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Is Anti-Virus Dead?

Aryeh Goretsky, Distinguished Researcher

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#ESETCast

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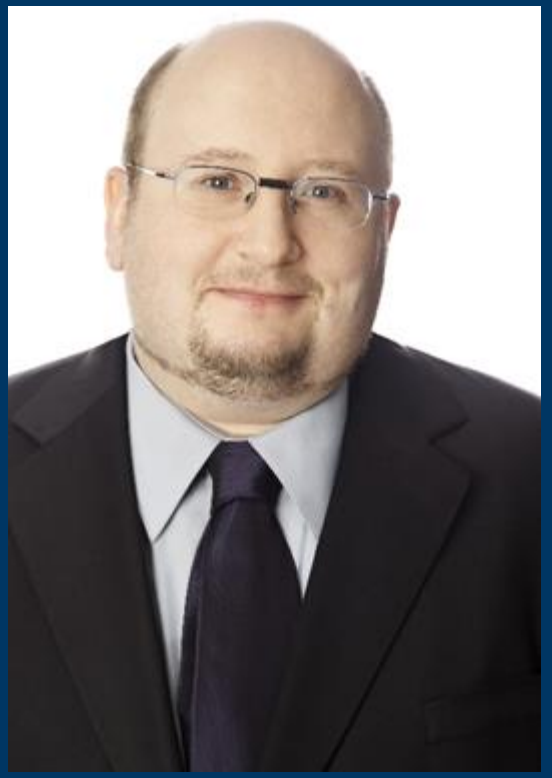

Aryeh is ESET's Distinguished Researcher and has been with the company for over nine years.

A twenty-six year veteran of fighting viruses, today he is responsible for threatscape monitoring, investigations and working with researchers in and outside of ESET globally.

He was the first employee at McAfee and is a veteran of several software and networking startups. He has received industry awards from Microsoft, Lenovo and *Securing our eCity* for his efforts to help make computing safer.

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Agenda

- Overview of the death of AV (1980s-today)
- History of threats
- History of defenses
- What is malware, anyways?
- What is anti-malware?
- Virus Bulletin 2015 highlights (if I have time)
- Q&A

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Not on the Agenda

This is an overview-level presentation, not a deep dive session. Not going to drill down into:

- **history of viruses**
- **history of anti-virus software**
- **examples of next-gen technology**
- **not going to be very ESET-specific**

While mentioned in passing, each of these is a multi-hour discussion by itself.

Who says ‘AV is dead,’ anyways?

Why say ‘AV is dead?,’ anyways

The question of anti-malware software being dead comes up perennially. Why is that?

- **those who do not understand the problem**
- **those who do not understand the solution**
- **those who are financially motivated**
- **those who have hidden agendas**

Choice words

"For me for the last three years I've been feeling that the anti-virus industry sucks. If you have 5.5 million new viruses out there how can you claim this industry is doing the right job?"

— **Eva Chen (2008)**
CEO, Trend Micro

Choice words

"Antivirus 'is dead.' We don't think of antivirus as a moneymaker in any way."

— **Brian Dye (2014)**
SVP Information Security, Symantec*

****Mr. Dye is no longer with Symantec***

Choice words recontextualized

Sometimes, it comes from within the anti-malware industry. Why?

- **it's easy to get quoted out of context**
  - **questions get reframed, cherry-picked, etc.**
- **people have agendas**
  - **responding to criticism**
  - **boosting shareholder value**
  - **getting a lot of page views**

A Quick History of Viruses

Virus *(n.)* – A computer program that modifies other computer programs to include a copy of itself, *i.e*, they exhibit parasitism. Computer viruses can be said to be recursively self-replicating.

