



**YILDIZ TEKNİK ÜNİVERSİTESİ  
ELEKTRİK-ELEKTRONİK FAKÜLTESİ  
BİLGİSAYAR MÜHENDİSLİĞİ BÖLÜMÜ**

**BLM 2022 BİLGİSAYAR DONANIMI**

## **ÖDEV 2**

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## CEVAP -1

-1 KB Page Büyüklüğü  $2^{10}$  B eşittir.

Bu nedenle PPO = 10 ve VPO = 10 olarak hesaplanır.

-VPN için Sanal Adress Genişliği – 10 = 20 – 10 = 10 olarak hesaplanır.

-PPN için Fiziksel Adress Genişliği – 10 = 18 – 10 = 8 olarak hesaplanır.

-L1 Cache 512 Byte / (8 set \* 8 word/set) = 8 satır olarak hesaplanır.

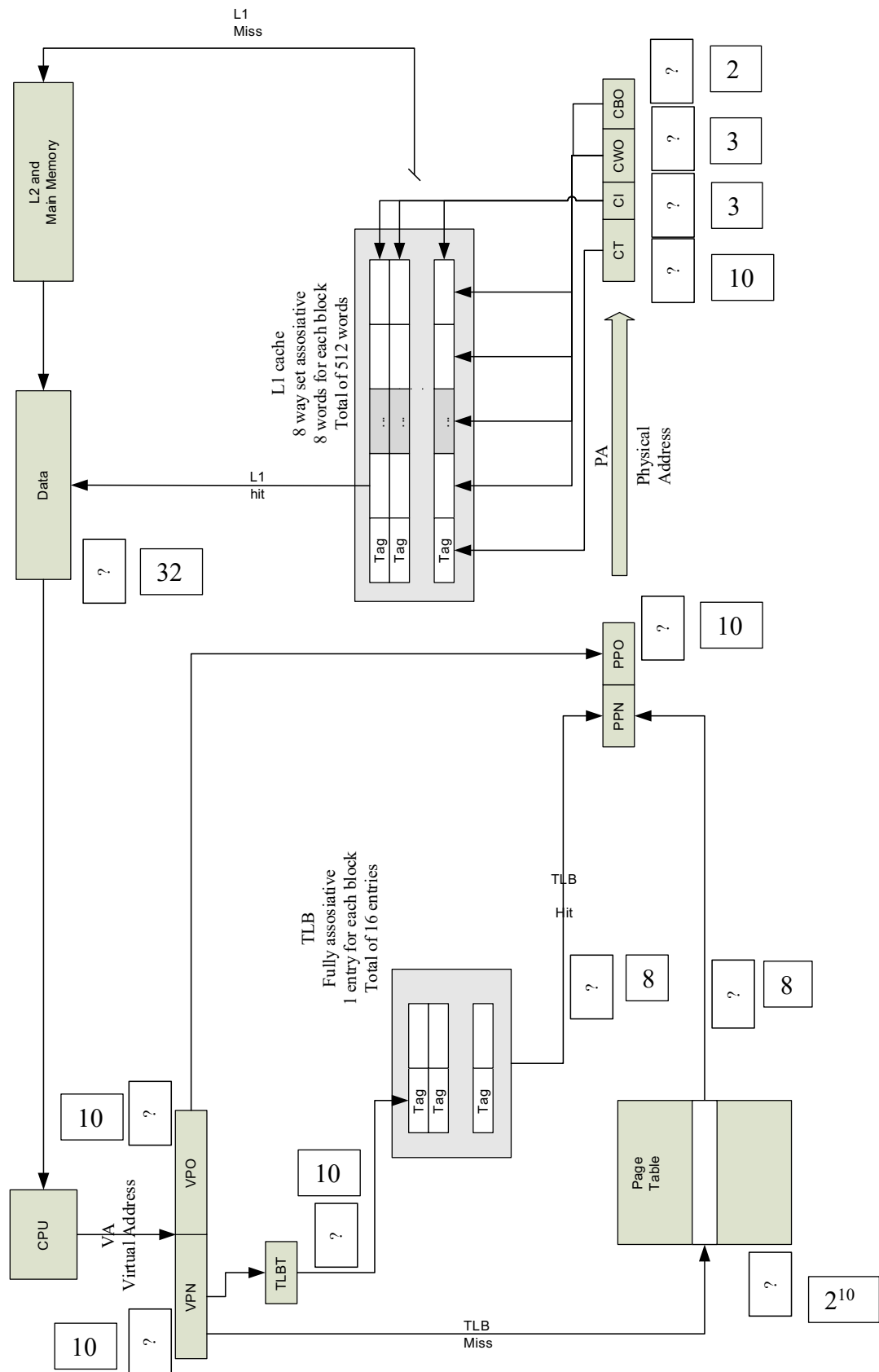
-CI 3 bit olur.

