Relocation Bonus

Attacking the Windows Loader Makes Analysts Switch Careers

Introduction

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Nick Cano

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- A look into the Windows Portable Executable (PE) header and how it can be weaponized to *destroy* parsers, disassemblers, and other tools

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Relocation Bonus

- A look into the Windows Portable Executable (PE) header and how it can be weaponized to *destroy* parsers, disassemblers, and other tools
- A PE rebuilder that takes any 32bit PE then obfuscates and rebuilds it using the attack

Why Attack Relocations?

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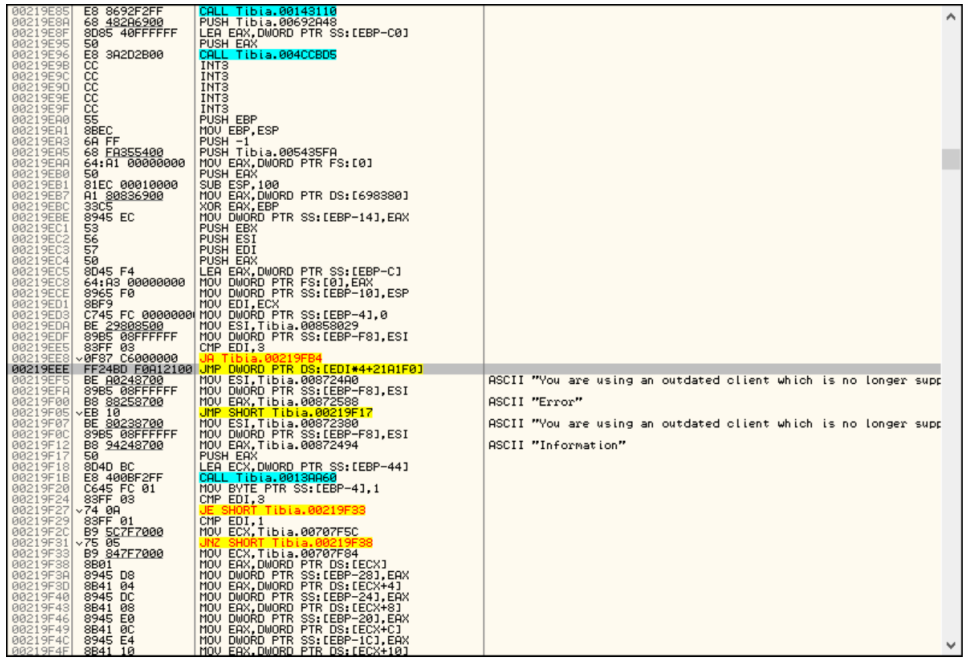

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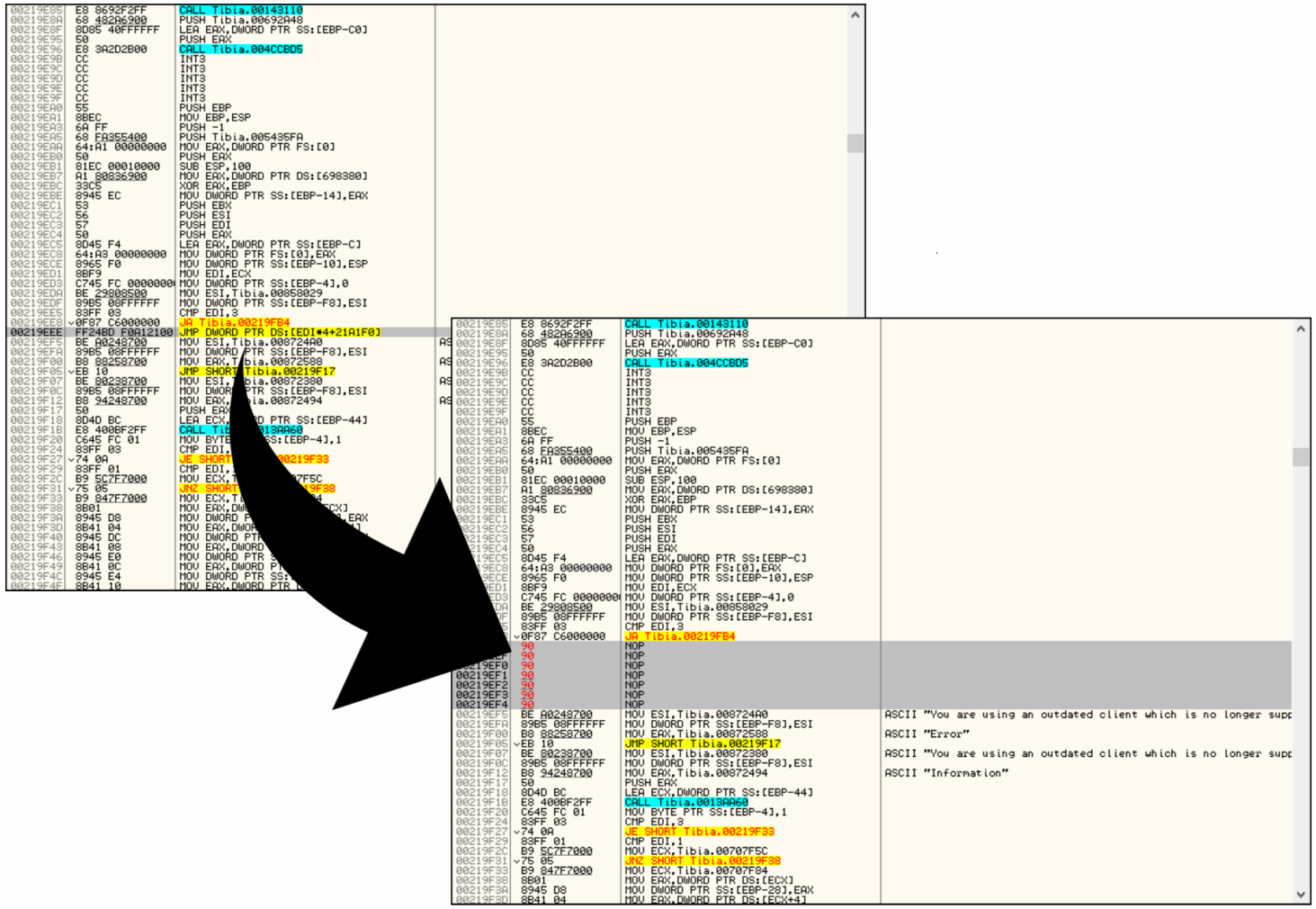

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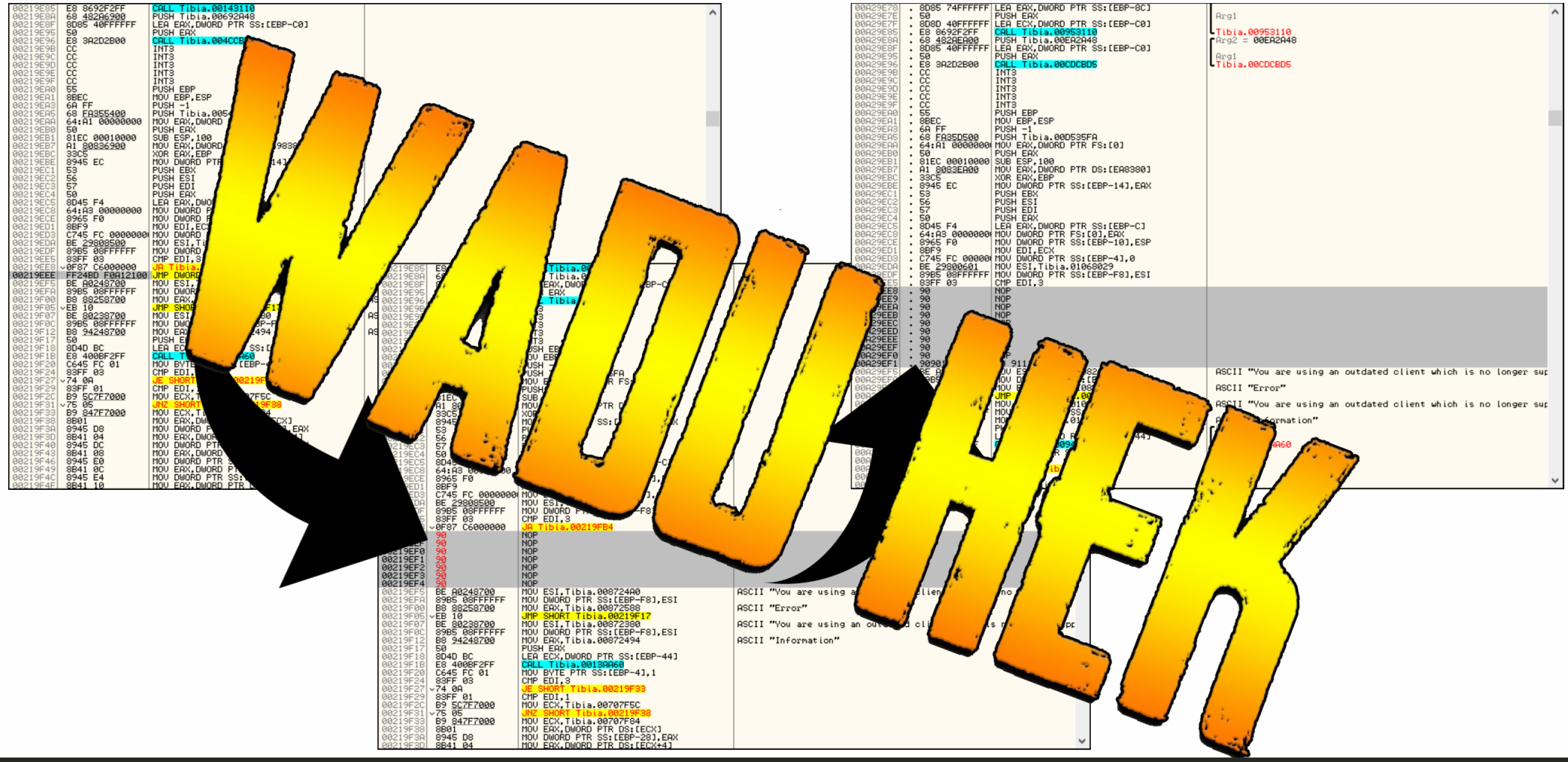

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its broken for no reason



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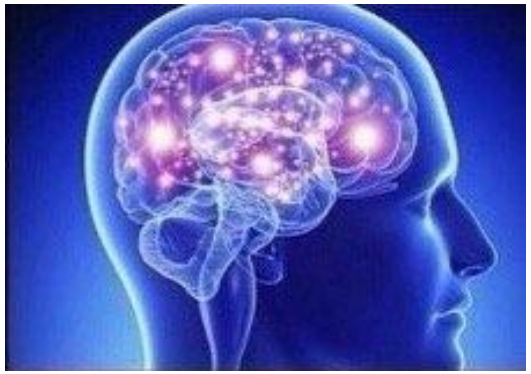

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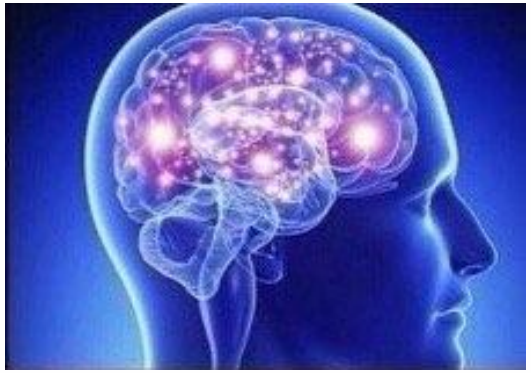

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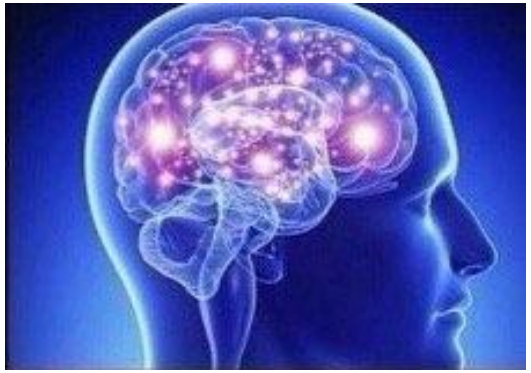

don't patch code that is relocated



relocations can be weaponized to hide my arsenal in the bowels of the machine



Mission Statement

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Me: *slaps roof of exe*
this bad boy can fit so many reloc entries in it



What Are Relocations?

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Relocations exist to enable dynamic mapping, specifically ASLR

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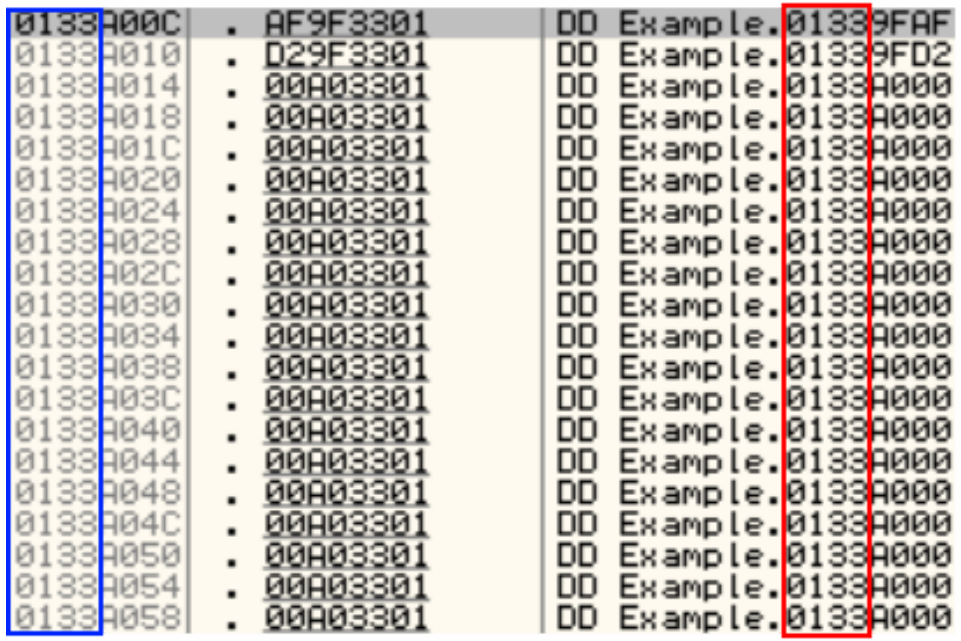

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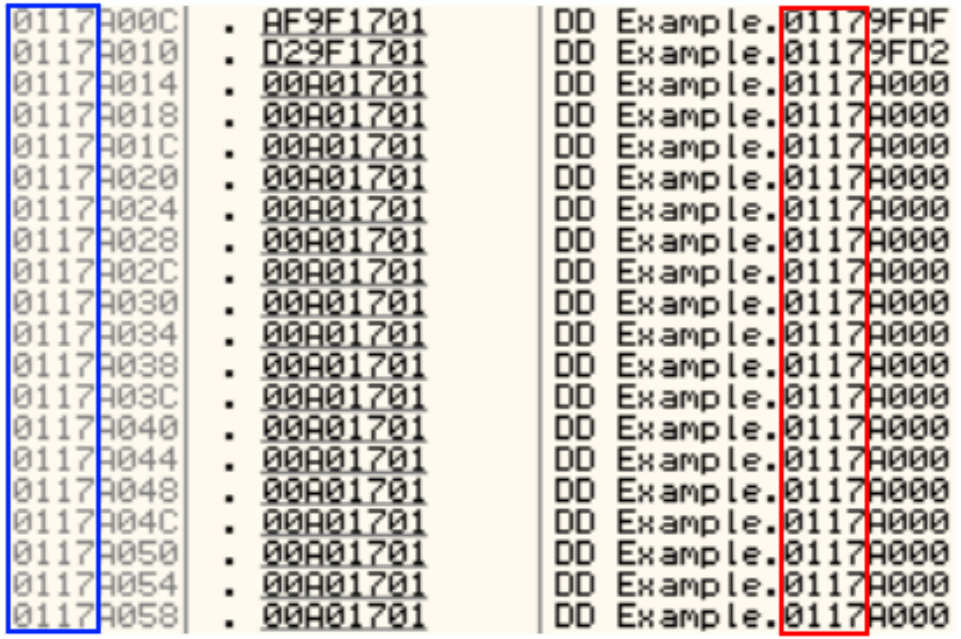