(a generally-accepted industry definition)

Fred Cohen's Ph.D thesis *Computer Viruses – Theory and Experiments* **is published in 1984.**

First definition of a "computer virus" as:

a computer program that can affect other computer programs by modifying them in such a way as to include a (possibly evolved) copy of itself *

*Actual definition (via Dr. Cohen's thesis):

1.1 WHAT IS A COMPUTER VIRUS?

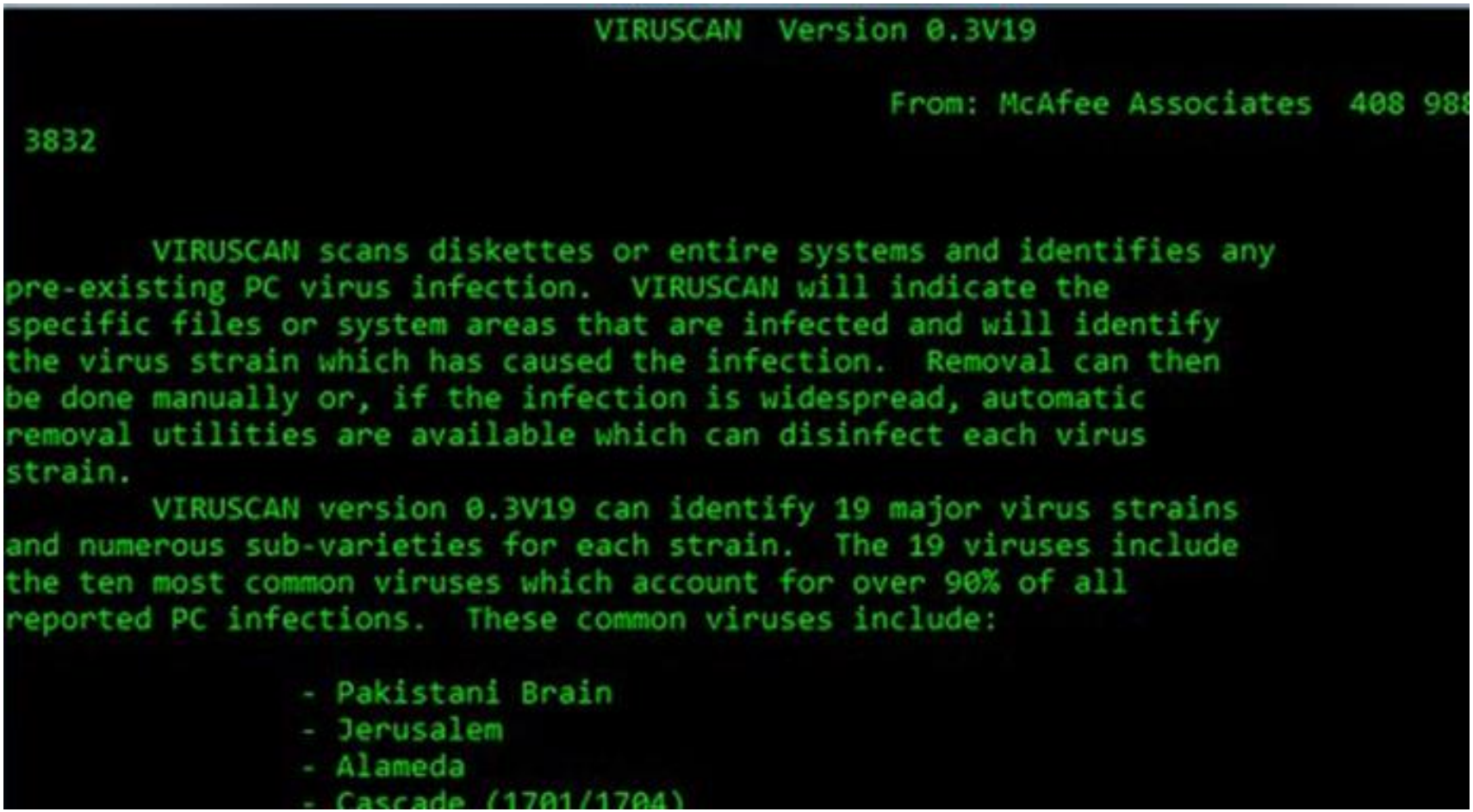
I would like to start with a formal definition

