Windows 10 and the Anti-malware Ecosystem

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Director, Antimalware strategy
We shipped Windows 10!
Recap: The Windows 10 upgrades process for AVs

• Our AV upgrade plan
  • If the AV product is Windows 10-compatible, auto-upgrade
  • Else, if the AV product has passed MS certification tests, offer for upgrade after 3 hours, and again on every reboot
  • We presented this plan in Docs, MVI meetings, and at MSRA in July

• When we presented, AVs had the following concerns
  • No time to upgrade products to Windows 10-compatible versions
  • Customers would never see/click on the pop-up
  • Customers would never reboot, see the pop-up, etc.

• We said we’d measure and report the results
What we measured

Data used: MSRT and Windows Defender telemetry

Caveats:
- data only through September 13
- not all machines run MSRT each month
- this is early in the Windows 10 upgrade process
- some issues mapping machines across OS installs
- imperfect mapping of AV vendors

<table>
<thead>
<tr>
<th>Region</th>
<th>UpgradeShare</th>
<th>Unprotected</th>
<th>Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>1.0%</td>
<td>17%</td>
<td>13%</td>
</tr>
<tr>
<td>Asia</td>
<td>15.3%</td>
<td>19%</td>
<td>6%</td>
</tr>
<tr>
<td>Australia</td>
<td>2.7%</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td>Central America</td>
<td>0.5%</td>
<td>15%</td>
<td>9%</td>
</tr>
<tr>
<td>Europe</td>
<td>39.1%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Middle East</td>
<td>1.6%</td>
<td>18%</td>
<td>12%</td>
</tr>
<tr>
<td>North America</td>
<td>32.2%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>Pacific</td>
<td>0.4%</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td>South America</td>
<td>7.3%</td>
<td>14%</td>
<td>9%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>100%</td>
<td>14%</td>
<td>6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>First: MSRT saw as Win 7/8</th>
<th>Then: Windows Defender saw as Win 10</th>
<th>Finally: MSRT saw as Win 10</th>
<th>We called this</th>
<th>How many we measured</th>
<th>What else we measured:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Auto-upgrades</td>
<td>10 million</td>
<td>Country Vendor</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Offer-upgrades</td>
<td>46 million</td>
<td>Country Offered vendor Eventual vendor AV protection state Windows Defender infections found Days Windows Defender was active OfferRetention OfferBonus FirstDayRetention</td>
</tr>
<tr>
<td>No</td>
<td>n/a</td>
<td>Yes</td>
<td>Fresh installs</td>
<td>24 million</td>
<td>Country Vendor</td>
</tr>
</tbody>
</table>
So how did AV vendors fare?

--- the biggest affecting factor:

1) Net change: AV vendors retained most customers who upgraded Windows 10
2) 77% of machines did not have on-box Windows 10-compatible AVs for auto-upgrades, causing us to offer upgrades

--- then when we had to offer AV after the upgrade:

3) The majority of machines were retained by AV vendor
4) The majority of retained machines occurred on the first day
5) Many customers chose to switch 3rd party AV vendors after the offered upgrade
6) Very few machines with out-of-date or disabled AVs were retained by AV vendor
7) Few machines where Windows Defender found infections were retained by AV vendor
8) No machines with missing Windows-10 compatible AVs were retained by AV vendor
Suggestions to increase AV retentions on Windows 10 upgrades

1) Avoid offer-upgrades
   • Get your AV ready for auto-upgrades by making it Windows 10-compatible

2) If that fails, make sure you have a Windows 10 AV for us to offer
   • Otherwise customers won’t have a fast path to install your product after upgrade

3) And, encourage your customers to enable your product
   • Unprotected customers aren’t staying with their original AV vendor

4) Also, reduce your infection rates
   • Infected customers aren’t staying with their original AV vendor

5) Promote your product/brand as Windows 10-ready
   • Ride the wave of upgrades and maybe pick up some new customers 😊
Antimalware Platform on Windows 10
Antimalware Platform

• The Antimalware Platform (AMP) is a Windows-based effort to ensure that all Windows 10 users are protected from malware by an antimalware app that provides synchronous protection using updated signatures.

• Microsoft invests in platform features that help protect our common customers. Many AMs take advantage of: ELAM, Secure Events Channel, AM-PPL, etc.

