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PERFORMANCE THROUGH TECHNOLOGY

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Ransomware is costing companies millions. What could it cost you?

Cloud sandboxing protection is as essential to security as keys are to encryption. Preventing CIOs and CISOs from having to make excuses when it comes to APTs, zero-days, and ransomware.

IMMUNITY FROM BEING A TARGET, BEING A VICTIM

There can be no doubt that every organisation now requires advanced malware protection. Even so, there are plenty of organisations that have either not yet implemented this protection, or have it only somewhat implemented. Do these organisations recklessly believe they won't be targeted? Do they think their investment in a midrange sandboxing system will be sufficient protection, in spite of the fact that it can be easily bypassed? Or do they simply accept the risk and hope for the best?

Can the CIO and CISO honestly say they have immunized the business from these threats to the best of industry standards?

EFFICACY IN THE REAL WORLD

Being effective at advanced security does not start and finish with a proof of concept and a purchase order for an appliance. It comes from executive leaders who make it clear that such threats have no place anywhere near their assets and can carry out that vision across all dimensions, including cost, locations, and user experience.

In other words, to be effective when it comes to advanced malware, the results must be real and measurable...at the speed of the business.

BETTER BY DESIGN, PROVING IT WORKS

At some point, someone has to question why things, such as appliance-centric security models in a cloud-enabled world, just aren't working out—and then set out to fix what is broken. IT security executives who understand this know that their ability to stay off the hot seat directly correlates to their ability to find platforms that truly work. Equally important, they must adopt them ahead of their competitors, thereby saving time and money that their organizations could put to better use elsewhere.

If advanced malware security doesn't work for off-network traffic, it's simply bad design. If it works on the network but not with SSL-encrypted traffic, it's also bad design. And if it ruins the user experience or the cost exceeds the benefit, then that, too, is bad design. Getting the design right is what keeps a CIO and CISO from uncomfortable conversations in the boardroom and in the media.

STOPPING MALWARE: HOW CONFIDENT ARE YOU?

Let's start off with a simple challenge:

What if I gave you a link to a piece of new malware for you to hand your CIO, CISO, CFO, CEO—any of your company's c-suite executives or board members—and you asked them to click on it? Would you be reasonably confident that your defenses would quickly prevent the malware from downloading and executing? Seems simple enough, right?

As your organisation's expert in information security, shouldn't the protections you've put in place be expected to handle something so fundamental? After all, this is really just a controlled test of something that is happening each and every day through phishing and other attack vectors.

Before you try and hit the straight pitch, consider some common curveballs about the malware:

- It is seemingly a simple PDF file, albeit containing the code to run scripts that download additional malware. The secondary payloads are specifically designed to seek out intellectual property and upload it to a drop server.
- The file, along with the secondary payloads, will be hosted on a CDN (content delivery network). More on why that matters a bit later.
- The file, along with the secondary payloads, is currently undetectable by any desktop antivirus engines (just validated by running through VirusTotal).
- It will be downloaded over SSL, thereby preventing any detection unless you are scanning SSL traffic.
- You will encourage the executives or board members to download it when they are on the network, as well as while traveling and/or at home (completely off the corporate network).

DID YOU KNOW?...

- By the end of 2016, SSL is expected to consume 60% of all web traffic (NSS Labs).
- Inspecting SSL traffic can require as many as 8X the number of security appliances.
- CDNs are the source of over 40% of web traffic—Akamai alone claims as much as 30% of that.
- Gartner dropped their antivirus magic quadrant analysis way back in 2006, indicative of what security practitioners know all too well: real security requires much more.

So right about now you are quite possibly thinking, “This is what our ridiculously expensive sandbox appliance is for!” And yet, you don’t let your boss click on that link because you have grave concerns. Why? Don’t you trust that your chosen solution for detecting unknown malware—which is absolutely what we are talking about here—can detect and then block the malware?

After all, it’s the promise of sandboxing to do the job, regardless of the location or network our target is on, before the malware ends up on the computing devices. Or, if the malware does somehow evade the detection engine, the sandbox should quickly detect and remediate that session before so much as a single packet makes it out. That’s what it’s there for, right?

Well, not so fast...