$$
\begin{aligned}
&\forall M \forall V (M,V) \in VS \Leftrightarrow [V \in TS] \text{ and } [M \in TM] \text{ and} \\
&\quad [\forall v \in V [\forall H_M [\forall t \forall j \\
&\qquad [1) P_M(t) = j \text{ and} \\
&\qquad 2) \square_M(t) = \square_M(0) \text{ and} \\
&\qquad 3) (\square_M(t,j), \ldots, \square_M(t, j + |v| - 1)) = v] \\
&\Rightarrow \qquad [\quad \exists v' \in V [\exists t' > t [\exists j' \\
&\qquad\quad [1) [[(j' + |v'|) \le j] or [(j + |v|) \le j']] \text{ and} \\
&\qquad\quad 2) (\square_M(t', j'), \ldots, \square_M(t', j' + |v'| - 1)) = v' \text{ and} \\
&\qquad\quad 3) [\exists t'' s.t. [t < t'' < t'] \text{ and} \\
&\qquad\qquad\quad [P_M(t'') \in j', \ldots, j' + |v'| - 1] \\
&]]]] \quad]\ ] \qquad] \quad]
\end{aligned}
$$

FIGURE 1.1 Formal definition.

A Quick History of Anti-virus

An old signature-based AV program



Defining Anti-Virus

In 1984, Dr. Cohen *also* described the three atomic (or fundamental) techniques used to detect computer viruses:

- **behavior blocking**
- **change detection**
- **signature matching**
  (fingerprint, pattern, hash, etc.)

Defining Anti-Virus

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I don't have formal mathematical proofs for these. Sorry.

Defining Anti-Malware

That was over 30 years ago. Today's threats:

- **are more sophisticated**
- **are more dangerous**
  - **financially motivated (selling spam, bot, DDoS…)**
  - **espionage (economic, intelligence, military…)**
- **require new concepts & ideas for defending systems**

Defining Anti-Malware

Today, all modern security programs use a broad range of techniques to detect these sophisticated threats using the following fundamentals:

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Defining Anti-Malware

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  (fingerprint, pattern, hash, etc.)

Often when saying “they’re not AV.” ☺

Do you think Anti-virus is dead?

- ❑ Yes
- ❑ No
- ❑ Don’t know

Malicious Software

- An umbrella term encompassing all malicious software (malware)
- Overwhelming majority of malware these days is non-viral in nature:
  - not self-replicating
  - not parasitic
- Many different types, no universal agreement about classification

Some malware types

- Adware
- Agents
- APTs
- Backdoor
- Bootkits
- Bots
- Botnets
- C&C servers
- DDoS
- Dialers
- Downloaders
- Droppers
- Exploit Kits
- Hoaxes
- Keyloggers
- Packers/crypters
- Memory-only processes
- Phishes
- PUAs
- Ransomware
- Remote Access Tools
- Rootkits
- Spyware
- Trojans
- Viruses
- Web Injects
- Worms
- Zero-days
- Zombies

To put things in perspective:

These days, when people are talking about computer viruses, they usually mean some other kind of malware.

Why call it Anti-Virus?

Public has awareness of computer viruses:

So they know they need to buy “AV” software to protect themselves.

AV Perception

- Lack of understanding how anti-malware (née -virus) works, even from other parts of security industry.
- Think that if programs don't provide 100% protection they provide 0% protection.
- Assume programs are simply matching hex strings, checksums, hashes, other predetermined values.

What people think signatures are

- Old technologies like fingerprint, pattern-matching, CRC-driven signatures were getting phased out in the mid-1990s
- Some were relatively sophisticated (regex, fuzzy logic, similarity matching, heuristics, etc.)
- May still be used for legacy detection (DOS, Classic Mac) in some cases

What signatures really are

At anti-malware firms, *signatures* are scripts or macros written in their proprietary languages used for describing:

- **Packers, cryptors, obfuscators**
  (automatically detect + decrypt)
- **Multiple families of malware**
  (covers several families + variants, accounts for polymorphism, etc.)
- **Heuristics**
  (behaviors repeatedly observed in malware…)
- **Cloud API Calls**
  (reputational/server-side analysis...)

