Game Security

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About Me

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Introduction

- Understanding why a games security exists.
- Sharing some specific work and operation of a Commercial Security Research team
- Explaining how a cheat develop.
- Understanding why low-level knowledge strongly related to security research.
- Understanding the overview of how a game security production.

Outline

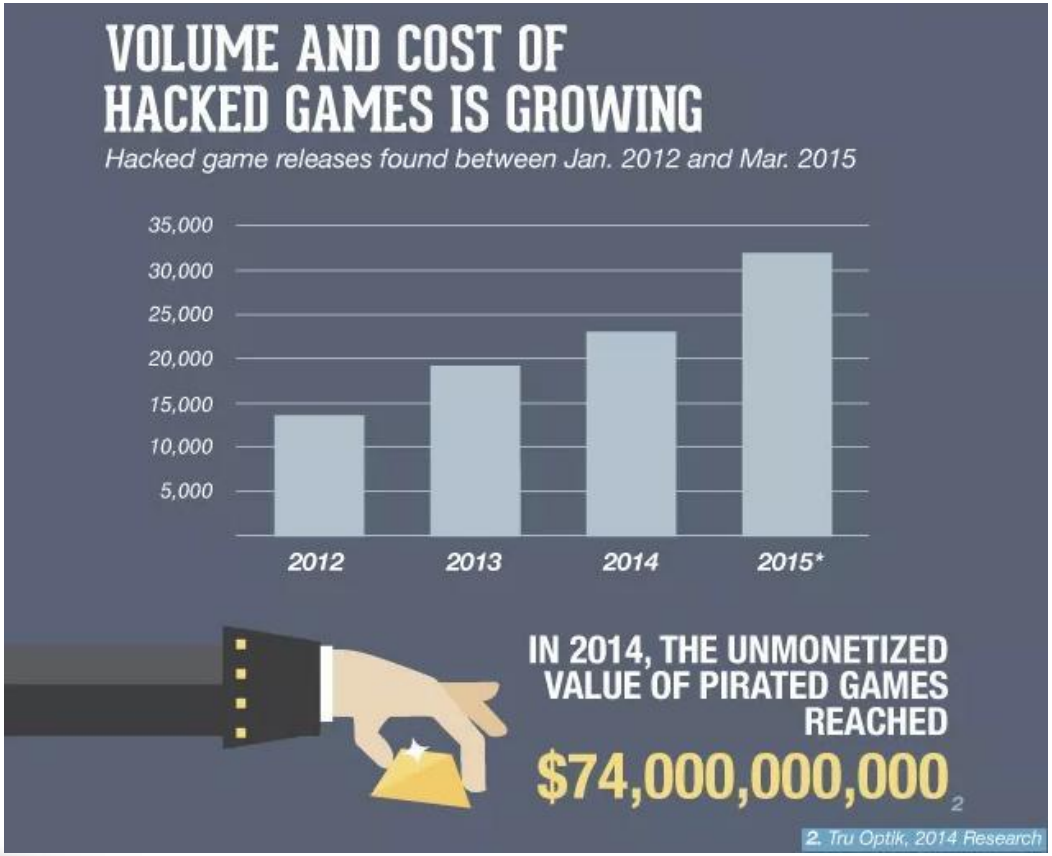
- Type of dark market
- Value of Game Security
- How cheat is developed
- Regular Works of Game Security
- How to defense a hackers?
- OS / CPU based research
- How research being used and example
- Monitoring
- Production and Stability

Type of black market

- DDOS
- Trojan
- Spam
- Malware
  - E.g. Ransomware
- Game Cheat Studio

Values of Game Security

- It is a big “business” in dark market, really profitable
- In 2014, whole games industry is lost 74 billion in the US, because of game hacked.



