Insider Threat Mitigation

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CERT Insider Threat Mitigation to Date

2001
First empirical studies of insider crime

2007
Interactive training simulation and workshop developed

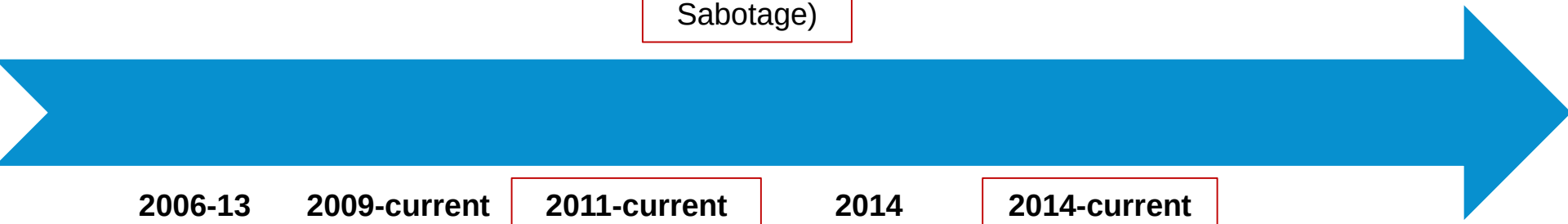
2009-current
Insider Threat Vulnerability Assessment applied

2012
The CERT Guide to Insider Threats published (Theft, Fraud, Sabotage)

2014-current
Insider threat mitigation patterns applied in industry (OSIT group)

2014-current
Assist all DoD military branches to develop ITPs

2015
ITPM, ITVA, ITPE certificates offered



2006-13
Espionage model developed for DoD

2009-current
Insider Threat Workshops

To date, 33 workshops presented to over 550 students

2011-current
Insider threat mitigation patterns developed and tested in DoD, DOE, DHS

2014
Develop linguistic clues of insider risk

2014-current
Insider sociotechnical network modeling and analysis

2015-current
Transition tools to DoD/IC customers

ITPM = Insider Threat Program Manager; ITVA = Insider Threat Vulnerability Assessor; ITPE = Insider Threat Program Evaluator
OSIT = Open Source Insider Threat Information Sharing Working Group

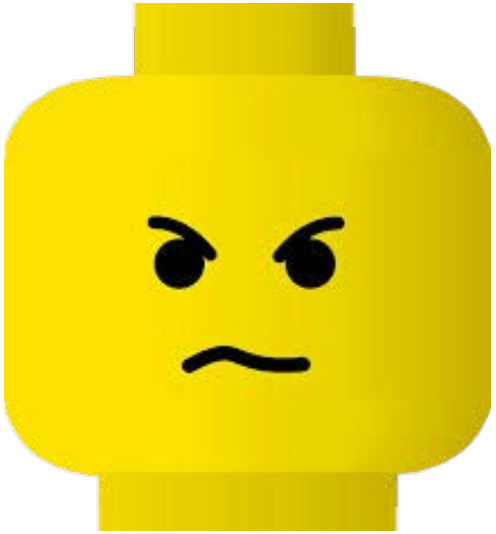
What is the Insider Threat?

The Insider Threat

“When you're in positions of privileged access like a systems administrator … you're exposed to a lot more information on a broader scale than the average employee”

