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Rebuilding Anti-Malware Testing for the Future

Dr. Igor Muttik, James Vignoles | McAfee | Avert Labs®

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And God said - Let the Data be; And so it happened. And God said - Let the Data go to their proper places.

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And God said - Let the computers be to process the Data. Thus God created computers and called them hardware.

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And there was no Software yet. But God created programs; good and bad... And told them - Go and multiply yourselves and fill all the Memory.

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And God said - I will create the AV Software; And the AV Software will check programs and govern over the computers and programs and Data.

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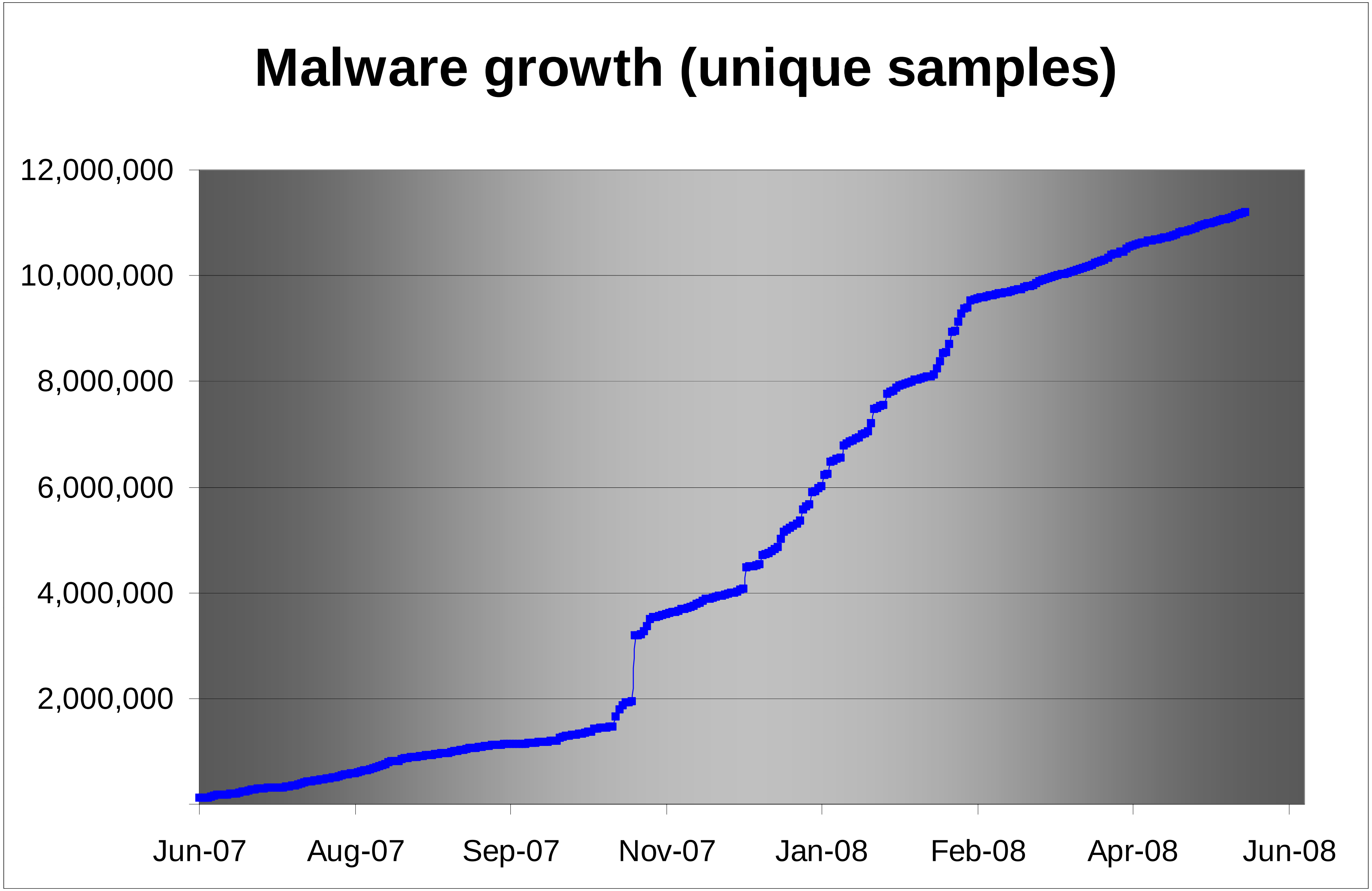
And God said - I will create the AV Software; And the AV Software will check programs and govern over the computers and programs and Data.

And God said – it is not good for AV Software to be alone. He took a bit from the AV Software's body and created a creature that would look up at the AV Software; and admire the AV Software; and love the things the AV Software does; and God called the creature: the AV Software Tester.