-32 bit / 8 bit = 4 byte /Word olarak hesaplanır.

-CBO 2 bit olur.

-8 word/block olursa CWO 3 bit olarak hesaplanır.

-CT = 18-2-3-3 = 10 bit olarak hesaplanır.



## CEVAP -2

Genel BilgiEkranlarDepolamaBellekDestekServis



# macOS Catalina

Sürüm 10.15.7

MacBook Pro (15-inch, Mid 2012)

İşlemci 2,6 GHz Dört Çekirdekli Intel Core i7

Bellek 12 GB 1600 MHz DDR3

Başlangıç Diski MyMac

Grafikler NVIDIA GeForce GT 650M 1 GB  
Intel HD Graphics 4000 1536 MB

Seri Numarası C02HL0JYDV35

Sistem Raporu...Yazılım Güncelleme...

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MacBook Pro

▼ Donanım

ATA  
Apple Pay  
Bellek  
Bluetooth  
Denetleyici  
Depolama  
Diske Basma  
Ethernet Kartları  
Fiber Kanal  
FireWire  
Grafikler/Ekranlar  
Güç  
Kamera  
Kart Okuyucu  
NVMeExpress  
PCI  
Paralel SCSI  
SAS  
SATA/SATA Express  
SPI  
Ses  
Tanılar  
Thunderbolt  
USB  
Yazıcılar

▼ Ağ

Disk Bölümleri  
Güvenlik Duvarı  
Konumlar

Genel Donanım Bilgileri:

Model Adı:	MacBook Pro
Model Tanıtıcısı:	MacBookPro9,1
İşlemci Adı:	Quad-Core Intel Core i7
İşlemci Hızı:	2,6 GHz
İşlemci Sayısı:	1
Toplam Çekirdek Sayısı:	4
L2 Önbellek (her bir çekirdek için):	256 KB
L3 Önbellek:	6 MB
Hyper-Threading Teknolojisi:	Etkin
Bellek:	12 GB
Boot ROM Sürümü:	426.0.0.0.0
SMC Sürümü (sistem):	2.1f175
Seri Numarası (sistem):	C02HL0JYDV35
Donanım UUID'si:	9008B4EA-FE26-5376-9E2F-1C37C146D8B8
Ani Hareket Sensörü:	Durum: Etkin

MalıSheN > Donanım

# MacBook Pro (15-inch Mid 2012) Benchmarks

Benchmark results for the MacBook Pro (15-inch Mid 2012) with an Intel Core i7-3720QM processor can be found below. The data on this chart is gathered from user-submitted Geekbench 5 results from the Geekbench Browser.

Geekbench 5 scores are calibrated against a baseline score of 1000 (which is the score of an Intel Core i3-8100). Higher scores are better, with double the score indicating double the performance.

General information	
Vendor:	GenuineIntel
Processor name (BIOS):	Intel(R) Core(TM) i7-3720QM CPU @ 2.60GHz
Cores:	4
Logical processors:	8
Processor type:	Original OEM Processor
CPUID signature:	306A9
Family:	6 (06h)
Model:	58 (03Ah)
Stepping:	9 (09h)
TLB/Cache details:	64-byte Prefetching Data TLB0: 2-MB or 4-MB pages, 4-way set associative, 32 entries Data TLB: 4-KB Pages, 4-way set associative, 64 entries Instruction TLB: 4-KB pages, 4-way set associative, 64 entries L2 TLB: 1-MB, 4-way set associative, 64-byte line size Shared 2nd-level TLB: 4 KB pages, 4-way set associative, 512 entries

Cache details				
Cache:	L1 data	L1 instruction	L2	L3
Size:	4 x 32 KB	4 x 32 KB	4 x 256 KB	6 MB
Associativity:	8-way set associative	8-way set associative	8-way set associative	12-way set associative
Line size:	64 bytes	64 bytes	64 bytes	64 bytes
Comments:	Direct-mapped	Direct-mapped	Non-inclusive Direct-mapped	Inclusive Shared between all cores

