

Selamat malam,

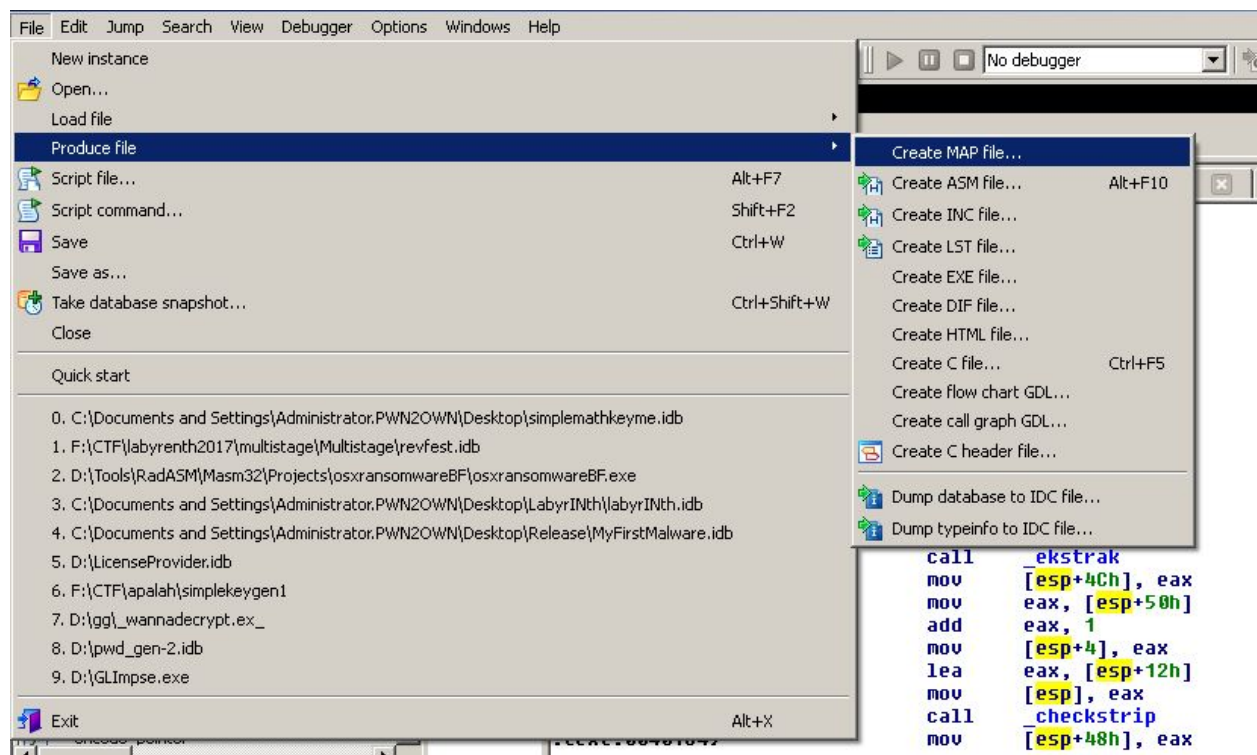
Kulgram kali ini kita bahas soal dari mas @darkro5e : simplemathkeyme

Terima kasih buat mas @darkro5e yang udah bikin keyme nya, dan udah bikin versi windows nya.

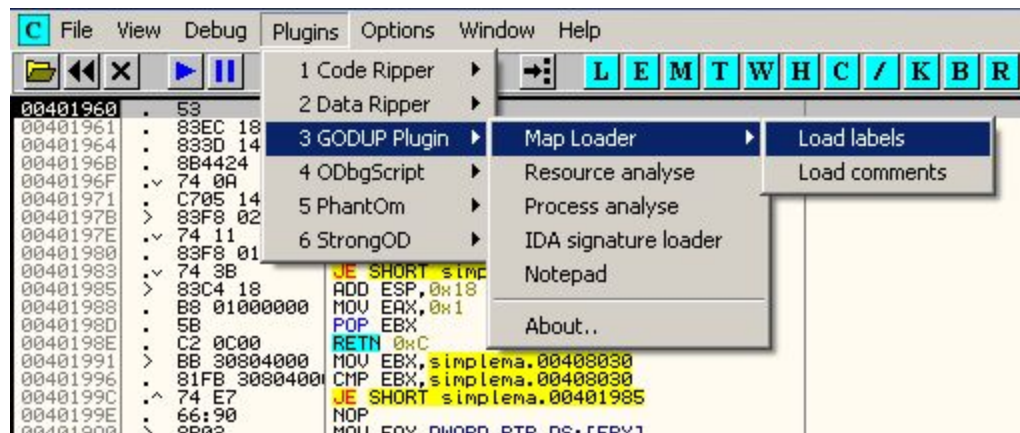
Untuk tool yang dipakai, IDA Pro (maap masih pake bajakan..) sama OllyDBG + GODUPPlugin.

