 K	154,740 K	5756	Telegram Desktop	Telegram Messenger LLP
notepad.exe		3,556 K	15,032 K	212	Notepad	Microsoft Corporation
FoxitReader.exe	0.42	83,272 K	99,864 K	9220	Foxit Reader 8.2	Foxit Software Inc.
notepad++.exe		41,888 K	53,084 K	13244	Notepad++ : a free (GNU) so...	Don HO don.h@free.fr
clion64.exe	45.03	1,212,808 K	1,201,544 K	14356	CLion	JetBrains s.r.o.
fsnotifier64.exe	0.07	1,520 K	3,152 K	10252	Filesystem events processor	JetBrains s.r.o.
conhost.exe		5,376 K	8,992 K	13344	Console Window Host	Microsoft Corporation
cmake.exe	0.65	2,344 K	8,216 K	3068		
conhost.exe	0.50	5,588 K	10,004 K	9504		
mingw32-make.exe	1.10	1,748 K	6,800 K	8960		
mingw32-make.exe	1.25	1,748 K	6,800 K	4944		
cmd.exe	0.34	4,956 K	4,548 K	8132		
winpty-agent.exe	0.41	2,276 K	6,572 K	13088		
conhost.exe	1.37	4,984 K	10,588 K	6096	Console Window Host	Microsoft Corporation
untitled1.exe	19.81	1,180 K	4,240 K	6700		
hsscp.exe	0.01	66,240 K	92,508 K	14560	Hss.Client.Application	AnchorFree Inc.
procexp64.exe	1.86	30,572 K	68,780 K	3228	Sysinternals Process Explorer	Sysinternals - www.sysinter...

T=0.063

Multi Thread:

برنامه مورد نظر: thread.exe

Process	CPU	Private Bytes	Working Set	PID	Description	Company Name
csrss.exe	0.25	2,556 K	7,756 K	804		
winlogon.exe		2,416 K	9,940 K	896		
GoogleCrashHandler.exe		1,824 K	52 K	7916		
GoogleCrashHandler64.exe		1,648 K	48 K	5196		
explorer.exe	0.78	201,044 K	255,308 K	1772	Windows Explorer	Microsoft Corporation
MSASCuiL.exe		1,932 K	9,540 K	9812	Windows Defender notificatio...	Microsoft Corporation
OneDrive.exe		9,428 K	31,176 K	9540	Microsoft OneDrive	Microsoft Corporation
IDMan.exe	< 0.01	9,956 K	30,292 K	10324	Internet Download Manager (L...	Tonec Inc.
Steam.exe	0.96	29,248 K	47,288 K	10520	Steam Client Bootstrapper	Valve Corporation
cmd.exe		2,132 K	3,176 K	6688	Windows Command Process...	Microsoft Corporation
conhost.exe		6,404 K	16,176 K	1304	Console Window Host	Microsoft Corporation
Telegram.exe	0.31	133,760 K	164,360 K	5756	Telegram Desktop	Telegram Messenger LLP
notepad.exe		3,556 K	15,032 K	212	Notepad	Microsoft Corporation
FoxitReader.exe	0.35	83,272 K	99,860 K	9220	Foxit Reader 8.2	Foxit Software Inc.
notepad++.exe		41,888 K	53,084 K	13244	Notepad++ : a free (GNU) so...	Don HO don.h@free.fr
clion64.exe	5.13	1,191,724 K	1,180,676 K	14356	CLion	JetBrains s.r.o.
fsnotifier64.exe	0.04	1,520 K	3,152 K	10252	Filesystem events processor	JetBrains s.r.o.
conhost.exe		5,376 K	8,992 K	13344	Console Window Host	Microsoft Corporation
cmake.exe	0.57	2,344 K	8,172 K	5888		
conhost.exe	0.43	5,588 K	10,000 K	9824	Console Window Host	Microsoft Corporation
mingw32-make.exe	0.79	1,740 K	6,792 K	5036		
mingw32-make.exe	0.97	1,744 K	6,776 K	5552		
cmd.exe	< 0.01	1,652 K	112 K	14020	Windows Command Process...	Microsoft Corporation
winpty-agent.exe	0.34	2,260 K	6,564 K	5172		
conhost.exe	1.09	4,972 K	10,528 K	12688	Console Window Host	Microsoft Corporation
thread.exe	20.70	19,748 K	21,416 K	14832		
hsscp.exe		66,164 K	92,412 K	14560	Hss.ClientApplication	AnchorFree Inc.
procexp64.exe	2.05	23,900 K	47,540 K	3228	Svsinternals Process Explor...	Svsinternals - www.svsinter...