This scenario highlights the limitations of appliance-based sandboxing products in the more modern cloud era. Specifically, there are a few realities that bring us to this point:

- **Blind Spots:** Appliances are physical—even those running as virtual appliances are running on physical hardware—and have to be located somewhere, leaving you to force the traffic through them if they are to be at all effective. Remote offices and employees are often only protected by a subset of what exists at the larger offices, which is especially true for APT protection.
- **Encryption:** Further adding to the blind spots, but in its own category and deserving special attention, SSL inspection is seldom enabled, even when appliances are used. Cost, complexity, performance, and limited visibility are typically cited as the reasons for this omission by design.
- **Scale:** Scalability becomes a challenge as appliances, unlike a comprehensive cloud platform like Zscaler, end up receiving all files, absent and filtering of known bad files before they ever hit the sandbox. This is great for appliance vendors as they get to sell you even more and larger appliances, further depleting your IT budget and limiting your ability to improve in other critical areas.
- **Compromise:** In order to find the balance between cost and performance, enterprises almost always put their sandbox appliances in tap mode, intentionally letting things get through with the goal of cleaning up the mess later. So, even if you believe that the best approach is to actually defend your network from zero-day and advanced exploits, you are compromised by the rules the appliance vendors have set up to sell more hardware capacity. It just doesn’t add up.

SANDBOXING: NOT REALLY ALL THAT NEW

The term “sandbox” is nothing new. Information security professionals have been using some form of sandboxing for decades. The term conveys the idea of testing something in a secured lab setting where it can’t impact production systems. More recently, the term has been applied more specifically to physical objects (appliances) as a way to market them for fighting against the latest threat vector (APTs).

What preceded all of the clever marketing and packaging of today’s sandboxes are several programs, many of which are still very much alive in one way or another, serving as the basis for the more contemporary commercial offerings. The more popular ones are known as Anubis, QEMU, and Libvert, and those interested in digging deeper would do well to research these themselves. Which is exactly what hackers do when trying to come up with ways to get around the various APT defenses.

CONNECTING THE DOTS WITH CLOUD SANDBOXING

1 **What is cloud sandboxing?**

Cloud sandboxing is a dynamic analysis technique designed to identify malware that doesn't rely on the use of signatures. It is a technique that has been leveraged by the research community for some time and is now seen as a critical component of a defense-in-depth strategy due to increasingly complex attacks that are simply not identified by traditional signature-based approaches.

Cloud Sandboxing takes a fundamentally different approach. Rather than looking for known content within a given sample, it instead relies on monitoring the behavior of the sample when executed. In this way, when a new attack vector is exploited, even when dealing with a true zero-day, malware can still be flagged as malicious based not on the exploited vulnerability but rather on the behaviors exhibited.

2 **Why is cloud sandboxing analysis needed?**

Simple. Because static, signature-based methods just don't get the job done:

- URL filtering fails because malware can be hosted anywhere and is commonly hosted at "legitimate" sites as opposed to attacker-controlled domains. Getting past these controls is now a trivial task.
- Antivirus, being signature-based, is ineffective against new attacks. The software simply can't find a match. It's like trying to match a fingerprint or DNA sample to a criminal who has never before had his/her data recorded. To make matters worse, simply re-encoding a binary file is often sufficient to bypass a signature that was previously known. As with URL filtering, the criminal has the upper hand here, not you. To be clear, AV is ineffective against new attacks.

In contrast, BA focuses on the outcome of the attack, the malicious behaviors ultimately observed, which cannot be altered as they represent the goal of the attack.

3 **Why are appliances so limited?**

Between remote employees, satellite offices, and SSL-encrypted traffic, organizations that have made significant investments in appliance-based solutions quickly realize that only a fraction of their overall traffic is being inspected. And because visibility is critical in security, all traffic must be inspected, regardless of the source or delivery mechanism. In order to be effective, we must be able to analyze binaries regardless of employees' location, the devices they are using, or the protocols being used to access information.

And of course all of this needs to be done without any performance issues as seen by the users. This is where appliance vendors fail, as they will simply argue that more and larger boxes are required to handle the load.