GODUP untuk load file .map yang digenerate lewat IDA

Create map file dari IDA:



Load map via di odbg pake plugin GODUP



Setelah load exe nya di IDA, kita coba decompile fungsi main

```
...  
v3 = check((int)&v4);  
if ( v3 != panjang((int)&v4) )  
    notserial();  
v11 = panjang((int)&v4);  
v10 = checkstrip((int)&v4, 0);  
v9 = ekstrak((int)&v4, 0, v10);  
v8 = checkstrip((int)&v4, v10 + 1);  
v7 = ekstrak((int)&v4, v10 + 1, v8);  
v6 = checkstrip((int)&v4, v8 + 1);  
v5 = ekstrak((int)&v4, v8 + 1, v6);  
if ( !(v7 % v11)  
    && !(v9 % v11)  
    && !(v5 % v11)  
    && v9  
    && (v9 < v7) < v5  
    && v5 * (v7 * v9 / (v9 * (v7 / v9))) / (v5 * v11) == 1 )  
    benar();  
    salah();  
...
```

Dari posisi ini lumayan jelas alur programnya ngapain aja.

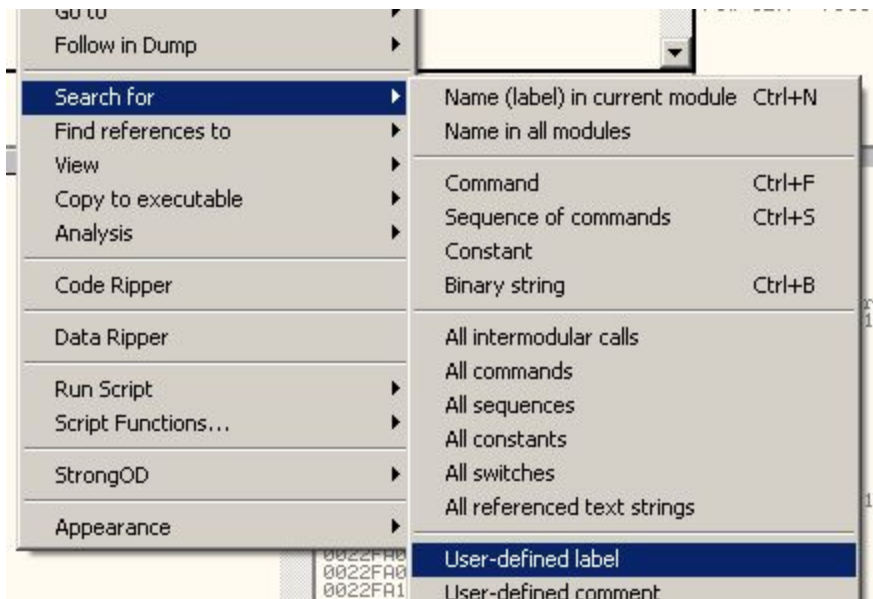
Karena exe nya ga di-strip, jadi beberapa nama fungsi masih bisa 'dibaca' oleh IDA

Kita akan cek satu per satu fungsi fungsi itu ngapain aja.

Ada beberapa hal yang ane pakai untuk dijadikan acuan kalo ngerjain crackme :

1. Return value dari sebuah fungsi biasanya ada di eax
2. Ngga perlu terlalu detail 'baca' kode assembly nya. Kadang ane pake metode blackbox. Inputnya apa, outputnya apa.

