Anti-Virus Outbreak Response Testing and Impact

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Introduction: past and current tests (I)

- Current tests are still too focused on detection rates of viruses (regardless if they are ItW or Zoo viruses)
- One addition: retrospective tests (old scanners were tested against the most current malware to see how many of them were detected proactively, without the requirement of updates)

Introduction: past and current tests (II)

- New test strategy for today's problems: Outbreak response time tests
- The main question we want to answer:

  How long does it take until signature updates (from the different AV companies) are ***publicly available*** (using recommended downloads) in cases of major worm outbreaks?

About the project (how it works)

- Project started in the current state at

  2004-01-01 (the first beta implementation was running since 2003-10-27), see VB 02/2004
- We monitor 24 different AV companies for the release of new regular and beta signatures, engine and program updates
- Checks are performed every minute since

  2004-06-29 (formerly, they were performed every five minutes)

About the project: download process

- Download system is running on Debian Linux 3.0
- We only download new (changed) files, using wget
- All files are stored into a large archive in our lab (sync'ed on-demand using rsync over SSH)
- A PostgreSQL database entry is created for every download with information about the filename, the size, MD5, plus the date/time of the download
- The system is located in a data center of a big ISP with a direct 100 MBit Internet connection

About the project: test process

- First idea: manual checks in case of outbreaks
  (we expected only a few per year…)
- After the Mydoom / Bagle / Netsky war was started, we switched to automated tests using command-line scanners whenever possible (with the same settings the GUI version uses, e.g. for heuristics)
- We have several scan systems which are running on Windows XP and Windows 2003 Server with Cygwin (due to the use of Unix shell scripts)

About the project: participants

- Regular definition updates from AntiVir, Avast, AVG, Bitdefender, ClamAV (since 2004-02-20), Command, Dr. Web, Esafe, eTrust (CA), eTrust (VET), Fortinet (since 2004-04-15), F-Prot, F-Secure, Ikarus, Kaspersky, McAfee, Norman, Panda, Quickheal, RAV, Sophos, Symantec (Intelligent Updates, but not LiveUpdates), Trend Micro and Virusbuster
- Beta definitions updates from F-Secure, McAfee, Panda, Symantec and Trend Micro
- To AV companies: There is no participation fee.

  Feel free to join if you're not yet included!

Current problems

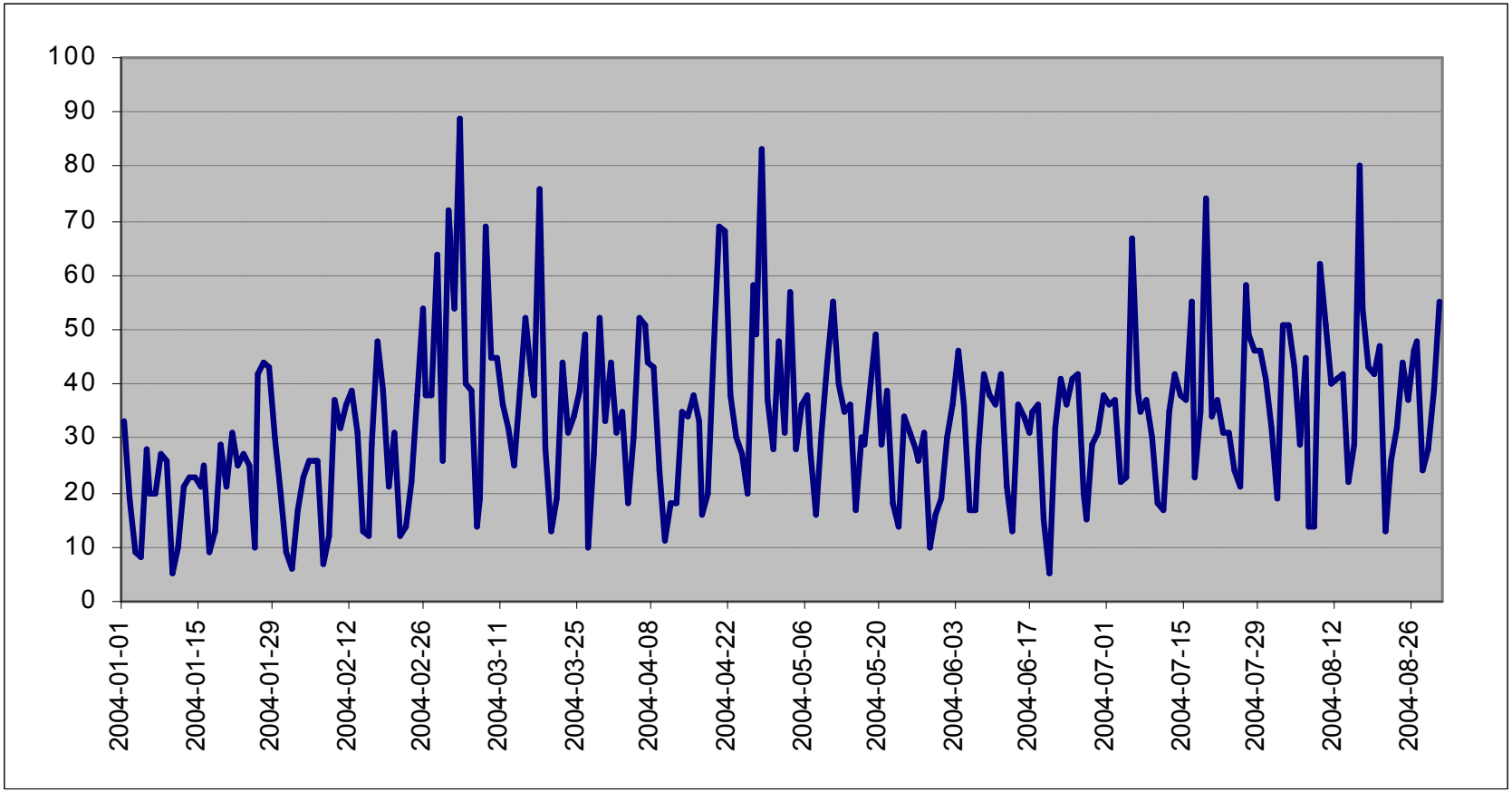
- From 2004-01-01 until 2004-09-01 we have downloaded more than 37,000 update files
- However, only about 30,000 are “valid”!
- Three main problems:
  - Update servers are out-of-sync (this means, we continuously download old and new updates)
  - Corrupted updates (damaged signatures or archives; e.g. we download a file during an upload process of the AV company)
  - Non-reachable (possible overloaded) servers
- Therefore, all files are sorted manually before use (which is a time-intensive process)

