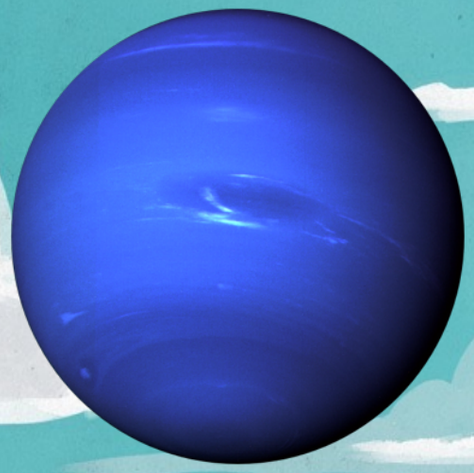
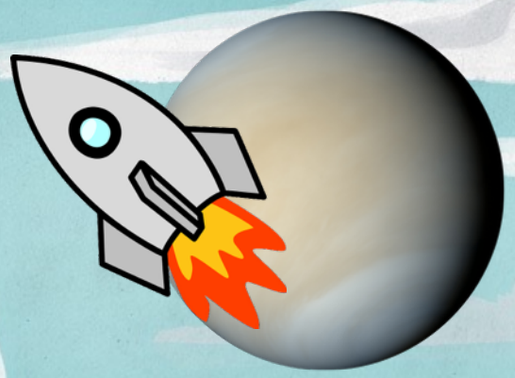


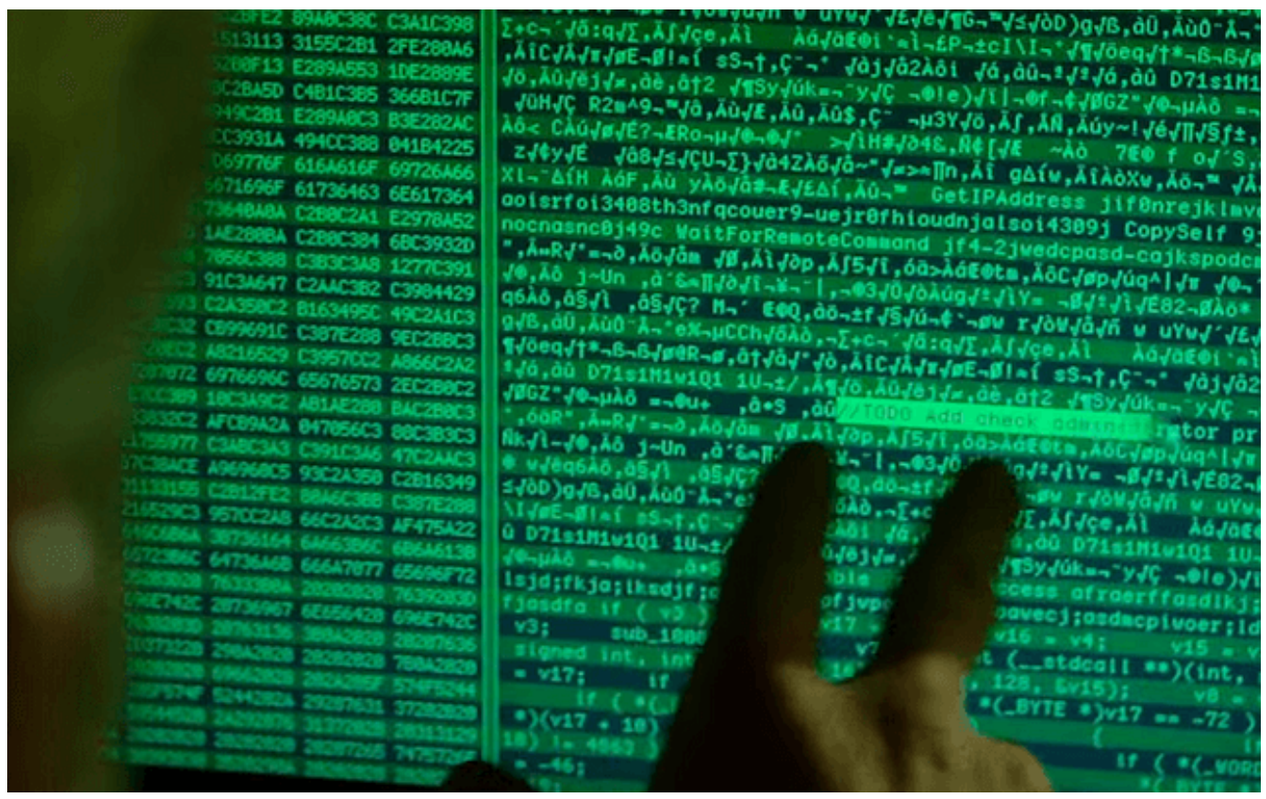
0X3E9 WAYS TO DIE



Check Point®
SOFTWARE TECHNOLOGIES LTD.