Let's debug. Load programnya ke odg  
dari odg, search for user generated label



Label yang tadi ada di IDA pro, bisa kita lihat di odg juga :

```
<__RUNTIME_PSEUDO_RELOC_LIST_END> MOV EAX,DWORD PTR SS:[EBP+0x8]
<_benar> 004015E0 PUSH EBP
<_salah> 00401603 PUSH EBP
<_notserial> 00401626 PUSH EBP
<_checkstrip> 00401649 PUSH EBP
<_pangkat> 004016B2 PUSH EBP
<_ekstrak> 004016E8 PUSH EBP
<_main> 00401747 PUSH EBP
```

kita bakalan nyari tau, fungsi check dan panjang itu ngapain aja..  
caranya, coba beberapa input text dan lihat hasil fungsi check dan fungsi panjang

pasang breakpoint di

**00401795** dan **004017A3** (setelah pemanggilan fungsi), jalanin debuggernya (F9).

untuk input text : **123456**

hasil fungsi check : **0** (lihat eax)

Address	Disassembly	Comment	Registers (FPU)
00401790	E8 9AFDFFFF	CALL <simplema._check>	EAX 00000000
00401795	89C3	MOV EBX,EAX	ECX 77C40C2B msvort.77C40C2B
00401797	8D4424 12	LEA EAX,DWORD PTR SS:[ESP+0x12]	EDX 00000000
00401798	890424	MOV DWORD PTR SS:[ESP],EAX	EBX 00000001
0040179E	E8 5DFDFFFF	CALL <simplema._panjang>	ESP 0022FE90
004017A3	39C3	CMP EBX,EAX	EBP 0022FFFF
004017A5	74 05	JE SHORT simplema.004017AC	

File Name	Text
C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe	Enter the serial key : 123456

hasil fungsi panjang : **6** (lihat eax)

Address	Disassembly	Comment	Registers (FPU)
00401790	E8 9AFDFFFF	CALL <simplema._check>	EAX 00000006
00401795	89C3	MOV EBX,EAX	ECX 77C40C2B msvort.77C40C2B
00401797	8D4424 12	LEA EAX,DWORD PTR SS:[ESP+0x12]	EDX 00000007
00401798	890424	MOV DWORD PTR SS:[ESP],EAX	EBX 00000000
0040179E	E8 5DFDFFFF	CALL <simplema._panjang>	ESP 0022FE90
004017A3	39C3	CMP EBX,EAX	EBP 0022FFFF
004017A5	74 05	JE SHORT simplema.004017AC	

File Name	Text
C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe	Enter the serial key : 123456

disini jelas kalo fungsi panjang akan menghitung jumlah karakter dari input teks (jelas banget sih dari namanya...)

kita bakal pake bantuan hexrays decompiler dari IDA Pro buat analisis fungsi check  
...

```
for ( i = 0; i <= v2; ++i )
{
    if ( *(_BYTE *)(i + a1) <= 79 || *(_BYTE *)(i + a1) > 89 )
    {
        if ( *(_BYTE *)(i + a1) != 45 || v2 - 1 <= i || !v5 )
            break;
        ++v4;
        v5 = 0;
    }
    else
    {
        ++v6;
        ++v5;
    }
}
if ( v4 == 2 )
    result = v6 + 2;
else
    result = 0;
return result;
...
```

sekilas dibaca, karakter yang akan diproses disini adalah yang berada di rentang **80** sampai **89** (ascii "**P**" sampai "**Y**")  
dan ada pengecekan terhadap karakter **45** (ascii "-") jika karakter tidak berada di rentang tersebut

kita coba input baru : PPPPPP-YYYYYY

hasil fungsi check : 0

```
0040178D . 890424 MOV DWORD PTR SS:[ESP],EAX
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
```

Registers (FPU)

EAX	00000000
ECX	77C40C2B msvcrt.77
EDX	00000000
EBX	00000001
ESP	0022FE90
EBP	0022FEF8
EIP	00401795

C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe

Enter the serial key : PPPPPP-YYYYYY

hasil fungsi panjang : 13 (0x0D)

```
0040178D . 890424 MOV DWORD PTR SS:[ESP],EAX
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
```

Registers (FPU)

EAX	00000000
ECX	77C40C2B msvcrt.77
EDX	00000000
EBX	00000000
ESP	0022FE90
EBP	0022FEF8
EIP	00401795

C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe

Enter the serial key : PPPPPP-YYYYYY

masih salah...

kita coba input baru : PPPPPP-QQQQQQ-YYYYYY

hasil fungsi check : 20 (0x14)

```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
```