YOU ZIG, THEY ZAG: BECAUSE THAT'S JUST HOW THE GAME IS PLAYED

Even with the latest sandboxing techniques, the more advanced the threat, the less likely you are to be able to detect it coming in. But there are some protections you must have in place if you hope to try to stop attacks.

For example, this discussion assumes you are addressing SSL inspection as well as ensuring that you are seeing all the traffic you should, both on and off the corporate network. If you haven't reached that level just yet, then this piece, while interesting, will probably not serve your desired outcomes. As the saying goes, you will be putting the cart before the horse.

Having addressed SSL inspection and the right level of visibility, let's say your sandbox is now getting all the interesting files. Why is it that some of the more advanced threats are still evading your defenses and getting through? And what can be done to mitigate each? The list of evasion techniques is actually quite long and evolving over time, so we'll just highlight some common techniques to illustrate the fact that sandbox appliances, absent the full picture of what is really going on, are increasingly mismatched against their counterparts.

As we know, a sandbox is really just pretending to be a user's PC, and it has to be better at pretending than the malware is at detecting the ruse. It sounds simple enough, but it hardly is. If you can imagine all the clever ways you might go about determining how to detect if you are running in a sandbox, you can bet the elite hacker community has had the same thoughts.

> "Content delivery networks will carry over half of Internet traffic by 2019. Globally, sixty-two percent of all Internet traffic will cross content delivery networks by 2019 globally, up from 39 percent in 2014."
>
> — ***Cisco Visual Networking Index:*** *Forecast and Methodology, 2014–2019 White Paper*

HOW A SANDBOX CAN BE IDENTIFIED (AND, SOMETIMES, BYPASSED):

- **VM/CPU detection:** Simply look for processes, registry keys, and other tell-tale signs that this is a virtual machine instance of a popular operating system rather than a standard desktop install. If it doesn't quite add up, just don't execute the malicious parts of your code, also known as Dynamic Code Execution, while in this state.
- **Timers:** As users won't tolerate waiting terribly long for files to be delivered, malware could simply come with a timer that prevents it from executing for, say, five to 10 minutes after it is launched. It's a simple but effective technique. Most sandboxes will, of course, deploy their own countermeasure, which is to adjust the clock in order to fool the malware into thinking the required time has lapsed. But in increasingly advanced attacks, this can also be detected and worked around.
- **Testing:** Once the hacker thinks the build is about right, testing is done to gain some degree of confidence that it won't be discovered. And this is not testing against your infrastructure, but rather in their own test sandboxes. If the budget is low, then the aggressor might just be running it through sites such as Anubis and VirusTotal. But if the budget is big, such as with a state-sponsored attack, you can bet they have many, if not all, of the same appliances you run to test against. When it comes up clean, it's time to target your users to go straight through your defenses.
- **Content delivery networks (CDNs):** What most don't realize about CDNs is that they, themselves, are a bit of a threat vector. The reason is simple: nearly all security appliances provide a higher degree of trust to CDNs, such as Google and Akamai, as doing so protects their performance (marketing data sheet numbers). Unfortunately, this implicit trust means things will get through with little to no inspection. And let's face it, it's hard to enforce a zero-trust security model when your appliance vendors are trusting huge swaths of Internet traffic for you and in spite of the security policy you think you implemented. In fact, when you run the Zscaler Security Preview tool, this is one of the clever ways we are able to demonstrate bypassing your security controls—safely, of course.

HERE'S WHAT IT TAKES TO KEEP MALWARE FROM REACHING THE DESKTOP, NETWORKS:

Reaching all locations

In order for any security control to be effective, it must have visibility into all the traffic, preferably inline and able to block bad traffic vs. those that are in tap mode and only able to alert after the malware has hit its target. It seems so simple and obvious, but the gaps faced by organizations are often huge. Zscaler closes the gaps by making the entire Internet security stack universally accessible.

Seeing inside the SSL blind spot

SSL traffic is already approaching 50% percent of total web traffic, and is expected to grow to 60 percent by the end of 2016. And as we all know, SSL is meant to be secure, not easily intercepted nor inspected. But inspecting all traffic, including SSL traffic, is what Zscaler does—at scale and without an impact to the user experience.

Most large enterprise customers running Zscaler have already implemented SSL inspection with great results. And none of them ever had to size up a bunch of appliances or compromise on what traffic gets inspected. It all does.