Some interesting general statistics

- In the next few slides you will see:
  - Number of released updates

    (Note: a high number might not be good and a small number might not be good either!)
  - Updates releases of the last few months, per day of the week and per hour
  - Signature update growth rates since 2004-01-01
- Note: all times are in GMT (24 hour format)!

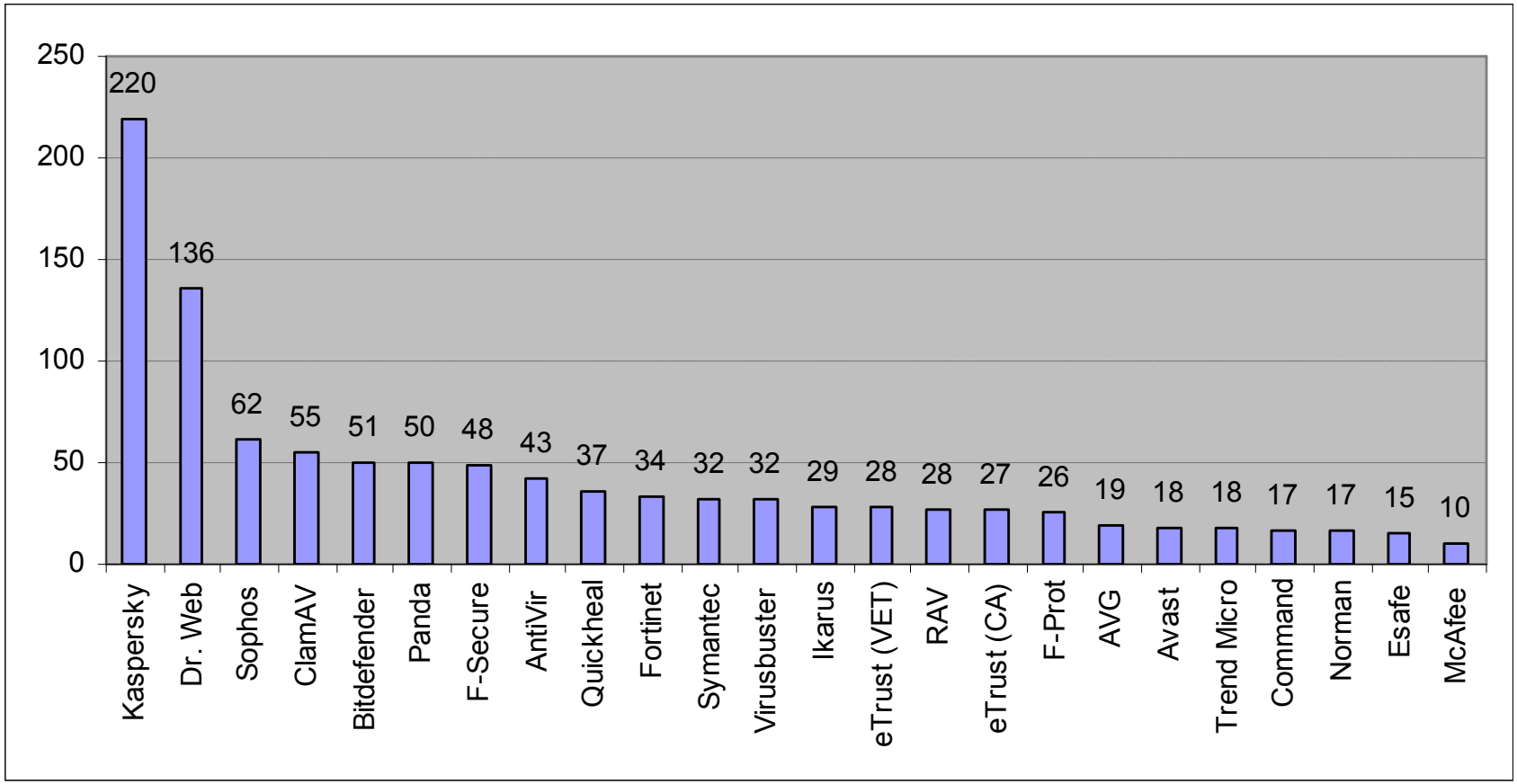
Regular update releases per day (I)
(x = date, y = number of updates)