Registers (FPU)

EAX	00000014
ECX	77C40C2B msvcrt.77
EDX	00000012
EBX	00000001
ESP	0022FE90
EBP	0022FEF8
EIP	00401795

C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe

Enter the serial key : PPPPPP-QQQQQQ-YYYYYY

hasil fungsi panjang : 20 (0x14)

```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
```

Registers (FPU)

EAX	00000014
ECX	77C40C2B msvcrt.77
EDX	00000015
EBX	00000014
ESP	0022FE90
EBP	0022FEF8
EIP	00401795

C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe

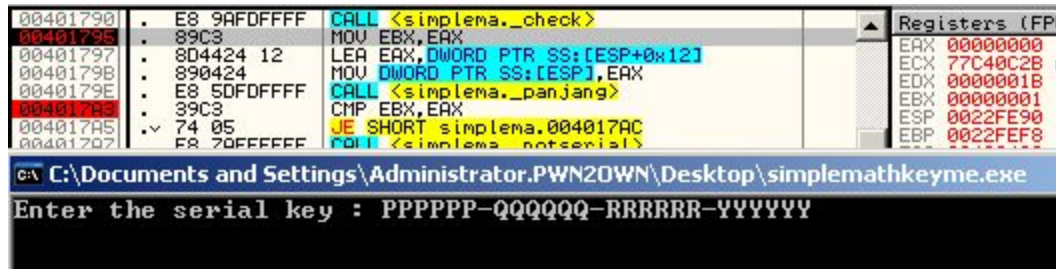
Enter the serial key : PPPPPP-QQQQQQ-YYYYYY

udah bener..



kita coba input baru : PPPPPP-QQQQQQ-RRRRRR-YYYYYY

hasil fungsi check : 0

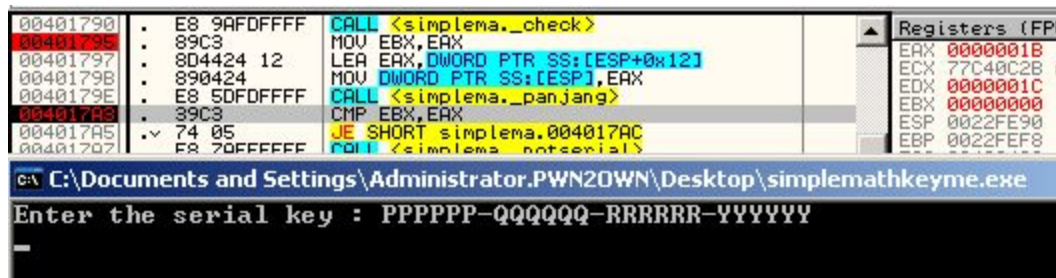


```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3      MOV EBX,EAX
00401797 . 8D4424 12  LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424    MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A5 . 39C3      CMP EBX,EAX
004017A5 ~ 74 05     JE SHORT simplema.004017AC
004017A7 . F8 70FFFF CALL <simplema.notserial>
```

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Enter the serial key : PPPPPP-QQQQQQ-RRRRRR-YYYYYY

hasil fungsi panjang : 27 (0x1B)



```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3      MOV EBX,EAX
00401797 . 8D4424 12  LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424    MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A5 . 39C3      CMP EBX,EAX
004017A5 ~ 74 05     JE SHORT simplema.004017AC
004017A7 . F8 70FFFF CALL <simplema.notserial>
```

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Enter the serial key : PPPPPP-QQQQQQ-RRRRRR-YYYYYY

salah lagi...

dari 3 percobaan diatas, bisa ane simpulkan kalo format yang diterima oleh programnya adalah :

**N-N-N**

dimana N ada di rentang "P" sampai "Y", dan terdapat 2 karakter "-"

The screenshot displays a Windows XP desktop environment. In the foreground, a command prompt window is open, showing the file path `C:\Documents and Settings\Administrator.PWN20WN\Desktop\simplemathkeyme.exe` and the prompt `Enter the serial key : PQRS-TUUV-XY`. In the background, a debugger window is visible, showing the assembly code for the application. The assembly code includes instructions such as `CALL <simplemath._check>`, `MOV EBX, EAX`, `LEA EAX, DWORD PTR SS:[ESP+0x12]`, `MOV DWORD PTR SS:[ESP], EAX`, `CALL <simplemath._panjang>`, `CMP EBX, EAX`, and `JE SHORT simplemath.004017AC`. The registers window on the right shows the values of the registers: `EAX 0000000C`, `ECX 77C40C2B`, `EDX 0000000A`, `EBX 00000001`, `ESP 0022FE90`, and `EBP 0022FEF8`.