## Ubuntu Üzerinde

1.c dosyası (dimension 256) çalıştırıldığında valgrind üzerinde %5.5 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip...
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ g
cc 1.c -o 1.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ v
algrind --tool=cachegrind ./1.out
==3844== Cachegrind, a cache and branch-prediction profiler
==3844== Copyright (c) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==3844== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==3844== Command: ./1.out
==3844==
--3844-- warning: L3 cache found, using its data for the LL simulation.

secs:3.352384
==3844==
==3844== I refs:      783,500,008
==3844== I1 misses:    1,214
==3844== LLi misses:    1,192
==3844== I1 miss rate:    0.00%
==3844== LLi miss rate:    0.00%
==3844==
==3844== D refs:      306,774,944 (288,804,245 rd + 17,970,699 wr)
==3844== D1 misses:    16,895,710 ( 16,870,463 rd +    25,247 wr)
==3844== LLd misses:     27,265 (    2,095 rd +    25,170 wr)
==3844== D1 miss rate:    5.5% (    5.8% +    0.1% )
==3844== LLd miss rate:    0.0% (    0.0% +    0.1% )
==3844==
==3844== LL refs:      16,896,924 ( 16,871,677 rd +    25,247 wr)
==3844== LL misses:     28,457 (    3,287 rd +    25,170 wr)
==3844== LL miss rate:    0.0% (    0.0% +    0.1% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$
```

2.c dosyası (dimension 256) çalıştırıldığında valgrind üzerinde %0.7 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipp...
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ gcc 2.c
-o 2.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ valgrind
--tool=cachegrind ./2.out
==40120== Cachegrind, a cache and branch-prediction profiler
==40120== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==40120== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==40120== Command: ./2.out
==40120==
--40120-- warning: L3 cache found, using its data for the LL simulation.

secs:5.622658
==40120==
==40120== I refs:      783,500,003
==40120== I1 misses:    1,211
==40120== LLi misses:    1,189
==40120== I1 miss rate:  0.00%
==40120== LLi miss rate: 0.00%
==40120==
==40120== D refs:      306,774,942 (288,804,244 rd + 17,970,698 wr)
==40120== D1 misses:    2,141,662 ( 2,116,415 rd +   25,247 wr)
==40120== LLd misses:    27,265 (   2,095 rd +   25,170 wr)
==40120== D1 miss rate:  0.7% (   0.7% +   0.1% )
==40120== LLd miss rate: 0.0% (   0.0% +   0.1% )
==40120==
==40120== LL refs:      2,142,873 ( 2,117,626 rd +   25,247 wr)
==40120== LL misses:    28,454 (   3,284 rd +   25,170 wr)
==40120== LL miss rate:  0.0% (   0.0% +   0.1% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$
```

3.c dosyası (dimension 256) çalıştırıldığında valgrind üzerinde %6.2 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipp...
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ gcc 3.c
-o 3.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$ valgrind
--tool=cachegrind ./3.out
==40214== Cachegrind, a cache and branch-prediction profiler
==40214== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==40214== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==40214== Command: ./3.out
==40214==
--40214-- warning: L3 cache found, using its data for the LL simulation.

secs:5.466731
==40214==
==40214== I refs:      783,500,003
==40214== I1 misses:    1,211
==40214== LLi misses:    1,189
==40214== I1 miss rate:  0.00%
==40214== LLi miss rate: 0.00%
==40214==
==40214== D refs:      306,774,942 (288,804,244 rd + 17,970,698 wr)
==40214== D1 misses:    18,968,028 ( 18,942,781 rd +   25,247 wr)
==40214== LLd misses:    27,265 (   2,095 rd +   25,170 wr)
==40214== D1 miss rate:  6.2% (   6.6% +   0.1% )
==40214== LLd miss rate: 0.0% (   0.0% +   0.1% )
==40214==
==40214== LL refs:      18,969,239 ( 18,943,992 rd +   25,247 wr)
==40214== LL misses:    28,454 (   3,284 rd +   25,170 wr)
==40214== LL miss rate:  0.0% (   0.0% +   0.1% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$
```

1.c dosyası (dimension 64) çalıştırıldığında valgrind üzerinde %1.1 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev...
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)
$ gcc 1.c -o 1_1.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)
$ valgrind --tool=cachegrind ./1_1.out
==40482== Cachegrind, a cache and branch-prediction profiler
==40482== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==40482== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==40482== Command: ./1_1.out
==40482==
--40482-- warning: L3 cache found, using its data for the LL simulation.

secs:0.059484
==40482==
==40482== I refs:      13,005,900
==40482== I1 misses:    1,238
==40482== LLi misses:    1,212
==40482== I1 miss rate:    0.01%
==40482== LLi miss rate:    0.01%
==40482==
==40482== D refs:      5,078,505 (4,729,153 rd + 349,352 wr)
==40482== D1 misses:    53,671 ( 51,464 rd + 2,207 wr)
==40482== Lld misses:    4,230 ( 2,102 rd + 2,128 wr)
==40482== D1 miss rate:    1.1% ( 1.1% + 0.6% )
==40482== Lld miss rate:    0.1% ( 0.0% + 0.6% )
==40482==
==40482== LL refs:      54,909 ( 52,702 rd + 2,207 wr)
==40482== LL misses:    5,442 ( 3,314 rd + 2,128 wr)
==40482== LL miss rate:    0.0% ( 0.0% + 0.6% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$
```