Edward Snowden

The Insider Threat



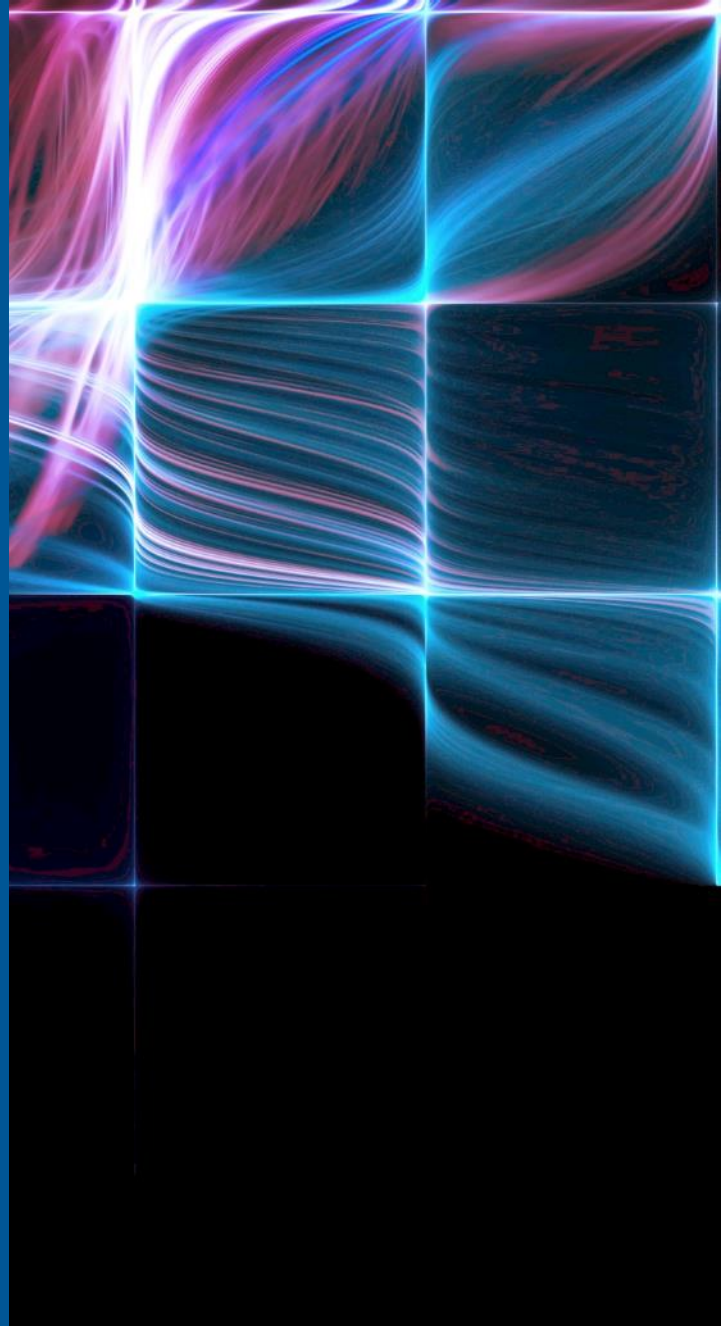
“We’re trying to locate the fugitive, but his face is so generic it matches every other face in our database.”

- The LEGO® Movie

Where to Look

Insider Threat Mitigation

Social Network Dynamics



Social Network Dynamics of Convicted Spies

Overview

- **Hypothesis:** Over time, insider social networks exhibit weakening of internal connections, AND the strengthening of external connections to adversaries
- **Data:** ~140 insider espionage incidents: court docs, media, …
- **Data Analysis method:** Measure connection strength over time between insider and family/coworkers/adversaries - Organizational Risk Analyzer (ORA)
- **Connection strength measures:** communication frequency, affect positivity

Social Network Dynamics of Convicted Spies

Progress: Hypothesis supported but is more complex than framed

- Analyzed dynamic, multidimensional networks of 9 espionage incidents (ORA)
  - Connections with family weaken; Connections with coworkers weaken or strengthen
    - Networks need to distinguish job activity from a spy gathering intel
  - Connections with adversary strengthen, including connections with any colluders
- Distinguished Enron “insiders” using machine learning (WEKA tool)
  - ROC curve identified 50% of insiders with a 18% false positive rate
- Developed simulation model of *physics* of job engagement and espionage
  - Shows how the flow of disengagement within organization translates to espionage