• Guidelines are required to keep the platform healthy and growing.
Antimalware Platform Whitepaper: Requirements for Windows 10

The AMPW requirements focus on three primary areas:

1. **Performance** requirements detail the metrics that will be used to ensure that antimalware software does not unnecessarily degrade the user experience. The metrics being used revolve around boot, browser launch, browser page display, and Windows Store app time.

2. **Reliability** requirements have been added in order to make sure customers are able to receive and install timely security and operating system updates. This boils down to not using undocumented APIs and data structures.

3. **User notifications**:
   
   a) AM apps must make exclusive use of User Protection Always On (UPAO) notifications that WSC provides to notify users that the app may expire soon, and enable users to proactively take action to renew their subscription.

   b) We have revised the other notification requirements in Chapter 9 to be objective and measurable, and these requirements will be included in the next version of the Whitepaper.
Motivation for AMPW Requirements

1. Current RTP software has a **dramatic impact on performance**, leading to a poor user experience. Performance impact is also a significant contributor to users turning RTP off, and thus making it less secure.

2. Necessary system updates and upgrades are **sometimes blocked** by RTP software’s use of undocumented APIs and data structures, resulting in customer frustration, as well as customers being left in a less secure state.

3. Many antimalware applications generate an **excessive number of alerts**. This not only leads to a poor user experience, but could also habituate the user to dismissing alerts if out of hand, thus missing out on truly urgent notifications.

### REASONS FOR TURNING OFF SECURITY SOFTWARE

(Base: Windows Users that would/turned off security software; USA+DEU+JPN)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected device performance</td>
<td>47%</td>
</tr>
<tr>
<td>Didn’t catch malware</td>
<td>42%</td>
</tr>
<tr>
<td>Didn’t remove malware</td>
<td>38%</td>
</tr>
<tr>
<td>Tried to upsell me</td>
<td>33%</td>
</tr>
<tr>
<td>Required too much user intervention</td>
<td>32%</td>
</tr>
<tr>
<td>Restricted web browsing</td>
<td>29%</td>
</tr>
<tr>
<td>Too many false positives</td>
<td>27%</td>
</tr>
<tr>
<td>Other reason</td>
<td>4%</td>
</tr>
</tbody>
</table>

Source: Microsoft Market Research conducted May 2015

Q(mid & right): At what point would you consider turning off or uninstalling your security software, or what has caused you to turn off or unistall your security software in the past?

Study Sample size: USA=1,652 / DEU=2,626 / JPN= 2,884
AMP Engagement Calendar

• **Windows is a Service (WaaS)**
  • 75 million devices in 1st month.
  • We’ll deliver new features when they’re ready, not waiting for the next major release.
  • *You should too!*

• **White Paper & Requirements updates to match Windows releases**
  • We’ll update the white paper up to three times a year, aligned with Windows releases.*
  • Your timely feedback on draft requirements is very important.

• **Continue regular engagement with our AM partners**
  • Today at Virus Bulletin
  • December in Da Nang, Vietnam (AVAR)
  • February in San Diego (AMTSO)
  • May in Bucharest (CARO)
  • July in Redmond (MSRA)

* Microsoft reserves the right to change this schedule as required to keep our customers safe.
Platform Updates
Windows 10 AMP Improvements

• **AM-PPL: Antimalware Protected Process Light**
  • AM processes can run critical user-mode service components as AM-PPL which is at a higher level than an Admin thus can help shield itself from admin level malware
  • White paper on [MSDN](https://msdn.microsoft.com)

• **Secure Event Channel**
  • Extensible channel that provides critical insight into process activities
  • AMs can listen to selected TCB/kernel/win32 level events without kernel level hooks
  • TCB/kernel events are trusted, they cannot be tampered with by malware
  • Whitepaper published via Connect in Feb 2015.

• **Inbox support for Offline Cleaning**
  • WSC provides API to AM apps to make use of inbox WinRE (Windows Recovery Environment) to provide seamless frictionless offline cleaning experience.
  • AM applications can remove rootkits and kernel malware difficult to clean online using this feature, without a need to carry their own offline environment.