> "There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know."

– Donald Rumsfeld

STANDARD CLOUD SANDBOX	**ADVANCED** CLOUD SANDBOX
Zscaler conducts sandboxing analysis on suspicious Windows executables and Windows libraries downloaded from suspicious URLs. A portion of the Windows executables and libraries are collected and run in a virtual environment to detect and block threats.	Zscaler conducts sandboxing analysis for all supported files, regardless of URL: • PDF • Java • Adobe Flash • sAPKs Android Application Packages • Archive: ZIP, RAR • Microsoft Office: Word, Excel, Powerpoint • 32 bit/64 bit Windows executables and DLLs

Once Zscaler detects malicious files, it propagates fingerprints of malicious files to all Zscaler Enforcement Nodes (ZENs) throughout the cloud, effectively maintaining a real-time blacklist to prevent users anywhere in the world from downloading malicious files.

ZSCALER HAS CRACKED THE CODE ON ADVANCED MALWARE: THE RIGHT PROCESS

Pre-Filtering

Security appliance vendors have no little to no incentive/capability to do this for you!

In-line Antivirus
Blacklisting: 40 threat feeds
Signature-based Modules

Security appliance vendors have no little to no incentive/capability to do this for you! There's really no point in scanning something that is already known to be bad, right? By filtering out as much of these files, we are able to take all the knowledge that comes from over 15 million users and 40 threat feeds to really speed things along.

Suspect Pre-Processing through Static Analysis

Multi-AV Scanner
Heuristics Signatures
Packer Detection
Whitelisting
Fuzzy Hashing

At this point we suspect something might not be quite right, or at the very least we just don't have enough to rule out whether or not the binary is innocent, so we will pre-process it just to be sure. A file that we have no hash for and is clearly the first time it has been seen in the cloud is going to get this special attention. This is very efficient, as it best filters the known good and bad.

Going Deep with Full Dynamic Cloud Sandboxing

Execute and Monitor
Flagging Malicious Activity
Flagging Suspicious Activity

It's finally time for "sandboxing". Fully inline and exceeding the capabilities of dedicated appliances, the engine goes to work, fully aware that the bad guys are "sandbox aware" and quite clever at their own countermeasures, the cloud-based engines are always kept up to date, with more than a few tricks of their own up their sleeves.

Even more – Final Pass of Static Analysis and Reporting

All Static Scans...Again!
Highly Detailed Reporting

This is same as static analysis but it runs on all the samples/artifacts that are collected from the sandbox virtual machine at the end of dynamic analysis phase. All of this is then captured in the final report.

The World Comes Together!