Address	Disassembly	Comment	Registers (FPU)
00401790	E8 9AFDFFFF	CALL <simplema._check>	EAX 0000000C
00401795	89C3	MOV EBX, EAX	ECX 77C40C2B
00401797	8D4424 12	LEA EAX, DWORD PTR SS:[ESP+0x12]	EDX 00000000
0040179B	890424	MOV DWORD PTR SS:[ESP], EAX	EBX 0000000C
0040179E	E8 5DFDFFFF	CALL <simplema._panjang>	ESP 0022FE90
004017A3	39C3	CMP EBX, EAX	EBP 0022FEF8
004017A5	74 05	JE SHORT simplema.004017AC	
004017A7	EB 30FFFFFF	CALL <simplema._exit>	

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Enter the serial key : PQRS-TUUV-XY

00401790	. E8 9AFDFFFF	CALL <simplema._check>		Registers (FPU)
00401795	. 89C3	MOV EBX,EAX		EAX 00000000
00401797	. 8D4424 12	LEA EAX, DWORD PTR SS:[ESP+0x12]		ECX 77C40C2B
0040179B	. 890424	MOV DWORD PTR SS:[ESP],EAX		EDX 00000000
0040179E	. E8 5DFDFFFF	CALL <simplema._panjang>		EBX 00000001
004017A3	. 39C3	CMP EBX,EAX		ESP 0022FE90
004017A5	. 74 05	JE SHORT simplema.004017AC		EBP 0022FFFF

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Enter the serial key : PQRS-TUUV-XYZ

00401790	•	E8 9AFDFFFF	CALL <simplema._check>	Registers (F)	EAX 00000000
00401795	•	89C3	MOV EBX,EAX		EAX 00000000
00401797	•	8D4424 12	LEA EAX, DWORD PTR SS:[ESP+0x12]		EAX 77C40C2B
0040179B	•	890424	MOV DWORD PTR SS:[ESP],EAX		EAX 00000000
0040179E	•	E8 5DFDFFFF	CALL <simplema._panjang>		EAX 00000000
004017A5	•	39C3	CMPL EBX,EAX		EAX 00000000
004017A5	•	74 05	JE SHORT simplema.004017AC		EAX 00000000
004017A7	•	E8 7AFDFFFF	CALL <simplema._notserial>		EAX 00000000
004017B0	•	8D4424 12	LEA EAX, DWORD PTR SS:[ESP+0x12]	EAX 00000000	ESI 00482490

C:\Documents and Settings\Administrator.PWN2OWN\Desktop\simplemathkeyme.exe

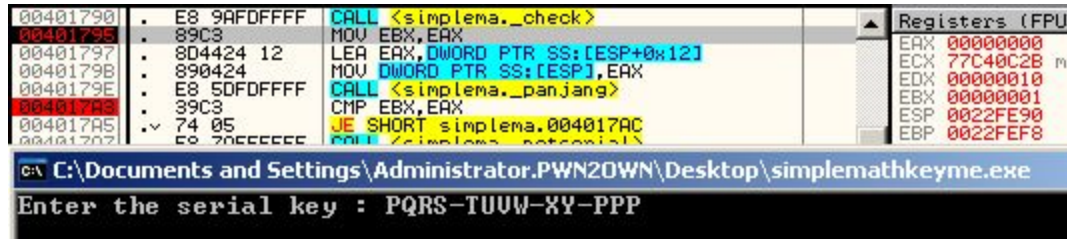
Enter the serial key : PQRS-TUUV-XYZ



ga valid ("Z" ga masuk range)