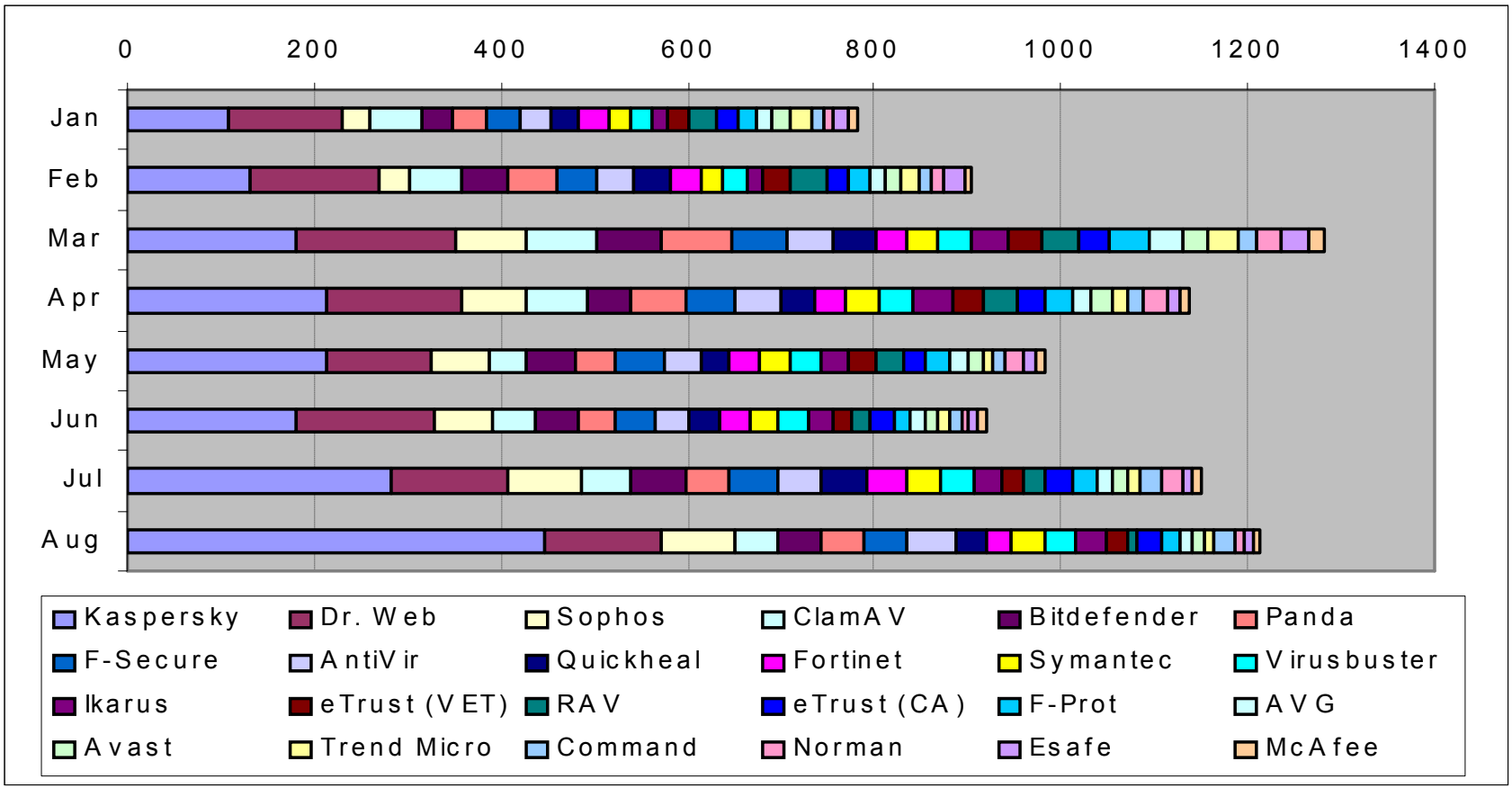
Regular update releases per day (II)

- Days with the most update releases:
  - 2004-03-03 (89), 2004-04-28 (83), 2004-08-16 (80), 2004-03-18 (76), 2004-07-19 (74)
- Days with the lowest number of update downloads:
  - 2004-06-20 (5), 2004-01-10 (5), 2004-02-01 (6), 2004-02-07 (7), 2004-01-04 (8)