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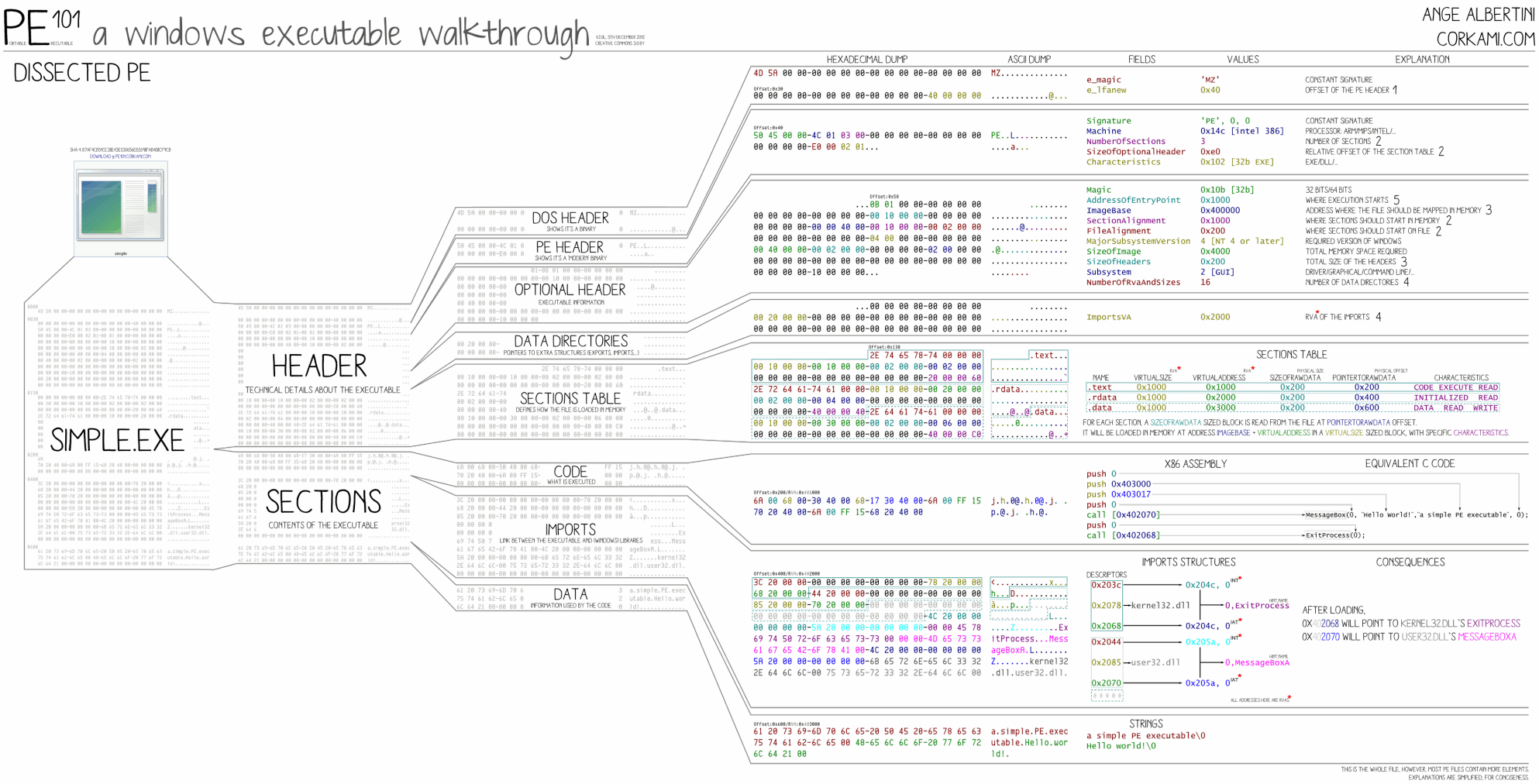

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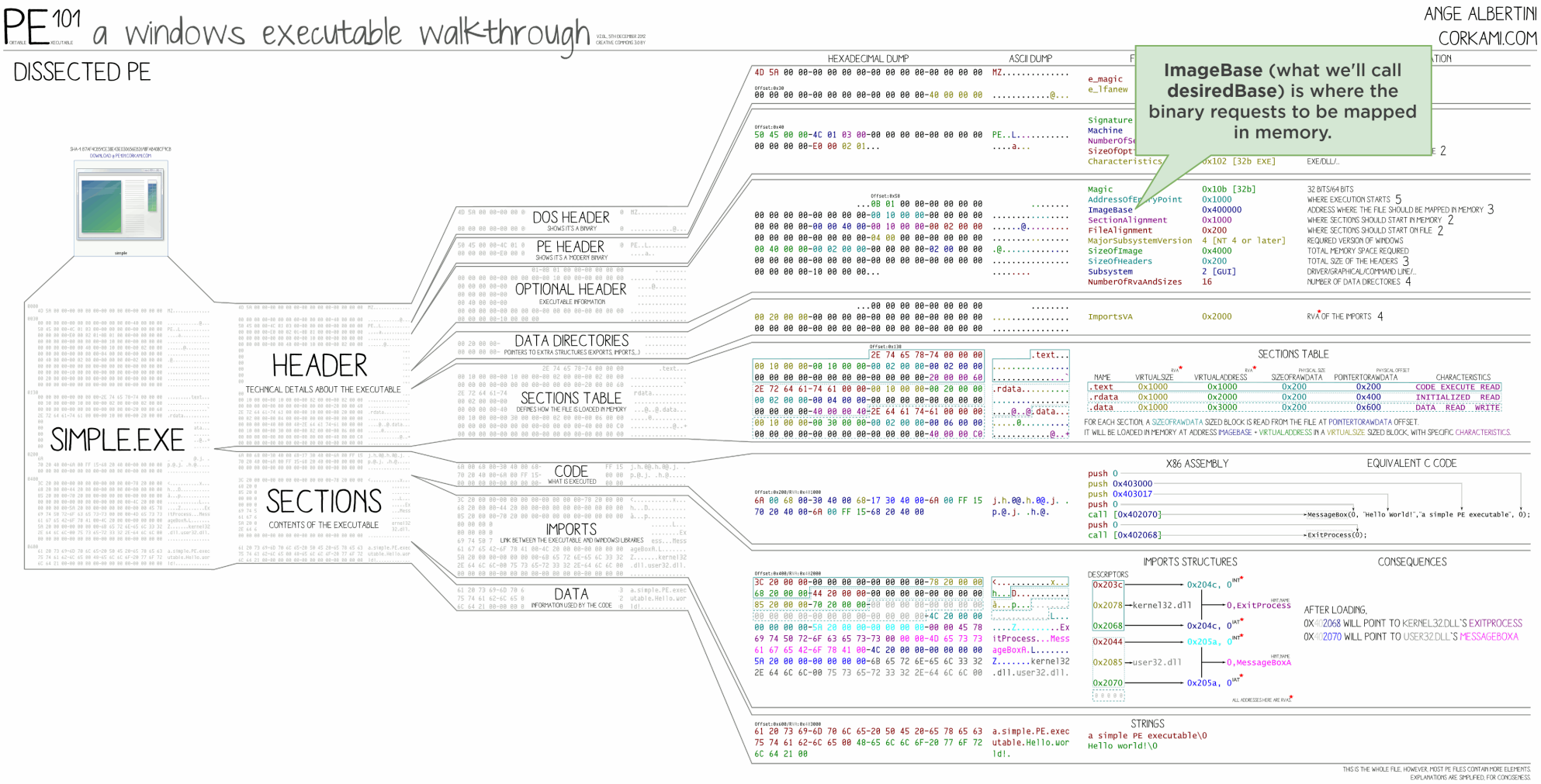

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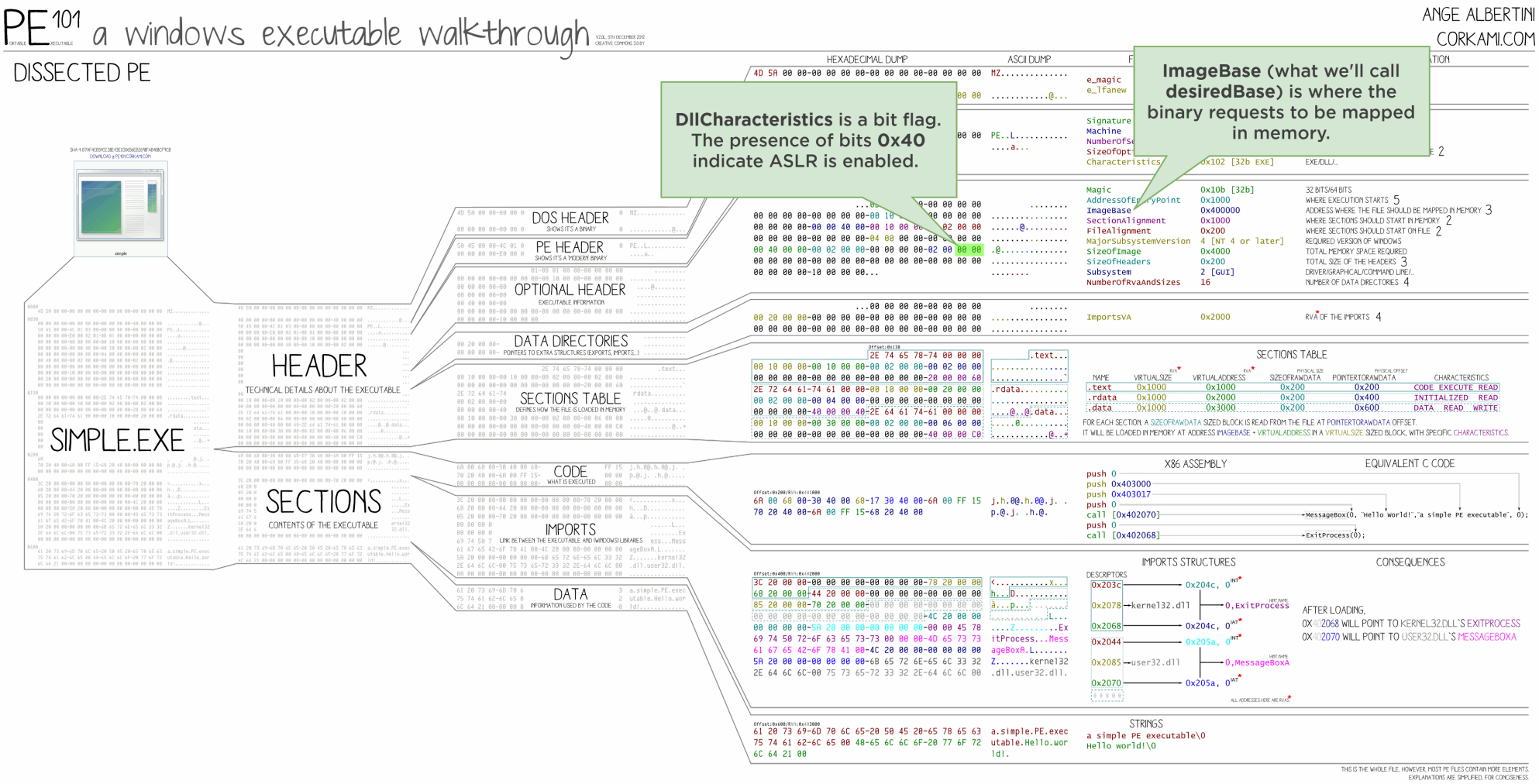

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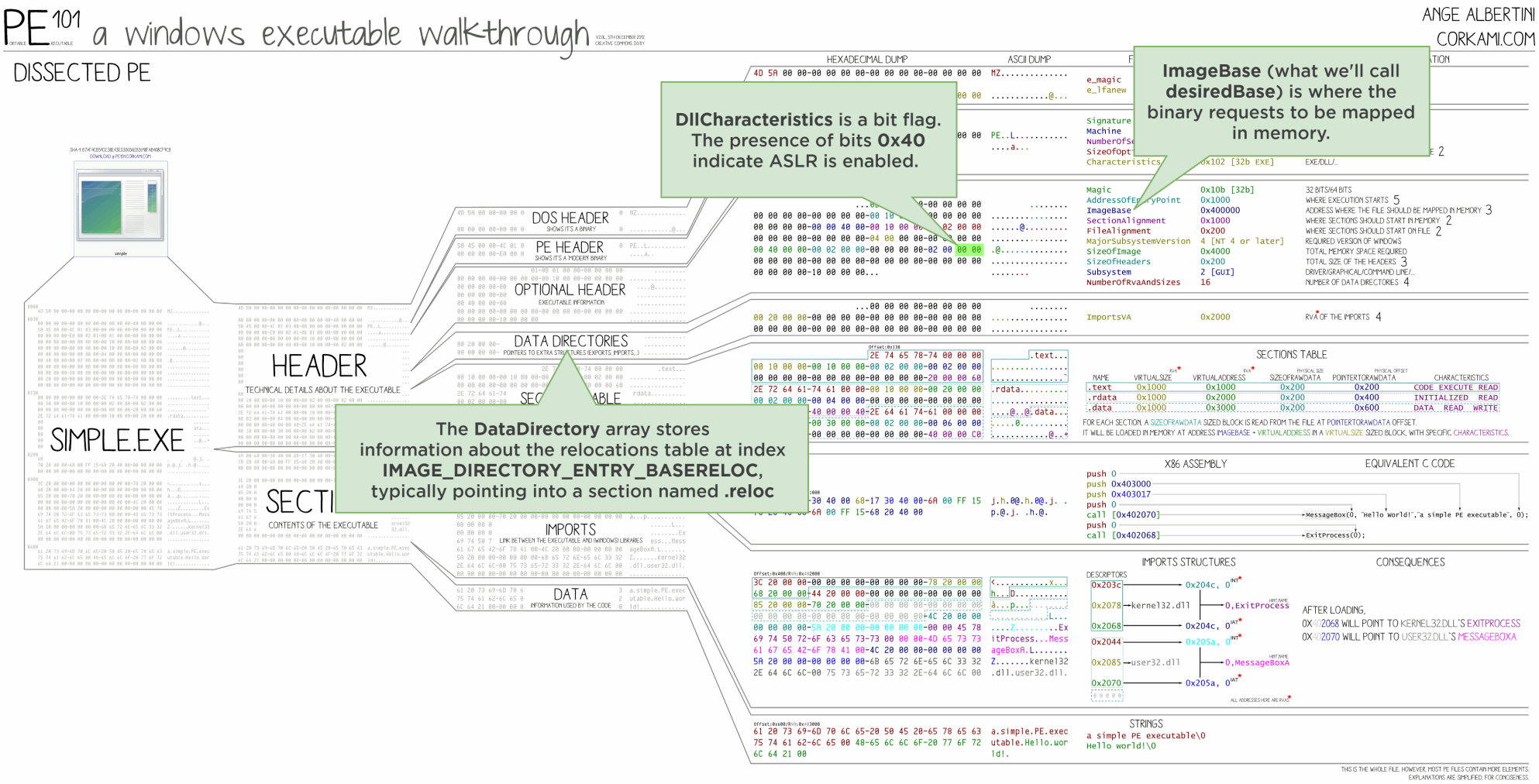

How Do Relocations Work?