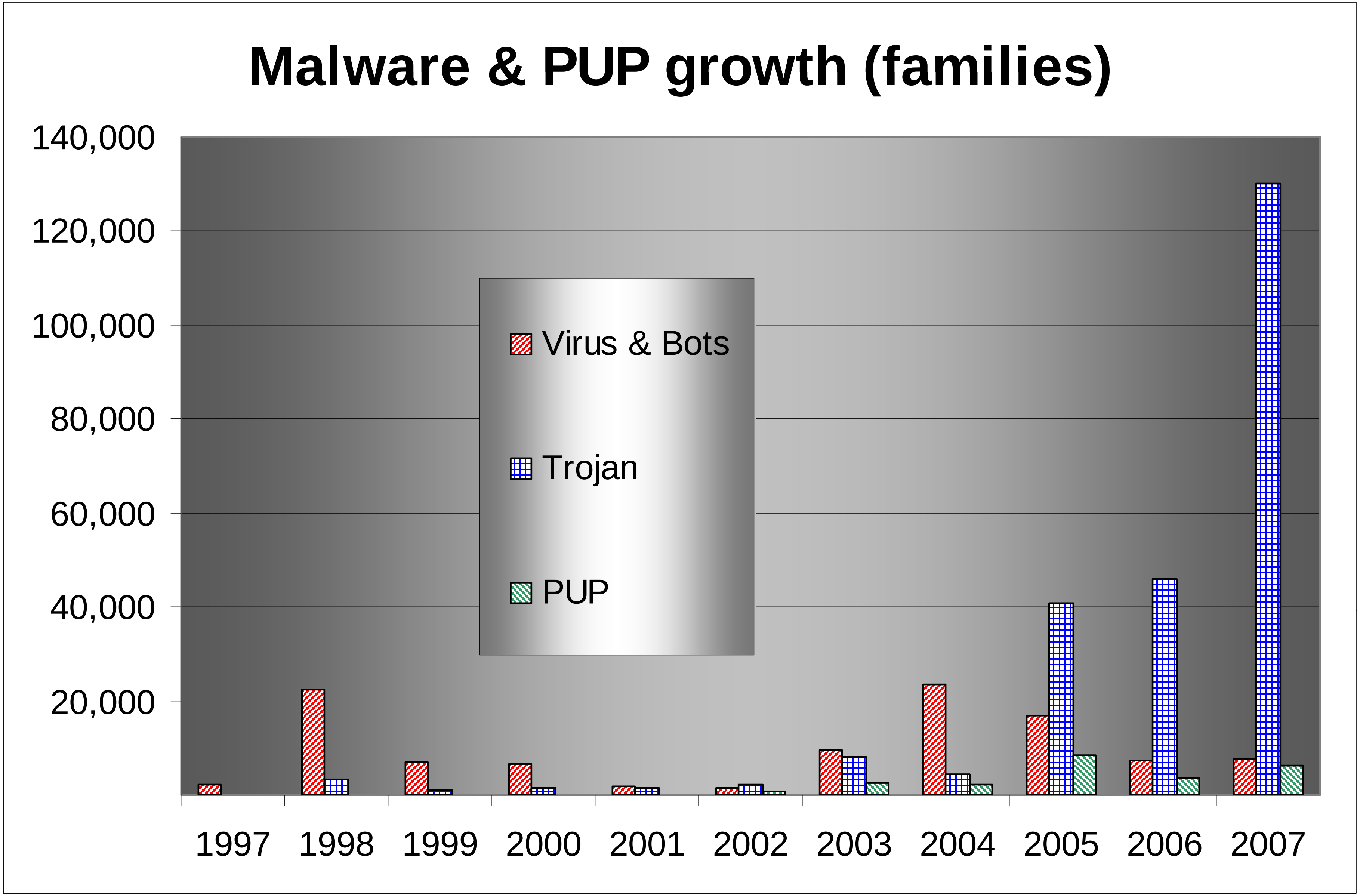
Agenda

- The evolution
  - Evolution of malware
  - Evolution of protection
  - Products become multi-dimensional
  - “Everything in, nothing out”
- Defining the test set
  - Reducing the test set
  - Importance of meta-data
- Suggestions for the future
  - AMTSO
  - Sharing meta-data
  - User and environmental profiles
  - Distributed testing
- Conclusion
- Questions