We will be encouraging you to use these as undocumented API replacements
Upcoming API Deprecations

• **Anti Spyware component in Windows Security Center (WSC) will be deprecated**
  • WSC will support only Anti-Virus but not Anti-Spyware
  • Converging will simplify AM management through WSC
  • All the existing APIs will continue to work, and will gracefully ignore Anti-Spyware registration/status

• **WDEnable API will be deprecated** ([MSDN link](https://msdn.microsoft.com))
  • Windows Defender status that the calling application wants to set. **TRUE** enables Windows Defender. **FALSE** disables Windows Defender.
  • This API will be deprecated.
  • WSC is the only supported way to disable Windows Defender

• **Timeline for Change**
  • Anti Spyware component deprecated: July 2016*
  • WDEnable API deprecated no later than July 2016*

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Reliability
Real World Problems with Current Reliability

Example 1
Internal testing showed that Windows would suffer BSOD when receiving a security update if the user had AM software from a particular vendor. The update was delayed for the entire world for a month. When it did ship, Windows Update detected if that vendor’s software was present and didn’t install the update, leaving those customers insecure until the vendor issued their own update.

*Root cause*: relying on undocumented data structures.

Example 2
Another vendor’s AM software blocked upgrades to Windows 10.

*Root cause*: the software was parsing signature information directly, rather than using the publicly documented crypto APIs.
Antimalware apps for Windows 10 must not use any undocumented, unsupported or private Windows APIs or data structures.

Antimalware apps for Windows 10 should use Microsoft-documented APIs and data structures for which documentation is:

- Publically available via the Microsoft Developer Network, and/or
- Privately shared with antimalware ISVs via the Microsoft Virus Initiative or Virus Information Alliance.

Our goal is to improve reliability, not limit your ability to detect block or remove malware.
Update on API lists sent to Microsoft

• Since July:
  • Received more than 1000 requests from 12 ISVs → 700+ unique APIs and data structures.
  • Volume much higher than expected.
  • We’ve triaged many of them, sent some back to you via Sysdev for more info.

• Themes have emerged:

<table>
<thead>
<tr>
<th>General Use case</th>
<th>How it is done</th>
<th>Supported Mechanism to Consider</th>
</tr>
</thead>
<tbody>
<tr>
<td>System observation for detection purposes</td>
<td>Hooking/interception of undocumented APIs for parameter inspection. Writing signatures to match calling patterns associated with known malicious behavior.</td>
<td>Secure Event Channel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Filter Drivers</td>
</tr>
<tr>
<td>System observation for self-preservation purposes</td>
<td>Hooking/interception of undocumented APIs for parameter inspection. Looking to match calling patterns associated with known malicious behavior with their own processes/resources as the target.</td>
<td>AM-PPL</td>
</tr>
<tr>
<td>Direct modification of APIs/Data Structures for</td>
<td>Invocation of undocumented APIs or changes made to in-memory data structures as part of cleaning a detected threat.</td>
<td>WinRE Offline Cleaning</td>
</tr>
<tr>
<td>remediation purposes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If there are themes missing, let us know: Sysdev or APISupport@microsoft.com
Performance
Why is Performance Important?

• According to Microsoft research, 19% of consumers who pay for security software rate performance as one of their top three criteria for purchasing.

• According to the same study, 47% of users who turned their security software off did so because of how they perceived it affected device performance. This was the number one reason cited for disabling security software.

• A Forester Research study concluded that performance was the second most important criteria (behind reliability) for purchasing a new PC.
Performance Requirements

For a given metric, a system falls into one of three categories, based on measured performance: exceptional, on target, or strong concerns.

For each of the four metrics, we run the test twice, once without the 3rd party AM software and once with it.

For each of the four metrics, a system must be in the same measured performance category with the 3rd party AM software as it was without it. If it does, it passes for that metric. If it doesn’t, but the performance degradation was less than 20% or less than 200ms, then it still passes.

There are eight predefined off-the-shelf systems with varying characteristics that are used for testing. The antimalware must pass for all 4 metrics on all 8 systems in order to be compliant.

<table>
<thead>
<tr>
<th>ADK Assessment</th>
<th>Metric and units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boot Performance (Fast Startup)</td>
<td>Total Boot [Excluding BIOS] Duration in seconds</td>
</tr>
<tr>
<td>Internet Explorer Startup Performance</td>
<td>IE Startup Duration (User Perceived) in seconds</td>
</tr>
<tr>
<td>Internet Explorer Security Software Impact</td>
<td>Page Display Time in seconds</td>
</tr>
<tr>
<td>Windows Store App Performance</td>
<td>Launch time in seconds</td>
</tr>
<tr>
<td>Microsoft Edge Performance</td>
<td>Navigation time in seconds</td>
</tr>
</tbody>
</table>
Do not delay in submitting your app for performance testing. See submission details in the white paper.