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	Bytes			
	1	2	3	4
	DataDirectories[ENTRY_BASERELOC].VirtualAddress			
	DataDirectories[ENTRY_BASERELOC].Size			
... UNRELATED ...				
Block[0]	VirtualAddress			
	SizeOfBlock			
	type[0]	offset[0]	type[1]	offset[1]
	...	...	...	...
	type[N]	offset[N]	0x0000	
Block[1]	VirtualAddress			
	SizeOfBlock			
	type[0]	offset[0]	type[1]	offset[1]
	...	...	...	...
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	type[0]	offset[0]	type[1]	offset[1]
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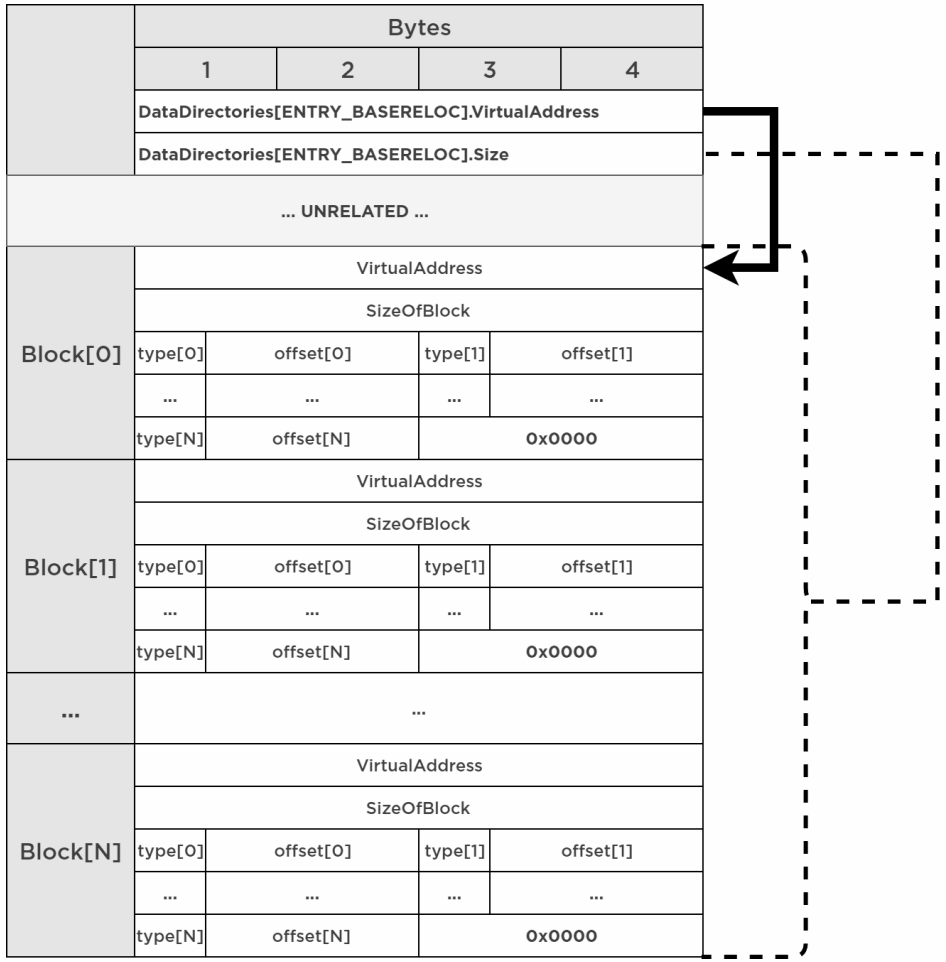

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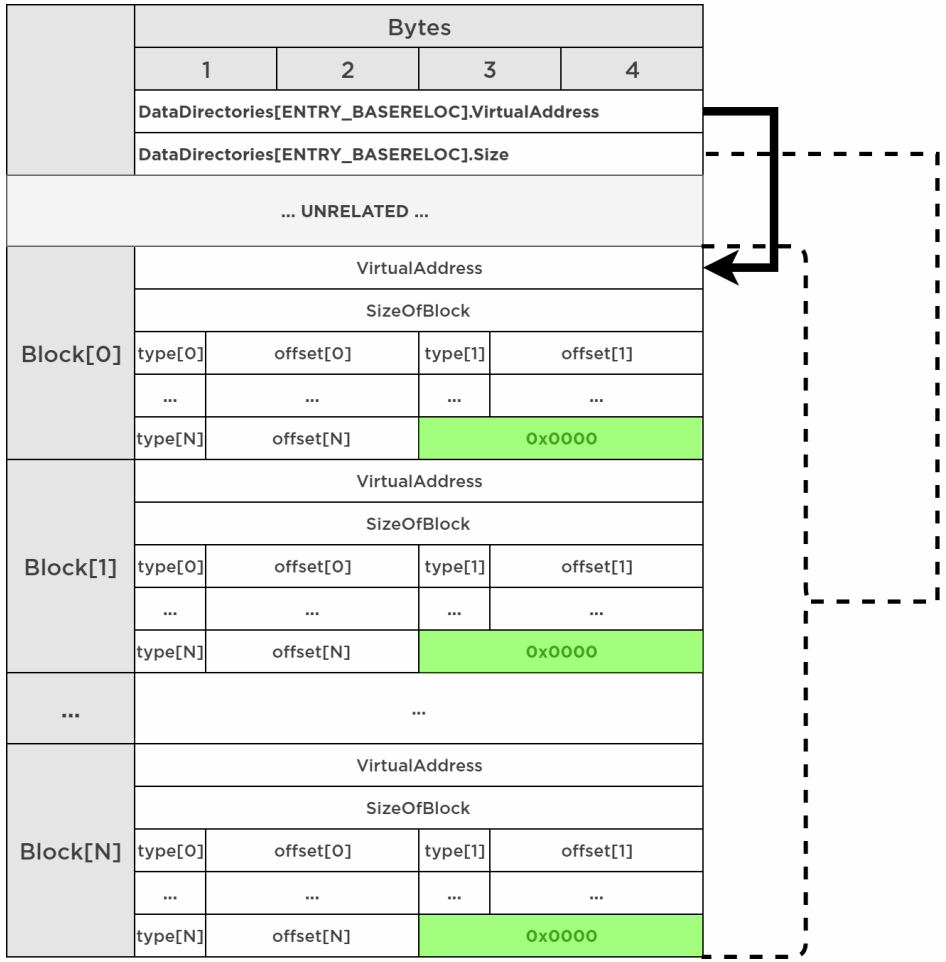

- `VirtualAddress` points to first reloc block
- `Size` is the size, in bytes, of all blocks
- `(uint16_t)0x0000` marks the end of each block

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	Bytes			
	1	2	3	4
0x00	VirtualAddress			
0x04	SizeOfBlock			
0x08	type[0]	offset[0]	type[1]	offset[1]
0x0C	type[2]	offset[2]	type[3]	offset[3]

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Virtual Address for start of the block. Offsets are 12-bit, so a block can cover up to 4096 bytes (or 1024 4-byte addresses)

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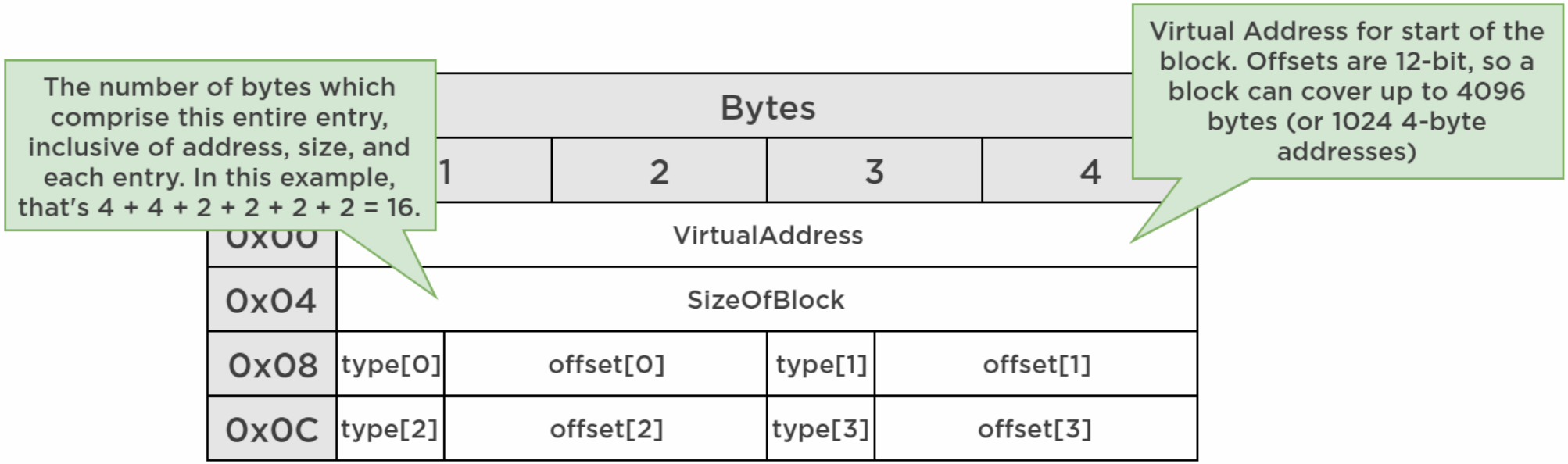

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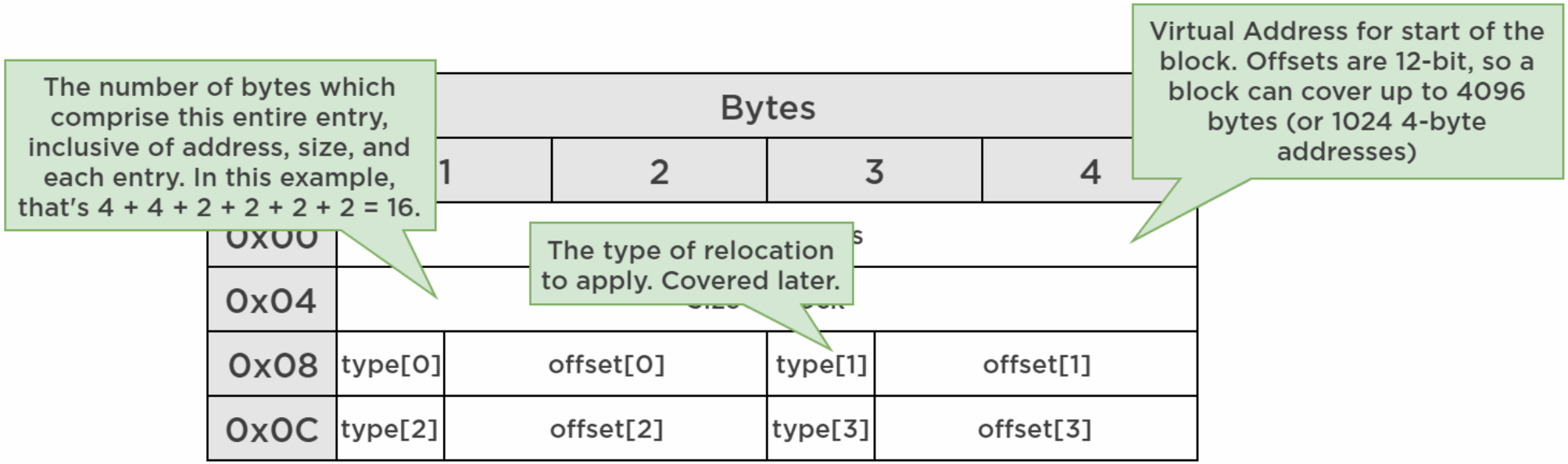

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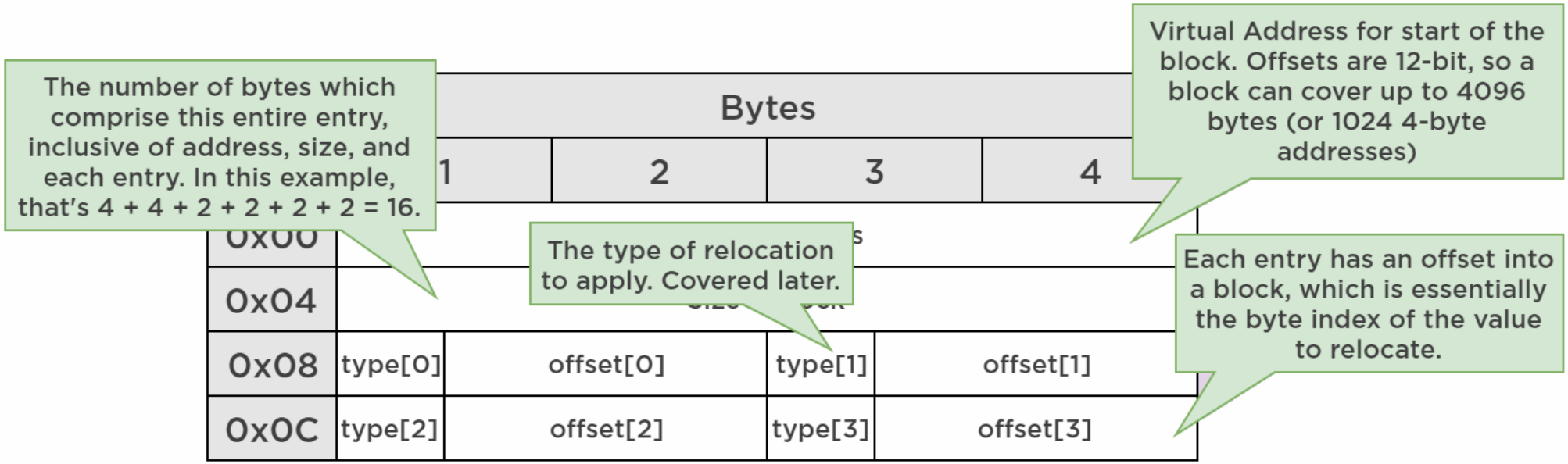

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Something like this

```
auto delta = base - desiredBase;
for (auto reloc : relocs) {
    auto block = (base + reloc.VirtualAddress);
    for (auto entry : reloc.entries) {
        auto adr = block + entry.offset;
        if (entry.type == IMAGE_REL_BASED_HIGHLOW) // <- this
            *((uint32_t*)adr) += delta;
        else if (entry.type == IMAGE_REL_BASED_DIR64)
            *((uint64_t*)adr) += delta;
        else if (entry.type == IMAGE_REL_BASED_HIGH)
            *((uint16_t*)adr) += (uint16_t)((delta >> 16) & 0xFFFF);
        else if (entry.type == IMAGE_REL_BASED_LOW)
            *((uint16_t*)adr) += (uint16_t)delta;
    }
}
```

Controlling Relocations

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Conclusion: to abuse relocations, `base` must be preselected, giving a predictable `delta`. This means ASLR must be tricked.

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- `0xFFFFFFFF`: PE fails to load; invalid header

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As I later learned, Corkami had already figured all of this out: https://github.com/corkami/pocs/

PE Loader Breakdown

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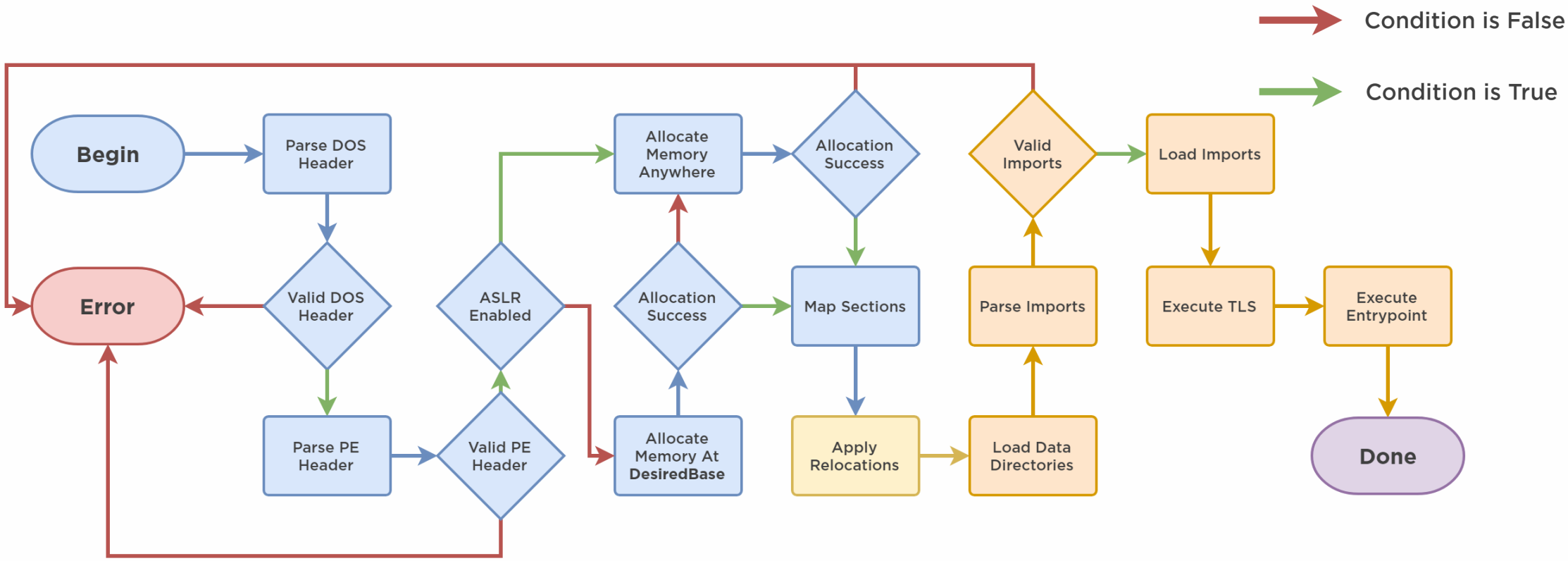