kita coba input baru : **PQRS-TUVW-XY-PPP**

hasil fungsi check : **0**



```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
004017A7 . 50 POP EAX
004017A8 . 50 POP EAX
004017A9 . 50 POP EAX
004017AA . 50 POP EAX
004017AB . 50 POP EAX
004017AC . 50 POP EAX
004017AD . 50 POP EAX
004017AE . 50 POP EAX
004017AF . 50 POP EAX
004017B0 . 50 POP EAX
004017B1 . 50 POP EAX
004017B2 . 50 POP EAX
004017B3 . 50 POP EAX
004017B4 . 50 POP EAX
004017B5 . 50 POP EAX
004017B6 . 50 POP EAX
004017B7 . 50 POP EAX
004017B8 . 50 POP EAX
004017B9 . 50 POP EAX
004017BA . 50 POP EAX
004017BB . 50 POP EAX
004017BC . 50 POP EAX
004017BD . 50 POP EAX
004017BE . 50 POP EAX
004017BF . 50 POP EAX
004017C0 . 50 POP EAX
004017C1 . 50 POP EAX
004017C2 . 50 POP EAX
004017C3 . 50 POP EAX
004017C4 . 50 POP EAX
004017C5 . 50 POP EAX
004017C6 . 50 POP EAX
004017C7 . 50 POP EAX
004017C8 . 50 POP EAX
004017C9 . 50 POP EAX
004017CA . 50 POP EAX
004017CB . 50 POP EAX
004017CC . 50 POP EAX
004017CD . 50 POP EAX
004017CE . 50 POP EAX
004017CF . 50 POP EAX
004017D0 . 50 POP EAX
004017D1 . 50 POP EAX
004017D2 . 50 POP EAX
004017D3 . 50 POP EAX
004017D4 . 50 POP EAX
004017D5 . 50 POP EAX
004017D6 . 50 POP EAX
004017D7 . 50 POP EAX
004017D8 . 50 POP EAX
004017D9 . 50 POP EAX
004017DA . 50 POP EAX
004017DB . 50 POP EAX
004017DC . 50 POP EAX
004017DD . 50 POP EAX
004017DE . 50 POP EAX
004017DF . 50 POP EAX
004017E0 . 50 POP EAX
004017E1 . 50 POP EAX
004017E2 . 50 POP EAX
004017E3 . 50 POP EAX
004017E4 . 50 POP EAX
004017E5 . 50 POP EAX
004017E6 . 50 POP EAX
004017E7 . 50 POP EAX
004017E8 . 50 POP EAX
004017E9 . 50 POP EAX
004017EA . 50 POP EAX
004017EB . 50 POP EAX
004017EC . 50 POP EAX
004017ED . 50 POP EAX
004017EE . 50 POP EAX
004017EF . 50 POP EAX
004017F0 . 50 POP EAX
004017F1 . 50 POP EAX
004017F2 . 50 POP EAX
004017F3 . 50 POP EAX
004017F4 . 50 POP EAX
004017F5 . 50 POP EAX
004017F6 . 50 POP EAX
004017F7 . 50 POP EAX
004017F8 . 50 POP EAX
004017F9 . 50 POP EAX
004017FA . 50 POP EAX
004017FB . 50 POP EAX
004017FC . 50 POP EAX
004017FD . 50 POP EAX
004017FE . 50 POP EAX
004017FF . 50 POP EAX
```

Registers (FPU)