Think of them as *maps* of malicious behavior.

Are Viruses Still Even a Problem?

- Viruses account for <10% threats seen daily
- Viruses are never going to be extinct.
- Attackers will blend techniques from them and other malicious programs
- Criminals want your money and will look for ways to continue stealing it

Building Better Anti-Malware

30-year-old+ ideas can today be applied, used and even combined in new & interesting ways.

When you get it right you can:

- **Improve security**
- **Increase performance**
- **Reduce false positives**

‘Modern’ Anti-Malware Techniques

CODE-SIGNING

- change detection

CLOUD-BASED

- client/server computing model
- move CPU intensive activities from local PC to anti-malware company’s servers

CONTEXT SENSITIVITY

- use riskier signatures, heuristic thresholds
- more likely to generate false positives on downloads, but that’s OK

‘Modern’ Anti-Malware Techniques

DETONATION CHAMBER

- behavioral analysis inside emulator or sandbox
- Determination based on codified set of rules (aka signatures)

GENERIC DETECTION

- teaching neural networks to…
  - create signatures for families (easy)
  - but not cause false positives (hard)

INDICATORS OF COMPROMISE (IOCs)

- signatures for evidence of infection

‘Modern’ Anti-Malware Techniques

HEURISTICS

- metasignatures derived from observed behavior, other signatures, etc.
- signatures calculated for behaviors

HIPS

- behavior blocking… for applications

NIDS

- signatures… for malicious network traffic

WHITELISTING

- change detection

How many new malware samples do you think the ESET virus lab sees per day?

