Towards malware-resistant networking environment

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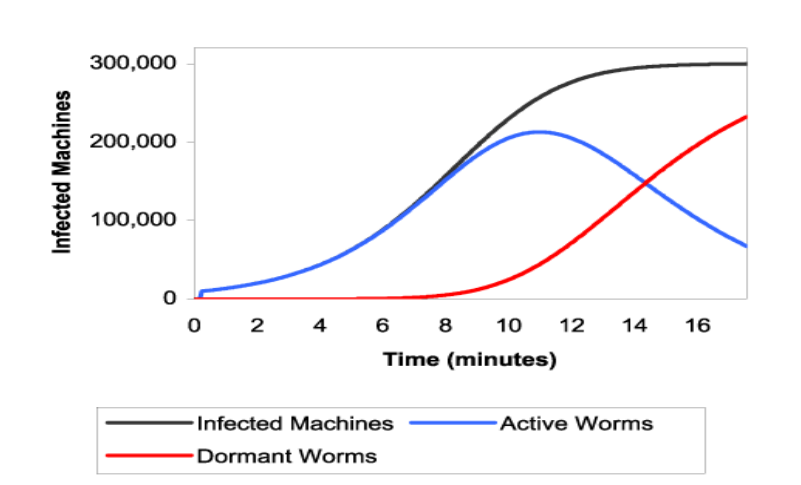
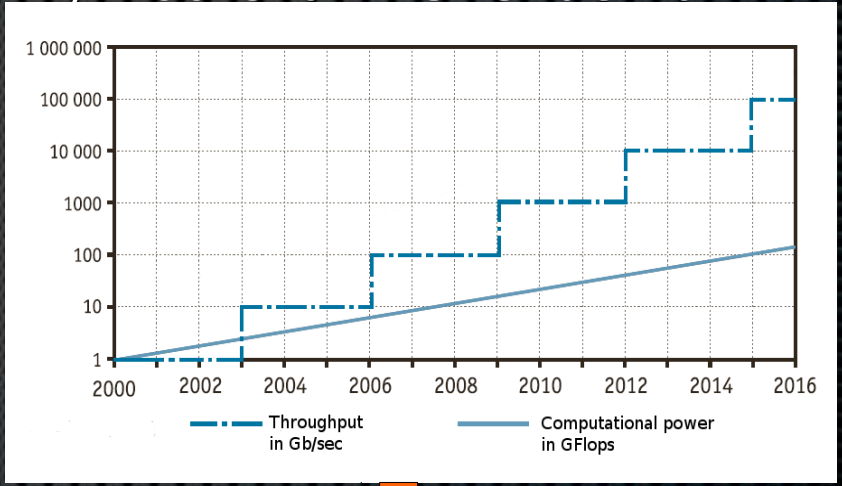
Malware propagation issues

Main focus: malware, which exploits memory corruption attacks remotely

1) Best observed on a large scale



2) Moore law vs. Gilder law



Besides:

- Content filtering is better done as close to the source as possible
- HIDS/AV administration issues, heavy resource usage

Ideas for better mitigation:

- Detect and filter at network level
- Try to minimize exploitation impact at host level

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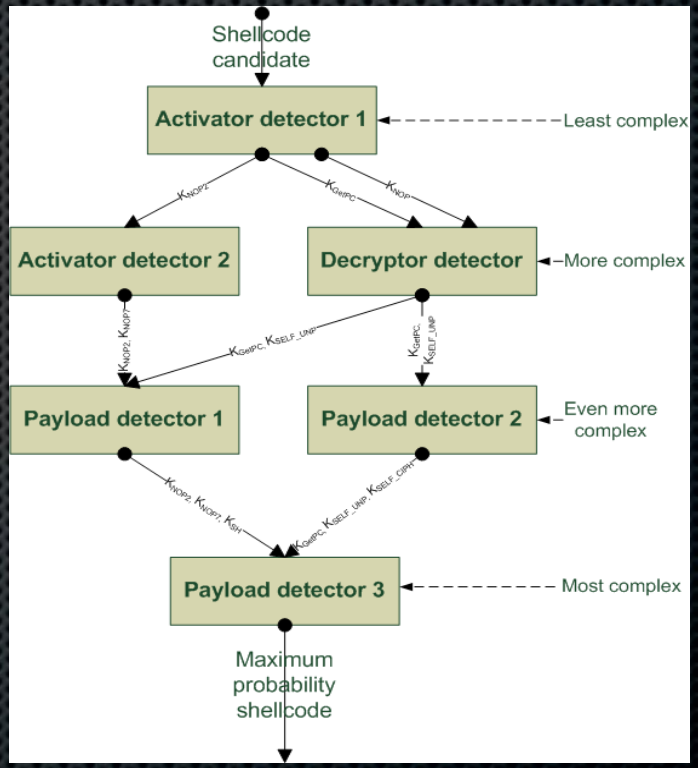
Network level: wire-speed shellcode filtering