“The ADK enabled us to make double digit improvements for many perf metrics across low/mid/high end platforms. For some metrics we observed 30% ~50% improvements.”

--AM vendor performance engineer
Problems with Current Notifications

- Alerts that are modal and display on top of whatever other applications the customer has open
- Alerts that do not leverage Windows Notification Services (WNS)
- Alerts that are not always clear or actionable to the customer (Ex: “Unknown device or PC detected”)
- Alerts that are shown to the customer by default, with no option within the desktop app to turn off alerts.
- Frequent pop-ups for marketing or sales purposes

REASONS FOR TURNING OFF SECURITY SOFTWARE
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- Affected device performance 47%
- Didn’t catch malware 42%
- Didn’t remove malware 38%
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Study Sample size: USA=1,652 / DEU=2,626 / JPN = 2,884
User Protection Always On (UPAO) Requirement

User Protection Always On:
• Antimalware apps must use UPAO notifications that WSC provides to notify users that the app may expire soon, and enable users to proactively take action to renew their subscription.
• This requirement has been published since March 31\textsuperscript{st} 2015 in the AMPW, and it will be enforced by February 1\textsuperscript{st} 2016. This enforcement date will not be extended.

Notifying Users Before Expiration
• WSC provides an API for antimalware apps to notify users 5 days prior to the app’s expiration date. AM apps must:
  • Register with WSC to report their apps correct status as expired.
  • Notify the user through the provided API. (They cannot notify the user outside of the API.)
• Requirements to prompt users before the antimalware app expires. AM apps must:
  • Be active, enabled, and not out of date.
  • Be close to its expiration date.
  • Invoke the UPAO scenario, but no more than 2x’s in a 30 day period.
Windows 10 Notification Requirements:

1. Non-critical information, no user action required
   • Use a toast message with Suppress-Popup = TRUE.
   • Notification will show up directly in the Action Center
2. Non-critical issue, may or may not be due to malware issues
   • Use a toast notification.
   • No more than once per 24 hours
3. User action or decision needed, not a malware threat
   • Use a toast notification
   • No more than once per 72 hours

Windows 10 Notification Recommendations:

• Critical malware issues
  • Use current notification service via AM
  • Can use toast notifications, is desired.

Please send any feedback you have on WNS to: ECOAV@microsoft.com by 10/16.
We heard your Feedback
Upgrade.exe
UX Changes
Post-upgrade notifications: antimalware

• Feedback is consistent
  • Users want to be informed about their protection state
  • Toast notification is not prominent enough

• Adjust messaging to ensure users are informed of state and choices
  • Notify users as soon as possible, rather than 3 hours after OOBE
  • Ensure users know that they have protection (Windows Defender)
  • Users can quickly fetch a compatible version of their third party antimalware if upgrade.exe is present
  • Better way to notify users (e.g., system modal dialog, persistent toast, etc) upgrade.exe isn’t present, offer users options on landing page
Summary
Summary

• Ship a Windows 10 compatible app before your customers upgrade.

• Feb 2016 enforcements include Perf, UPAO and notifications.

• Please send us feedback on revised notifications requirements by 10/16.

• Start preparing now for the No undocumented API requirement in July.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Detailed Scenario</th>
<th>By July 2015</th>
<th>By February 2016</th>
<th>By July 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Startup</td>
<td>Total boot duration</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>App Launch</td>
<td>Internet Explorer startup performance</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Internet Explorer Security Software impact</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Windows Store apps performance</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Browsing</td>
<td>Microsoft Edge performance</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>Streaming video playback</td>
<td>-</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>File Operations</td>
<td>File Copy</td>
<td>-</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>OOBE</td>
<td>OOBE duration</td>
<td>-</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td>User Experience</td>
<td>Upgrade.exe</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>No additional apps promoted through Upgrade.exe</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Using Notifications In Windows 10</td>
<td>-</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>No undocumented APIs</td>
<td>-</td>
<td>-</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>User Protection Always On</td>
<td>-</td>
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<td>√</td>
</tr>
</tbody>
</table>
Q&A