Sociotechnical Network Analysis

Sociotechnical network (STN) = social network + info flow network

Key Ideas

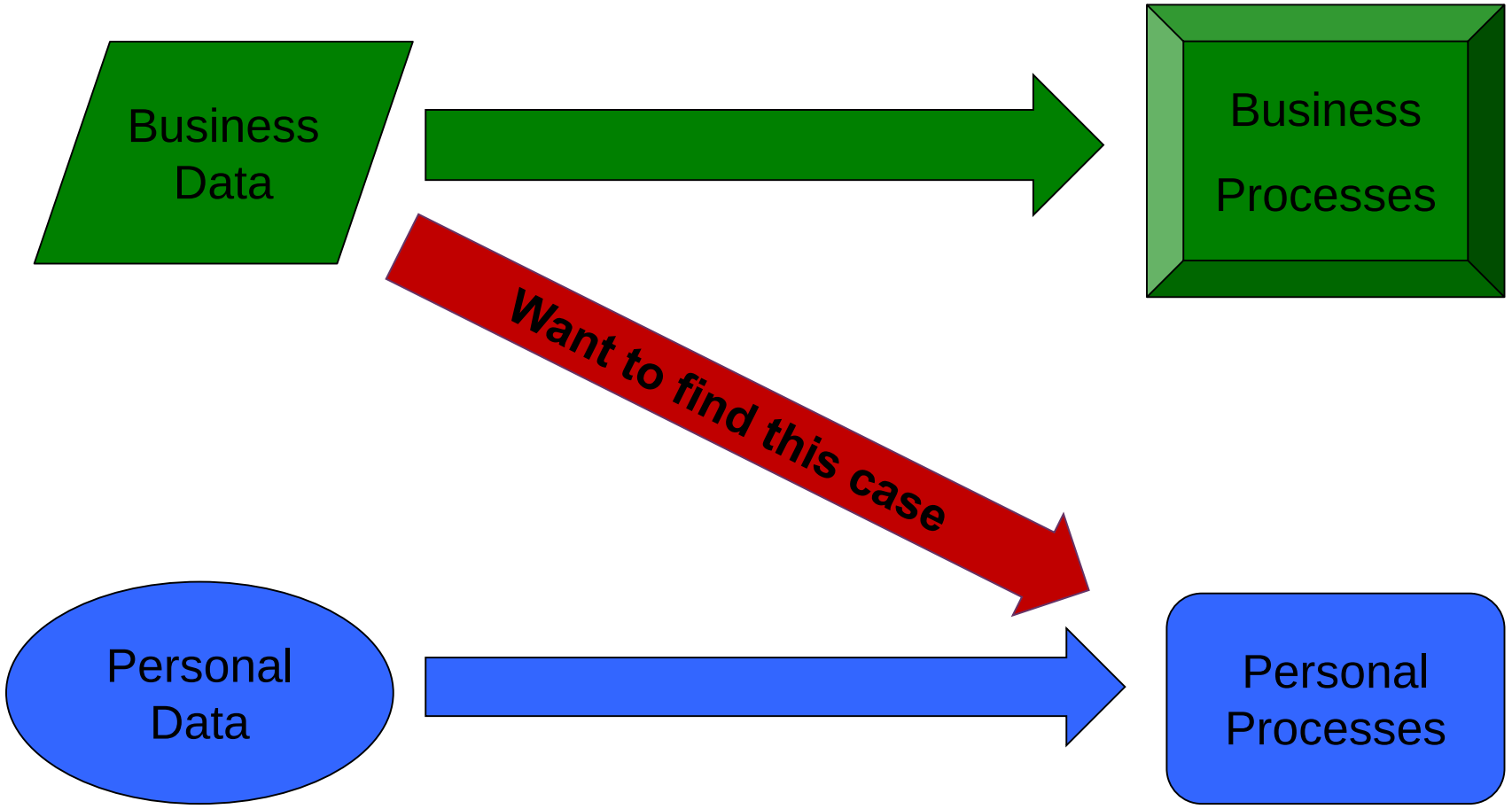
- Combine analysis of information flow networks with social network analysis
  - earlier detection with lower false positive rates
- Focus not on insider access rights
  - but movement and trajectory of info flow

Compare baseline document flows with actuals (Gemini tool)*

- Identify document (expected) workflows as baseline (up front)
- Compare actual document flows with expected; identify anomalies (real time)
- Requires comparing *documents to documents* and *flows to flows*
- *Proposed Measures*
  - *Document Similarity :* hashing, plagiarism detection, keyword matching
  - *Flow Similarity :* graph matching algorithms – eg, using GED measures

* Ard, et.al., “Information Behaving Badly,” NSPW ‘13

Information Flow Analysis



New Paradigms for IF Net Analysis

- Moves the focal point of behavioral analysis from the user to the information we want to protect.
  - Anomalous information flows point back to a user.
  - Combine these flags with SNA flags for higher-value alerts.
- Document content similarity analysis
  - Progress in the Enron dataset:
    - Analyzed cases where the same filename can indicate dissimilar content (e.g., Resume.doc, Agenda.doc), and that the same content can be found under different filenames (renamed files)
    - File extension is incorrect for 24% of the files in the Enron dataset, which inhibits our ability to extract and compare raw text

Similarity Metric Conclusions

- Bit-based forensic hashes
  - Successful in detecting file extension changes
  - Easily defeated by minor text changes
    - e.g .docx, due to xml encoding
- Text-based similarity measures
  - Similar to plagiarism detection
  - Successful at detecting minor text changes
  - Easily defeated when file extension is incorrect, for some tools