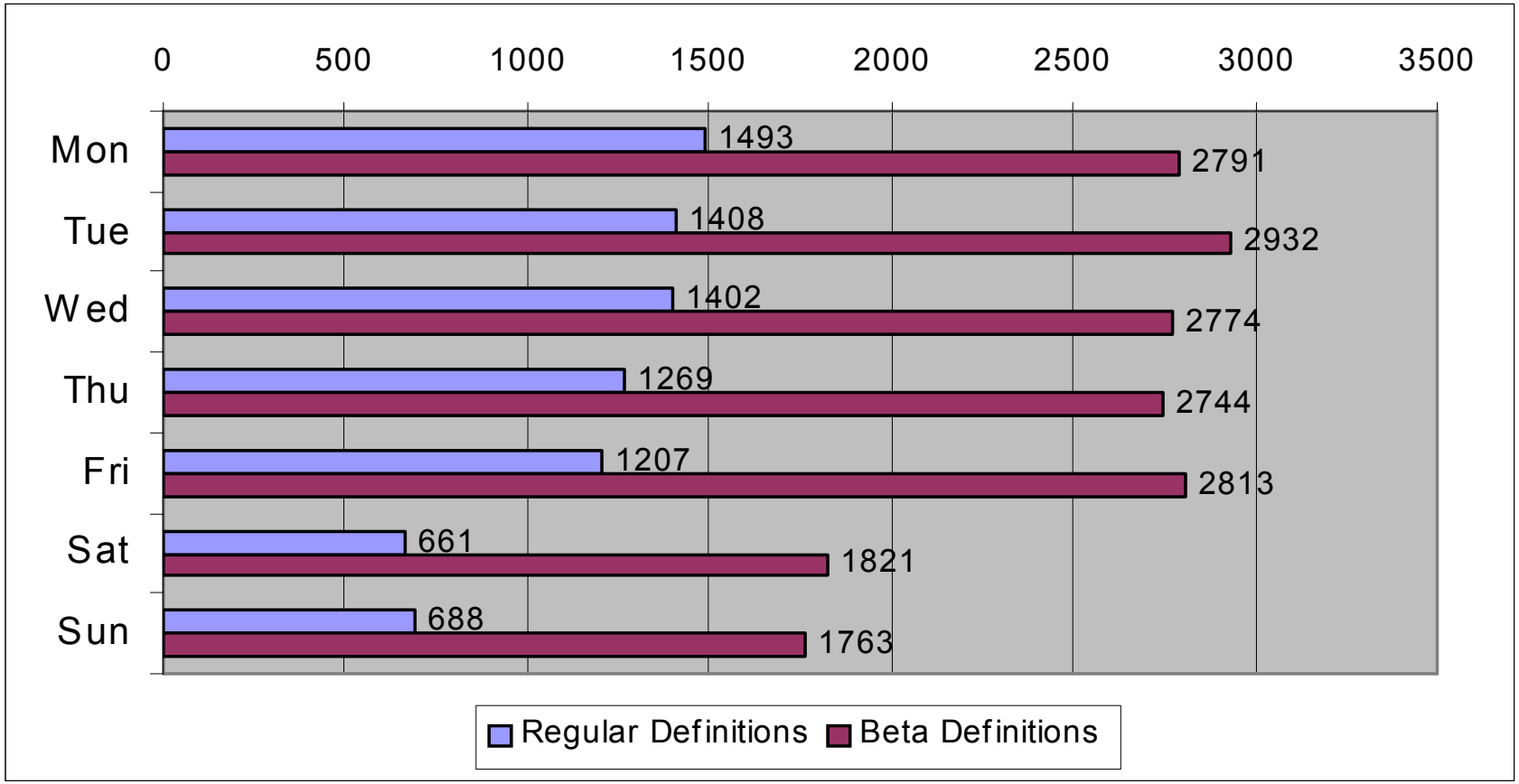
Regular update releases per company (x = product, y = # of updates / month)



