# A Case Study on the Spread and Victims of Smart Worms

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**Abstract**— Security threats caused by worms are increased dramatically. Worms are major security threats to internet. Worms refers to a kind of computer viruses which are actively and widely spread on the internet to infect the computers. Worms spread in a very short span of time and does not give time for any human countermeasures to happen. These cause network traffic which in turn results in the equipment malfunctioning, network crowding etc. Active worms are spread autonomously without the necessary of human interaction. They scan the system, probe them transfer the copy and thus infect the machine. These are detected through anti-virus. Smart worms cause most important security threats to the Internet. These worms develop during their propagation and thus create great challenges to defend against them. In this paper, we look into "Spread and victims of Smart Worms". The Smart Worms are different from traditional worms because of its nature to intelligently manipulate its scan traffic volume over time.

**Index Terms**—Worm, Camouflage worm, Smart Worm.

## 1. INTRODUCTION:

Security in computing is the running issue in current situation. Threats are increased rapidly to disturb the security. Worms are one type of threat to security. Worms are a malicious program code which are, self-propagating and does not require any human interaction by which it infects the hosts. The term "Worm" was coined by John Burner in his novel "The Shockwave Rider". Worms are capable of shackling the working of internet. In order to build better defense systems and enable a good application we study in detail about worms. These worms have known to infect millions of computers and cause heavy damage. In 1988 first worm was discovered which was Morris Worm. Since then it was continued and many worms were find till now like Code Red in 2001, Sapphire in 2003, Zotob in 2005 and so on ....

## 2. RELATED WORK:

2.1 Active Worms: Active worms are those programs which self-propagate across the internet by exploiting security in widely used services. Active worms are used to infect a large number of computers networked together to form botnets. These botnets cause heavy loss of data, Distributed Denial Of Service attack which interrupts the system utilities, access to sensitive information, spread disinformation etc..

## 2.2 Mechanism for Worm Spreading:

Worm propagation can be explained in a clear way as follows. The below is the mechanism of worm propagation. This can be broadly classified into 5 step process illustrated as follows:

2.2.1) Initial Infection: This stage is where it begins with an assumption that system is already infected by the worm and worm is active.

2.2.2) Target Acquisition: For propagation the worm finds additional systems to infect .Worms mainly target systems which are using email addresses, IP addresses etc..

2.2.3) Delivery of Hostile Code: After the system is targeted, it transfers the worm to targeted system for infection. The delivery of code takes place through Email, Web Clients etc.

2.2.4) Execution of Hostile Code: The hostile code which resides in a system is not sufficient for the propagation of worm, the code must be executed and it can be done in many ways through:

- Programming Attacks like Buffer Overflow.
- Clients using emails.
- Automatic execution by target system.

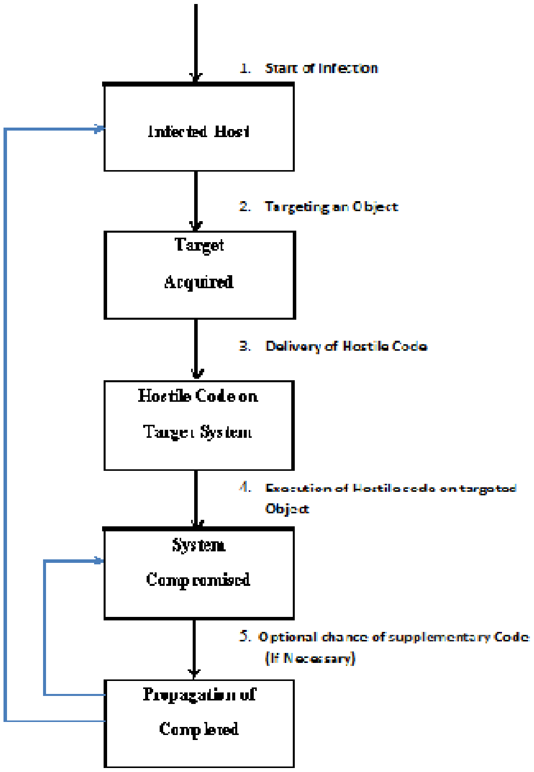
2.2.5) Optional Transfer Of Additional Code : Sometimes the worms does not transfer complete code in the above step if that happens the remaining code will be transferred after the system has been comprised and this can be done through the Network File Systems.

The worm does not need any manual interaction so it just needs to compromise a running program. These running programs are hosted in a server so the worms attack the host machines. When the worms attack the host machines they infect the host machine by modifying the data, terminating the current programs and starting the other programs, installing Trojans, etc.. These worms are faster in action and the defense mechanism should be as faster as them in order to counter it. There has been a substantial damage caused by worms in years and hence efforts are made in developing detection and defense mechanisms against worms.

## 2.3 Detection of worms:

The spread of these worms affect the security in Internet. So, these should be detected early so that threat to the system can be reduced. Various detection techniques are introduced to reduce the loss caused by worms. Many researchers proposed the detection of worm intrusion by tracing connection paths through departments of an organization. So based on this concept Destination Source Correlation (DSC) was developed. This is similar to Moore's distributed "network telescopes".

The detection algorithm described here is a combination of both infection nature of worm and anomaly scan detection mechanism. This approach to some extent effectively detects the fast spreading of worms.


1. Start of Infection
Infected Host
2. Targeting an Object
Target Acquired
3. Delivery of Hostile Code
Hostile Code on Target System
4. Execution of Hostile code on targeted Object
System Compromised
5. Optional chance of supplementary Code (If Necessary)
Propagation of Completed

### 2.4 Destination Source Correlation:

This worm victim detection algorithm is designed by considering the worm infection pattern. Infection patterns of worm are many but in general they follow a common pattern. This algorithm has 2 phases: Finding Infection Pattern and Checking Scan Rate for hosts in first phase.

The general scenario is a sliding window of local network traffic is kept. Two basic items are tracked:

- For each port in traffic we record address of host and scan the source.
- If source scan originates from host that already received scan a worm behavior like infection pattern is observed.

By combining the incoming, outgoing traffic and anomaly scan detection DSC focuses on worm behavior instead not only focusing on symptoms of worms. We consider high rate of outgoing scanning that accompanies a worm which distinguishes authorized from infectious traffic. To identify unusual patterns anomaly detection heuristics are used. These heuristics are not applied to networks with various other infections like behaviors. In such places Chebyshev's inequality is used whether simple heuristic detection can be used or not.

In probability theory, **Chebyshev's inequality** guarantees that in any probability distribution, "nearly all" values are close to the mean — the precise statement being that no more than $1/k^2$ of the distribution's values can be more than $k$ standard deviations away from the mean (or equivalently, at least 1 - $1/k^2$ of the distribution's values are within k standard deviations of the mean). The inequality has great utility because it can be applied to completely arbitrary distributions (unknown except for mean and variance), for example it can be used to prove the weak law of large numbers.

The term *Chebyshev's inequality* may also refer to the **Markov's inequality**, especially in the context of analysis.

Chebyshev's inequality is usually stated for random variables, but can be generalized to a statement about measure spaces.

### 3. LIMITATIONS:

Apart from all these assumptions there are even limitations for DSC in general. Several applications produce infection like traffic and may not have a stable scan rate. The other drawback is DSC cannot be used for multi vector worms. DSC is designed for detection of fast spreading worms and it does not match the perfect algorithm case.

## 4. CONCLUSION:

In this paper we have studied approach for worm spreading and detection mechanisms. We can conclude in this paper that detection algorithms can be used for early detection of worms and for slowing the propagation.

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