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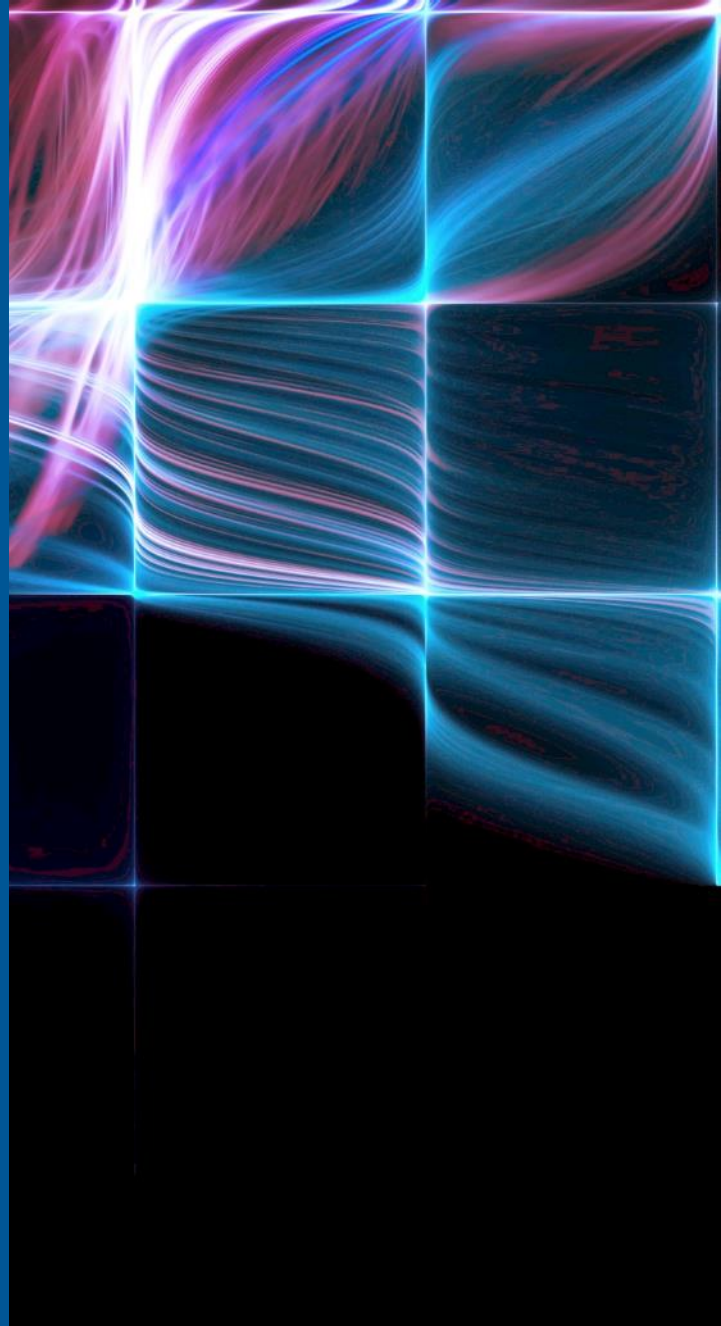
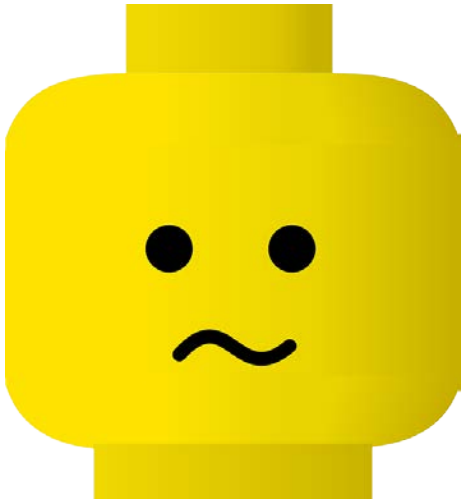
Detecting Stress