- ❑ 250
- ❑ 2,500
- ❑ 25,000
- ❑ 250,000
- ❑ 2,500,000

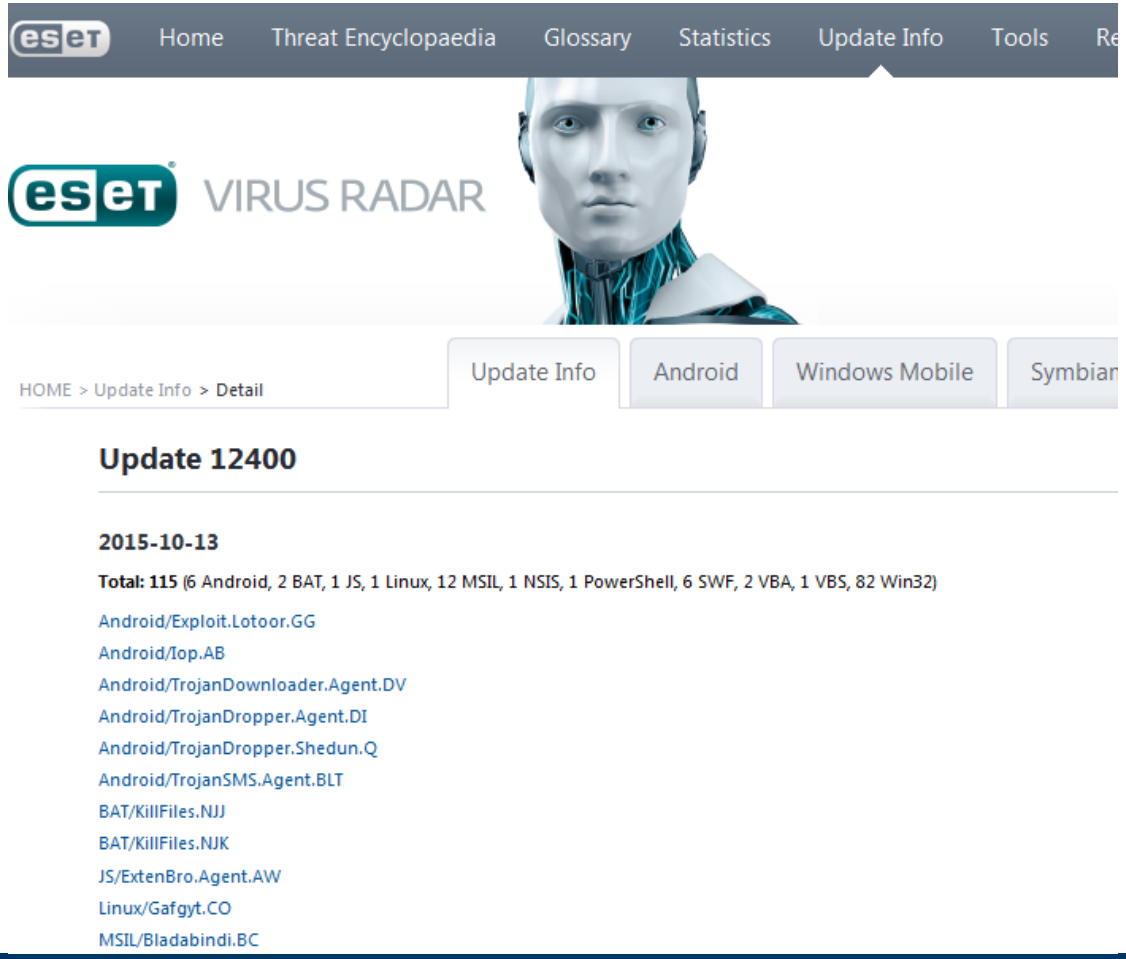
The smörgåsbord of techniques

Can you use new and old tech to protect PCs?

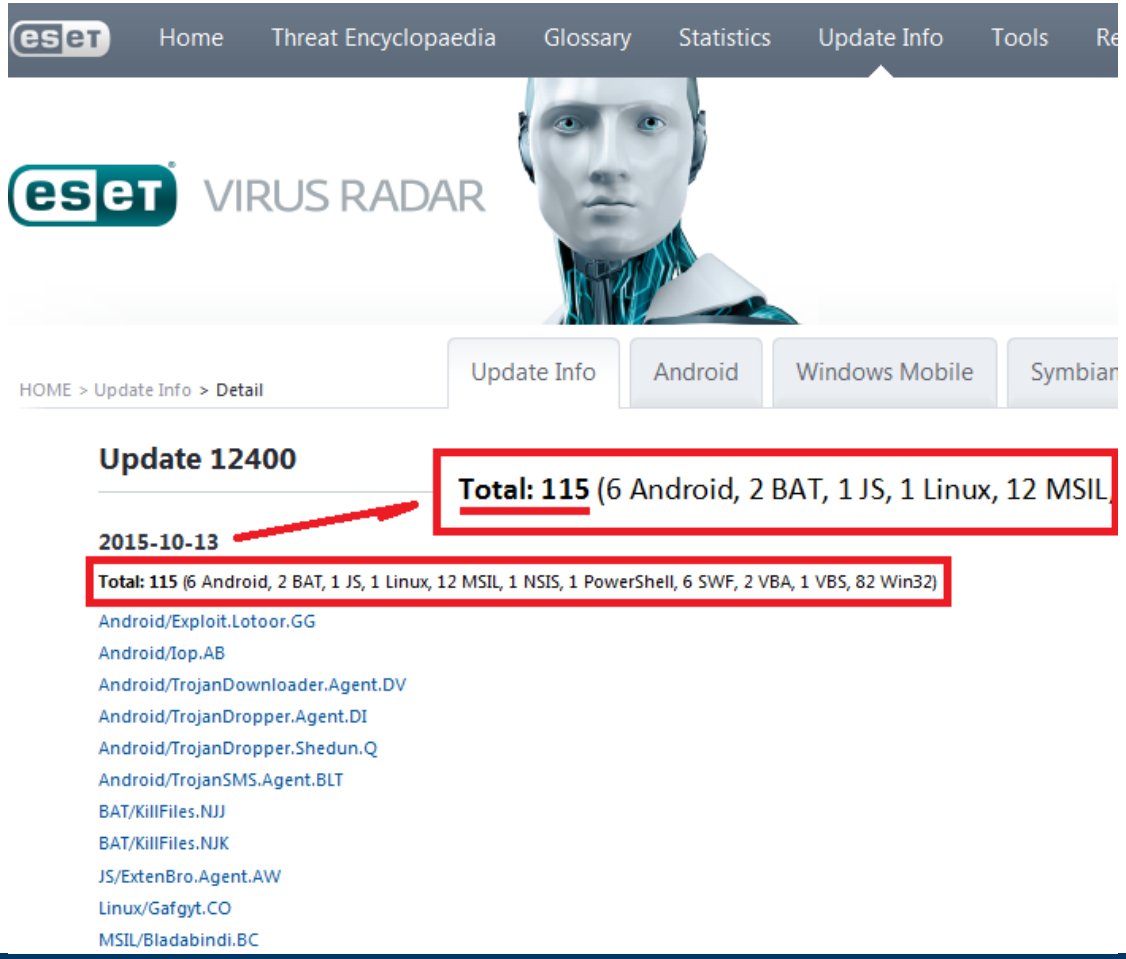
- ESET receives about 250,000 new samples of malware a day
- ESET does not add 250,000 signatures a day