Who am I?

- Yaniv Balmas (@ynvb)
- Security Researcher @ Check Point Software Technologies
- Malware Research
- Vulnerability Research
- Spend most of my day staring at assembly code and binary files.



What is the problem?

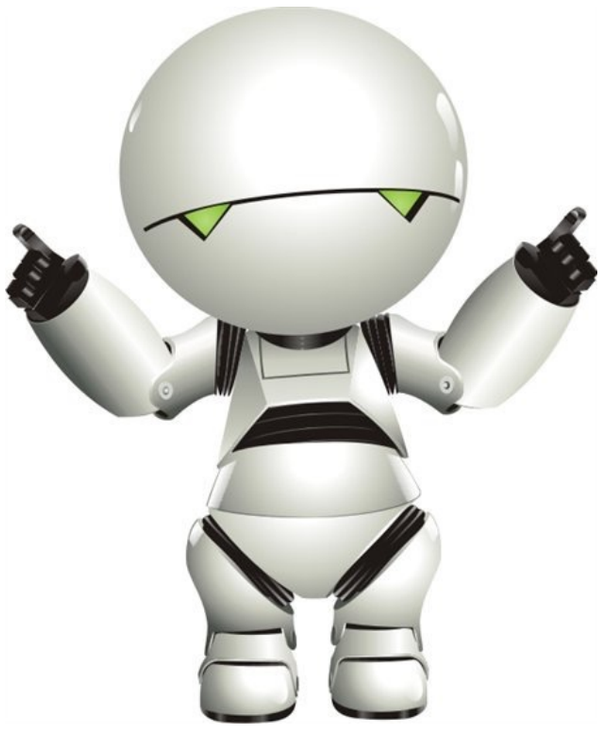
- Static analysis tools contain a lot of useful data about binary files.
- Dynamic analysis tools (e.g Debuggers) contain all execution flow related data.
- It seems trivial to bridge those two approaches.

"Well I wish you'd just tell me rather than try to engage my enthusiasm."
–*Marvin*

PREVIOUS SOLUTIONS

IDA-Splode

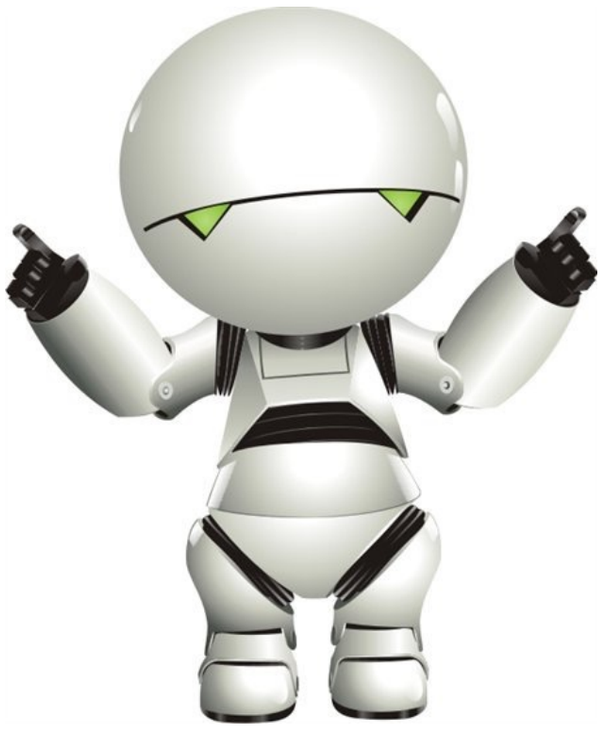
- 2014, Zach Riggle
- Uses Intel PIN framework



- Very extensive tracing
- Branch Statistics
- Data is stored as .IDB comments
- Only works on INTEL archs and is designed mainly for Windows.

Funcap

- 2013, Andrzej Derezowski
- Uses IDA Debugging API



- Very intuitive solution
- Parses ASCII\Unicode string values
- New threads are not being followed
- Argument offsets are calculated “manually”

What is missing?

- The extracted dynamic data is not indexed and searching through it can be a *pain*.
- Entry level for adding custom functionality is relatively high.

