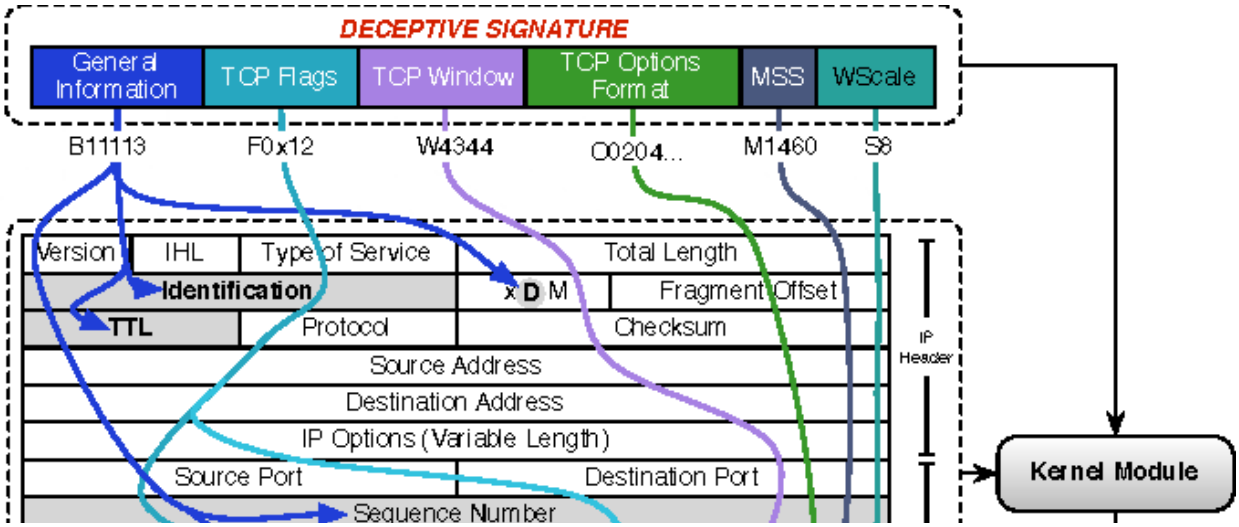

A Deception Based Approach for Defeating OS and Service Fingerprinting

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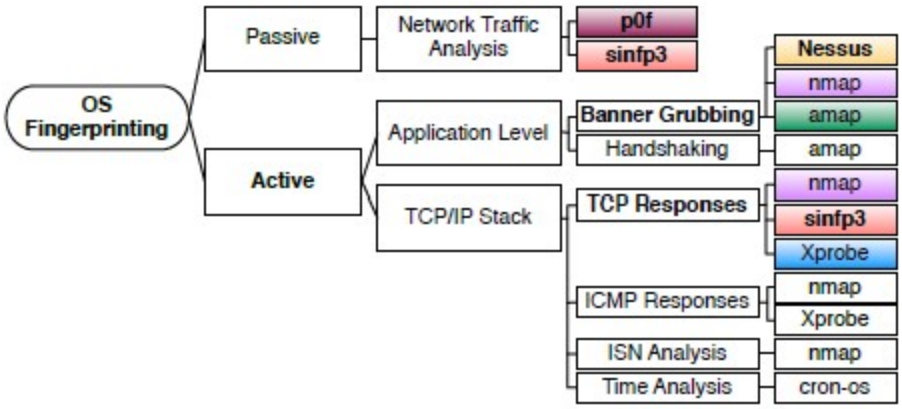
总结与摘录

1. 研究背景

- 操作系统指纹（OS Fingerprint）：记录主机的操作系统信息
  - 获取方式：
    - 静态：嗅探（sniffing）、流量分析（traffic analysis）
    - 动态：ICMP / TCP / UDP 探针（probing）

- 分类及工具



  - **Nmap**（按本文方法部分起作用）
    1. 原理：6 TCP probes → 2 ICMP echo request → 6 TCP tests → UDP test (closed port)
    2. 缺陷：包经不同主机传递后指纹可能会改变
- 服务指纹（Service Fingerprint）：记录主机上运行的服务信息

2. 操作系统指纹欺骗

- TCP Options（对大多数操作系统而言长度为**定值**）
  - 参数修改：IP 头长度域、TCP头 offset值
  - 重排序：调 sequence number
- 实现方法：Netfilter POST_ROUTING hook
  - deception module

```
if(ip->protocol == TCP && ip->len == 44 && tcp->ack == 1 &&
     tcp->syn == 1)
{
  //Probably 1st sinfp3's probe Response
  set_id();
  set_df_bit();
  set_ttl();

  set_tcp_window();
  set_tcp_flags();
  set_tcp_sequence();
  set_tcp_ack();

  if(new_option_len != option_len)
  {
    modify_packet_size(); //expands or shrinks
    //packet and updates IP Lenght and Offset
  }

  set_tcp_options(MSS, WScale, Option_Layout);
}
else if(ip->protocol == TCP && ip->len == 60 && tcp->ack ==
     1 && tcp->syn == 1)
{
  //Probably 2nd sinfp3's probe Response

  // Extract the timestamp value from the packet and save
  // it for re-injecting it in the right position later
  timestamp = get_tcp_timestamp();

  set_id();
  set_df_bit();
  set_ittl();
  set_tcp_window();
  set_tcp_flags();
  set_tcp_sequence();
  set_tcp_ack();

  if(new_option_len != option_len)
  {
    modify_packet_size(); //expands or shrinks
    //packet and updates IP Lenght and Offset
  }
  set_tcp_options(timestamp, MSS, WScale, Option_Layout);
}

if(tcpHeader_modified)
{
  tcp->check = 0;
  tcp->check = tcp_csum();
}

if(ipHeader_modified)
{
  ip->check = 0;
  ip->check = ip_csum();
}
```

    - extraction module
- 评价指标选择
    - 不同配置下服务器处理请求的能力（Apache Benchmark）：服务用户数量、服务器负荷
    - 工具软件：Nessus 漏洞扫描、OS 扫描工具误检率