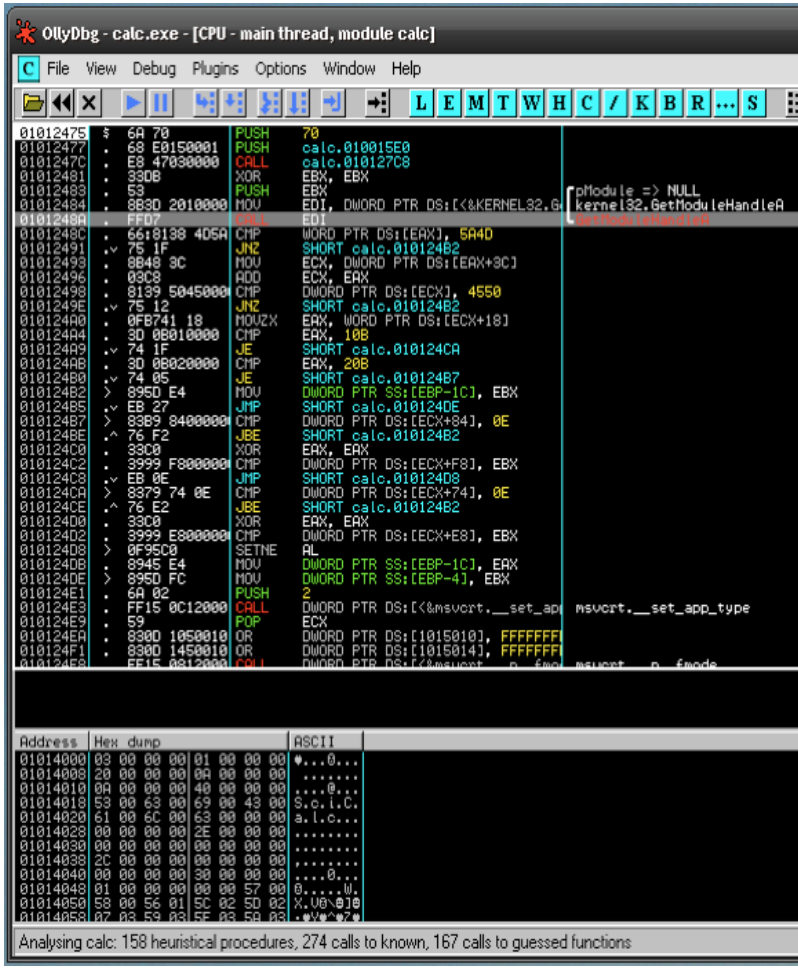
Revenue of Tencent Game

Type of Cheat

- Automation attack, run, do a mission, emulate any process specific with game logic, etc.
- I/O Device emulation, keyboard, mouse, joystick,etc.
- Game Logic modification, invincible character, unlimited HP(Health Point)
- Speed Acceleration
- Network Packet Emulation, fully emulate a client with reverse enginering whole network protocol

How cheat is developed?

- Online-Game, actually is a process that running on a specific OS (e.g. Windows)
- Normally, Hackers will analysis a game first, by Reverse Engineering(Debugging)
- Hackers will get the information what they needs. Such as, an address of Function(e.g. attack function), a character object base address, monster object base address. any character attribute loaded in the memory.
- Typical skills, stack-trace, hardware breakpoint, Software breakpoint, and step-into, so on.



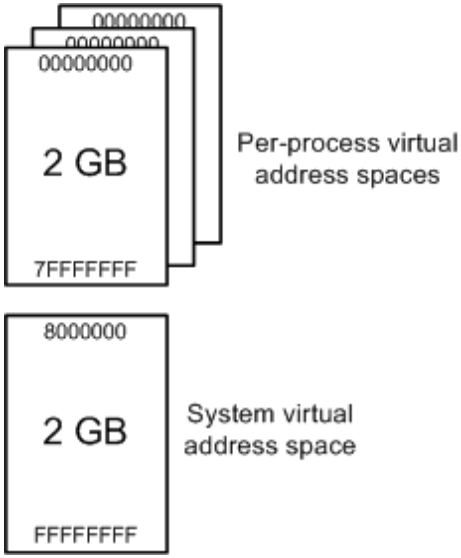
How cheat is developed?

•Hacker will then build a cheat program / module.