NO REFERENCE TO VALUE TYPES!!

DON'T PANIC

(And Prepare to DIE...)

Howto DIE?

- DIE - “Dynamic IDA Enrichment”
- Collect context from function calls & returns only.
- Parse argument values and present them in a “Human Readable” format.
- Smart interaction between static & dynamic data.
- Use as much IDA-API Magic as possible.

Implementation Challenges

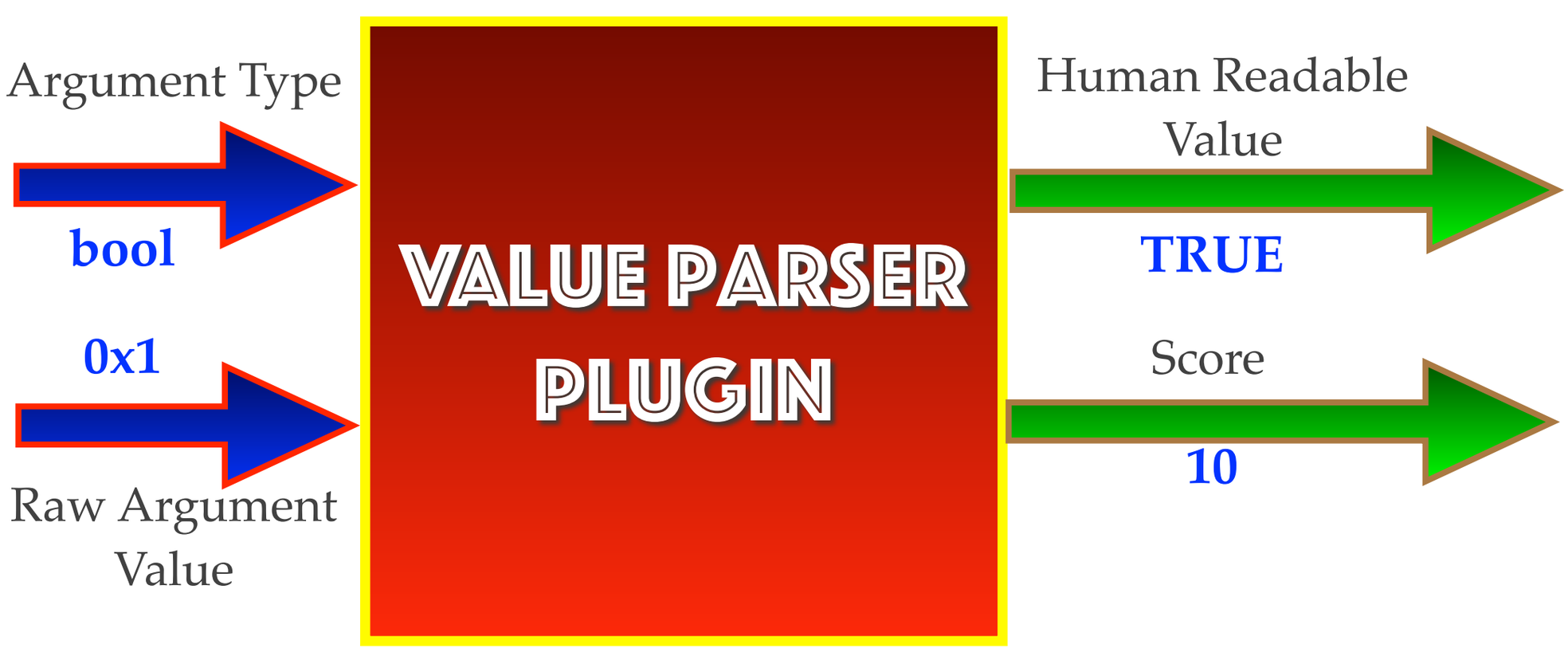
- How can we query IDA for function argument types?
- Once we have the argument values, how do we parse them? which values should we parse?
- How do we parse complex data types? (structs, unions, pointers, etc)?

Function Arguments

- After hours of fun reading IDA-API, it turns out there are some objects we can actually use.
- tinfo_t objects holds a ridiculous amount of information about data types.
- Digging even deeper into tinfo_t object reveals the func_type_data_t, func_arg_t and arg_loc_t objects which store everything we need to parse function arguments.

Parsing Argument Values

- Impossible to think of all parsing options!
- Makes more sense to create an open source plugin framework.