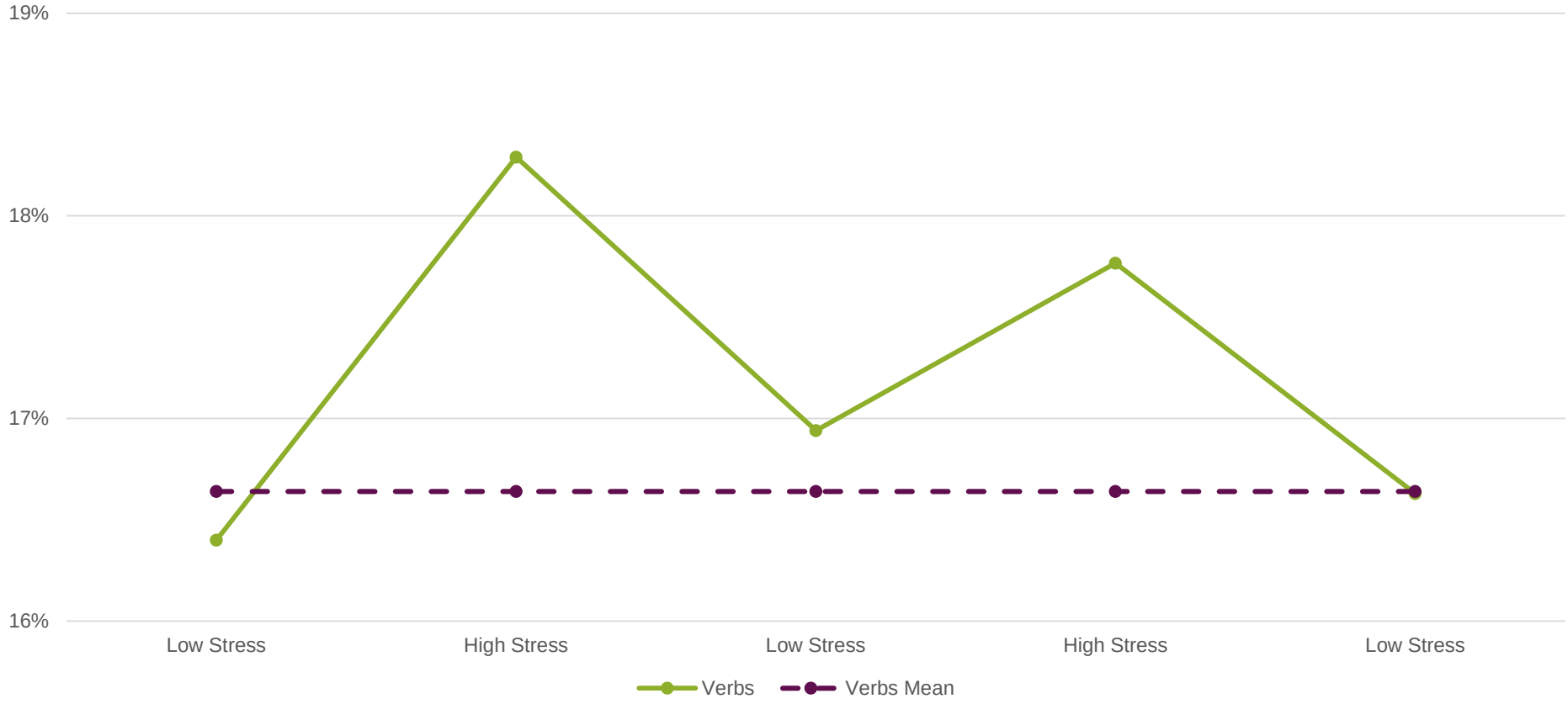


Stress Detection

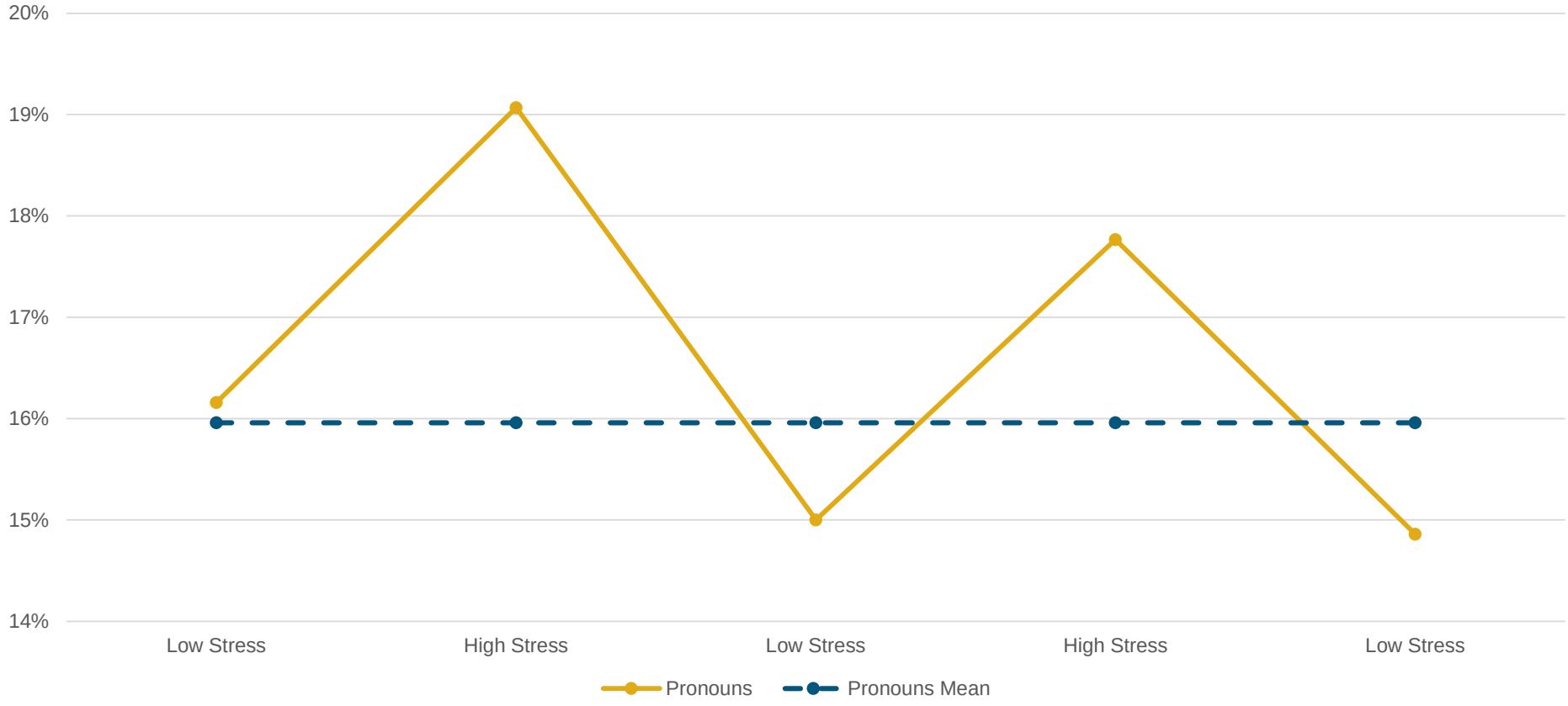
- Key ideas
  - Personality is reflected in language
  - Emotion and sentiment is also reflected in language
- Open question
  - Are temporary states such as stress also reflected in language?