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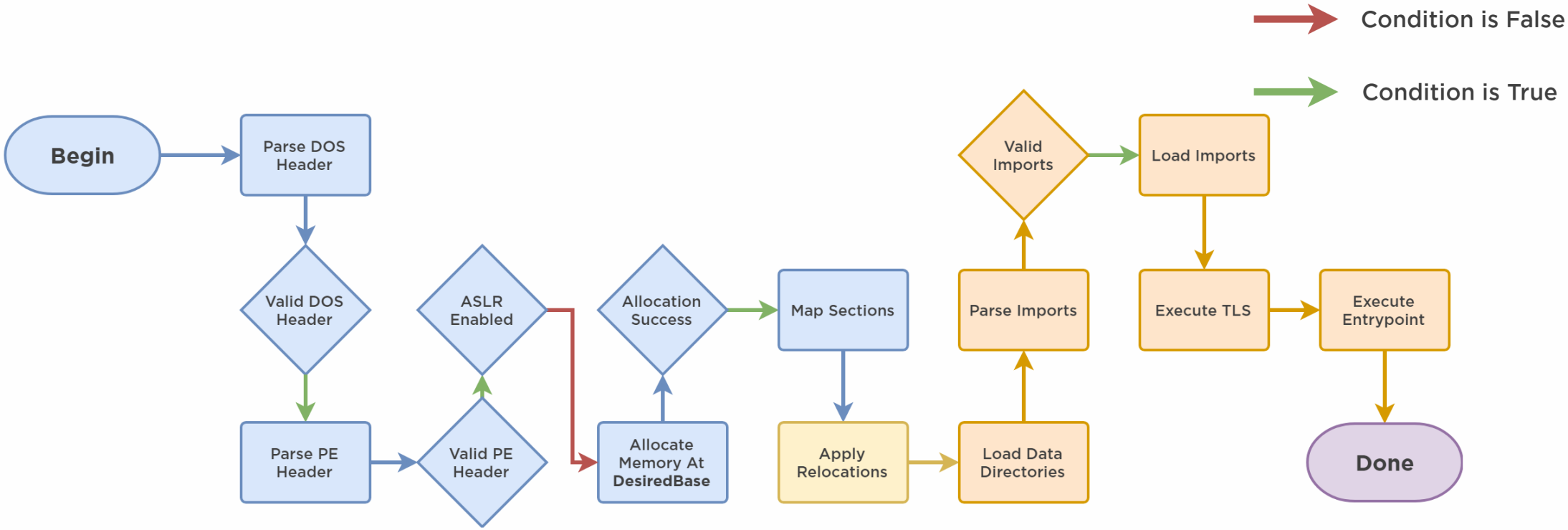

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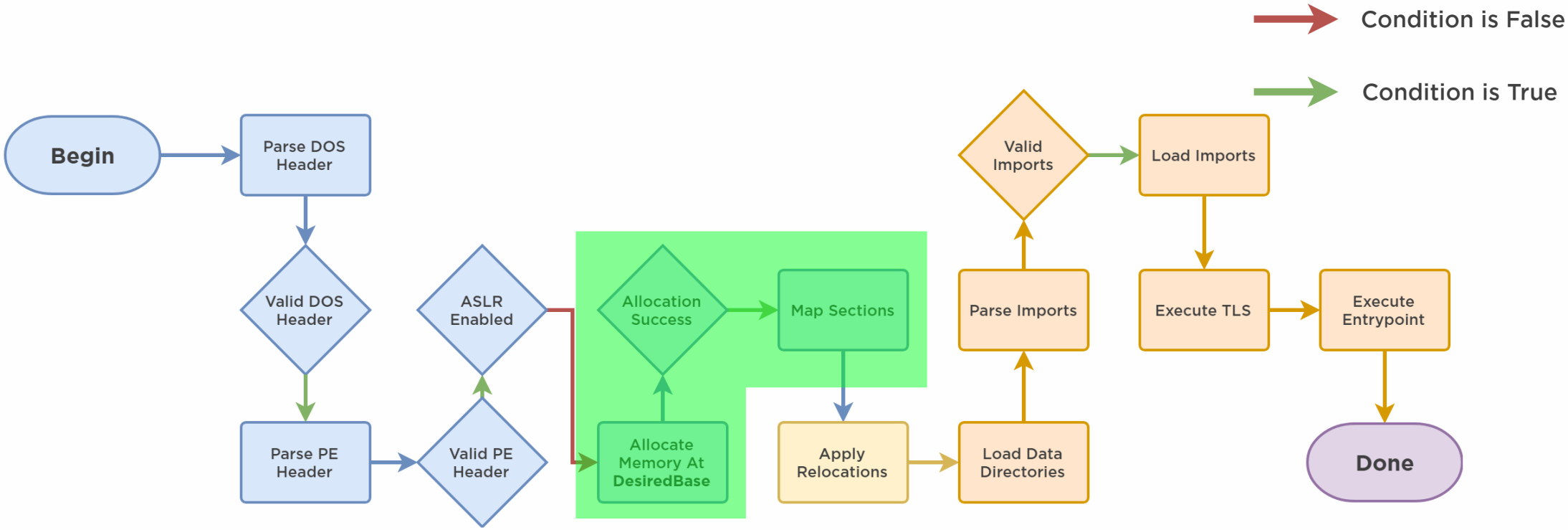

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Conclusion: can mangle imports, code and resource sections, and optionally the `entryPoint` if DEP is off on the target machine.

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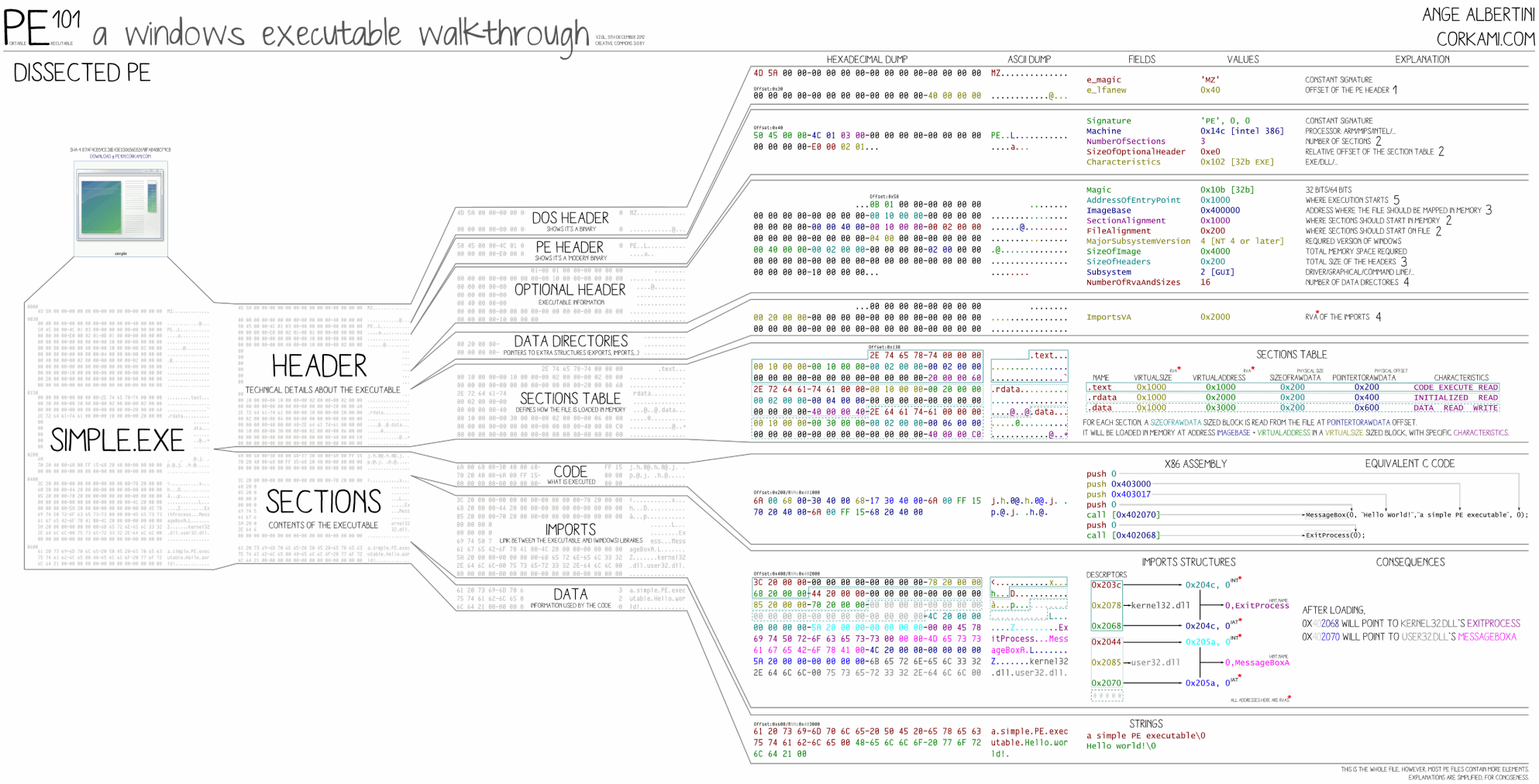

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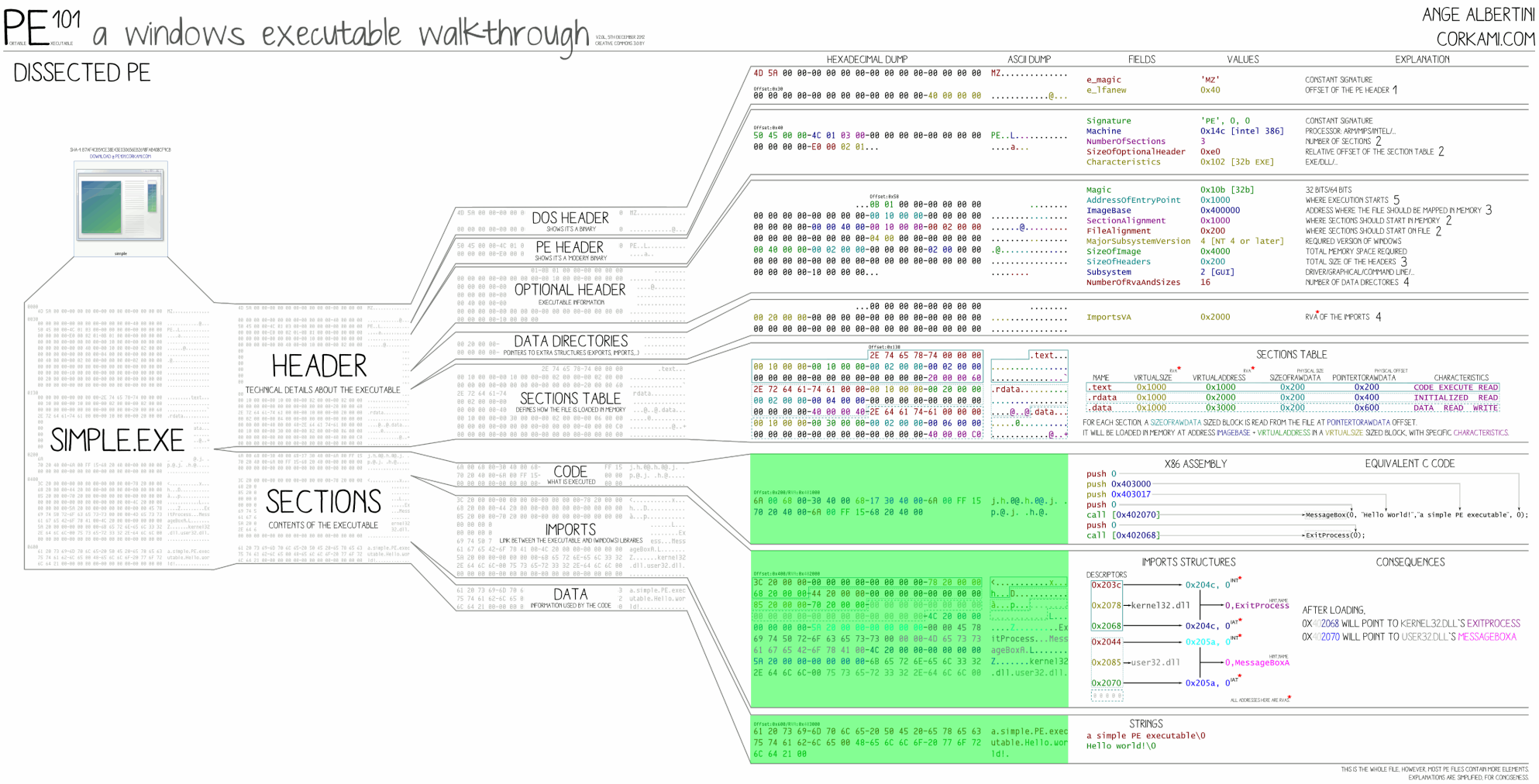

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ROUND ONE

FIGHT

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THE END

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Conclusion: it can work on Windows 10, but I don't like it