Parsing Argument Values

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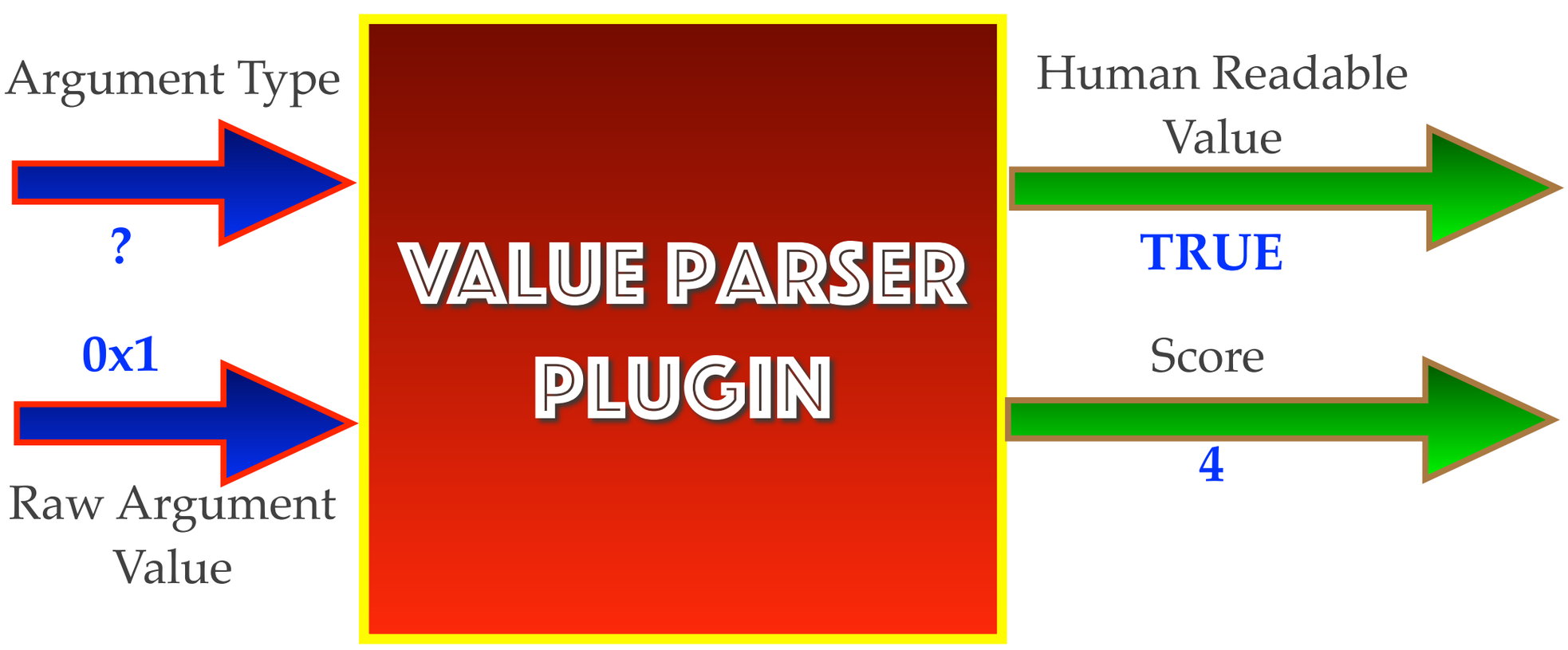


Complex Data Types

- What do we do when we encounter a complex data type?
- Simple. Break it up until we reach the simple types.

STRUCTS \ UNIONS

```
udt = udt_idaapi.udt_type_data_t
type_info.get_udt_details(udt)
```

ARRAYS

```
arr = idaapi.array_type_data_t()
type_info.get_array_details(arr)
```

