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Hacking Windows Internals

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Hacking Shared Sections

- Shared Section definition
- Using Shared Sections
- Tools
- Problems
- Searching for holes
- Exploitation
- Conclusions
- References

Shared Section

- Basically a Shared Section is a portion of memory shared by a process, mostly used as an IPC (Inter Process Communication) mechanism.
  - Shared Memory.
  - File Mapping.
  - Named or Unnamed.

Using Shared Sections

- Loading binary images by OS.
  - Process creation.
  - Dll loading.
- Mapping kernel mode memory into user address space !?.
  - Used to avoid kernel transitions.
- Sharing data between processes.
  - GDI and GUI data, pointers !?, counters, any data.

Using Shared Sections

- Creating a shared section

```
HANDLE CreateFileMapping(
  HANDLE hFile,                          // handle to file (file mapping)
                                         //or 0xFFFFFFFF (shared memory)
  LPSECURITY_ATTRIBUTES lpAttributes,    // security
  DWORD flProtect,                       // protection
  DWORD dwMaximumSizeHigh,               // high-order DWORD of size
  DWORD dwMaximumSizeLow,                // low-order DWORD of size
  LPCTSTR lpName                         // object name (named)
                                         //or NULL (unnamed)
);//returns a shared section handle
```

Using Shared Sections

- Opening an existing shared section

```
HANDLE OpenFileMapping(
 DWORD dwDesiredAccess,       // access mode (FILE_MAP_WRITE
                                    // FILE_MAP_READ, etc.)
 BOOL bInheritHandle,              // inherit flag
 LPCTSTR lpName                  // shared section name
);//returns a shared section handle
```

Using Shared Sections

- Mapping a shared section

```
LPVOID MapViewOfFile(
 HANDLE hFileMappingObject,          // handle to created/opened
                                     // shared section
  DWORD dwDesiredAccess,             // access mode(FILE_MAP_WRITE
                                     // FILE_MAP_READ, etc.)
  DWORD dwFileOffsetHigh,            // high-order DWORD of offset
  DWORD dwFileOffsetLow,             // low-order DWORD of offset
  SIZE_T dwNumberOfBytesToMap  // number of bytes to map
); //returns a pointer to begining of shared section memory
```

Using Shared Sections

- Ntdll.dll Native API
  - NtCreateSection() Creates a new section
  - NtOpenSection() Opens an existing section
  - NtMapViewOfSection() Map a section on memory
  - NtUnmapViewOfSection() Unmap a section from memory
  - NtQuerySection() Returns section size
  - NtExtendSection() Change section size

Using Shared Sections

- Mapping unnamed Shared Sections.

  OpenProcess(PROCESS_DUP_HANDLE,...)
  DuplicateHandle(...)
  MapViewOfFile(...)

- Need permissions on target process

Using Shared Sections

- Demo

Tools

- Process Explorer
  - Shows information about processes (dlls, handles, etc.).
- WinObj
  - Shows Object Manager Namespace information (objects info, permissions, etc.)
- ListSS
  - Lists Shared Sections names (local and TS sessions).
- DumpSS
  - Dumps Shared Section data.
- TestSS
  - Overwrites Shared Section data (to detect bugs)

Problems

- Input validation
- Weak permissions
- Synchronization

Problems

- Input validation
  - Applications don't perform data validation before using the data.
  - Processes trust data on shared sections.

Problems

- Weak permissions
  - Low privileged users can access (read/write/change permissions) shared sections on high privileged processes (services).
  - Terminal Services (maybe Citrix) users can access (read/write/change permissions) shared sections on local logged on user processes, services and other user sessions.