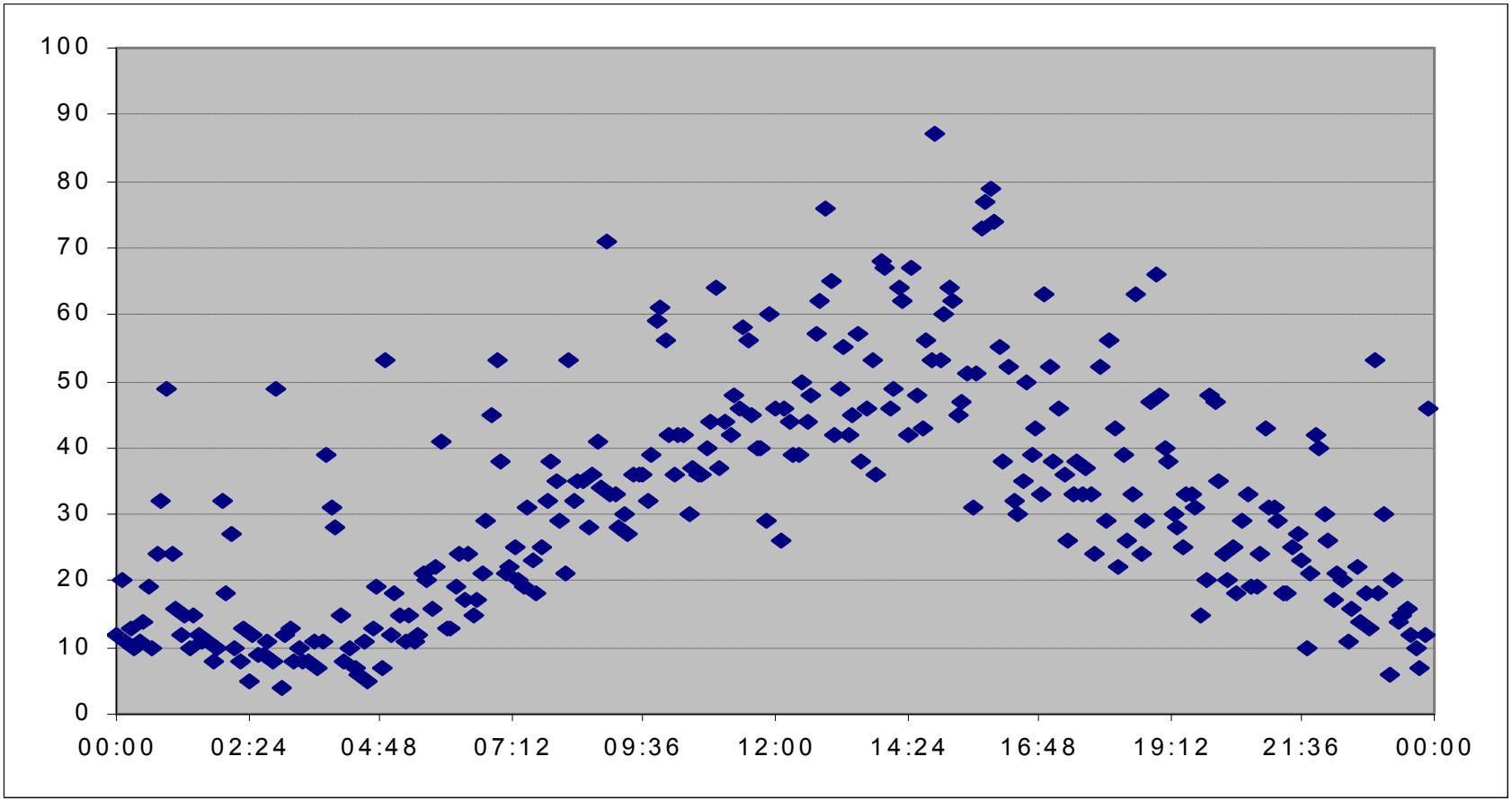
Regular update releases per month (x = number of updates, y = month)