•And since the memory address space is isolated when we started protected-mode and paging from CPU start-up period.

•Some common method they may used:

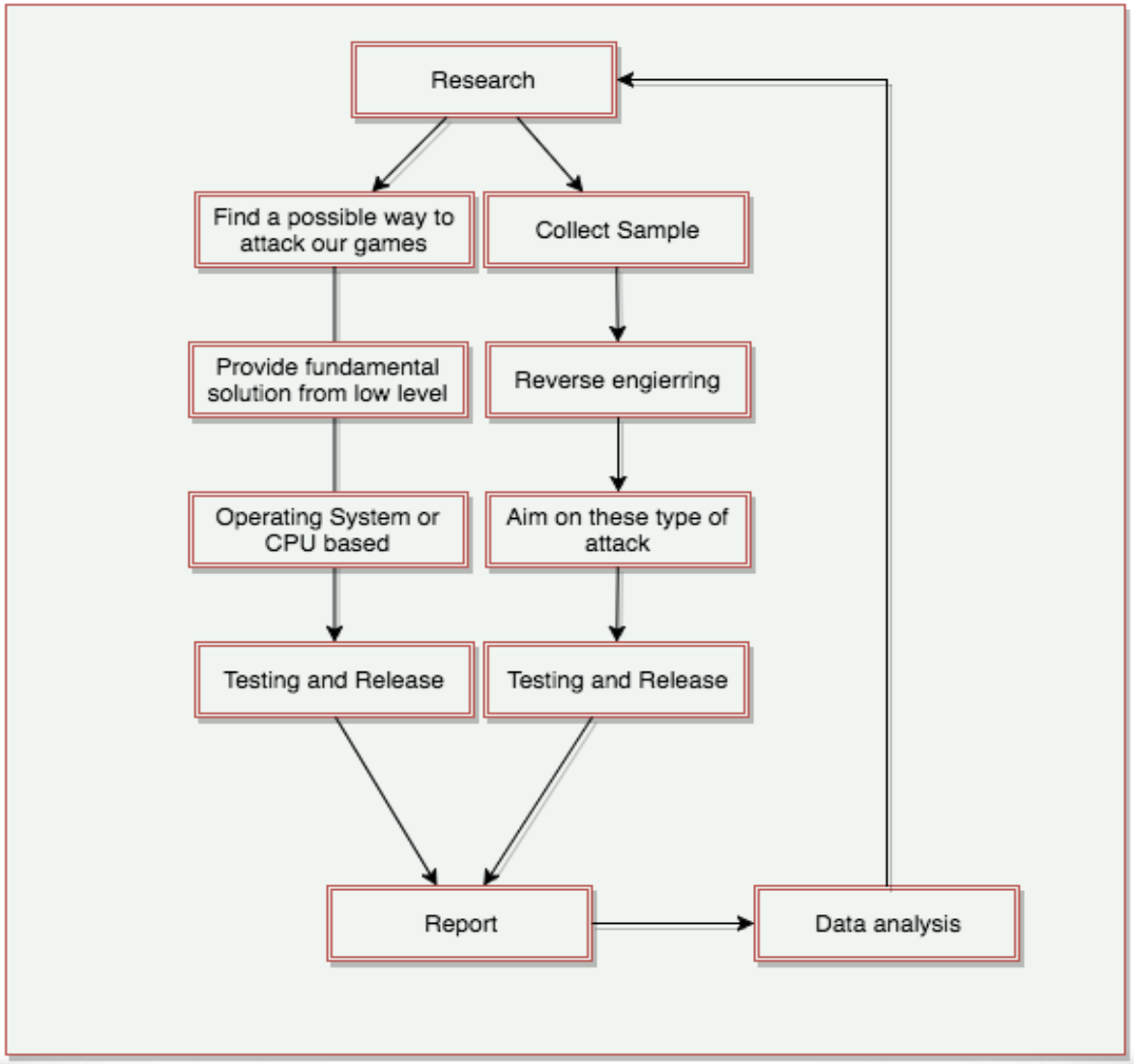
- Directly use windows API, WriteProcessMemory
- Inject a module into game process, and directly read, write by normal memory access
- Driver direct read/write (relatively rare)
- ShellCode injection
- so on.... (umlimited method for hacking...)