REFERENCES

```
type_info.get_pointed_object()
```

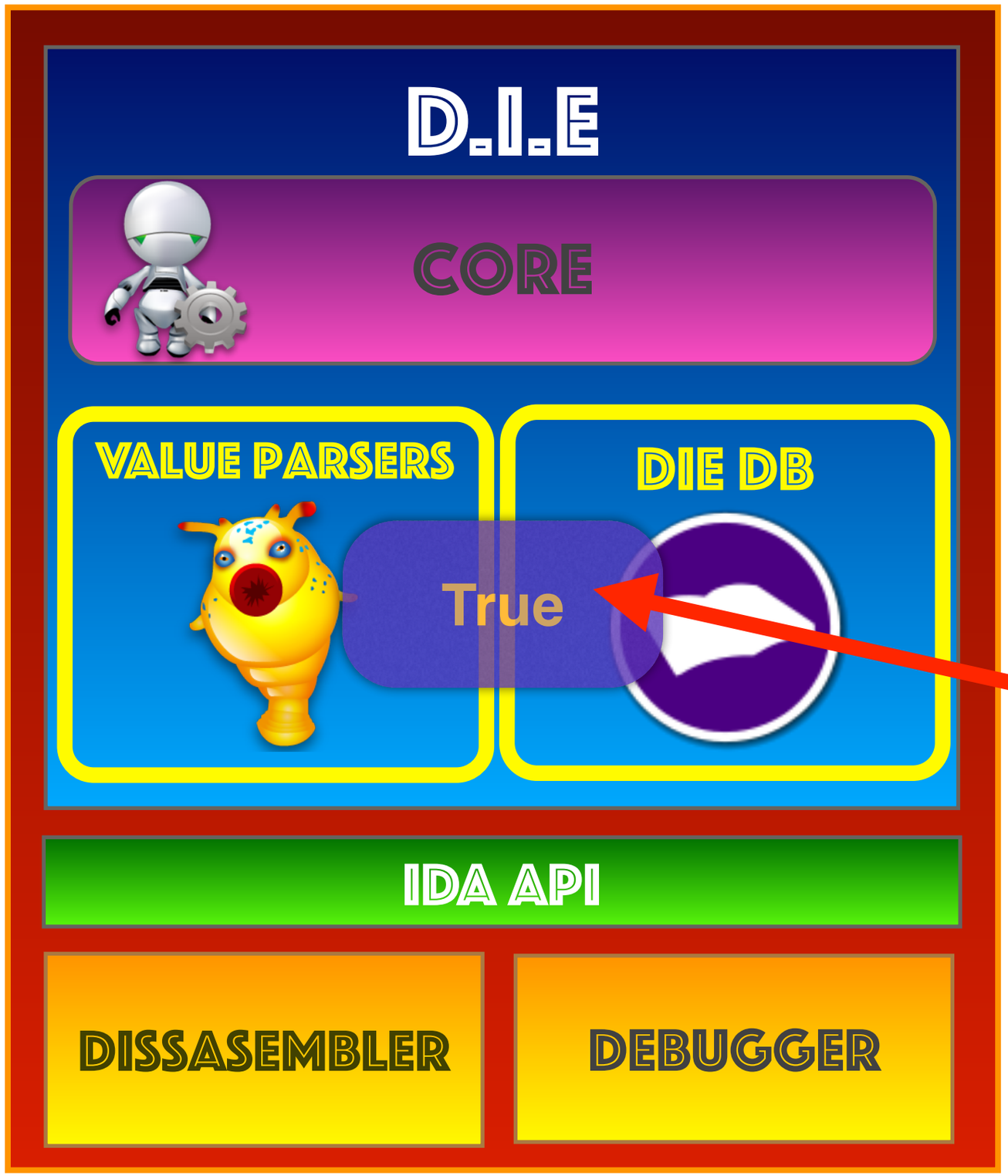

```
__cdecl main (int argc, char **argv)
proc near

push    1
lea     eax, ds:string ; “Str1”
push    eax
call    func_1
add     esp, 8
lea     eax, ds:string ; “Str1”
push    eax
call    unknown
```


```
; bool __cdecl func_1(char *a, int b)
proc near
```

CHAR *a

int b

```
push    ebp
mov     esp, ebp
sub     esp, 0C0h
mov     eax, [ebp+name]
push    eax
call    _strcmp
ret
```