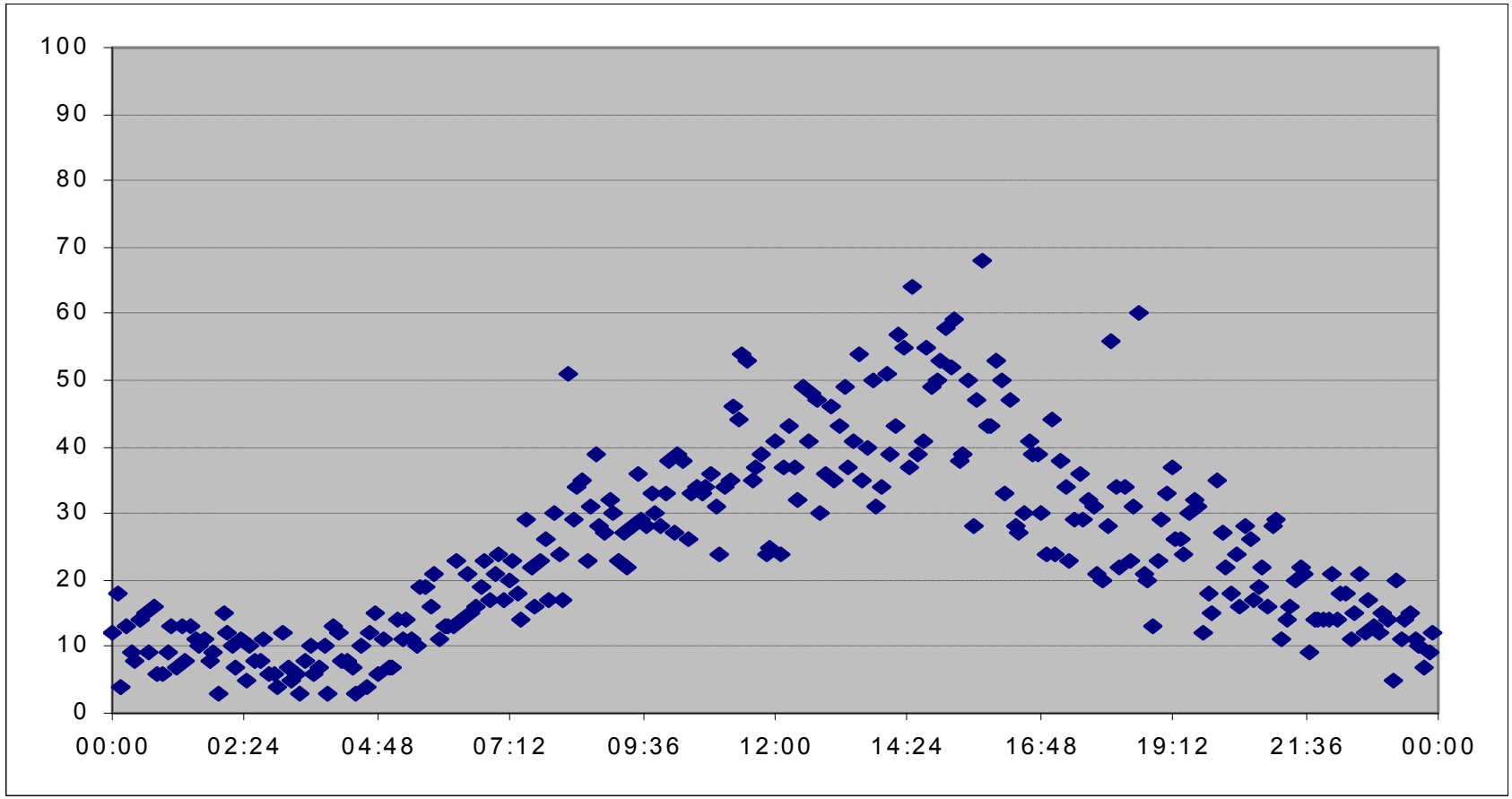
Update releases per weekday (x = number of updates, y = weekday)