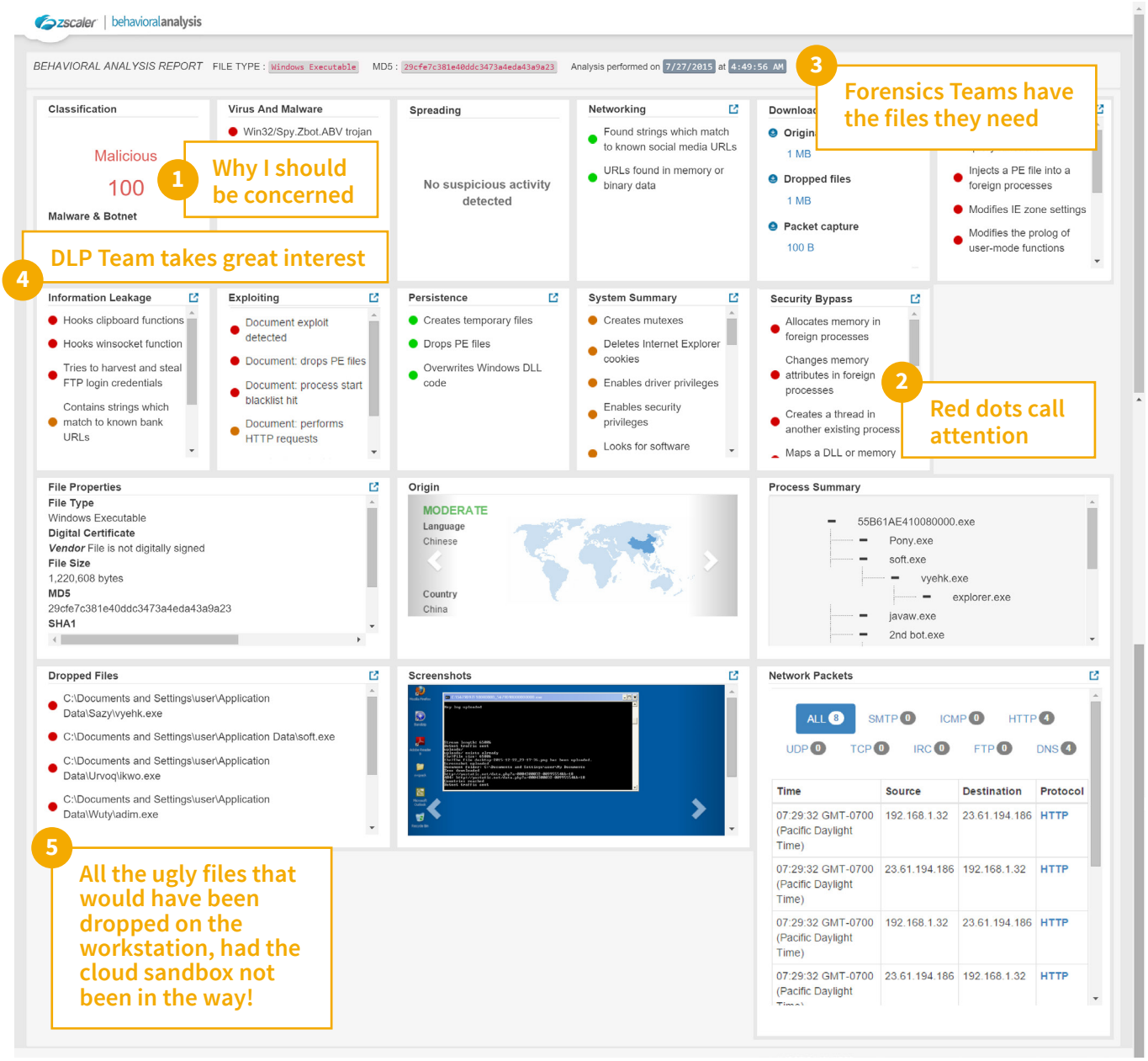
Share with over 15M Users
Over 15M Users Share Back
Entire Global Cloud Updated

There's no imagining the possible here. It's real. As others find and clean up traffic, you get the benefit and share back yourself.

DETAILED ANALYSIS—THE LIFEBLOOD OF A TRUE SECURITY PROFESSIONAL.

Having seen a malware alert in your SIEM that has piqued your interest, you can simply click the shortcut to access the detailed BA report. Here, you will see everything your professional needs require. Some will merely be events, while others may be part of a broader incident response. In either case, the information needed in the moment is there for immediate investigation.

What's really great here is that you won't be wasting your time looking through problems that have already been solved, as the only files sent to the cloud sandboxing engine are those that are truly the new unknowns.



ACTION CHECKLIST

- ✓ **Be bold:** Know with relative certainty that top executives in the company can click on a phishing email and that your security protection will sufficiently block the attack, even if they are the very first to encounter it.
- ✓ **Test your current security:** Both while on the organisation network as well as while remote. Are the results acceptable to the business leadership?
- ✓ **Inspect encrypted traffic:** Set a goal to scan outbound SSL traffic, looking for malware and data leakage. Don't let another quarter pass without having this in place.
- ✓ **Play offence—globally:** Leverage the power of the cloud, changing the rules of the game from simple defence to all-out offence. If a user clear across the globe encounters the newest malware for the first time (patient zero), you need that protection within minutes. Likewise, you want to share what you have learned.
- ✓ **Take the trash out:** If you are eating a meal but the food is spoiled, it is doubtful you would continue. Yet that's akin to what businesses do all the time, saying that their capital assets (software and hardware) must first be depreciated. That's just not good for the health of the business though. If what you have is not good, by all means, make the simple case to throw it out!

Securing the UK's leading organisations 24x7x365 from our UK NOC & SOC

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