Problems

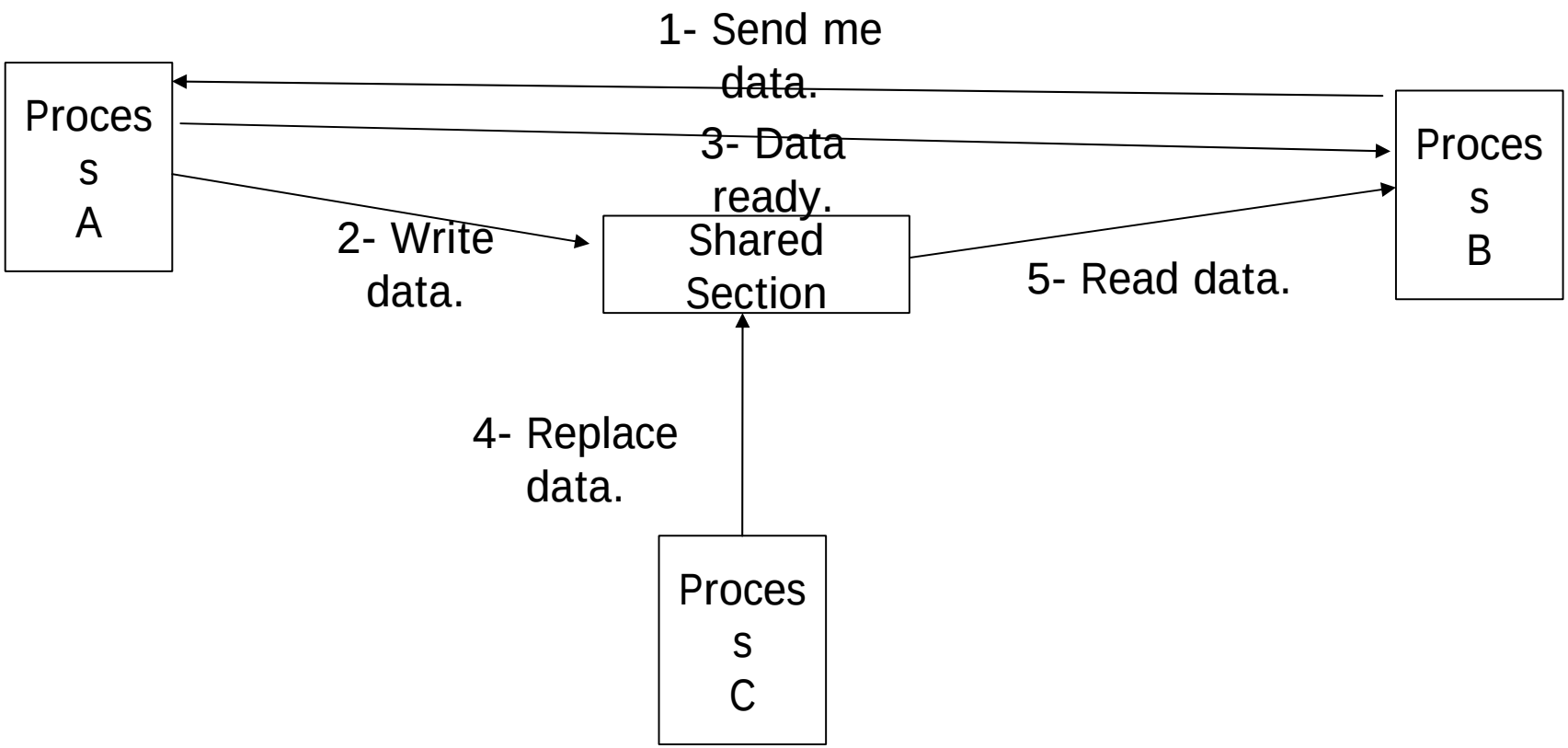
- Weak permissions
  - Demo

Problems

- Synchronization
  - Not built-in synchronization.
  - Synchronization must be done by processes in order to not corrupt data.
  - There isn't a mechanism to force processes to synchronize or to block shared section access.
  - Any process (with proper rights) can alter a shared section data while another process is using it.

Problems

- Synchronization
  - Communication between Process A and B



Searching for holes

- Look for shared sections using Process Explorer or ListSS.
- Attach a process using the shared section to a debugger.
- Run TestSS on shared section.
- Interact with process in order to make it use (read/write) the shared section.
- Look at debugger for crashes :).

Searching for holes

- Demo

Exploitation

- Elevating privileges.
  - Reading data.
  - Altering data.
  - Shared section exploits.
- Using shared sections on virus/rootkits/ etc.

Exploitation

- Reading data.
  - From high privileged processes (services).
  - From local logged on user processes, services and other sessions on Terminal Services.
  - This leads to unauthorized access to data.

Exploitation

- Reading data.
  - Reading Internet Explorer cookies and history information. (Demo)

Exploitation

- Altering data.
  - On high privileged processes (services).
  - On local logged on user processes, services and other sessions on Terminal Services.
  - This leads to arbitrary code execution, unauthorized access, processes or kernel crashing (DOS).

Exploitation

- Altering data.
  - IIS 5 DOS. (Demo)

Exploitation

- Shared section exploits.
  - When overwriting shared section data allow us to take control of code execution.
  - Some shared sections start addresses are pretty static on same OS and Service Pack.
  - Put shellcode on shared section.
  - Build exploit to jump to shellcode on shared section at static location.

Exploitation

- Shared section exploits.
  - MS05-012 - COM Structured Storage Vulnerability
    - Exploit (Demo)

Exploitation

- Using shared sections on virus/rootkits/etc.
  - Some shared sections are used by many processes (InternatSHData used for Language Settings) others are used by all processes :).
  - Write code to shared section and the code will be instantly mapped on processes memory and also on new created processes.
  - Use SetThreadContext() or CreateRemoteThread() to start executing code.
  - Similar to WriteProcessMemory() - SetThreadContext() technique or DLL Injection.

Exploitation

- Using shared sections on virus/rootkits/etc.
  - Some shared sections have execute access.
  - It would be possible to avoid WinXP sp2 NX .

Conclusions

- Windows and 3rd. Party applications have a bunch of Shared Section related holes.
- These kind of holes will lead to new kind of attacks “SSAtacks” (Shared Section Attacks) ;)
- Microsoft forgot to include a Shared Sections audit on the trustworthy computing initiative :).
- Windows guts are rotten:).

References

- MSDN
- Programming Applications for MS Windows - Fourth Edition
- Process Explorer (www.sysinternals.com)
- WinObj (www.sysinternals.com)
- Rattle - Using Process Infection to Bypass Windows Software Firewalls (PHRACK #62)
- Crazylord - Playing with Windows /dev/(k)mem (PHRACK #59)

FIN

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- Questions?
- Thanks.
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- Argeniss – http://www.argenis.com