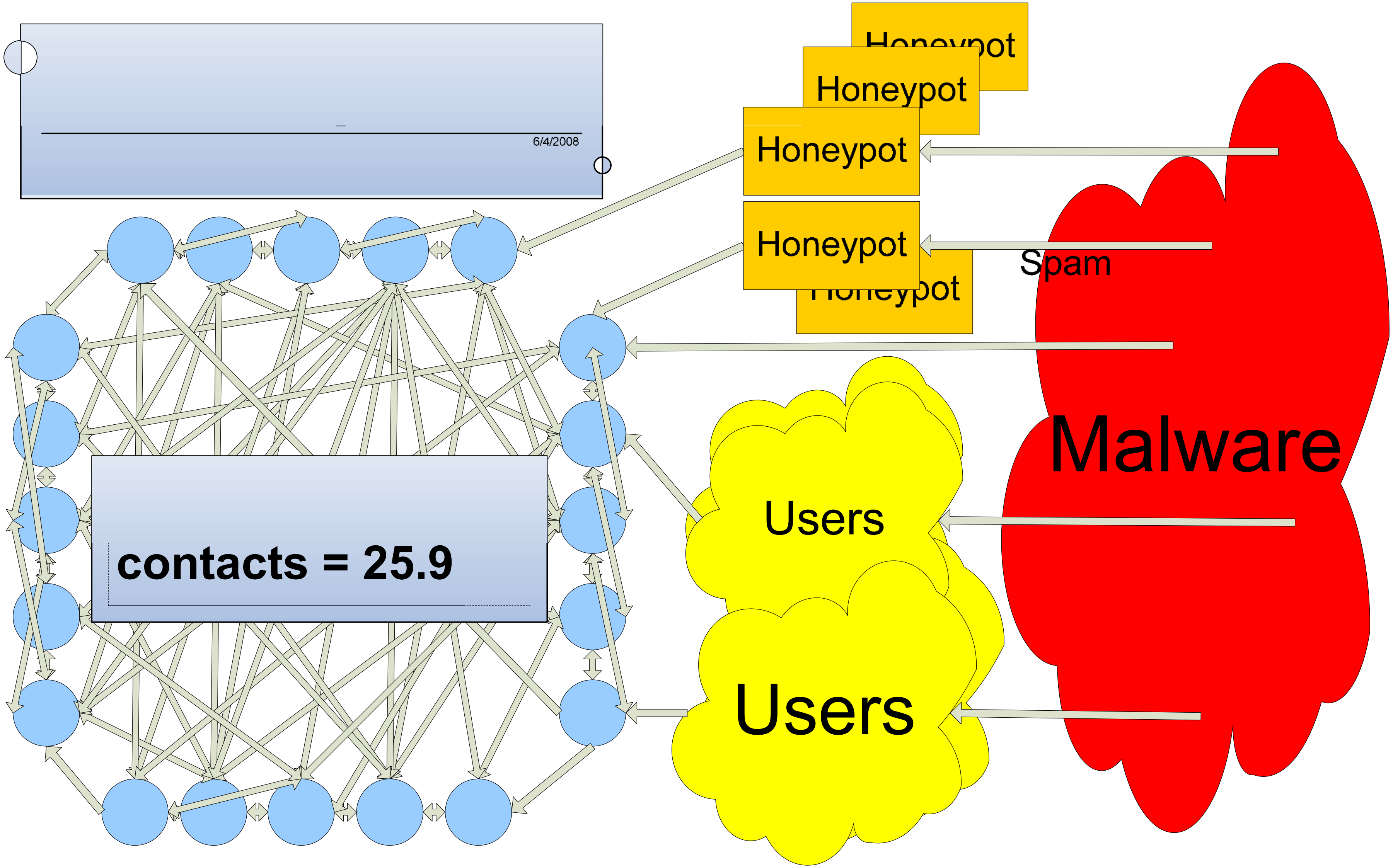
The Evolution



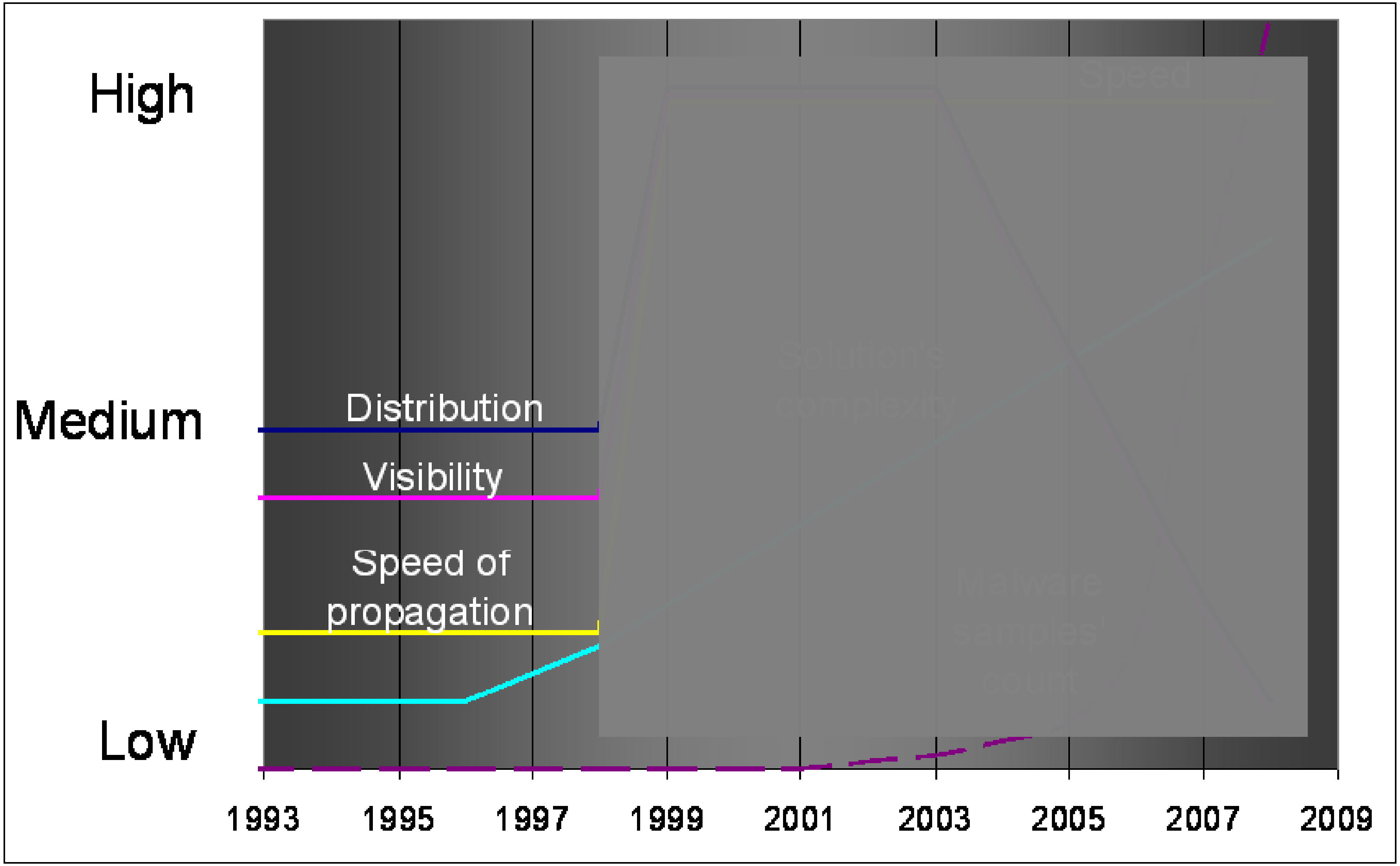
Source: McAfee Avert Labs


Malware & PUP growth (families)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
Virus & Bots
Trojan
PUP
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007