A New Hope

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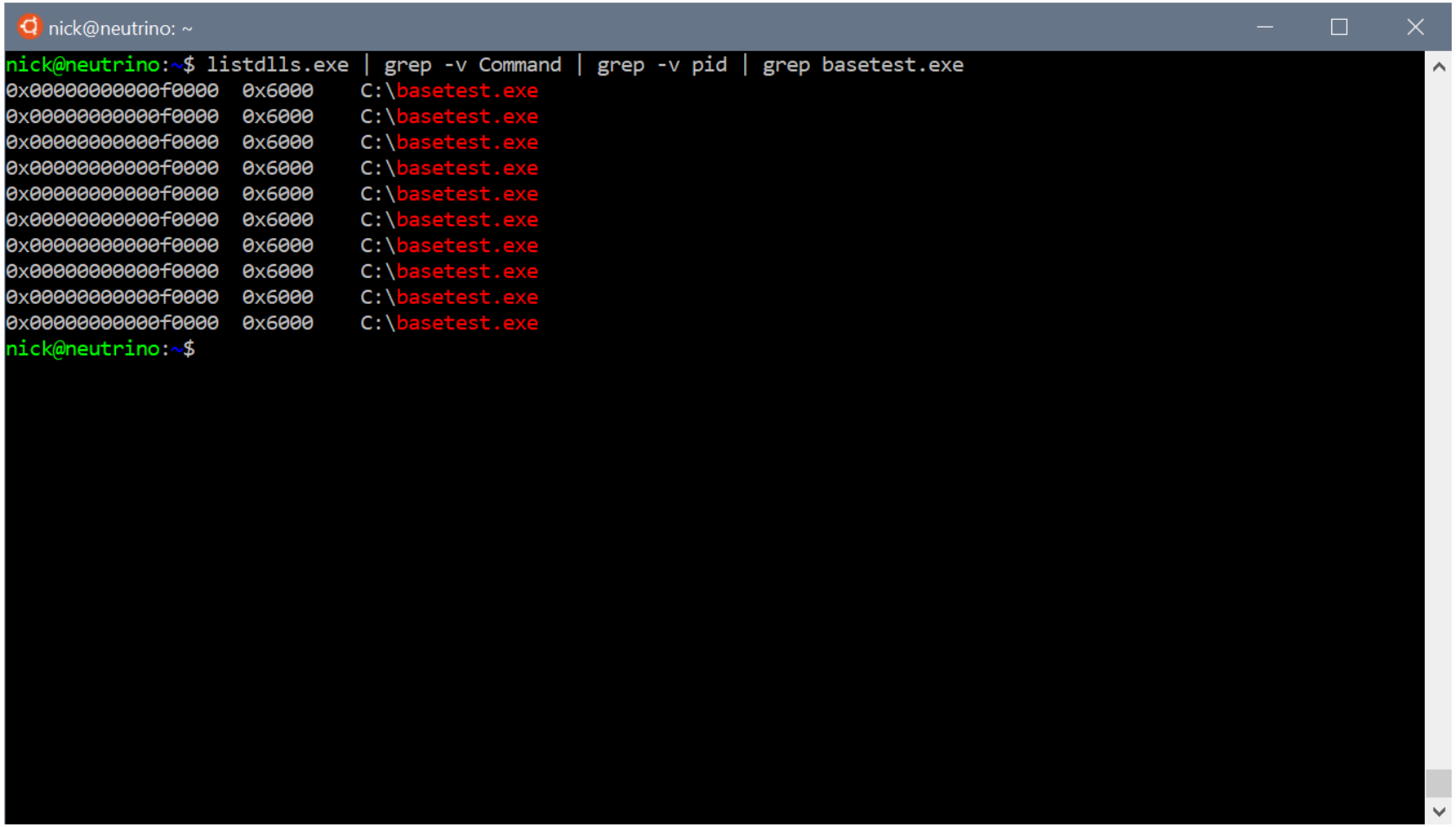
nick@neutrino: ~
nick@neutrino:~$ listdlls.exe | grep -v Command | grep -v pid | grep basetest.exe
0x00000000000f0000 0x6000 C:\basetest.exe
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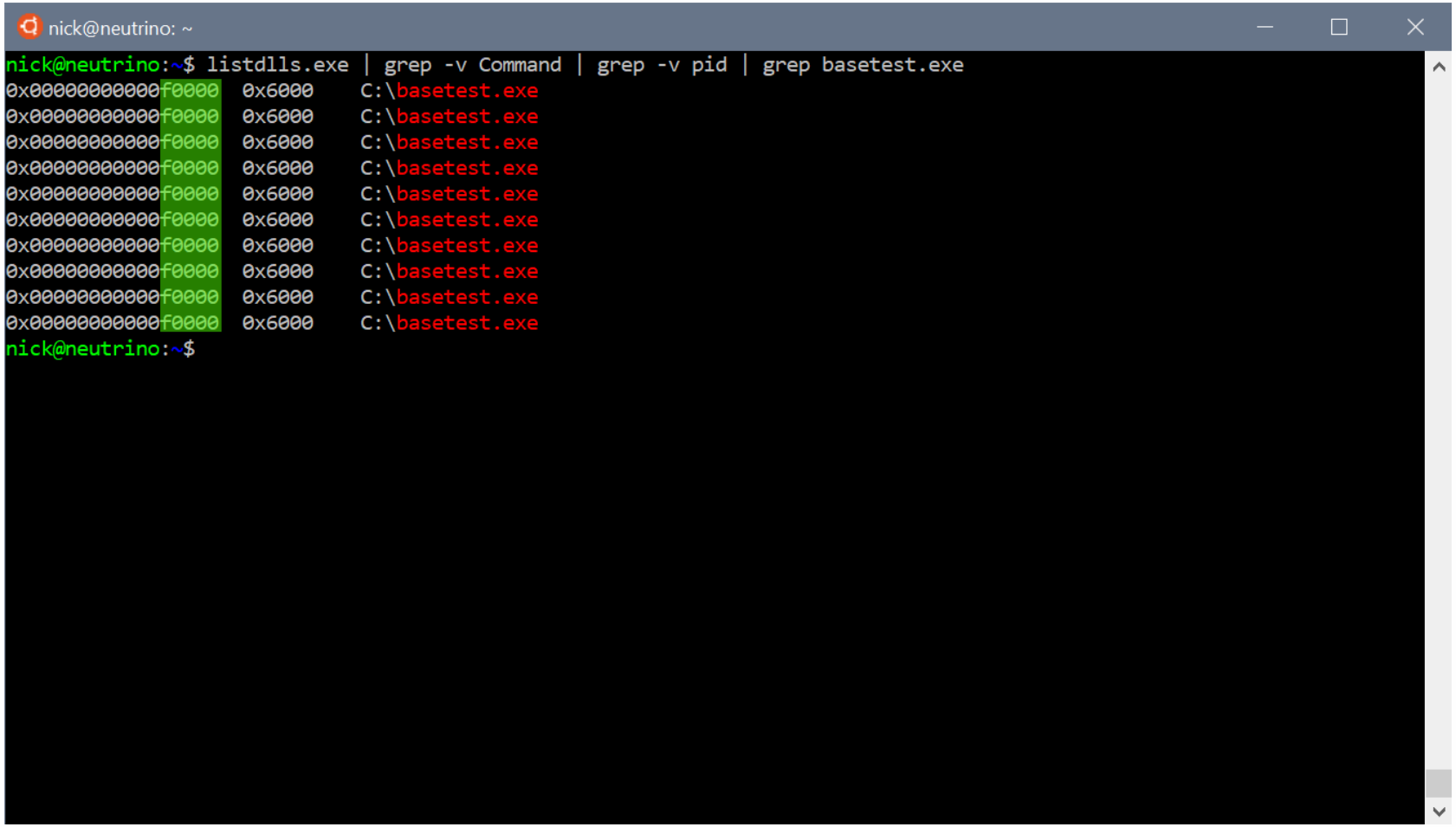
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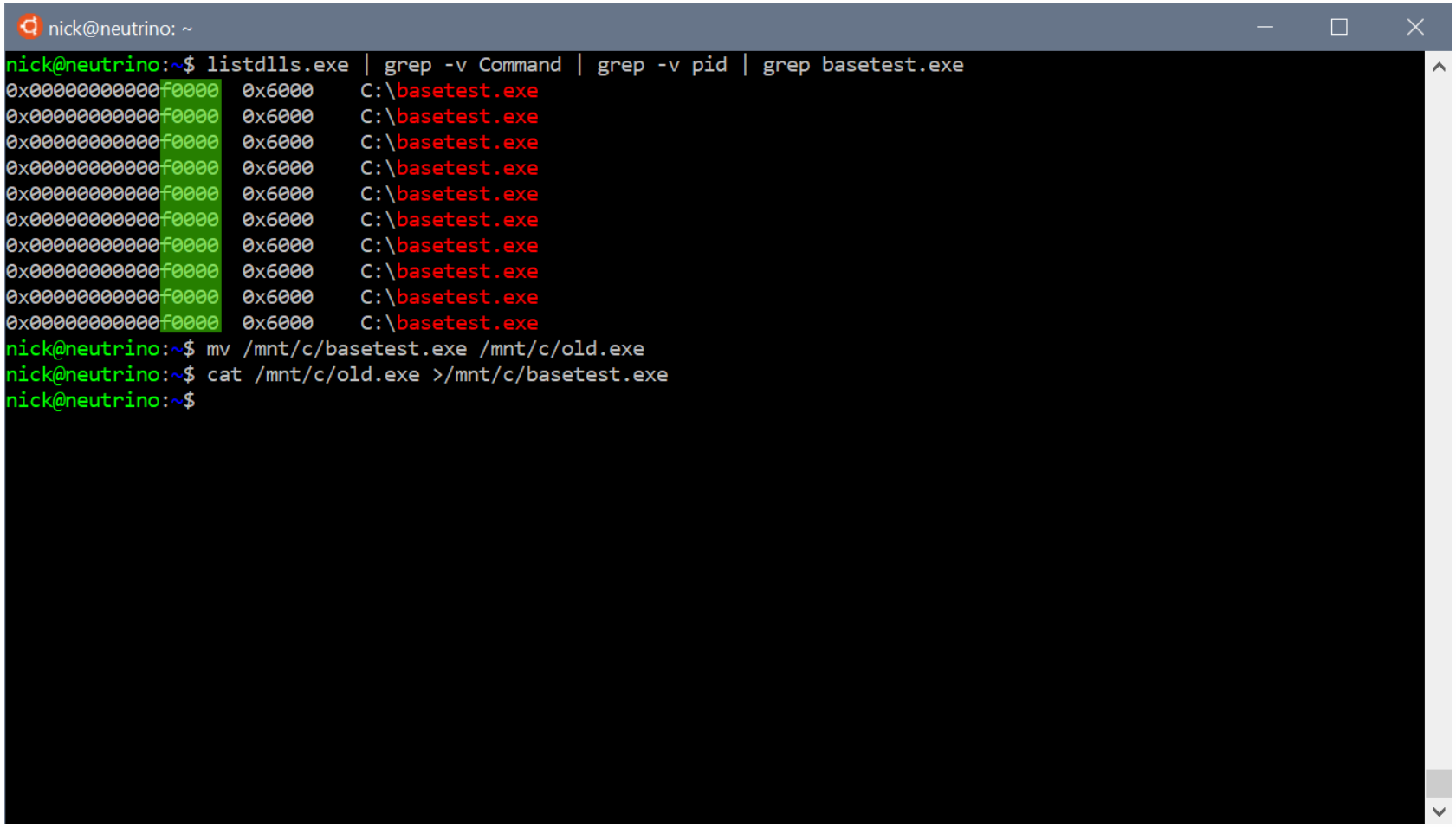
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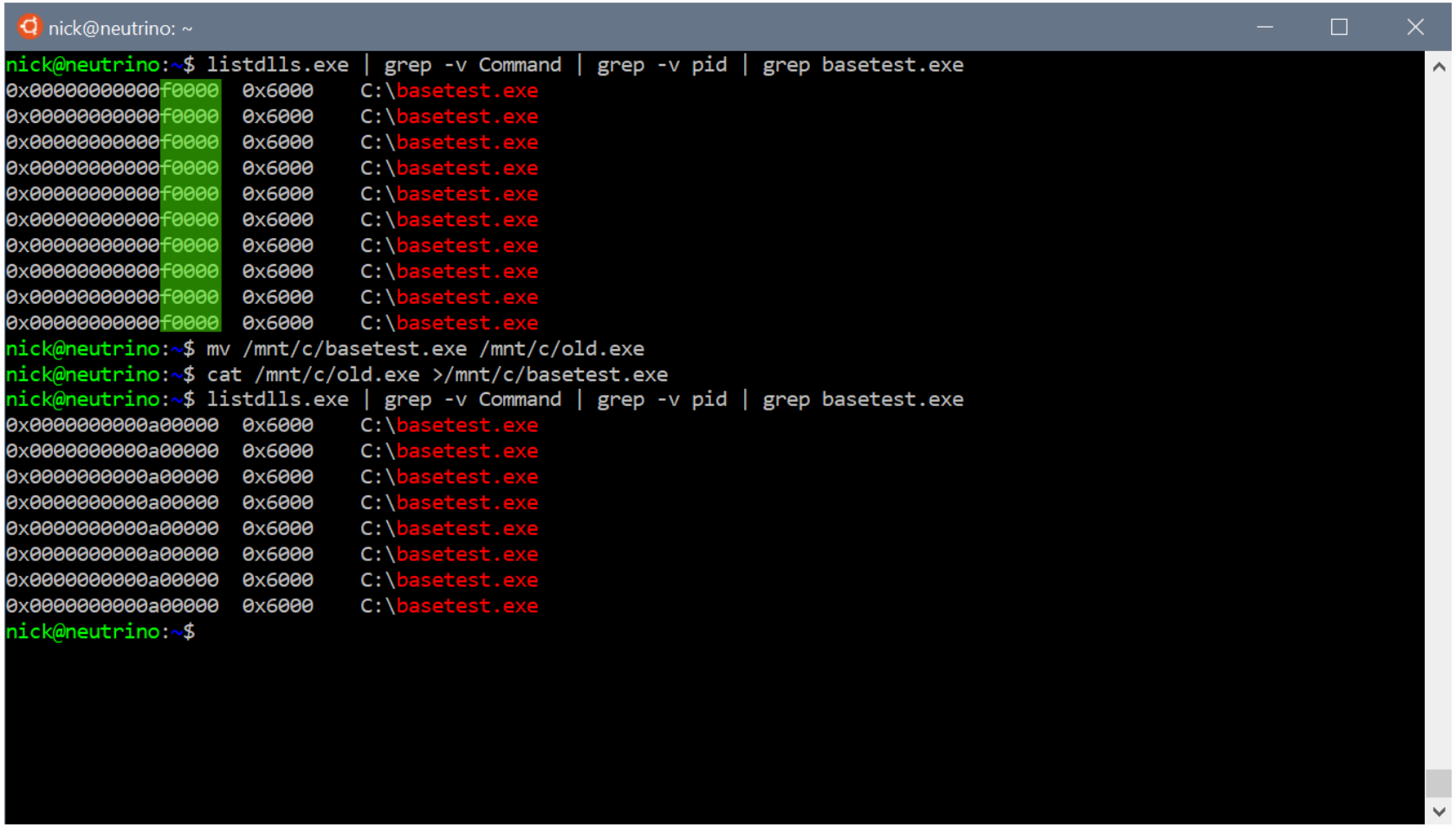
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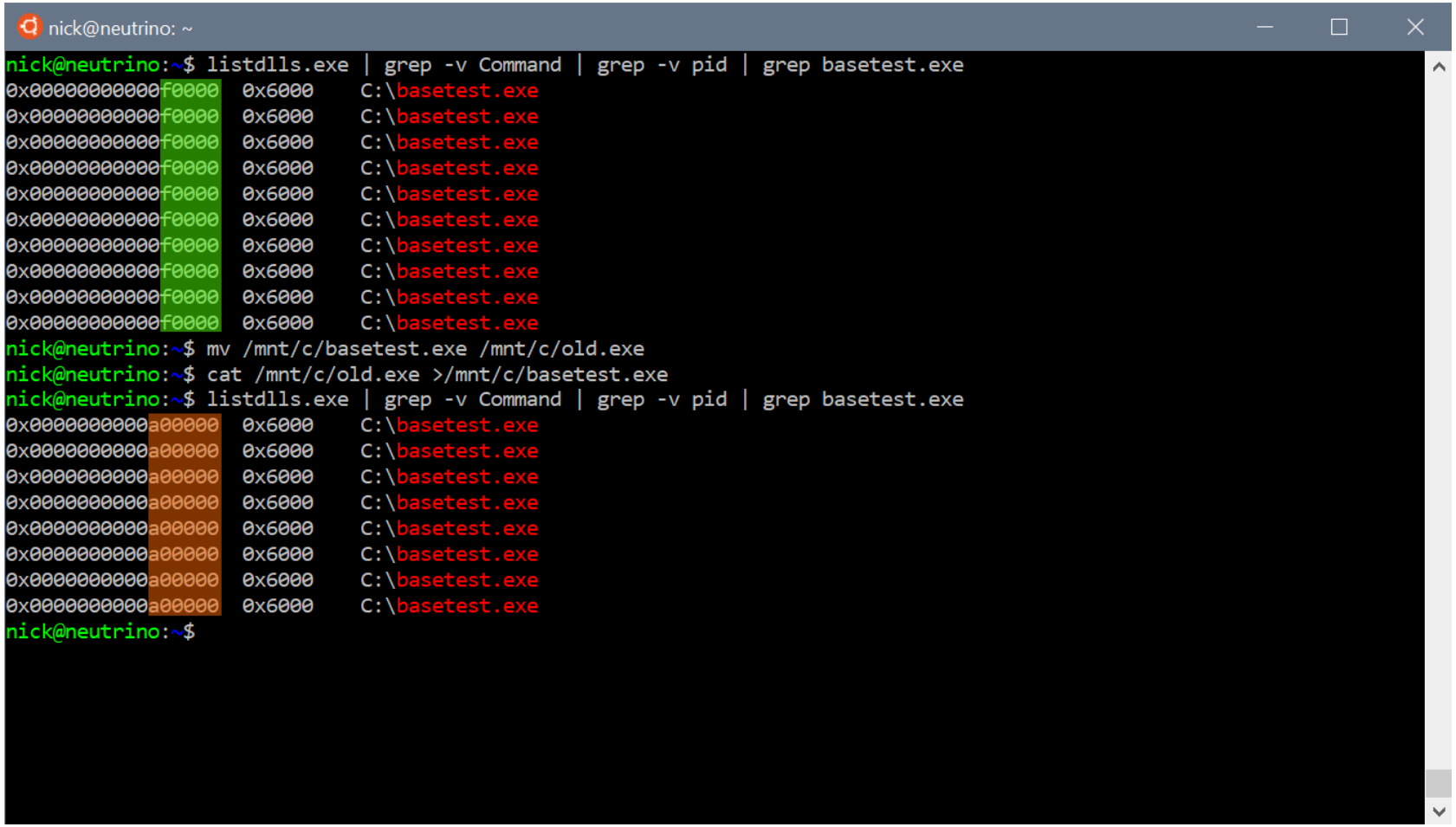
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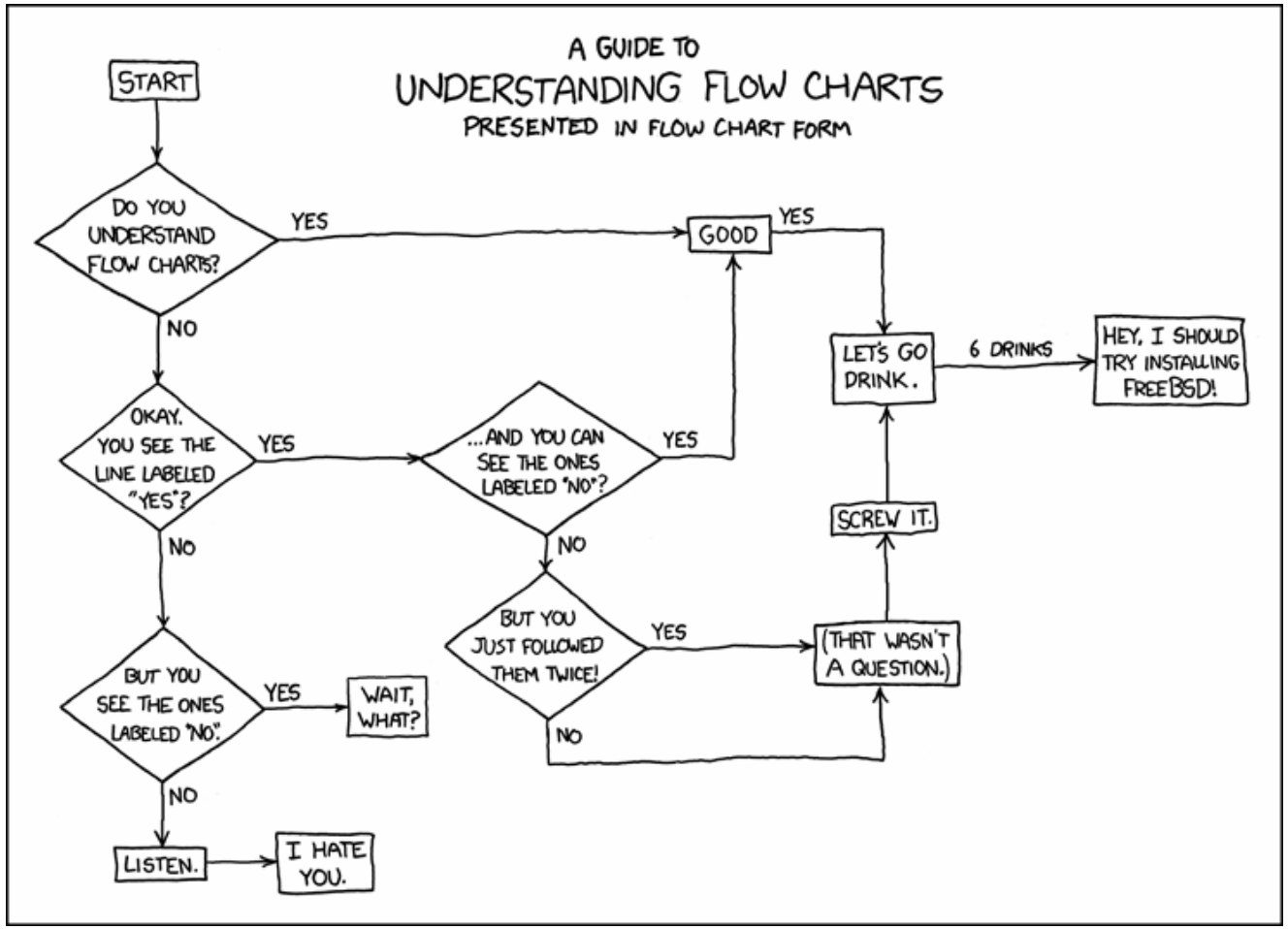