2.c dosyası (dimension 64) çalıştırıldığında valgrind üzerinde %0.3 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/o...
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Fil
es)$ gcc 2.c -o 2_1.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Fil
es)$ valgrind --tool=cachegrind ./2_1.out
==40636== Cachegrind, a cache and branch-prediction profiler
==40636== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==40636== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==40636== Command: ./2_1.out
==40636==
--40636-- warning: L3 cache found, using its data for the LL simulation.

secs:0.056817
==40636==
==40636== I refs:      13,005,903
==40636== I1 misses:    1,241
==40636== LLi misses:    1,215
==40636== I1 miss rate:    0.01%
==40636== LLi miss rate:    0.01%
==40636==
==40636== D refs:      5,078,506 (4,729,153 rd + 349,353 wr)
==40636== D1 misses:    15,232 ( 13,025 rd + 2,207 wr)
==40636== Lld misses:    4,230 ( 2,102 rd + 2,128 wr)
==40636== D1 miss rate:    0.3% ( 0.3% + 0.6% )
==40636== Lld miss rate:    0.1% ( 0.0% + 0.6% )
==40636==
==40636== LL refs:      16,473 ( 14,266 rd + 2,207 wr)
==40636== LL misses:    5,445 ( 3,317 rd + 2,128 wr)
==40636== LL miss rate:    0.0% ( 0.0% + 0.6% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)$
```

3.c dosyası (dimension 64) çalıştırıldığında valgrind üzerinde %1.5 miss rate oranı görülmektedir.

```
ubu@ubu-Mashen: ~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev...
$ gcc 3.c -o 3_1.out
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)
$ valgrind --tool=cachegrind ./3_1.out
==40745== Cachegrind, a cache and branch-prediction profiler
==40745== Copyright (C) 2002-2017, and GNU GPL'd, by Nicholas Nethercote et al.
==40745== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==40745== Command: ./3_1.out
==40745==
--40745-- warning: L3 cache found, using its data for the LL simulation.

secs:0.061826
==40745==
==40745== I refs:      13,005,901
==40745== I1 misses:    1,241
==40745== L1i misses:   1,215
==40745== I1 miss rate:  0.01%
==40745== L1i miss rate: 0.01%
==40745==
==40745== D refs:      5,078,506 (4,729,153 rd + 349,353 wr)
==40745== D1 misses:    77,835 ( 75,628 rd +  2,207 wr)
==40745== L1d misses:   4,230 (  2,102 rd +  2,128 wr)
==40745== D1 miss rate:  1.5% (  1.6% +  0.6% )
==40745== L1d miss rate: 0.1% (  0.0% +  0.6% )
==40745==
==40745== LL refs:      79,076 ( 76,869 rd +  2,207 wr)
==40745== LL misses:    5,445 (  3,317 rd +  2,128 wr)
==40745== LL miss rate:  0.0% (  0.0% +  0.6% )
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001/odev2.zip (Unzipped Files)
ubu@ubu-Mashen:~/Desktop/BilDon/odev2.zip (Unzipped Files)-20220603T144010Z-001//
odev2.zip (Unzipped Files)$
```

Yapılan tüm hesaplamalar sonucunda valgrind çıktısında yer alan sonuçlara ulaşılamamıştır. Set associative cache yapısına uygun şekilde bir çok farklı çözüm denenmiş ancak terminal çıktısında yer alan sonuçlara yakın sonuçlar elde edilememiştir.