سیستم عامل Linux:

Single Process:

Took 0.058799 seconds to execute

Memory usage: 952620 bytes

The current CPU utilization is : 0.047500

The current CPU utilization is : 0.035443

The current CPU utilization is : 0.030075

The current CPU utilization is : 0.022727

The current CPU utilization is : 0.030848

The current CPU utilization is : 0.027708

The current CPU utilization is : 0.045340

The current CPU utilization is : 0.028061

The current CPU utilization is : 0.045113

The current CPU utilization is : 0.030227

Multi Process:

took 0.000869 seconds to execute

Memory usage: 951884 bytes

The current CPU utilization is : 0.037783

The current CPU utilization is : 0.125313

The current CPU utilization is : 0.077889

The current CPU utilization is : 0.025126

The current CPU utilization is : 0.040816

The current CPU utilization is : 0.040404

The current CPU utilization is : 0.037783

The current CPU utilization is : 0.028278

The current CPU utilization is : 0.049751

The current CPU utilization is : 0.022727

Multi Thread:

took 0.063774 seconds to execute

Memory usage: 951932 bytes

The current CPU utilization is : 0.048101

The current CPU utilization is : 0.040404

The current CPU utilization is : 0.065327

The current CPU utilization is : 0.157068

The current CPU utilization is : 0.185379

The current CPU utilization is : 0.114796

The current CPU utilization is : 0.067010

The current CPU utilization is : 0.111959

The current CPU utilization is : 0.058228

The current CPU utilization is : 0.081794

همان طور که مشاهده می شود در سیستم عامل ویندوز و لینوکس بیشترین بهره وری CPU را برنامه های multi thread و multiprocessing دارند (بهره وری multi thread کمی از multi process هم بطور متوسط بیشتر است) زیرا موازی سازی انجام می دهند و در نتیجه بخش بیشتری از CPU مورد استفاده قرار می گیرد. بهره وری کلی دو سیستم عامل را هم میتوان تقریباً برابر در نظر گرفت.

میزان حافظه مصرفی در سه شکل متفاوت در لینوکس تقریباً برابر است اما در ویندوز برنامه multiprocessing حافظه بیشتری استفاده کرده است. و در مقایسه سیستم عامل ها میزان حافظه مصرفی لینوکس بیشتر است.

زمان اجرا single process در ویندوز و لینوکس تقریباً برابر است. در ویندوز برنامه multi thread بسیار زمان اجرا را کم کرده است به علت داشتن 4 ترد همزمان اما در برنامه multiprocessing زمان اجرا به اندازه مورد نظر کم نیست و آن به علت تبادل داده از طریق فایل و خواندن از فایل است که کمی زمان بر است. در لینوکس برنامه multi process بسیار خوب عمل می کند و زمان اجرا خیلی کمتر می شود و موازی سازی به خوبی صورت می گیرد اما در multithread به اندازه مورد انتظار زمان اجرا کم نمی شود.

البته به علت درخت بودن ساختمان داده مورد استفاده امکان این وجود دارد که درخت ساخته شده بالانس نباشد در نتیجه زمان جستجو در process و یا thread ها یکسان نباشد.