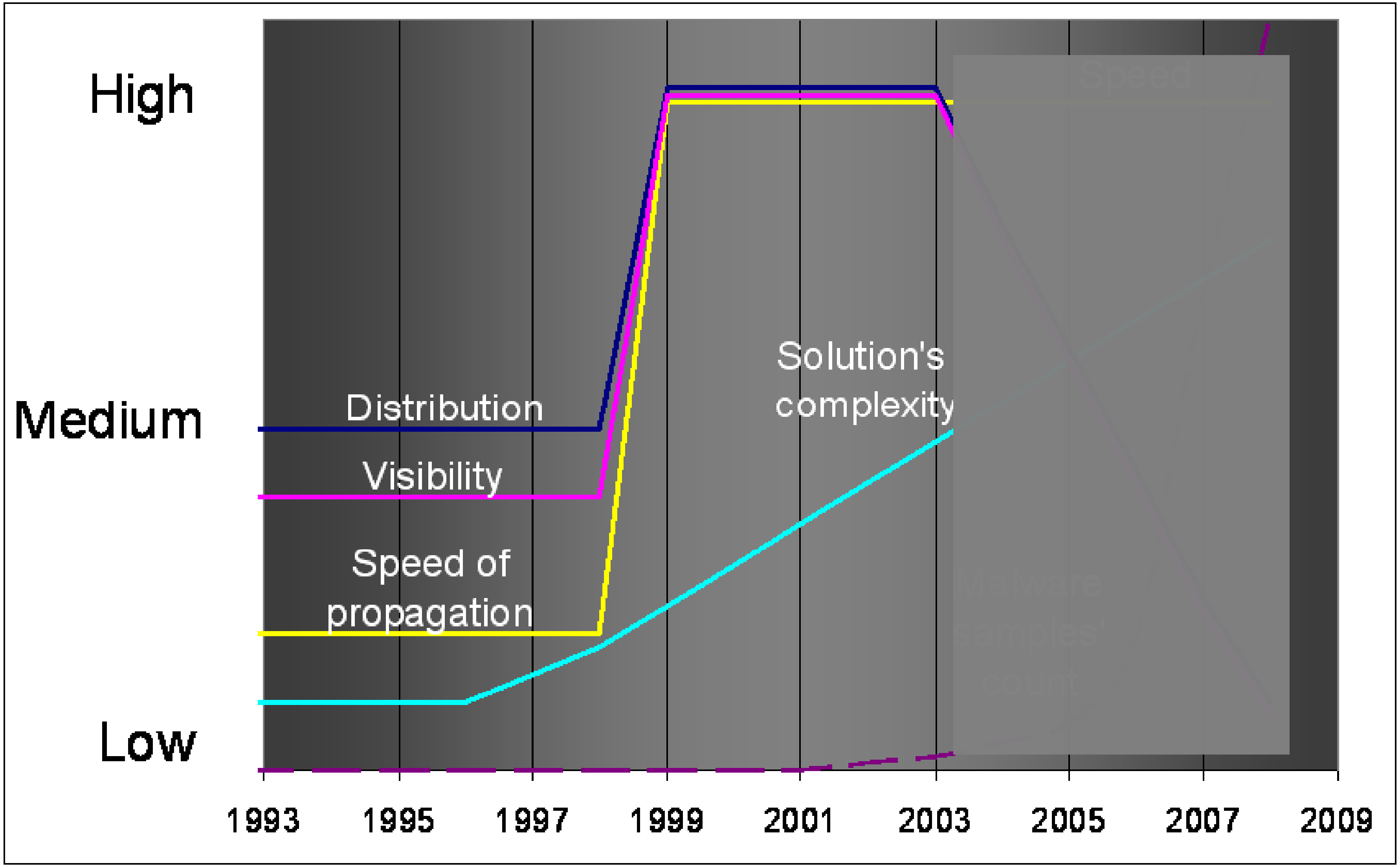
Distribution of samples



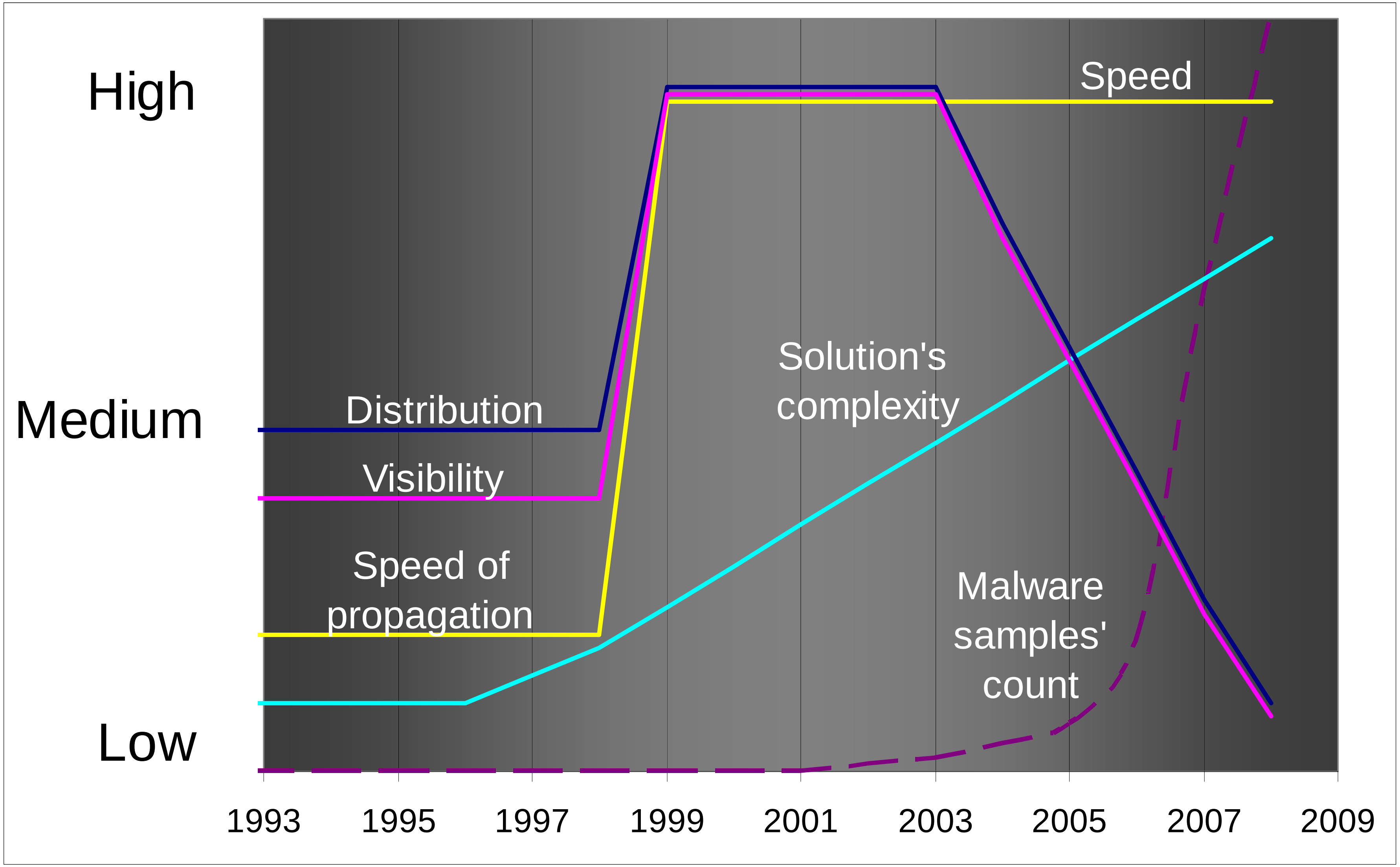
Evolution of malware



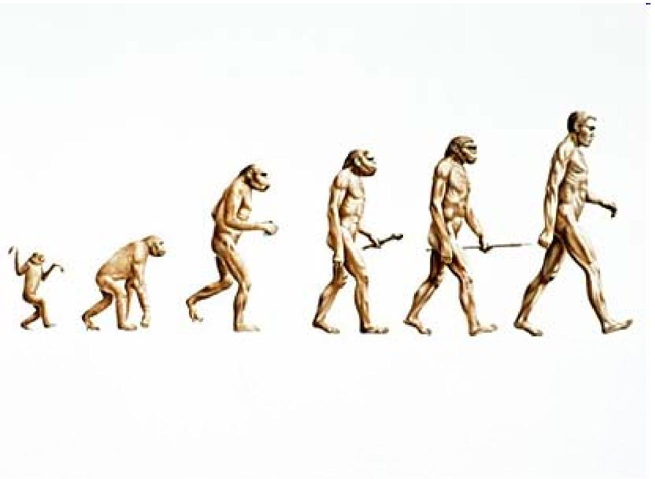
Evolution of malware



Evolution of malware

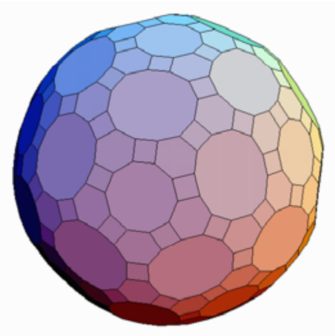


Evolution of protection



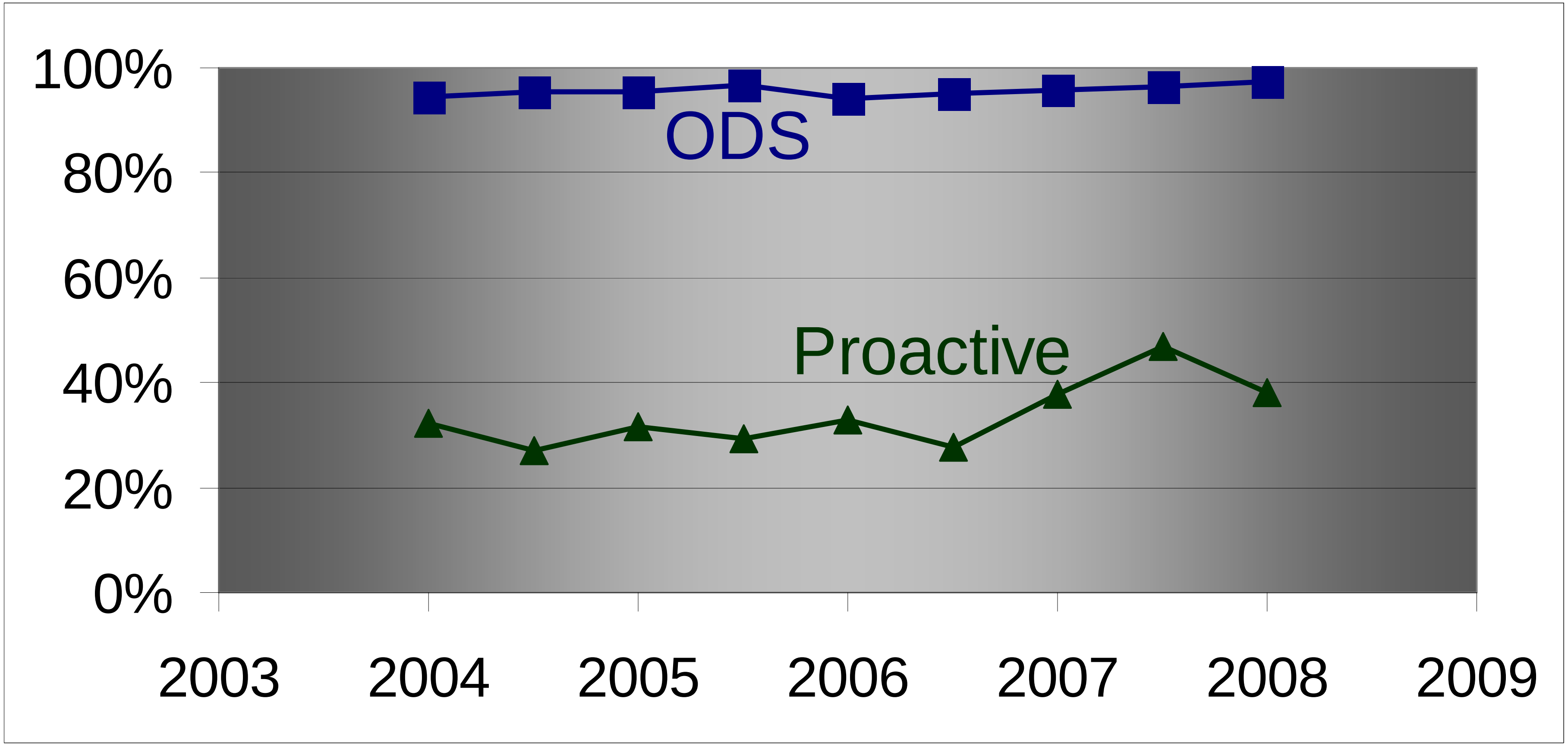
- Scanning was born in 1980-90s
  - Testing ODS over sample collection
  - Then it reflected user experience well
- Assumption was that every piece of malware will be re-used
  - Getting less and less true
  - If not re-used – why detect by a scanner?
  - That means the meta-data (commonality, age) is very important
- Measuring the quality by scanning past threats is getting progressively less relevant