Linguistic Metrics During Periods of Stress - Verb Use



Linguistic Metrics During Periods of Stress - Pronoun Use



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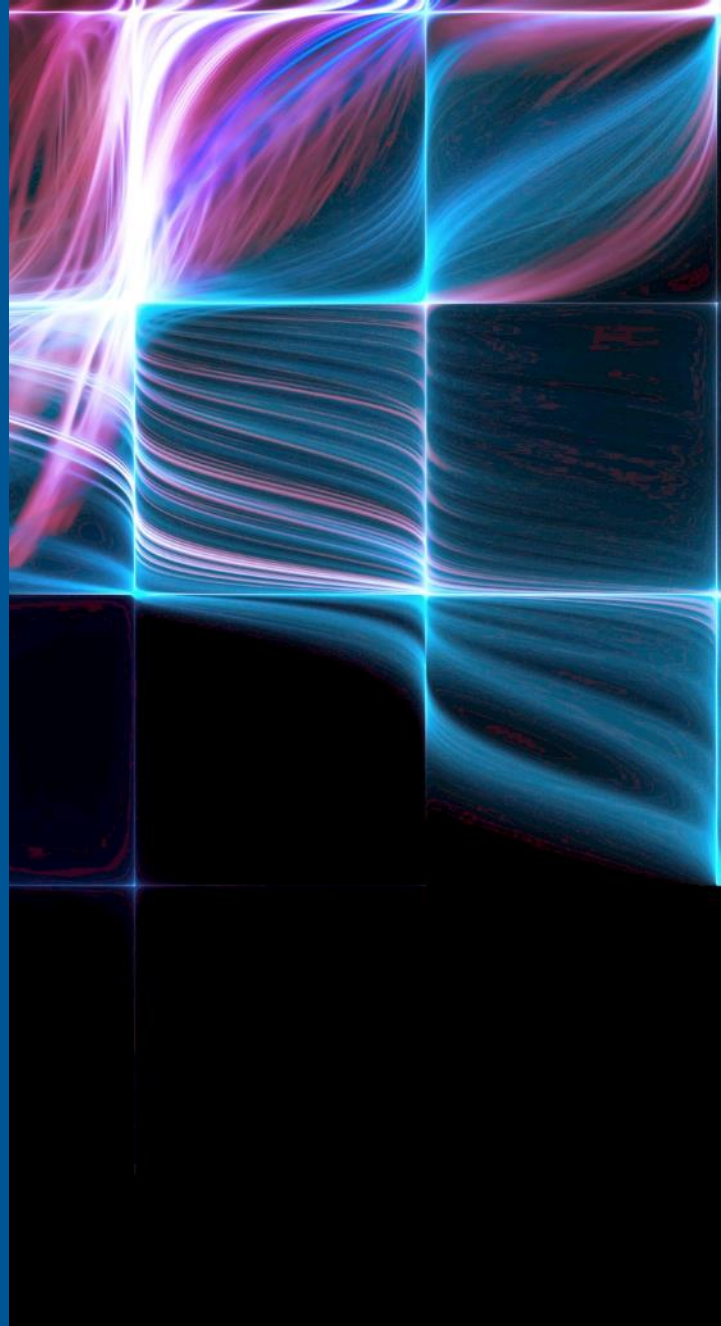
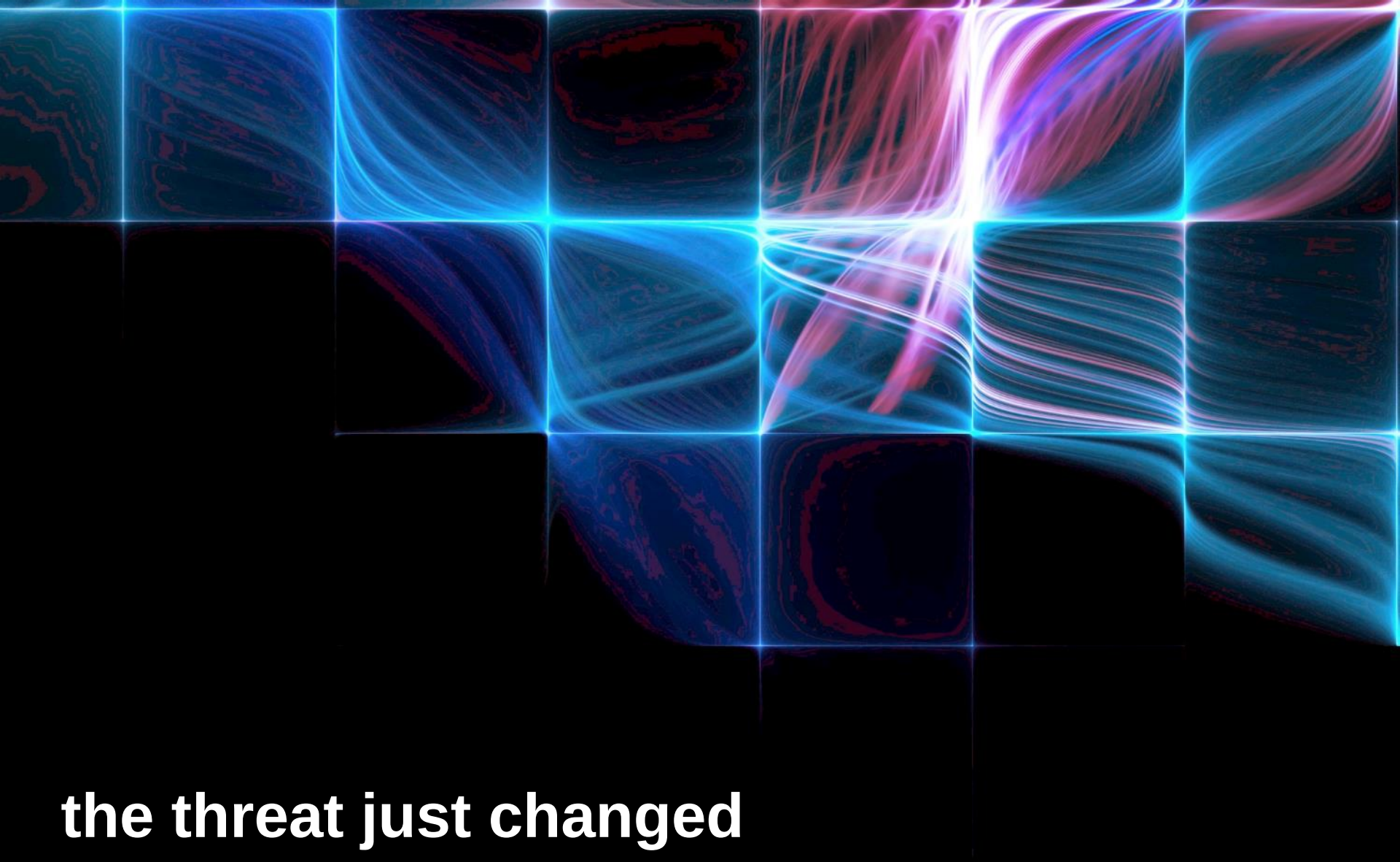
But…