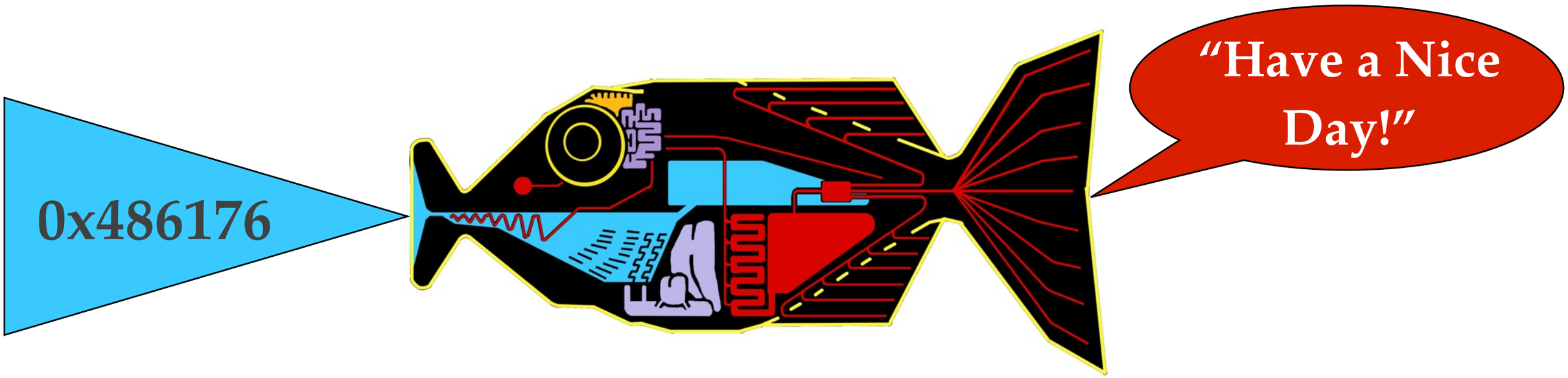



```
__cdecl main (int argc, char **argv)
proc near

push    1
lea     eax, ds:string ; “Str1”
push    eax
call    func_1
add     esp, 8
lea     eax, ds:string ; “Str1”
push    eax
call    unknown
```


```
; int __cdecl unknown(int)
proc near

push    ebp
mov     esp, ebp
sub     esp, 0C0h
mov     ebx, edx
mov     [ebp+var_4], ecx
push    esi
xor     esi, esi
cmp     ebx, esi
jle     loc_XXXXXX
ret
```

int

VALUE PARSERS



Simple Value Parsers

STRING PARSER	Uses idc.GetString to parse ASCII, Unicode, Pascal and other strings
BOOL PARSER	Returns TRUE for 0x1 and FALSE for 0x0. (Duh!)
FUNCTION PARSER	Returns the referenced function name.
MODULE PARSER	Returns the referenced module name.

Advanced Parser – Handles

- Works on Windows systems with local debugger (currently).
- Uses DuplicateHandle() to duplicate the handle associated with the raw value from the current running process.
- Uses NtQueryObject() on the local handle to retrieve the handles details.
- Returns the handle name and type.

Advanced Parser – STD String

```
0:000:x86> dt str1a+4 std::_String_val<std::_Simple_types<char> >::_Bxty
BasicString!std::_String_val<std::_Simple_types<char> >::_Bxty
   +0x000 _Buf             : [16]  "Hello "
   +0x000 _Ptr             : 0x6c6c6548  "--- memory read error at address 0x6c6c6548 ---"
   +0x000 _Alias           : [16]  "Hello "
0:000:x86>
0:000:x86>
0:000:x86>
0:000:x86> dt test+4 std::_String_val<std::_Simple_types<char> >::_Bxty
BasicString!std::_String_val<std::_Simple_types<char> >::_Bxty
   +0x000 _Buf             : [16]  "P???"
   +0x000 _Ptr             : 0x00669d50  "I am the king of the world!!!"
   +0x000 _Alias           : [16]  "P???"
```

- Great example of an ad-hoc parser.
- Check if the value pointed by offset 4 of raw address is either a string or references a string.
- Also, make sure raw value is not a string.

DEMO TIME

"Demos, don't talk to me
about demos…"
-Marvin

Bypass Password Protection

YOUR ORDERS:

Watch The DEMO

Assigned By:

Agent M

Target Application:

ATEN Firmware Upgrade Utility

Mission:

Bypass password protection

Quickly!

Defeat C++ Code

YOUR ORDERS:

Watch The DEMO

Assigned By:

Agent M

Target Application:

7zip cli (32-bit version)

Mission:

Get a complete code analysis

Quickly!

String De-Obfuscation

YOUR ORDERS:

Watch The DEMO

Assigned By:

Agent M

Target Application:

Explosive Trojan

Mission:

Find the string de-obfuscation function

Quickly!

#TODO

- Thunk Functions
- Complex function parsers
- Better GUI
- (Much) Better DB
- Solve (very) dramatic crashes

Looks cool, Can I have it?

- Yes.
- DIE is an open source tool.
- https://github.com/ynvb/DIE
- If you like it, contribute.

SARK

IDA Python Made Easy

- Simple
- Intuitive
- Object Oriented API

- Docs: sark.rtfd.org
- Code: github.com/tmr232/sark
- Written by Tamir Bahar @tmr232

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