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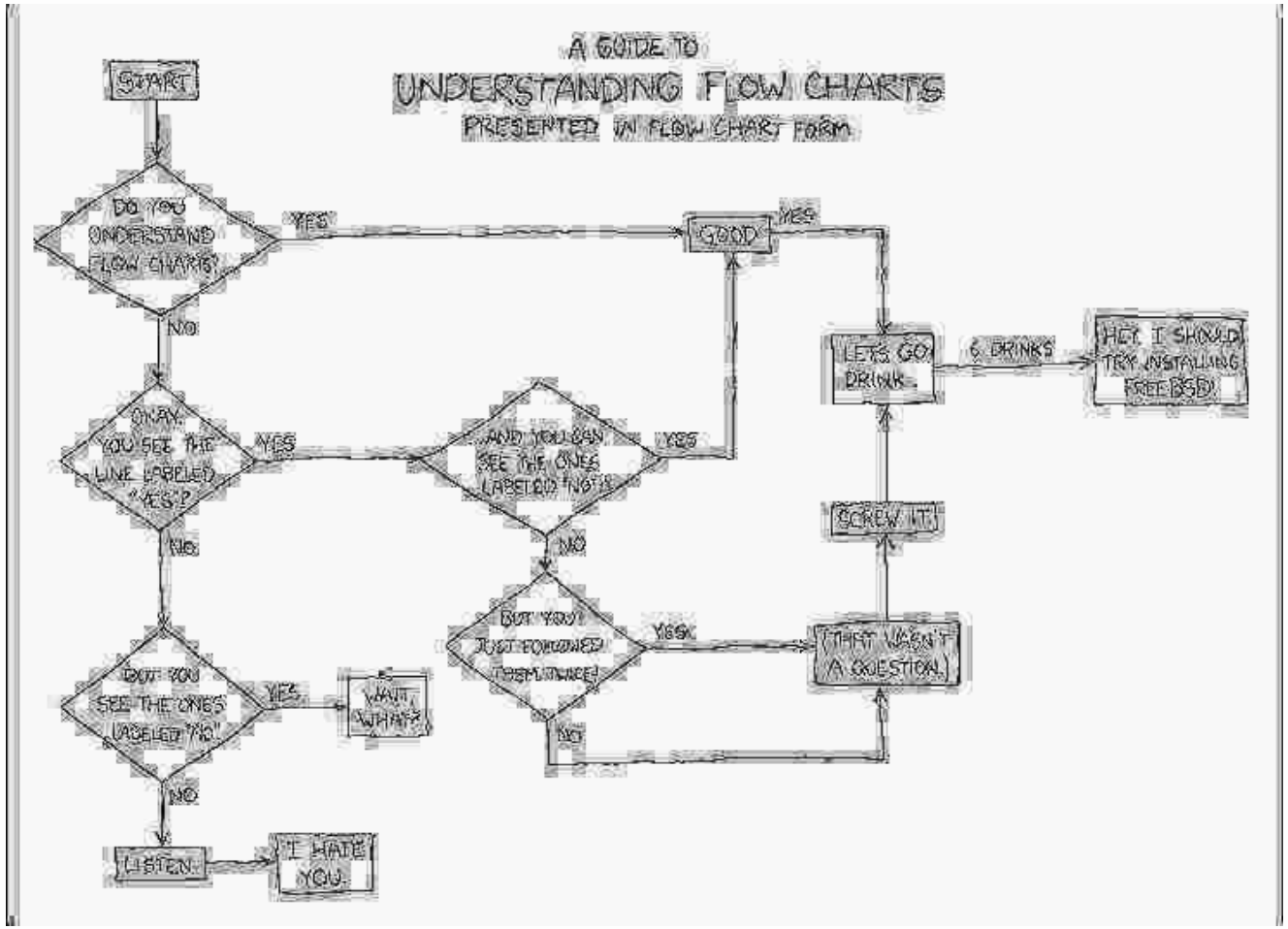

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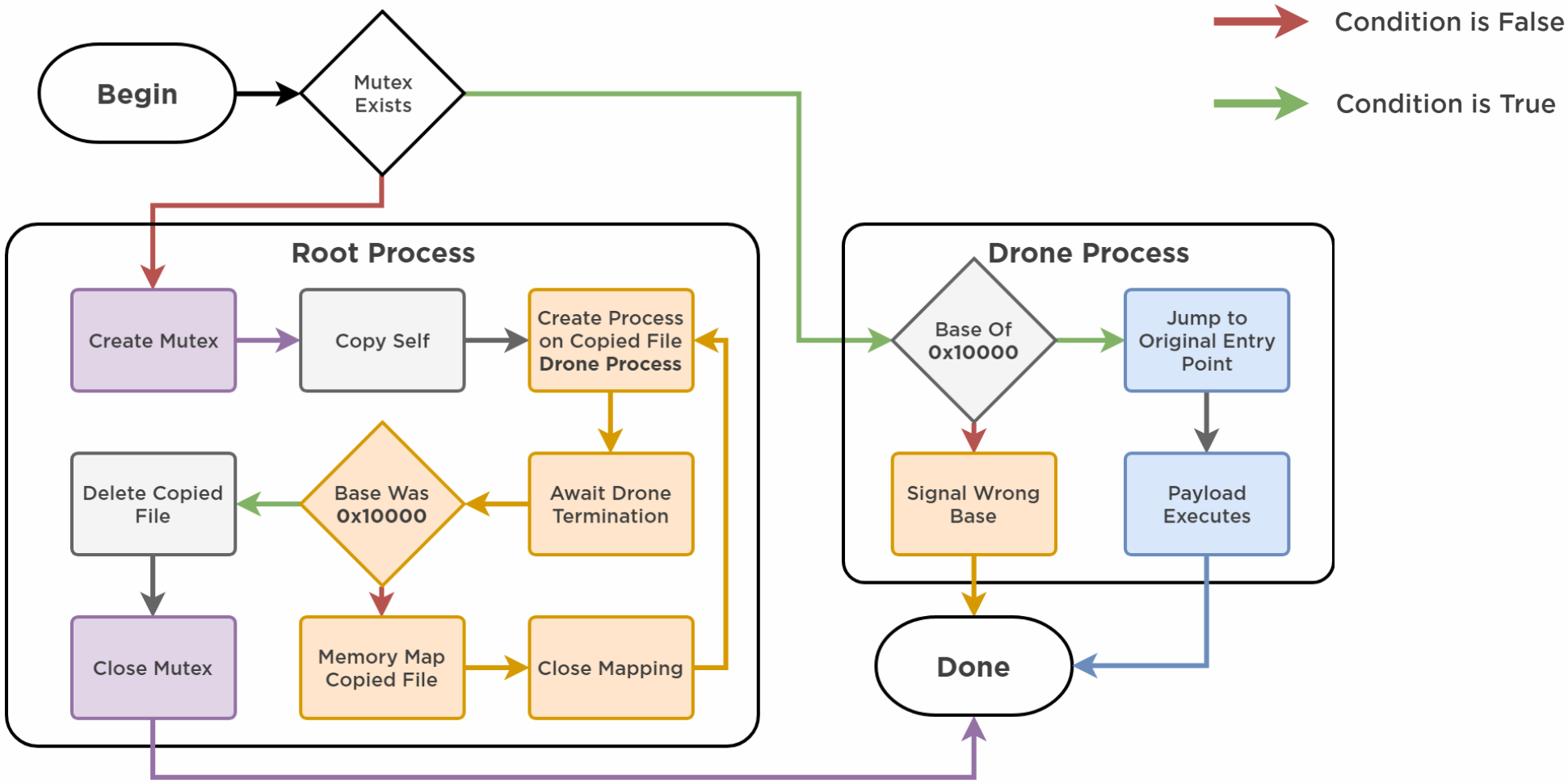

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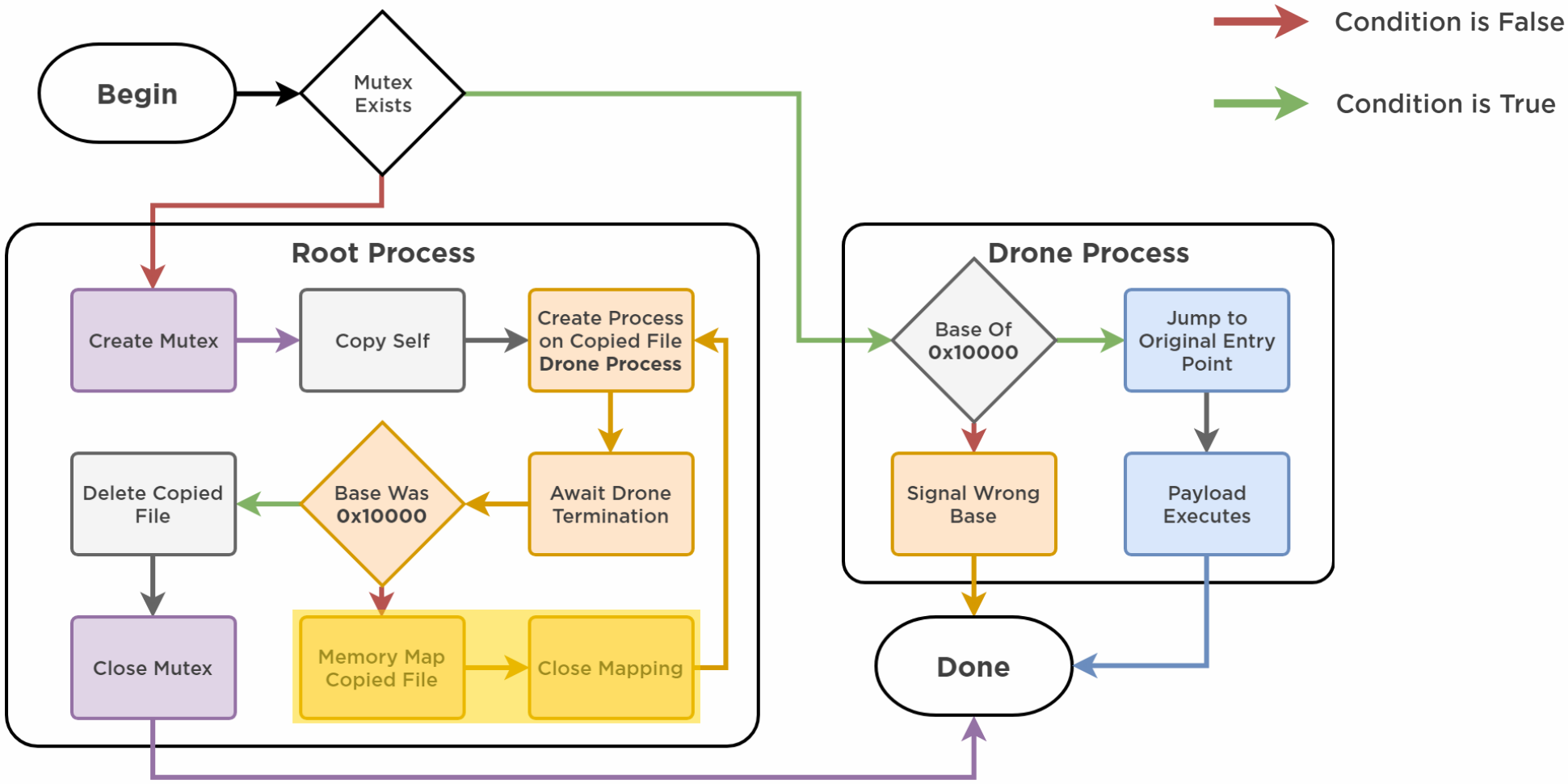

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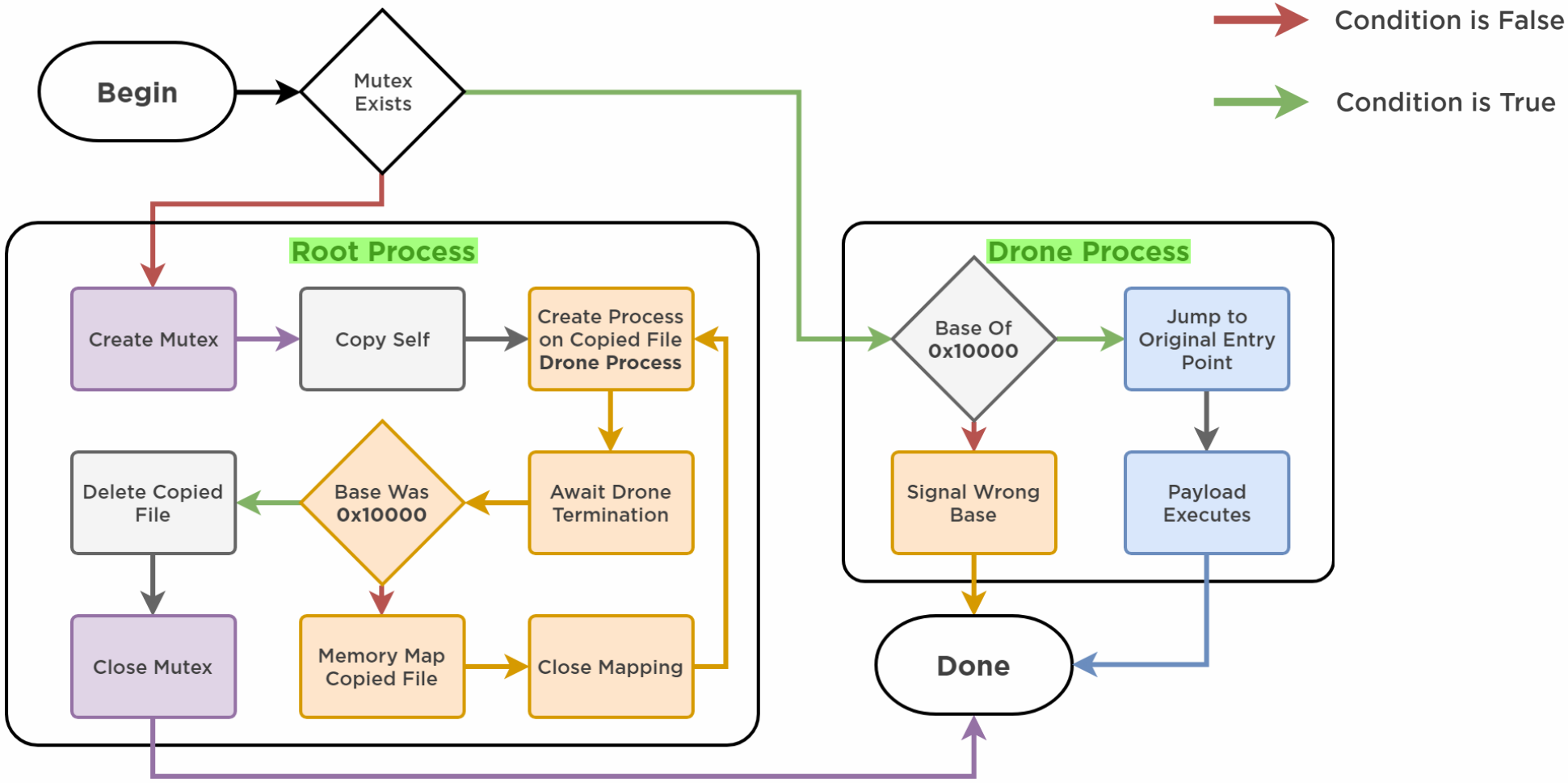