the threat just changed

Poster/demo Plug

Come to our poster session and demo to see:

- Dynamic meta-network analysis of espionage incidents
- Machine learning of Enron “insiders” showing false/true positive detection rates
- Simulation model of an emerging *physics* of job engagement and espionage

Contact Information

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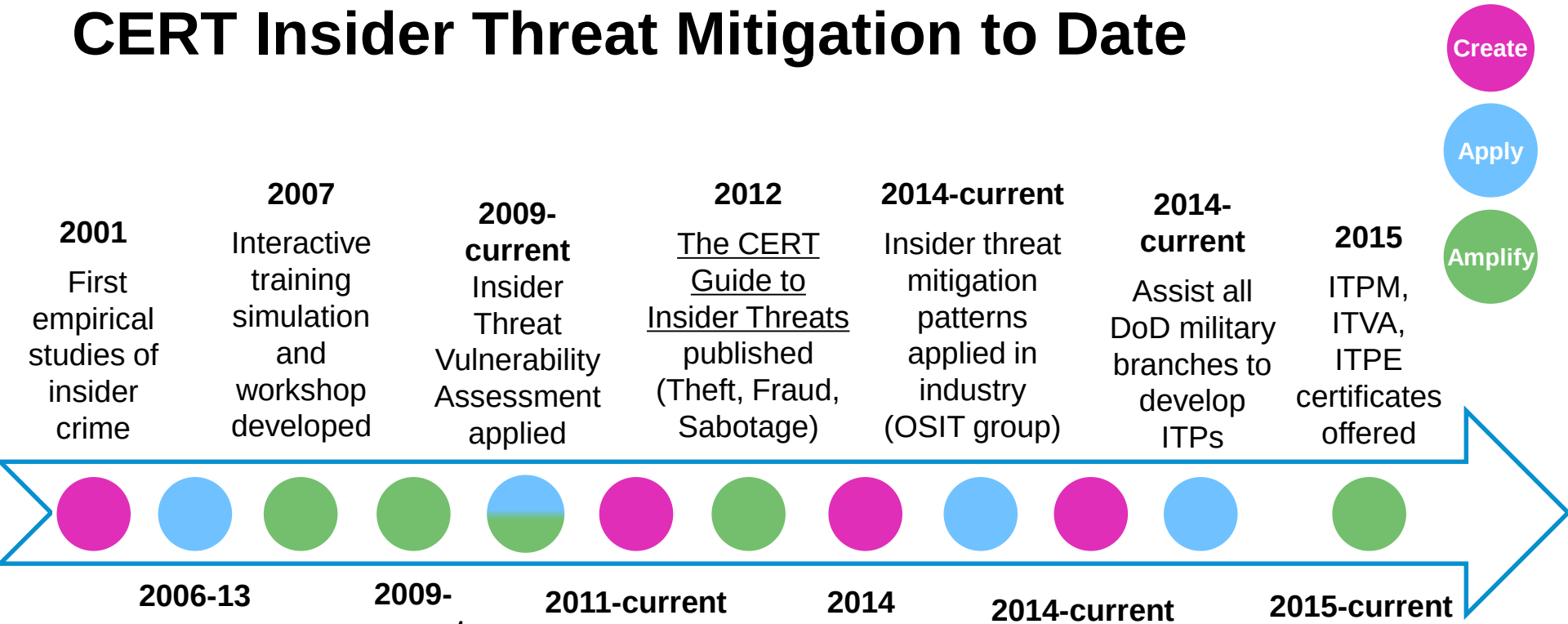
CERT Insider Threat Mitigation to Date



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