Multi-dimensional products = multi-dimensional testing



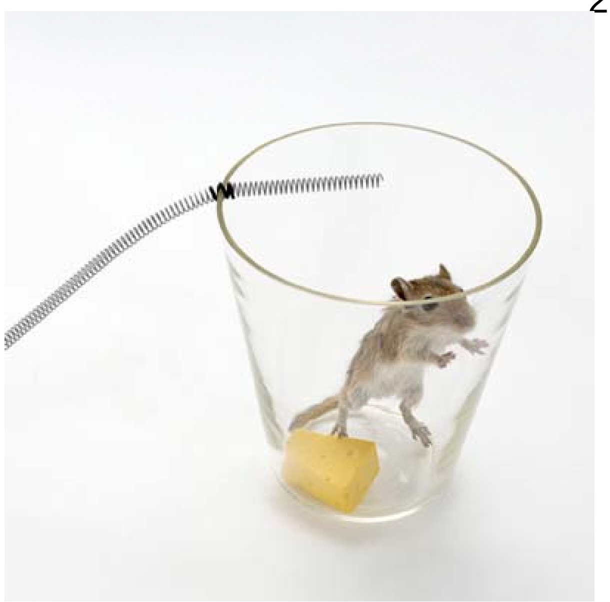
- Extreme growth in malware count is due to how successful AV products are
- Scanners are “testable” by the bad guys
- Solution - proactive multi-dimensional security products
  - Behavioral
  - Herd intelligence and field telemetry
  - Instant updating
  - Web filtering/reputation
  - Anti-spam
  - Access-protection rules (e.g. - no PEs in %TEMP%)
  - White-listing, black-listing (files, URLs, IPs, etc.)
- So testing also have to change

Industry average detection rates



Based on data from AV-Comparatives.org

Everything in, nothing out



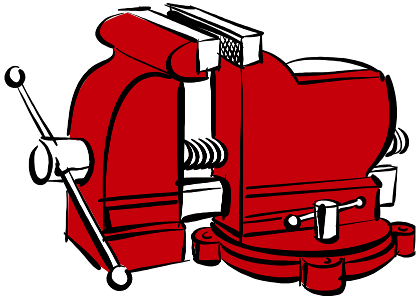
- Test sets rarely shrink
  - Dropped DOS viruses
  - Dropped Word6 macros
- Today viruses are out-numbered by short-lived trojans
- What mechanisms are available to track threats’ commonality and ageing?
  - Sample counts, telemetry in AV products
  - Virtually none available to the testers
- Anti-Spam model
- Concerted effort to retire threats

Accuracy and reproducibility

- “Freezing” the solutions tested
  - — Repeatability
  - — Verifiability
  - — Controlled changes
- Some solutions cannot be “frozen”
  - — If they rely on dynamic online database
    - Protection in-the-cloud
    - Managed services
  - — If security software modifies itself
    - For example – old threats are “aged out”
    - Or if there is artificial intelligence (self-modifiable database of detection or behavioral rules)
  - — Comprehensive logging
    - Verifiable but not repeatable

Defining the test set

Reducing the test set



- Can we test against all samples? Yes.
- Do we need to test against all samples? No.
- Need info about what can be removed
  - Meta-data about age and commonality
  - Verify sample’s viability
  - Periodically verify samples again
- Weeding the test set is a not a one-off exercise
  - Malware also uses “in-the cloud” technology
  - Malware test set cannot be frozen either!

Do no harm

- Sample testing requires execution
- Leaks from the laboratories
  - Isolated networks
  - Simulated Internet
  - Risks of DDoS, spam, data leakage
- Solutions
  - Filtering firewalls (automatic and interactive)
  - Logging and playback of network traffic

Example – many HTML samples

- Encrypted/encoded HTML

```
<Script Language='Javascript'>
<!--
document.write(unescape('%3C%41%20%68%72%65%66%3D%68%74%74%70%3A%2F%2F
%77%77%77%2E%62%61%64%2E%62%69%7A%3E%3C%69%6D%67%20%73%72%63%3D%68%74
%74%70%3A%2F%2F%77%77%77%2E%62%61%64%2E%62%69%7A%2F%6D%61%6C%77%61%72
%65%2E%65%78%65%20%77%69%64%74%68%3D%31%20%68%65%69%67%68%74%3D%31%3E%0A'));
//-->
</Script>
```

- Contains a script
- With only a link inside
- Link is frequently inactive
- Is this a valid malware sample?
- Are spammed downloaders?