Task of optimal shellcode detection can be divided into three subtasks:

- Subtask 1 – **Shellcode classification**
  - Build a set of classes of shellcode «building blocks» and corresponding feature space
- Subtask 2 – **Library of simple classifiers**
  - Build a set of algorithms, capable of detecting specific classes of shellcode «building blocks» (i.e. NOP, GetPC, decryptors, etc)
- Subtask 3 – **Optimal hybrid classifier**
  - Solve an optimization problem of generating data flow graph of elementary classifiers, which covers all classes, and is optimal in terms of FP rates and computational complexity.



Research deliverable: shellcode detection library

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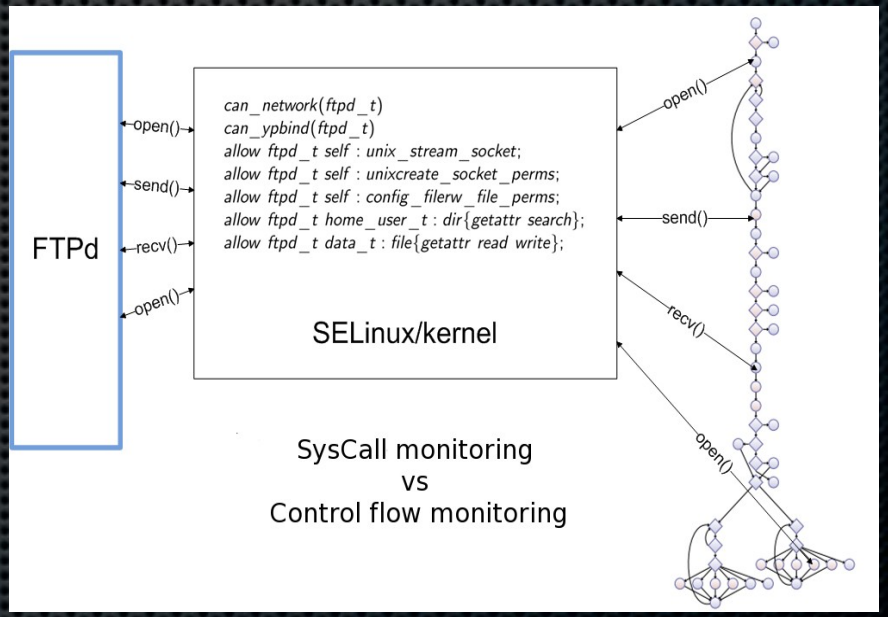
Host level: fine-grained privilege control

Task of application privilege control can be divided into three subtasks:

- Subtask 1 - **Program slicing**
  - Split CFG into the set of non-overlapping blocks: the number of privileges per block is less than overall number of privileges in the initial SELinux profile
- Subtask 2 – **Generating normal behavior model**
  - Build normal program behavior model as DFA where symbols are syscalls and checkpoints passing
- Subtask 3 - **Run-time behavior monitoring**
  - Get the parameters of syscalls and checkpoints in run-time, pass them to the normal behavior model and effectively utilize the model output



Research deliverable:
SELinux extention

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Summary: two complementary research directions

- **Fast polimorphyc shellcode detection in network flow**
  - Aim — detect massive phenomena like worm propagation as close to the source as possible
    - Build hybrid shellcode classifier, optimal in throughput and FP rates
    - Generate signatures with very short lifetime to use in existing filtering devices
- **Fine-grained application privilege control at host level**
  - Aim – minimize the negative effect of successful exploitation of unknown vulnerabilities in software
    - Build «privilege flow graph» for application in terms of SELinux
    - Monitor execution trace and enforce «hard» least privilege principle

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