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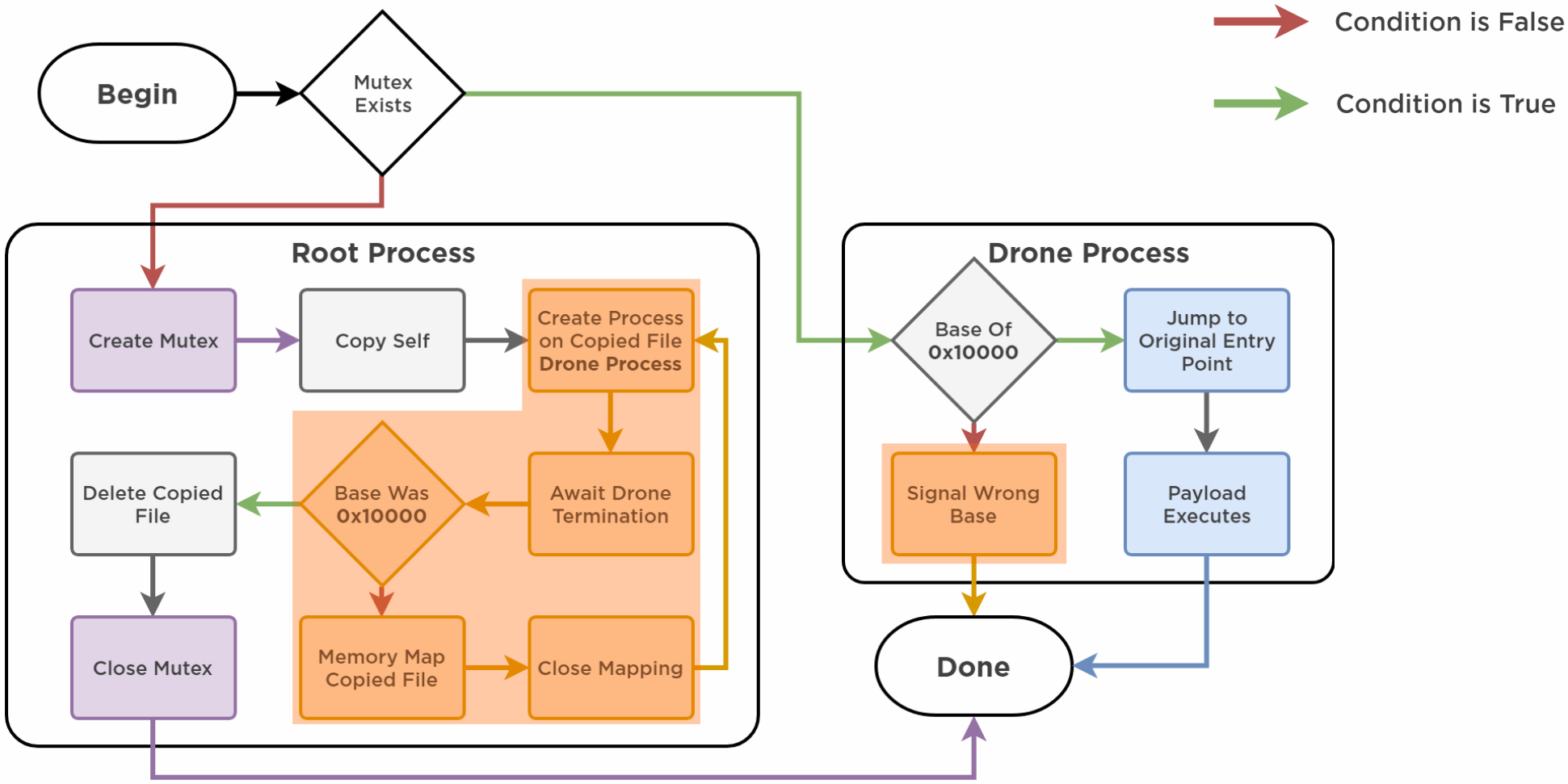

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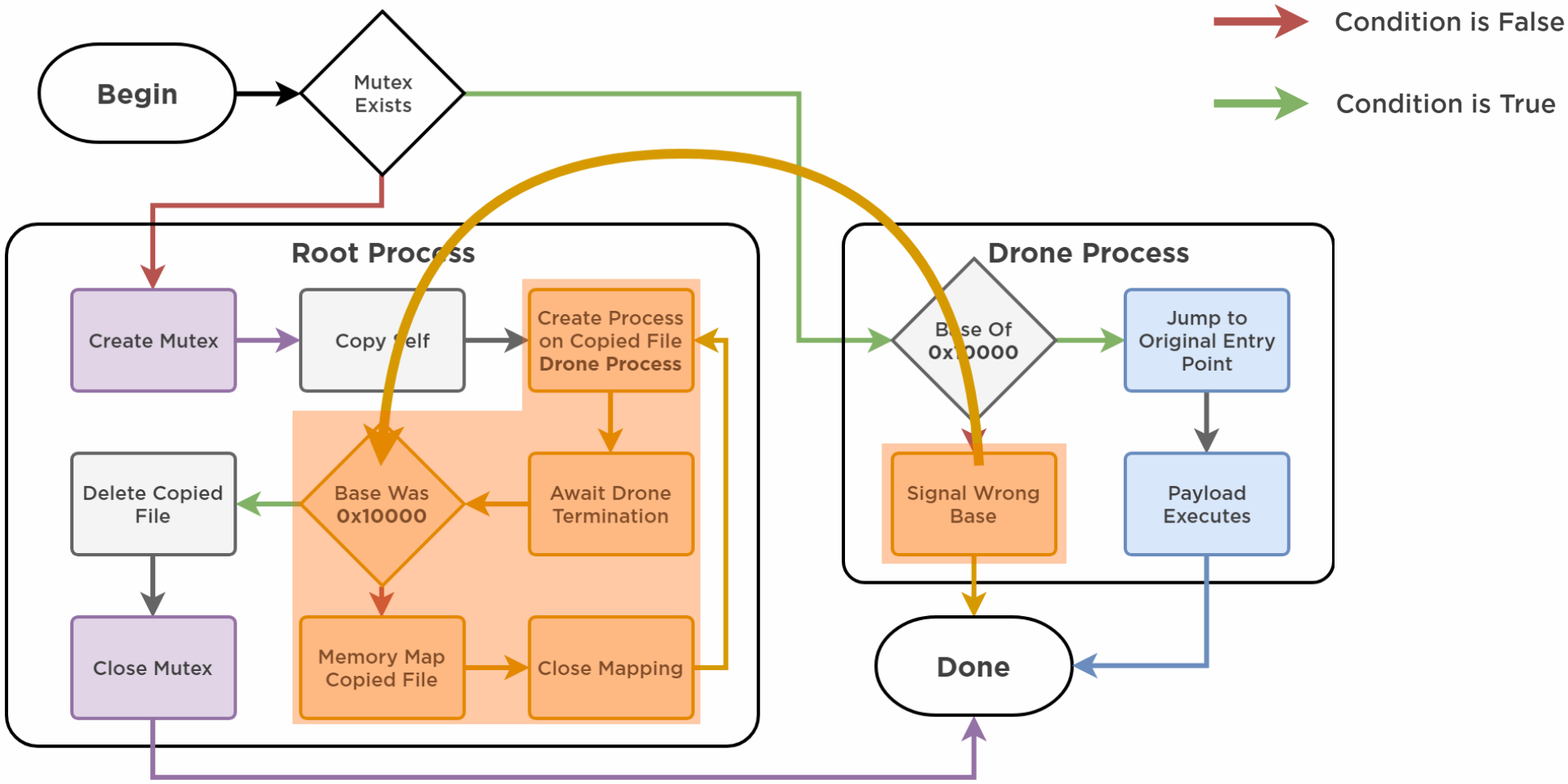

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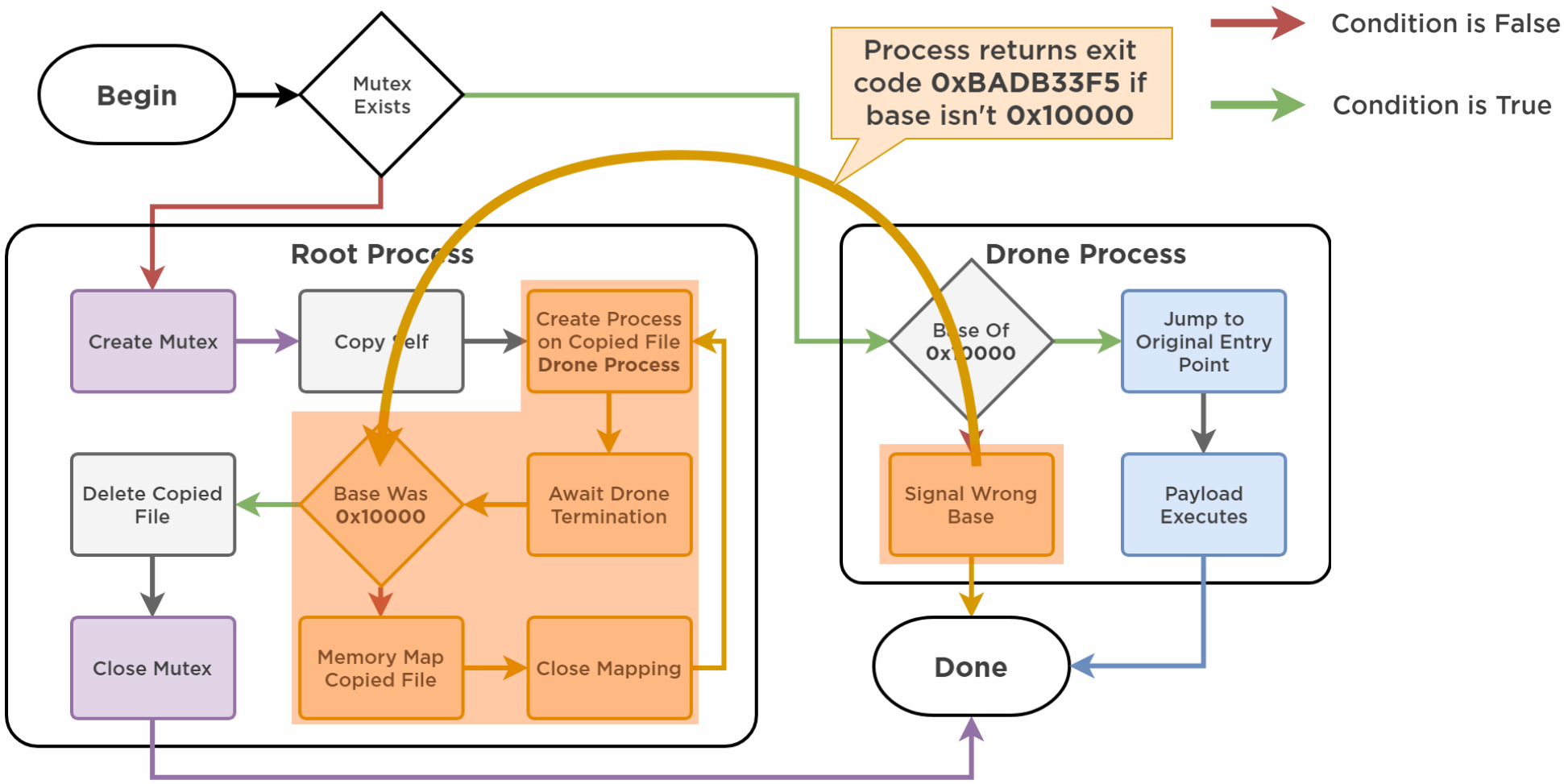

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// HELPERS FOR VARIADIC MACROS
#define EXPAND( x ) x
#define __ARG_N( \
     _1, _2, _3, _4, _5, _6, _7, _8, _9,_10, \
    _11,_12,_13,_14,_15,_16,_17,_18,_19,_20, \
    _21,_22,_23,_24,_25,_26,_27,_28,_29,_30, \
    _31,_32,_33,_34,_35,_36,_37,_38,_39,_40, \
    _41,_42,_43,_44,_45,_46,_47,_48,_49,_50, \
    _51,_52,_53,_54,_55,_56,_57,_58,_59,_60, \
    _61,_62,_63,N,...) N
#define __RSEQ_N() \
    63,62,61,60,                    \
    59,58,57,56,55,54,53,52,51,50, \
    49,48,47,46,45,44,43,42,41,40, \
    39,38,37,36,35,34,33,32,31,30, \
    29,28,27,26,25,24,23,22,21,20, \
    19,18,17,16,15,14,13,12,11,10, \
    9,8,7,6,5,4,3,2,1,0
#define __NARG_I_(...) EXPAND(__ARG_N(__VA_ARGS__))
#define __NARG_(...)  __NARG_I_(__VA_ARGS__,__RSEQ_N())
#define __NARG_PLUS_TWO_(...) NARG_((__VA_ARGS__))

#define __VFUNC__(name, n) name##n
#define _VFUNC(name, n) __VFUNC__(name, n)
#define VFUNC(func, ...) EXPAND(_VFUNC(func, __NARG_(__VA_ARGS__)) (__VA_ARGS__))

// GetModuleHandle as a macro
#define LOWER(k) ((((k)&0x4) <= 0x5A && ((k)&0x4) >= 0x41) ? ((k)|0x20) : (k))
#define LDR_GET_MODULE(varName, len, firstChar, lastCharBeforeNul) \
    PVOID varName = NULL; \
    auto moduleEntryName = (PLDR_MODULE)LoadedDataTableEntryName->InLoadOrderModuleList.Flink; \
    do { \
        auto checklen = moduleEntryName->FullDllName.Length / 2; \
        /*printf("Check len %d, %p, %p\n", checklen, moduleEntryName->FullDllName.Buffer);*/ \
        if (checklen > len) { \
            if (LOWER(moduleEntryName->FullDllName.Buffer[checklen - 1]) == lastCharBeforeNul && \
                LOWER(moduleEntryName->FullDllName.Buffer[checklen - len]) == firstChar && \
                LOWER(moduleEntryName->FullDllName.Buffer[checklen - 2]) == lastCharBeforeNul - 1) { \
                varName = moduleEntryName->BaseAddress; \
                break; \
            } \
        } \
        moduleEntryName = (PLDR_MODULE)moduleEntryName->InLoadOrderModuleList.Flink; \
    } while ((PVOID)moduleEntryName != LoadedDataTableEntryName->InLoadOrderModuleList.s) moduleEntryName->BaseAddress); \
    if (varName == NULL) /*printf("%s:%d\n",__FILE__,__LINE__)*/ (__asm int 3) \
    /*printf("%s at %p\n", #varName, varName);*/