EAX	00000000
ECX	77C40C2B
EDX	00000010
EBX	00000001
ESP	0022FE90
EBP	0022FEF8

C:\Documents and Settings\Administrator.PWN20WN\Desktop\simplemathkeyme.exe

Enter the serial key : PQRS-TUVW-XY-PPP

hasil fungsi panjang : **16 (0x10)**



```
00401790 . E8 9AFDFFFF CALL <simplema._check>
00401795 . 89C3 MOV EBX,EAX
00401797 . 8D4424 12 LEA EAX,DWORD PTR SS:[ESP+0x12]
0040179B . 890424 MOV DWORD PTR SS:[ESP],EAX
0040179E . E8 5DFDFFFF CALL <simplema._panjang>
004017A3 . 39C3 CMP EBX,EAX
004017A5 . 74 05 JE SHORT simplema.004017AC
004017A7 . 50 POP EAX
004017A8 . 50 POP EAX
004017A9 . 50 POP EAX
004017AA . 50 POP EAX
004017AB . 50 POP EAX
004017AC . 50 POP EAX
004017AD . 50 POP EAX
004017AE . 50 POP EAX
004017AF . 50 POP EAX
004017B0 . 50 POP EAX
004017B1 . 50 POP EAX
004017B2 . 50 POP EAX
004017B3 . 50 POP EAX
004017B4 . 50 POP EAX
004017B5 . 50 POP EAX
004017B6 . 50 POP EAX
004017B7 . 50 POP EAX
004017B8 . 50 POP EAX
004017B9 . 50 POP EAX
004017BA . 50 POP EAX
004017BB . 50 POP EAX
004017BC . 50 POP EAX
004017BD . 50 POP EAX
004017BE . 50 POP EAX
004017BF . 50 POP EAX
004017C0 . 50 POP EAX
004017C1 . 50 POP EAX
004017C2 . 50 POP EAX
004017C3 . 50 POP EAX
004017C4 . 50 POP EAX
004017C5 . 50 POP EAX
004017C6 . 50 POP EAX
004017C7 . 50 POP EAX
004017C8 . 50 POP EAX
004017C9 . 50 POP EAX
004017CA . 50 POP EAX
004017CB . 50 POP EAX
004017CC . 50 POP EAX
004017CD . 50 POP EAX
004017CE . 50 POP EAX
004017CF . 50 POP EAX
004017D0 . 50 POP EAX
004017D1 . 50 POP EAX
004017D2 . 50 POP EAX
004017D3 . 50 POP EAX
004017D4 . 50 POP EAX
004017D5 . 50 POP EAX
004017D6 . 50 POP EAX
004017D7 . 50 POP EAX
004017D8 . 50 POP EAX
004017D9 . 50 POP EAX
004017DA . 50 POP EAX
004017DB . 50 POP EAX
004017DC . 50 POP EAX
004017DD . 50 POP EAX
004017DE . 50 POP EAX
004017DF . 50 POP EAX
004017E0 . 50 POP EAX
004017E1 . 50 POP EAX
004017E2 . 50 POP EAX
004017E3 . 50 POP EAX
004017E4 . 50 POP EAX
004017E5 . 50 POP EAX
004017E6 . 50 POP EAX
004017E7 . 50 POP EAX
004017E8 . 50 POP EAX
004017E9 . 50 POP EAX
004017EA . 50 POP EAX
004017EB . 50 POP EAX
004017EC . 50 POP EAX
004017ED . 50 POP EAX
004017EE . 50 POP EAX
004017EF . 50 POP EAX
004017F0 . 50 POP EAX
004017F1 . 50 POP EAX
004017F2 . 50 POP EAX
004017F3 . 50 POP EAX
004017F4 . 50 POP EAX
004017F5 . 50 POP EAX
004017F6 . 50 POP EAX
004017F7 . 50 POP EAX
004017F8 . 50 POP EAX
004017F9 . 50 POP EAX
004017FA . 50 POP EAX
004017FB . 50 POP EAX
004017FC . 50 POP EAX
004017FD . 50 POP EAX
004017FE . 50 POP EAX
004017FF . 50 POP EAX
```

Registers (FPU)

EAX	00000010
ECX	77C40C2B
EDX	00000011
EBX	00000000
ESP	0022FE90
EBP	0022FEF8

C:\Documents and Settings\Administrator.PWN20WN\Desktop\simplemathkeyme.exe

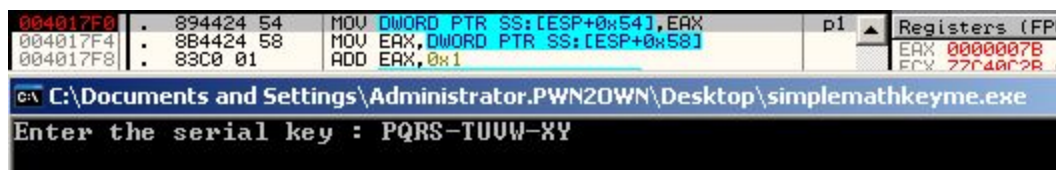
Enter the serial key : PQRS-TUVW-XY-PPP

ga valid (ada 3 karakter "-")