How cheat is developed?

- Generic Attack Method:
  - Attack on windows kernel protection mechanism, such as, attack patch guard for hooking some critical API
- Game Logic modification and Automation :
  - Memory hiding
  - attack on windows kernel protection mechanism
- Speedy Acceleration :
  - Modify a clock, and fake a system the next second is actually second * 2 (depend on how many we what)
- Keyboard emulation :
  - RGB capture
  - Emulated by SendMessage to Game Window
  - Direct write to the I/O port which is corresponding to the keyboard and mouse.
  - Driver emulation, send a keyboard / mouse message packet from kernel to user mode.
  - Game Enginee hacked (e.g. Direct-X)

How to defense a hackers?



Why OS / CPU based research

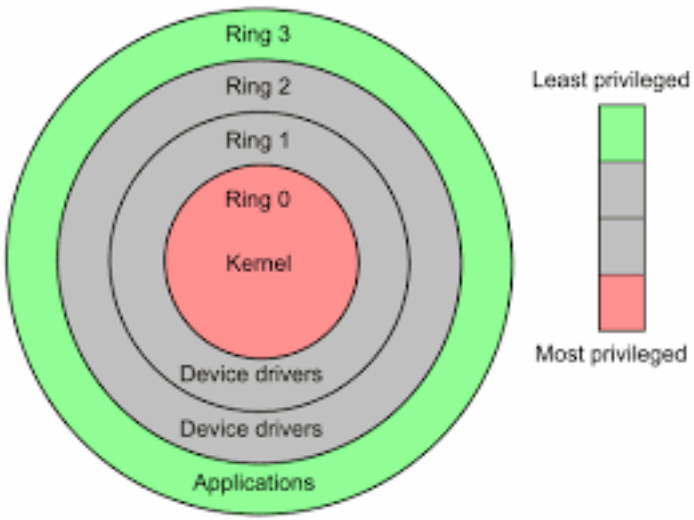
•Any cheat, running in a specific OS, it is just a process, or module. So, from the OS aspect to protect our game. It is a good choice.

•As low level as possible. Because all of the API a cheat used will finally be called into the Ring 0(kernel mode).

•More Accurately, some instruction will be running on Ring 0 level, so the granularity of detection point can be a instruction execution (if we can, VT-x may be a good choice.)

•p.s. Windows is only used Ring 0 and Ring 3 as kernel mode and user mode respectively.

•Ring 1 and Ring 2 is reserved, for software-based-virtualization, they maybe used for isolation between VMs



How research being used ?

•Since hackers need to ensure they are able to debug(reversing) our games, then getting the information they wants.

•So, anti-debugging will be the very first wall for defensing their attack.