Update releases per five minutes (x = time, y = number of updates)



Update releases without Kaspersky (x = time, y = number of updates)



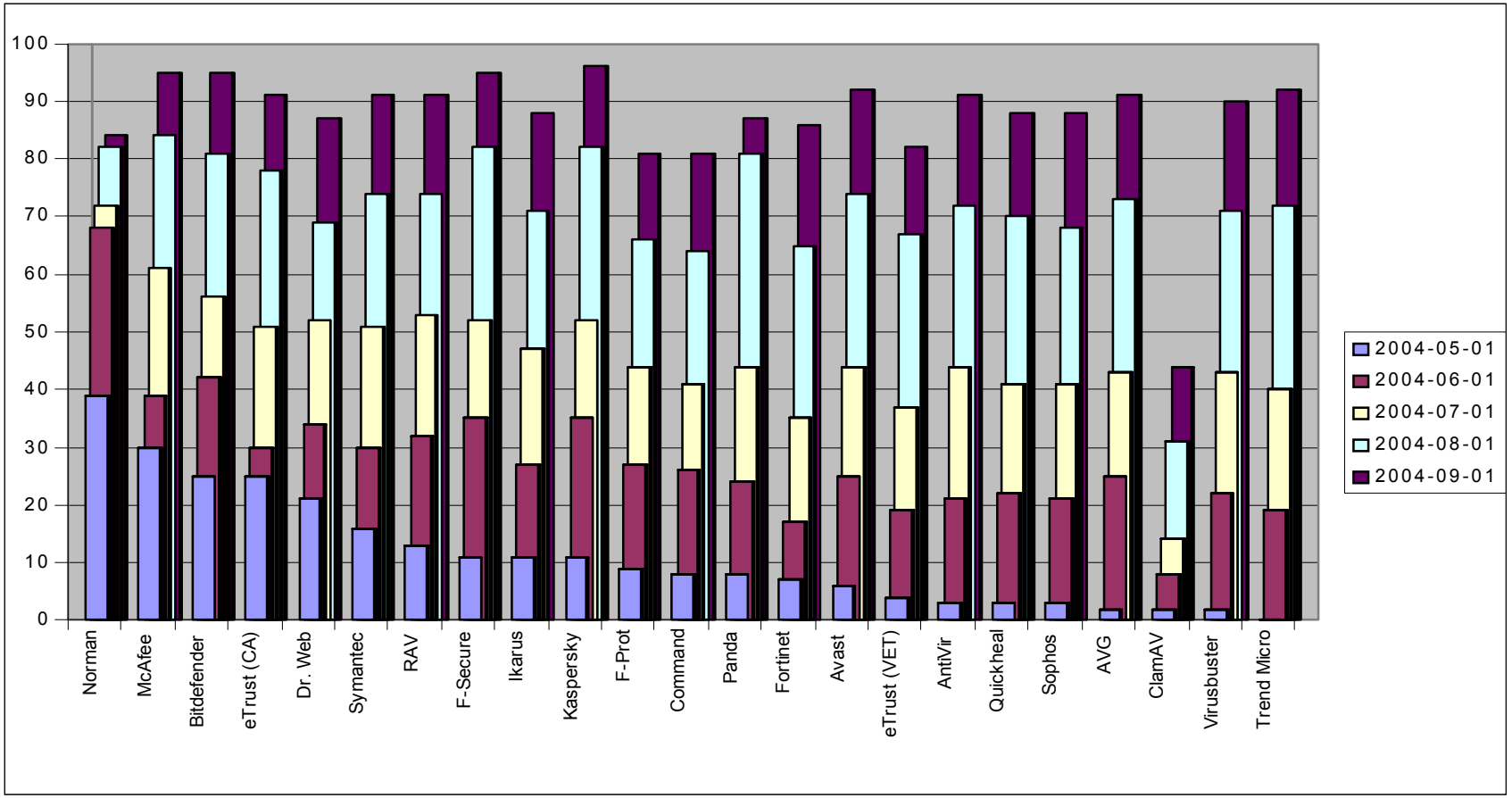
Signature file growth rates

- Average signature file growth rate of all AV vendors from 2004-01-01 until 2004-09-01 is 24.3%
- Some examples:
  - AntiVir: 1,616 KB → 1,868 KB (15.6%)
  - Bitdefender: 2,279 KB → 2,839 KB (24.5%)
  - Kaspersky: 3,424 KB → 4,361 KB (27.4%)
  - McAfee: 3,813 KB → 4,606 KB (20.8%)
  - Norman: 1,062 KB → 1,172 KB (10.3%)
  - Panda: 4,872 KB → 6,634 KB (36.1%)
  - Sophos: 5,655 KB → 6,558 KB (16.0%)
  - Symantec: 9,052 KB →10,688 KB (18.1%)
  - Trend Micro: 7,540 KB → 9,664 KB (28.2%)

Retrospective test results (I)

- Set of 100 different Win32 ItW malware (but not necessarily outbreaks), with variants of the following families:
  - Agobot, Atak, Bagle, Blueworm, Bobax, Evaman, Korgo, Lovgate, Mydoom, Nachi, Plexus, Sasser, Sdbot, Sober, Zafi
- Out of these, 23 were discovered in May, 23 in June, 25 in July, 16 in August, 13 in September 2004
- Scanners were tested in monthly intervals starting at 2004-05-01 until 2004-09-01 (this means, five test-runs)
- Tests show both the heuristic results (in May) and signature-based virus detection, plus the detection development over time
- Note: many virus authors check their new malware against ***some*** scanners first, trying to avoid heuristic detection

Retrospective test results (II) (x = product, y = detection score)



Retrospective test results (III)

- Norman scored best, detecting 39 out of 100 malware proactively using its Sandbox
  - Furthermore, a short analysis of the malware is provided
  - Negative: Requires a lot more scan time
- McAfee scored well, too (30 %), while Trend Micro detected no malware without updates

Outbreak response time test results (I)

- Our starting point (time 0:00 h) = where the first scanner detected the malware with a special (non-generic) signature update
- Proactive detection = response time of 0:00 h, too
- Alternative methods possible, but not used:
  - Starting point = the time where the first sample was seen somewhere in the world or when the outbreak started (but it‘s hard to find out the exact times…)
  - Proactive detection = 0:00 h response time, signature detection = a response time of at least 1:00 h