Would anyone care to make a guess how many signatures ESET adds a day?

The smörgåsbord of techniques



The smörgåsbord of techniques



The smörgåsbord of techniques

Anti-malware software can

- **block 100s-1,000s of malware samples a day using specific signatures**
- **block 100,000s of malware samples a day using other techniques *(generic + heuristic signatures, etc.)***

Keep in mind, a single signature might detect a family of malware that has billions of permutations

Recap

Next generation security programs are based on three fundamental, atomic mechanisms:

- **Behavior blocking**
- **Change detection**
- **Signature matching**

So are “old” anti-virus/anti-malware programs.

Recap

What does this all mean, though?

- Even the oldest technologies can be applied in novel ways
- It is important to keep track of research
- Innovations can occur both inside and outside the anti-malware space
- Keep on researchin’


vb
2015
PRAGUE
30 Sept - 2 Oct 2015

Virus Bulletin 2015 highlights

Economic sanctions on malware

Prof. Igor Muttik *Intel Security*

- **increase costs to malware ecosystem**
  - technologies to de-incentivize malware authors

Virus Bulletin 2015 highlights

The *Kobayashi Maru* Dilemma*

Morton Swimmer, *Trend Micro*; Nick FitzGerald, *independent researcher*; Andrew Lee, *ESET*

- **Offensive hacking**
  - Is attacking the attackers legal? Ethical?

**bonus points for Star trek reference*

Virus Bulletin 2015 highlights

discussions about

- APTs
- Certificate technologies
- Linux malware
- Packers

I would like to request one of the following

- ❑ Contact from ESET Sales
- ❑ Technical Demo
- ❑ Business trial
- ❑ Information on becoming a Reseller Partner or MSP
- ❑ None of the Above

Q+A Discussion

Bibliography

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- *Paper: Hype heuristics, signatures and the death of AV (again)* – Virus Bulletin
- *Presentation: Economic sanctions on malware* - Virus Bulletin
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- *Signatures, product testing, and the lingering death of AV* – We Live Security
- *Symantec Develops New Attack on Cyberhacking* – Wall Street Journal
- *Trend Micro's CEO says 'AV industry sucks'* – The Register

Join Us Next Time…

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Thank You

No presentation gets done in a void, and I'd like to thank my co-workers for their assistance:

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And thank you for attending!

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Aryeh Goretsky

WWW.ESET.COM
WWW.WELIVESECURITY.COM

aryeh.goretsky@eset.com

@goretsky *(personal)* / @esetna / @welivesecurity

/u/goretsky

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