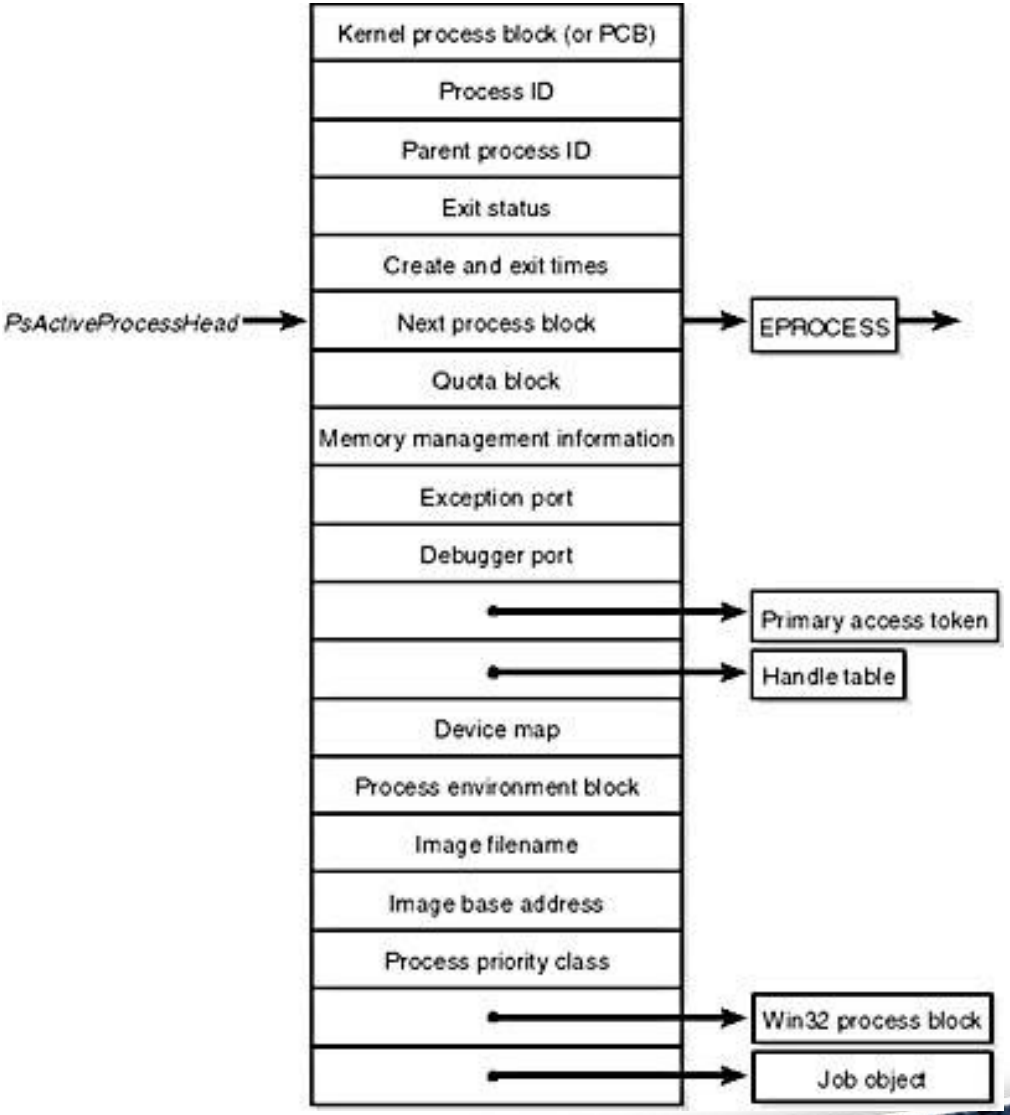
•As we said, a process is running on Windows, so, we can reused this concept for anti-debugging.

•So the question is : How debugger / disassembler works?

•We need to proceed a research of debugging and analysis, for understand how debugging works in specific windows.

Example

- Since we need to anti-debugging
- After studying how a debugging is supported by Windows kernel.
- We can know that, debugger and debuggee is connected by a kernel-maintained structure,
- This structure is stored in process structure as a member, called DebugPort, which is an pointer of debugport structure.
- If we detect or clear this member, we can know if we are being debugged, or stop the debugging instantly.



Monitoring

- Exception exploitation

•For example:

• We directly set a specific memory address's page is invalid, and any process access this page will issue a Page-Fault.

- Virtualization-based method

• Intel VT-x provided Extended page table(EPT) for virtualizing a physical memory.

• This ability is good for monitoring a memory accessing.

• Because Exception exploitation is not a perfect method for monitoring, it is dangerous in case we modify the OS logic.

Production and Stability

- Full System test – we need to make a full system test on Windows before we release a protect solution.
- Gray Scale - we need to ensure the stability of over 100 million end-user environment is stable.

Conclusion

- Explained why game security needs R&D
- Given a overview of the war between hackers and research team.
- That’s why low level is required for playing hacking or security research.
- In real commercial security production, we need to 100% ensure, our solution is not affecting the games(product) functionality.

https://github.com/Kelvinhack/kHypervisor

End