Example – many HTML samples

- Encrypted/encoded HTML

```
<A href=http://www.bad.biz><img src=http://www.bad.biz/exploit.jpg
width=1 height=1>
```

- Contains a script
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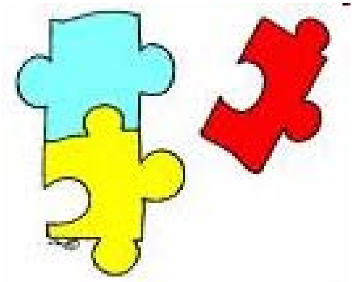
Test sets



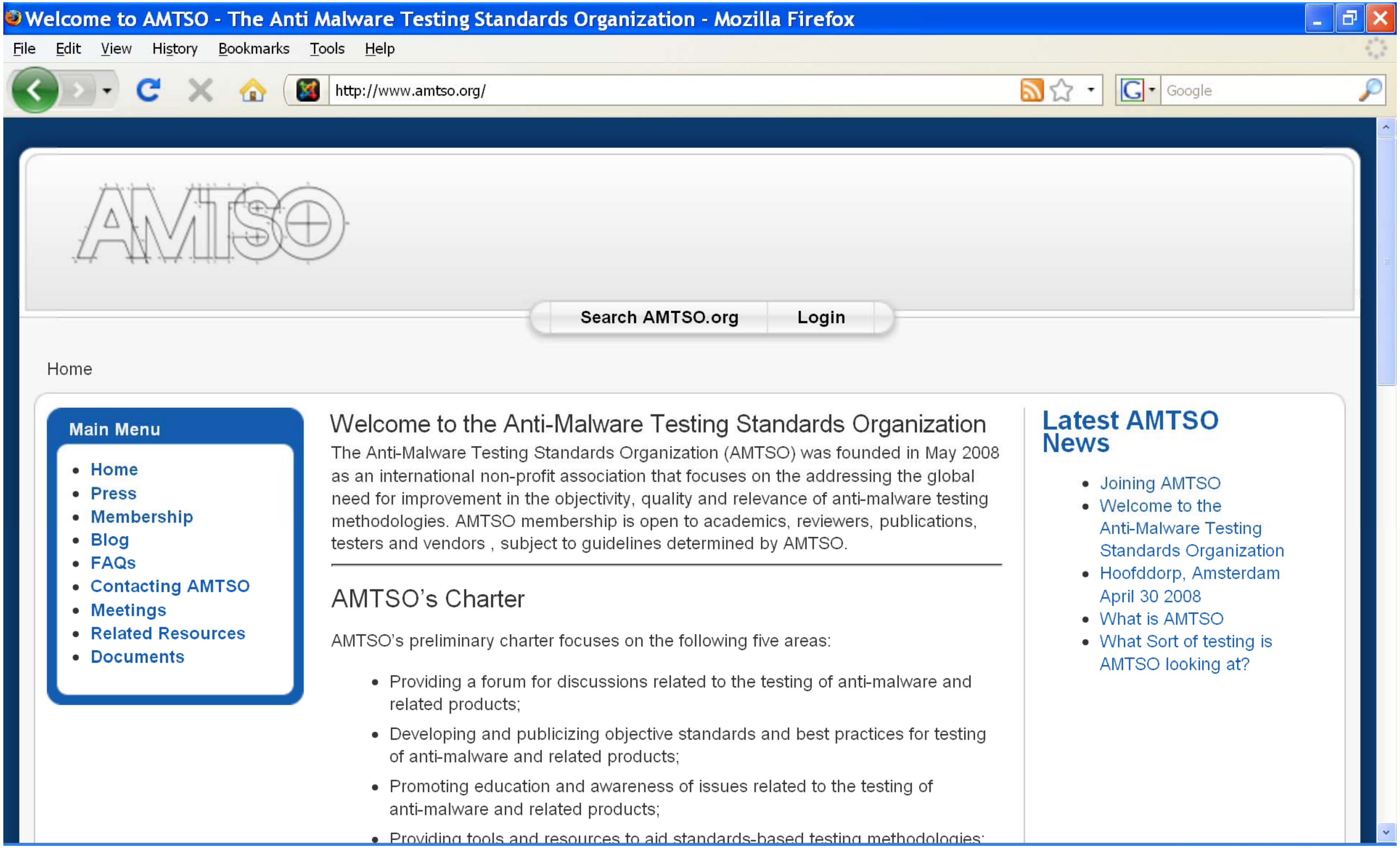
- Weeding and sorting
- Reducing the size but keeping relevant
  - Small set will produce random results
  - Ranking threats using field telemetry
  - Removing short-lived and inactive threats
  - Excluding most HTMLs
  - Grouping threats (“attack groups”)
  - “Chopping the tail”
- Meta-data needed
  - Sharing meta-data
  - Standard for meta-data is needed
- Same applies to clean set – commonality & age

Suggestions for the future

“Hard core” collections

- Test what is not commonly known
- Identify samples detected by the majority
- Exclude these samples – test the rest
- No bias in favour of products used for selection
- Recognizing and resolving the bias
  - Geographical
  - Timing

AMTSO – www.amtso.org



Welcome to the Anti-Malware Testing Standards Organization

The Anti-Malware Testing Standards Organization (AMTSO) was founded in May 2008 as an international non-profit association that focuses on the addressing the global need for improvement in the objectivity, quality and relevance of anti-malware testing methodologies. AMTSO membership is open to academics, reviewers, publications, testers and vendors , subject to guidelines determined by AMTSO.