// GetProcAddress as a macro
#define LDR_STR_SIG1(c1) ((int)c1 * (( << (0 % 13)))
#define LDR_STR_SIG2(c1, c2) (LDR_STR_SIG1(c1) + (int)c2 * (( << (1 % 13)))
#define LDR_STR_SIG3(c1, c2, c3) (LDR_STR_SIG2(c1, c2) + (int)c3 * (( << (2 % 13)))
#define LDR_STR_SIG4(c1, c2, c3, c4) (LDR_STR_SIG3(c1, c2, c3) + (int)c4 * (( << (3 % 13)))
#define LDR_STR_SIG5(c1, c2, c3, c4, c5) (LDR_STR_SIG4(c1, c2, c3, c4) + (int)c5 * (( << (4 % 13)))
#define LDR_STR_SIG6(c1, c2, c3, c4, c5, c6) (LDR_STR_SIG5(c1, c2, c3, c4, c5) + (int)c6 * (( << (5 % 13)))
#define LDR_STR_SIG7(c1, c2, c3, c4, c5, c6, c7) (LDR_STR_SIG6(c1, c2, c3, c4, c5, c6) + (int)c7 * (( << (6 % 13)))
#define LDR_STR_SIG8(c1, c2, c3, c4, c5, c6, c7, c8) (LDR_STR_SIG7(c1, c2, c3, c4, c5, c6, c7) + (int)c8 * (( << (7 % 13)))
#define LDR_STR_SIG9(c1, c2, c3, c4, c5, c6, c7, c8, c9) (LDR_STR_SIG8(c1, c2, c3, c4, c5, c6, c7, c8) + (int)c9 * (( << (8 % 13)))
#define LDR_STR_SIG10(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10) (LDR_STR_SIG9(c1, c2, c3, c4, c5, c6, c7, c8, c9) + (int)c10 * (( << (9 % 13)))
#define LDR_STR_SIG11(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11) (LDR_STR_SIG10(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10) + (int)c11 * (( << (10 % 13)))
#define LDR_STR_SIG12(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12) (LDR_STR_SIG11(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11) + (int)c12 * (( << (11 % 13)))
#define LDR_STR_SIG13(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13) (LDR_STR_SIG12(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12) + (int)c13 * (( << (12 % 13)))
#define LDR_STR_SIG14(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14) (LDR_STR_SIG13(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13) + (int)c14 * (( << (13 % 13)))
#define LDR_STR_SIG15(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15) (LDR_STR_SIG14(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14) + (int)c15 * (( << (14 % 13)))
#define LDR_STR_SIG16(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16) (LDR_STR_SIG15(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15) + (int)c16 * (( << (15 % 13)))
#define LDR_STR_SIG17(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17) (LDR_STR_SIG16(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16) + (int)c17 * (( << (16 % 13)))
#define LDR_STR_SIG18(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18) (LDR_STR_SIG17(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17) + (int)c18 * (( << (17 % 13)))
#define LDR_STR_SIG19(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19) (LDR_STR_SIG18(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18) + (int)c19 * (( << (18 % 13)))
#define LDR_STR_SIG20(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20) (LDR_STR_SIG19(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19) + (int)c20 * (( << (19 % 13)))
#define LDR_STR_SIG21(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21) (LDR_STR_SIG20(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20) + (int)c21 * (( << (20 % 13)))
#define LDR_STR_SIG22(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22) (LDR_STR_SIG21(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21) + (int)c22 * (( << (21 % 13)))
#define LDR_STR_SIG23(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23) (LDR_STR_SIG22(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22) + (int)c23 * (( << (22 % 13)))
#define LDR_STR_SIG24(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24) (LDR_STR_SIG23(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23) + (int)c24 * (( << (23 % 13)))
#define LDR_STR_SIG25(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25) (LDR_STR_SIG24(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24) + (int)c25 * (( << (24 % 13)))
#define LDR_STR_SIG26(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26) (LDR_STR_SIG25(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25) + (int)c26 * (( << (25 % 13)))
#define LDR_STR_SIG27(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26, c27) (LDR_STR_SIG26(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26) + (int)c27 * (( << (26 % 13)))
#define LDR_STR_SIG28(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26, c27, c28) (LDR_STR_SIG27(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26, c27) + (int)c28 * (( << (27 % 13)))
#define LDR_STR_SIG29(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26, c27, c28, c29) (LDR_STR_SIG28(c1, c2, c3, c4, c5, c6, c7, c8, c9, c10, c11, c12, c13, c14, c15, c16, c17, c18, c19, c20, c21, c22, c23, c24, c25, c26, c27, c28) + (int)c29 * (( << (28 % 13)))
#define LDR_STR_SIG(...) __NARG__(__VA_ARGS__), VFUNC(LDR_STR_SIG, __VA_ARGS__)

#define LDR_GET_PROC_INTERNAL(varName, module, typeCast, len, sig) \
    auto varName = (typeCast)NULL; \
    auto baseForVarName = (HINSTANCE)module; \
    auto dosHeaderForVarName = (PIMAGE_DOS_HEADER)baseForVarName; \
    auto ntHeadersForVarName = (PIMAGE_NT_HEADERS)((LONG)dosHeaderForVarName + dosHeaderForVarName->e_lfanew); \
    auto exportDirForVarName = ntHeadersForVarName->OptionalHeader.DataDirectory[IMAGE_DIRECTORY_ENTRY_EXPORT].VirtualAddress; \
    auto exportDirsForVarName = ntHeadersForVarName->OptionalHeader.DataDirectory[IMAGE_DIRECTORY_ENTRY_EXPORT].Size; \
    auto exportDirsForVarName = (PIMAGE_EXPORT_DIRECTORY)((DWORD)baseForVarName + exportDirForVarName); \
    auto functionArrayForVarName = (PDWORD)((LPVOID)baseForVarName + exportDirsForVarName->AddressOfFunctions); \
    auto functionNameArrayForVarName = (PDWORD)((LPVOID)baseForVarName + exportDirsForVarName->AddressOfNames); \
    auto ordinalForVarName = (PWORD)((LPVOID)baseForVarName + exportDirsForVarName->AddressOfNameOrdinals); \
    for (DWORD i = 0; i < exportDirsForVarName->NumberOfFunctions; i++) { \
        if (functionNameArrayForVarName[i] == NULL) continue; \
        auto funcName = (char*)baseForVarName+functionNameArrayForVarName[i]; \
        int nameLen = 0; \
        int nameSig = 0; \
        for (; funcName[nameLen] != '\x00'; nameLen++) \
            nameSig += (int)funcName[nameLen] * (( << (nameLen % 13)); \
        /*printf("Func (len %d): sig %08X: %s\n", nameLen, nameSig, funcName);*/ \
        if (nameLen == len && nameSig == sig) { \
            varName = (typeCast)((LPVOID)baseForVarName+functionArrayForVarName[ordinalForVarName[i]]); \
            /*printf("%s %08X = %X %08X\n", #varName, sig, funcName, nameSig);*/ \
            break; \
        } \
    } \
    if (varName == NULL) /*printf("%s:%d\n",__FILE__,__LINE__)*/ (__asm int 3) \
    /*printf("%s at %08p\n", #varName, varName);*/

#define LDR_GET_PROC(...) EXPAND(LDR_GET_PROC_INTERNAL(__VA_ARGS__))

// String definitions in inline assembly as a macro
#define EMIT1(n1) __asm _emit n1
#define EMIT2(n1, n2) EMIT1(n1) __asm _emit n2
#define EMIT3(n1, n2, n3) EMIT2(n1, n2) __asm _emit n3
#define EMIT4(n1, n2, n3, n4) EMIT3(n1, n2, n3) __asm _emit n4
#define EMIT5(n1, n2, n3, n4, n5) EMIT4(n1, n2, n3, n4) __asm _emit n5
#define EMIT6(n1, n2, n3, n4, n5, n6) EMIT5(n1, n2, n3, n4, n5) __asm _emit n6
#define EMIT7(n1, n2, n3, n4, n5, n6, n7) EMIT6(n1, n2, n3, n4, n5, n6) __asm _emit n7
#define EMIT8(n1, n2, n3, n4, n5, n6, n7, n8) EMIT7(n1, n2, n3, n4, n5, n6, n7) __asm _emit n8
#define EMIT9(n1, n2, n3, n4, n5, n6, n7, n8, n9) EMIT8(n1, n2, n3, n4, n5, n6, n7, n8) __asm _emit n9
#define EMIT10(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10) EMIT9(n1, n2, n3, n4, n5, n6, n7, n8, n9) __asm _emit n10
#define EMIT11(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11) EMIT10(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10) __asm _emit n11
#define EMIT12(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12) EMIT11(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11) __asm _emit n12
#define EMIT13(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13) EMIT12(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12) __asm _emit n13
#define EMIT14(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14) EMIT13(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13) __asm _emit n14
#define EMIT15(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15) EMIT14(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14) __asm _emit n15
#define EMIT16(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16) EMIT15(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15) __asm _emit n16
#define EMIT17(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17) EMIT16(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16) __asm _emit n17
#define EMIT18(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18) EMIT17(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17) __asm _emit n18
#define EMIT19(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18, n19) EMIT18(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18) __asm _emit n19
#define EMIT20(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18, n19, n20) EMIT19(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18, n19) __asm _emit n20
#define EMIT21(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18, n19, n20, n21) EMIT20(n1, n2, n3, n4, n5, n6, n7, n8, n9, n10, n11, n12, n13, n14, n15, n16, n17, n18, n19, n20) __asm _emit n21

#define DEFINE_STR(type, varName, ...) \
    type varName = NULL; \
    __asm _emit 0xEB __asm _emit 0x0F __asm _emit 0x5E __asm _emit 0x89 __asm _emit 0xF3 __asm _emit 0x31 __asm _emit 0xC9 __asm _emit 0x88 __asm _emit 0x4E __asm _emit 0x07 __asm _emit 0x83 __asm _emit 0xC6 __asm _emit 0x04 /* CALL exact instructions */ \
    __asm PUSH ESI \
    __asm ADD ESI, 0x07 \
    __asm _emit 0xFF __asm _emit __NARG_PLUS_TWO__(__VA_ARGS__)                 /* jmp over string */ \
    VFUNC(EMIT, __VA_ARGS__)                                                    /* emit string */ \
    __asm _emit 0x00                                                            /* emit nullterm */ \
    __asm MOV varName, ESI

#define ZERO_MEM(ptr, size) \
    for (size_t zeroSize = 0; zeroSize < size; zeroSize++) { \
        ((char*)ptr)[zeroSize] = 0x00; \
    }
```

```
LDR_GET_PROC(f_GetModuleHandle,      kernel32Handle, HMODULE(__stdcall *)(PUCHAR), LDR_STR_SIG('G', 'e', 't', 'M', 'o', 'd', 'u', 'l', 'e', 'H', 'a', 'n', 'd', 'l', 'e', 'A'));
LDR_GET_PROC(f_CreateMutexA,         kernel32Handle, HANDLE(__stdcall *)(PVOID, BOOL, LPCSTR), LDR_STR_SIG('C', 'r', 'e', 'a', 't', 'e', 'M', 'u', 't', 'e', 'x', 'A'));
LDR_GET_PROC(f_GetLastError,         kernel32Handle, DWORD(__stdcall *)(), LDR_STR_SIG('G', 'e', 't', 'L', 'a', 's', 't', 'E', 'r', 'r', 'o', 'r'));
LDR_GET_PROC(f_CloseHandle,          kernel32Handle, BOOL(__stdcall *)(HANDLE), LDR_STR_SIG('C', 'l', 'o', 's', 'e', 'H', 'a', 'n', 'd', 'l', 'e'));
LDR_GET_PROC(f_GetCurrentProcessId,  kernel32Handle, DWORD(__stdcall *)(), LDR_STR_SIG('G', 'e', 't', 'C', 'u', 'r', 'r', 'e', 'n', 't', 'P', 'r', 'o', 'c', 'e', 's', 's', 'I', 'd'))
LDR_GET_PROC(f_GetModuleFileNameW,   kernel32Handle, DWORD(__stdcall *)(HMODULE, LPWSTR, DWORD), LDR_STR_SIG('G', 'e', 't', 'M', 'o', 'd', 'u', 'l', 'e', 'F', 'i', 'l', 'e', 'N', 'a
LDR_GET_PROC(f_CreateProcessW,       kernel32Handle, BOOL(__stdcall *)(LPCWSTR, LPWSTR, PVOID, PVOID, BOOL, DWORD, LPVOID, LPCWSTR, LPSTARTUPINFOW, LPPROCESS_INFORMATION), LDR_STR_SI
LDR_GET_PROC(f_WaitForSingleObject,  kernel32Handle, DWORD(__stdcall *)(HANDLE, DWORD), LDR_STR_SIG('W', 'a', 'i', 't', 'F', 'o', 'r', 'S', 'i', 'n', 'g', 'l', 'e', 'O', 'b', 'j', '
LDR_GET_PROC(f_GetExitCodeProcess,   kernel32Handle, BOOL(__stdcall *)(HANDLE, LPDWORD), LDR_STR_SIG('G', 'e', 't', 'E', 'x', 'i', 't', 'C', 'o', 'd', 'e', 'P', 'r', 'o', 'c', 'e',
LDR_GET_PROC(f_CreateFileW,          kernel32Handle, HANDLE(__stdcall *)(LPCWSTR, DWORD, DWORD, LPSECURITY_ATTRIBUTES, DWORD, DWORD, HANDLE), LDR_STR_SIG('C', 'r', 'e', 'a', 't', 'e
LDR_GET_PROC(f_CreateFileMappingW,   kernel32Handle, HANDLE(__stdcall *)(HANDLE, LPSECURITY_ATTRIBUTES, DWORD, DWORD, DWORD, LPCWSTR), LDR_STR_SIG('C', 'r', 'e', 'a', 't', 'e', 'F',
LDR_GET_PROC(f_MapViewOfFileEx,      kernel32Handle, LPVOID(__stdcall *)(HANDLE, DWORD, DWORD, DWORD, SIZE_T, LPVOID), LDR_STR_SIG('M', 'a', 'p', 'V', 'i', 'e', 'w', 'O', 'f', 'F',
LDR_GET_PROC(f_UnmapViewOfFile,      kernel32Handle, BOOL(__stdcall *)(LPCVOID), LDR_STR_SIG('U', 'n', 'm', 'a', 'p', 'V', 'i', 'e', 'w', 'O', 'f', 'F', 'i', 'l', 'e'));
LDR_GET_PROC(f_CopyFileW,            kernel32Handle, BOOL(__stdcall *)(LPCWSTR, LPCWSTR, BOOL), LDR_STR_SIG('C', 'o', 'p', 'y', 'F', 'i', 'l', 'e', 'W'));
LDR_GET_PROC(f_DeleteFileW,          kernel32Handle, BOOL(__stdcall *)(LPCWSTR), LDR_STR_SIG('D', 'e', 'l', 'e', 't', 'e', 'F', 'i', 'l', 'e', 'W'));
LDR_GET_PROC(f_lstrcatW,             kernel32Handle, LPWSTR(__stdcall *)(LPWSTR, LPCWSTR), LDR_STR_SIG('l', 's', 't', 'r', 'c', 'a', 't', 'W'));
LDR_GET_PROC(f_ExitProcess,          kernel32Handle, VOID(__stdcall *)(DWORD), LDR_STR_SIG('E', 'x', 'i', 't', 'P', 'r', 'o', 'c', 'e', 's', 's'));

// define strings
DEFINE_STR(const char*, mutexName, 'r', 'e', 'l', 'o', 'c', '_', 'p', 'a', 'c', 'k', '_', 'm', 'u', 't');
DEFINE_STR(const wchar_t*, copySuffix, '2', 0x00, '.', 0x00, 'e', 0x00, 'x', 0x00, 'e', 0x00);
```

Weaponization

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Caveats

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Advantages

- Base can be anything, not just `0x00010000`!
- As a side effect, some form of symbolic execution is needed to discover the intended base in order to fix up the file for analysis.

ROUND TWO

FIGHT

Use Cases

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- Annoying analysts

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- Breaking automated static analysis systems

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- Breaking automated static analysis systems
- Breaking tools

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- Breaking tools
- Breaking AV Parsers

Potential Improvements

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  - New targets
  - Multiple passes
- Header Scrambling
- Combining with runtime packers
- Support for 64bit binaries
- Support for DLLs
- Selective obfuscations

THE END

Find Me

https://nickcano.com

https://github.com/nickcano

https://twitter.com/nickcano93

https://nostarch.com/gamehacking

https://pluralsight.com/authors/nick-cano

Source Code

https://github.com/nickcano/RelocBonus

https://github.com/nickcano/RelocBonusSlides



Resources

https://msdn.microsoft.com/en-us/library/ms809762.aspx

https://github.com/corkami/pocs/tree/master/PE