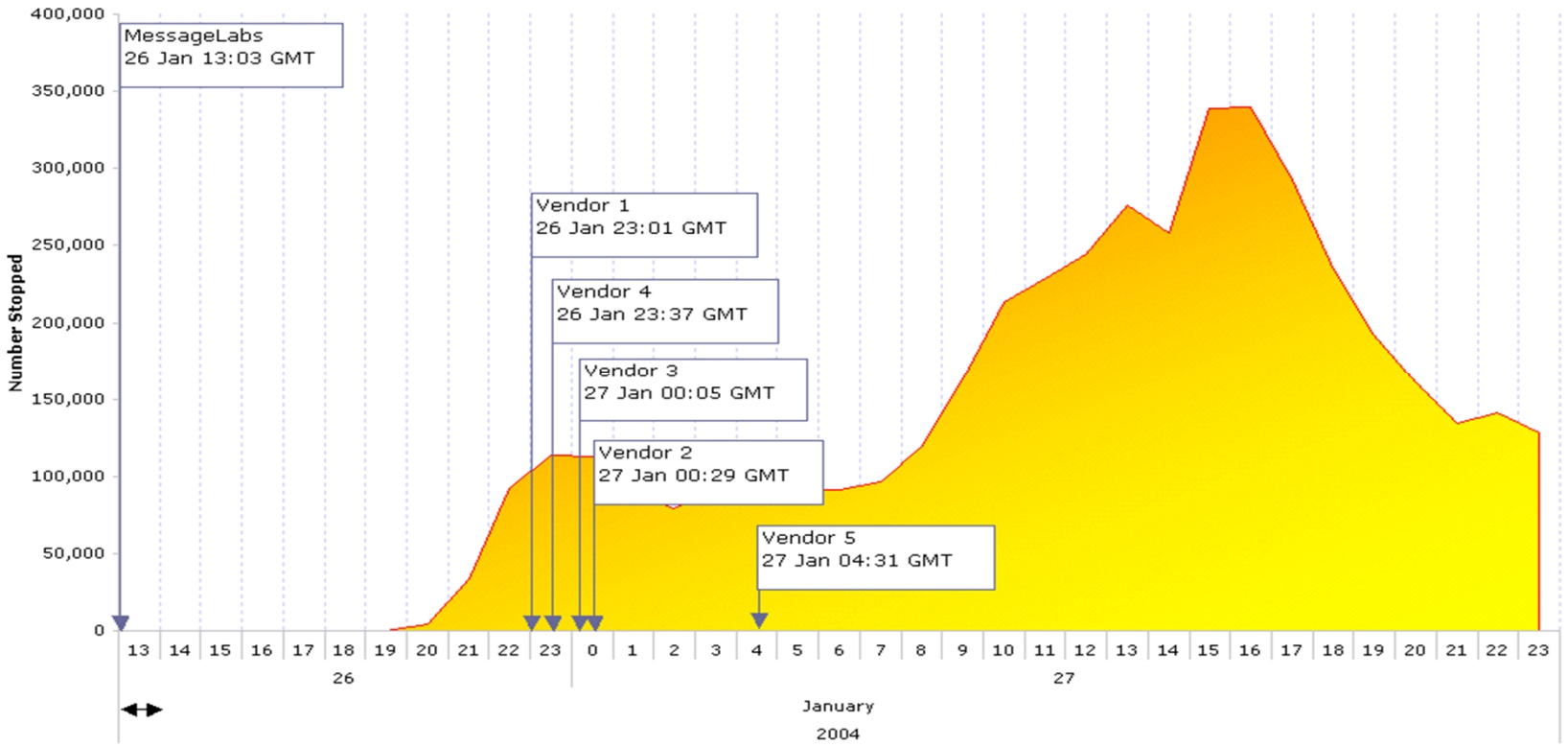
Example: Mydoom.A

- All AV updates which were released on 2004-01-26:
  - F-Prot 22:30 W32/Mydoom.A@mm
  - Trend Micro 22:35 WORM_MIMAIL.R
  - RAV 23:00 Win32/Novarg.A@mm
  - Norman 23:05 MyDoom.A@mm
  - F-Secure 23:05 W32/Mydoom.A@mm
  - Virusbuster 23:05 I-Worm.Mydoom.A
  - AVG 23:15 I-Worm/Mydoom
  - Avast 23:15 Win32:Mydoom [Unp]
  - Kaspersky 23:30 I-Worm.Novarg
  - AntiVir 23:30 Worm/MyDoom.A2

Example: Mydoom.A (continued)

- All AV updates which were released on 2004-01-27:
  - Symantec 00:05 W32.Novarg.A@mm
  - eTrust (CA) 00:20 Win32/Shimg.Worm
  - Command 00:20 W32/Mydoom.A@mm
  - Sophos 00:40 W32/MyDoom-A
  - eTrust (VET) 01:30 Win32.Mydoom.A
  - Esafe 01:50 Win32.Mydoom.a
  - Dr. Web 02:40 Win32.HLLM.Foo.32768
  - McAfee 04:00 W32/Mydoom@MM
  - Quickheal 04:00 W32.Novarg
  - Bitdefender 04:00 Win32.Novarg.A@mm
  - Panda 04:10 W32/Mydoom.A.worm
  - Ikarus 08:35 I-Worm.Mydoom

Example: Mydoom.A (stopped e-mails)
Data source: © 2004 MessageLabs



Outbreak response time test results (II)

- We measured the response times with ***publicly available updates*** of 45 outbreaks (2004 only)
- Sorry, but we have no results of…
  - ClamAV, because a large number of files in our test set are still not detected (for the detected stuff, mainly e-mail worms, the response time was less than six hours)
  - Fortinet, because the measurement interval was too small (most outbreaks were in the first quarter of 2004, but we started to track Fortinet at 2004-04-15)
  - Esafe, because we don‘t have a working scanner anymore

Average response times (I)

- Less than 2 hours: none!
- Less than 4 hours: Bitdefender and Kaspersky
- Less than 6 hours: AntiVir, Dr. Web, F-Secure, Panda and RAV
- Less than 8 hours: Quickheal and Sophos
- Less than 10 hours: AVG, Command, F-Prot, Norman, Trend Micro and VirusBuster
- Less than 12 hours: Avast and eTrust (CA)

Average response times (II)

- Less than 14 hours: Ikarus and McAfee
- Less than 16 hours: eTrust (VET) and Symantec (Intelligent Updates, but not LiveUpdates)
- Overall response time: about 10 hours
- Note: beta definition update of McAfee (DailyDats) and Symantec (Rapid Release Definitions) were usually available within less than 4 hours
- Many larger AV companies have Service Level Agreements (SLAs) for a predefined response time with ***special*** (non-publicly available) signature updates

Average response times (III)

- Reaction times are always a trade-off between a fast response and reliability (think about false positives, non-working or PC-crashing updates)
- The shown number includes only the time for the detection of the main malware component, but not for (possible) dropped files (e.g. keyloggers)
- Another interesting test: Did all companies detect the dropped components with the first update (or with a second update which was available a few hours later), too?

Average response times (IV)

- The answer is: NO!
- Only 7 out of 24 tested AV companies were able to do it: AntiVir, AVG, eTrust (VET), McAfee, Panda, Sophos and Trend Micro detected everything
- Some companies required a few days to weeks for full detection (not mentioning a full repair)
- Thus, AntiVir and Panda had the best complete updates ready within 6 hours! (Anyway, AntiVir doesn’t have incremental updates available yet…)

Summary

- Response times are a key factor of current AV solutions, but too many updates can be as wrong as too few updates
- AV industry is quite busy: About 25 % signature update growth rates for the first 8 months only
- Heuristics of some programs are very good, but consider that the detection is still below 40 %
- The overall response time of 10 hours is improvable
- Future tests: IDS and IPS systems (Jan 2005)

Any questions?

- Are there any questions?