AMTSO's Charter

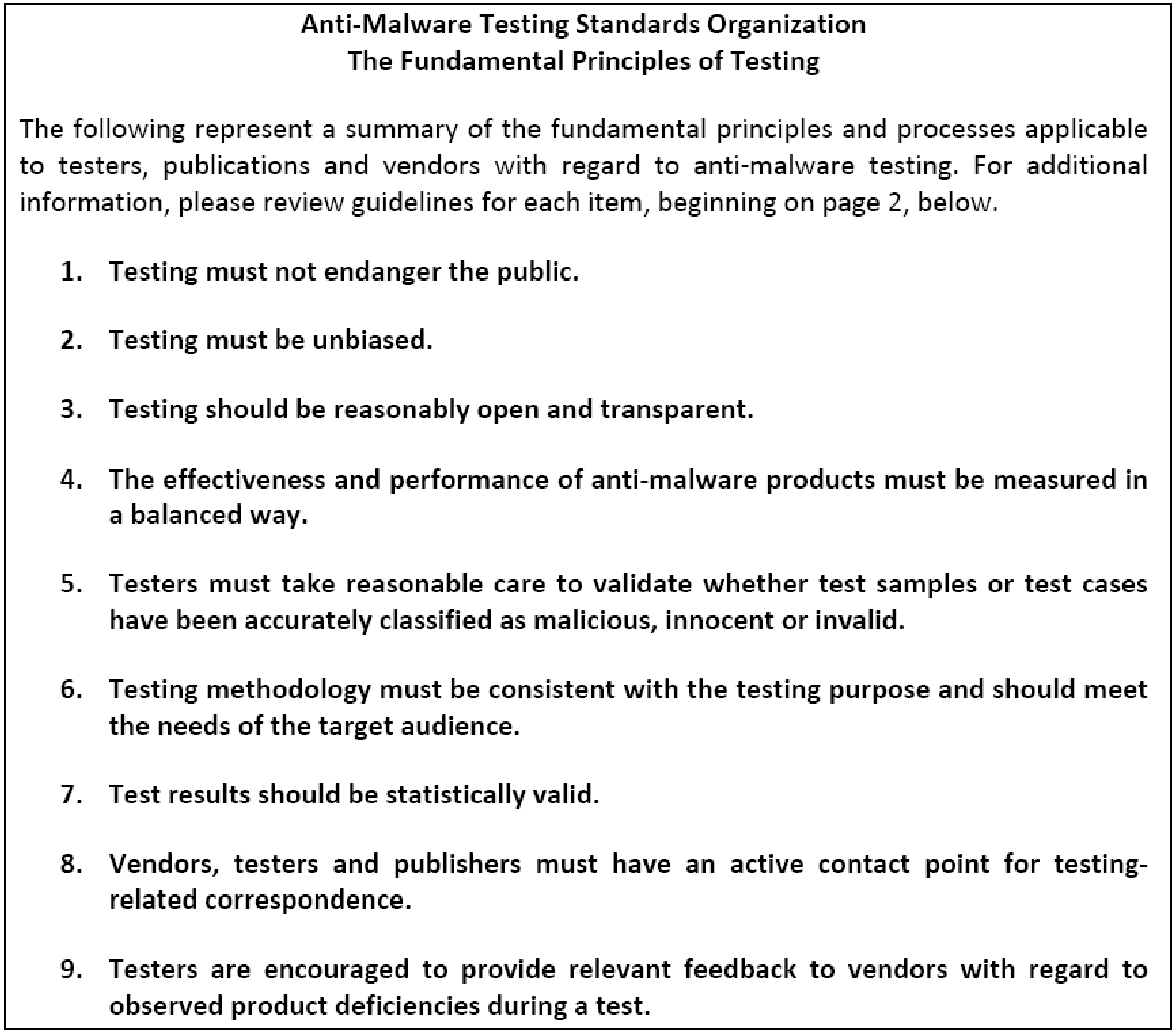
AMTSO's preliminary charter focuses on the following five areas:

- Providing a forum for discussions related to the testing of anti-malware and related products;
- Developing and publicizing objective standards and best practices for testing of anti-malware and related products;
- Promoting education and awareness of issues related to the testing of anti-malware and related products;
- Providing tools and resources to aid standards-based testing methodologies;

Latest AMTSO News

- Joining AMTSO
- Welcome to the Anti-Malware Testing Standards Organization
- Hoofddorp, Amsterdam April 30 2008
- What is AMTSO
- What Sort of testing is AMTSO looking at?

AMTSO principles



Anti-Malware Testing Standards Organization
The Fundamental Principles of Testing

The following represent a summary of the fundamental principles and processes applicable to testers, publications and vendors with regard to anti-malware testing. For additional information, please review guidelines for each item, beginning on page 2, below.

1. **Testing must not endanger the public.**
2. **Testing must be unbiased.**
3. **Testing should be reasonably open and transparent.**
4. **The effectiveness and performance of anti-malware products must be measured in a balanced way.**
5. **Testers must take reasonable care to validate whether test samples or test cases have been accurately classified as malicious, innocent or invalid.**
6. **Testing methodology must be consistent with the testing purpose and should meet the needs of the target audience.**
7. **Test results should be statistically valid.**
8. **Vendors, testers and publishers must have an active contact point for testing-related correspondence.**
9. **Testers are encouraged to provide relevant feedback to vendors with regard to observed product deficiencies during a test.**

For better testing

- Follow AMTSO principles (www.amtso.org)
- Testing “whole solution” is always better
  - Protection at the point of delivery (SMTP / HTTP / POP3 / IM / P2P scanner)
  - Threat class – for example:
    - Rootkits
    - Parasitic viruses
    - Malware that does data exfiltration
  - Cleaning
- The user and the environment profile
  - A script simulating specific user behavior (“GUI monkey”)
    - Internet surfer
    - P2P or IM user, etc.

Distributed live testing

- Common AV testing plug-in
  - Installs alongside AV
  - Tracks security responses and submit logs
  - “Retrospective telemetry”
  - Like SETI@Home
  - Allows for retrospective analysis of product efficacy
  - Can be open-source
- Collect user feedback
- Combining objective and subjective measurements

Conclusions

- Testing is no longer a simple task
- Great synergy in the industry - AMTSO
- Collect and standardize telemetry meta-data
- Share it and use it – for dev and testing
- We are optimistic

Questions, please

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