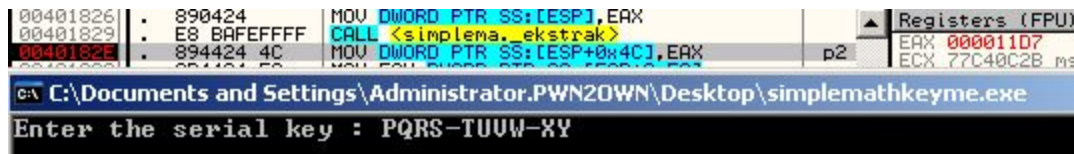
tinggal 2 fungsi yang tersisa : checkstrip dan ekstrak  
 disable semua breakpoint, pasang breakpoint baru di akhir pemanggilan fungsi ekstrak

**004017F0**  
**0040182E**  
**0040186C**

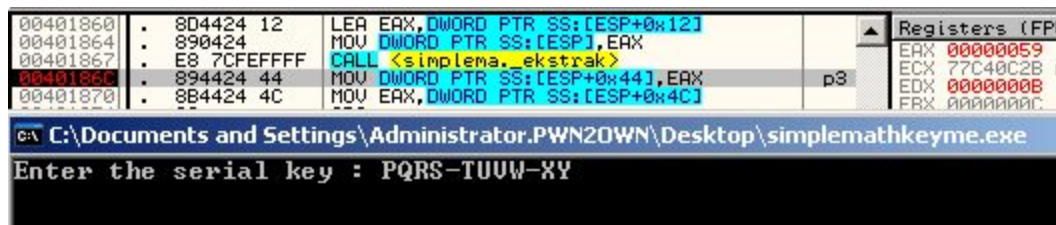
kita coba input baru : **PQRS-TUVW-XY**  
 hasil ekstrak1 : **123 (0x7B)**



hasil ekstrak2 : **4567 (0x11D7)**



hasil ekstrak3 : **89 (0x59)**



dari hasil ini, bisa disimpulkan kalo fungsi kedua fungsi tersebut adalah fungsi untuk  
 'mentranslate' input **text** ke **integer**  
 dan kalo dibandingkan antara format input dan integer yang dihasilkan, bisa kita simpulkan kalo

fungsi ekstrak, akan mengkonversi input ("P" sampai "Y") ke angka desimal (**0** sampai **9**)  
 dimana "P"=0, "Q"=1, ... , "Y" = 9

**P Q R S T U V W X Y**  
**0 1 2 3 4 5 6 7 8 9**

sehingga input **PQRS-TUVW-XY** akan dikonversi ke angka **0123-4567-89**

lanjut..

dari hasil dekompileksi HexRays :

```
...  
v11 = panjang((int)&v4);  
v9 = ekstrak((int)&v4, 0, v10); ekstrak1  
v7 = ekstrak((int)&v4, v10 + 1, v8); ekstrak2  
v5 = ekstrak((int)&v4, v8 + 1, v6); ekstrak3  
  
if ( !(v7 % v11)  
    && !(v9 % v11)  
    && !(v5 % v11)  
    && v9  
    && (v9 < v7) < v5  
    && v5 * (v7 * v9 / (v9 * (v7 / v9))) / (v5 * v11) == 1 )  
    benar();  
...
```

kondisi agar inputan teks yang kita input itu benar :

- nilai v7,v9,v5 harus kelipatan v11 (panjang inputan text)
- v9 != 0
- (v9 < v7) < v5
- $v5 * (v7 * v9 / (v9 * (v7 / v9))) / (v5 * v11) == 1$

nah.. kita selesaikan dulu persamaan

$$v5 * (v7 * v9 / (v9 * (v7 / v9))) / (v5 * v11) == 1$$

$$v5 * (v7 * v9 / (v9 * (v7 / v9))) = v5 * v11$$

$$(v7 * v9 / (v9 * (v7 / v9))) = v11$$

dari rumus persamaan

...

$$a * \frac{b}{a} = b$$

...

persamaan :

...

$$v7 * \frac{v9}{v7} = v11$$

...

disederhanakan menjadi :

...

$$v7 * \frac{v9}{v7} = v11$$

...

disederhanakan lagi :

$$v9 = v11$$

nah... rumusnya udah dapet,

syarat serial valid :

format : v9-v7-v5

kondisi :

- v9 = v11 = panjang serial

- v7 & v5 kelipatan v11

contoh serial valid :

PX-WR-VT

08-72-64

Panjang serial (v11) : 8

v9 = 08 (v11)

v7 = 72 (kelipatan v11)

v5 = 64 (kelipatan v11)