Supply Chain Security Workshop

April 28 & 29, 2021

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Hardware and Supply Chain Security in the Era of Advanced Heterogenous Integration

MEPTEC Supply Chain Security Workshop, April 2021.

Nader Sehatbakhsh
Department of Electrical and Computer Engineering
University of California, Los Angeles

Video

- Let's start with a story…

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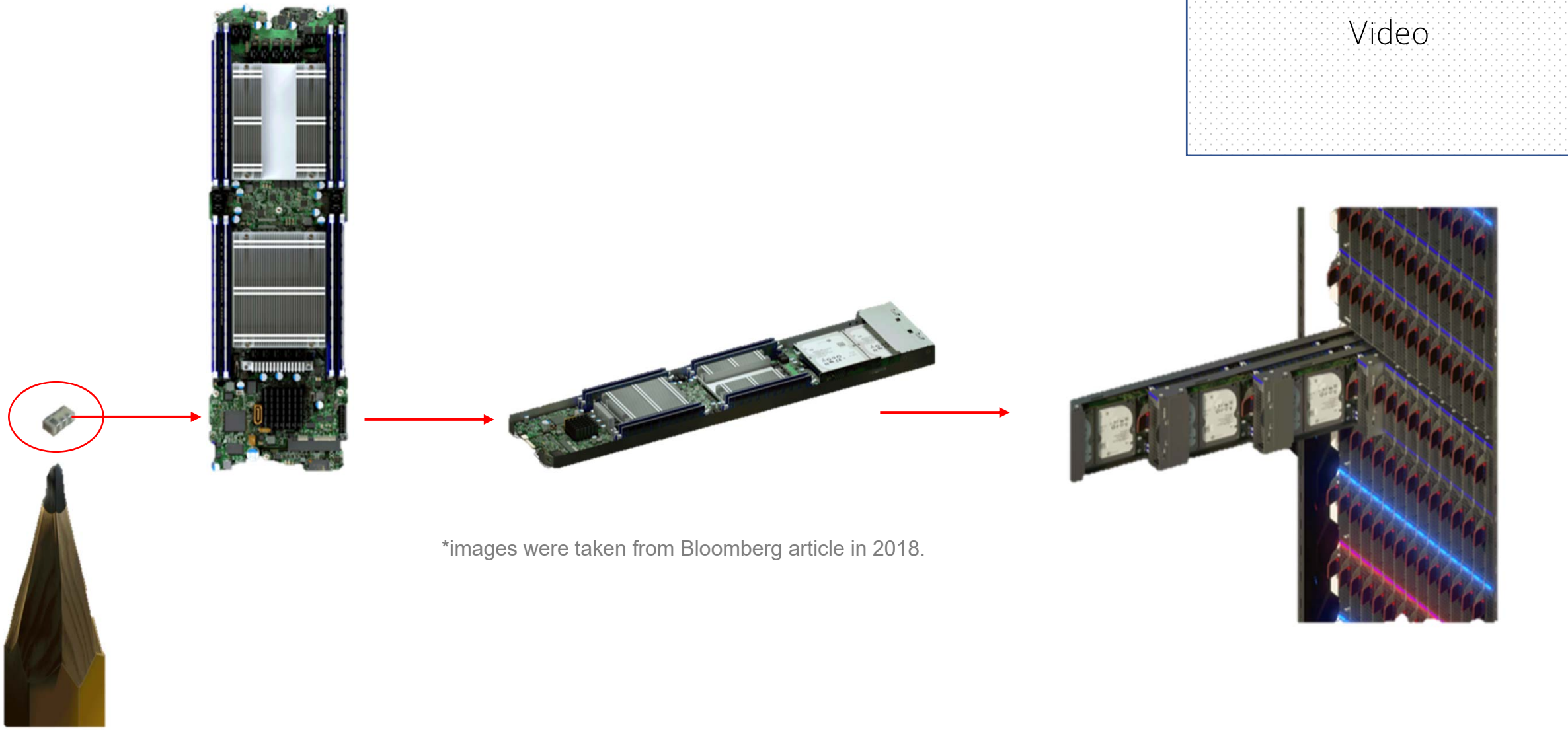
Video



*images were taken from Bloomberg article in 2018.

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Who were impacted?

Video

- AWS Servers
- Apple devices
- National Labs
- …

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Other Incidents?

Video

- *Quite a few …*

- Some where not confirmed, but technically possible, *so who knows?*

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Video

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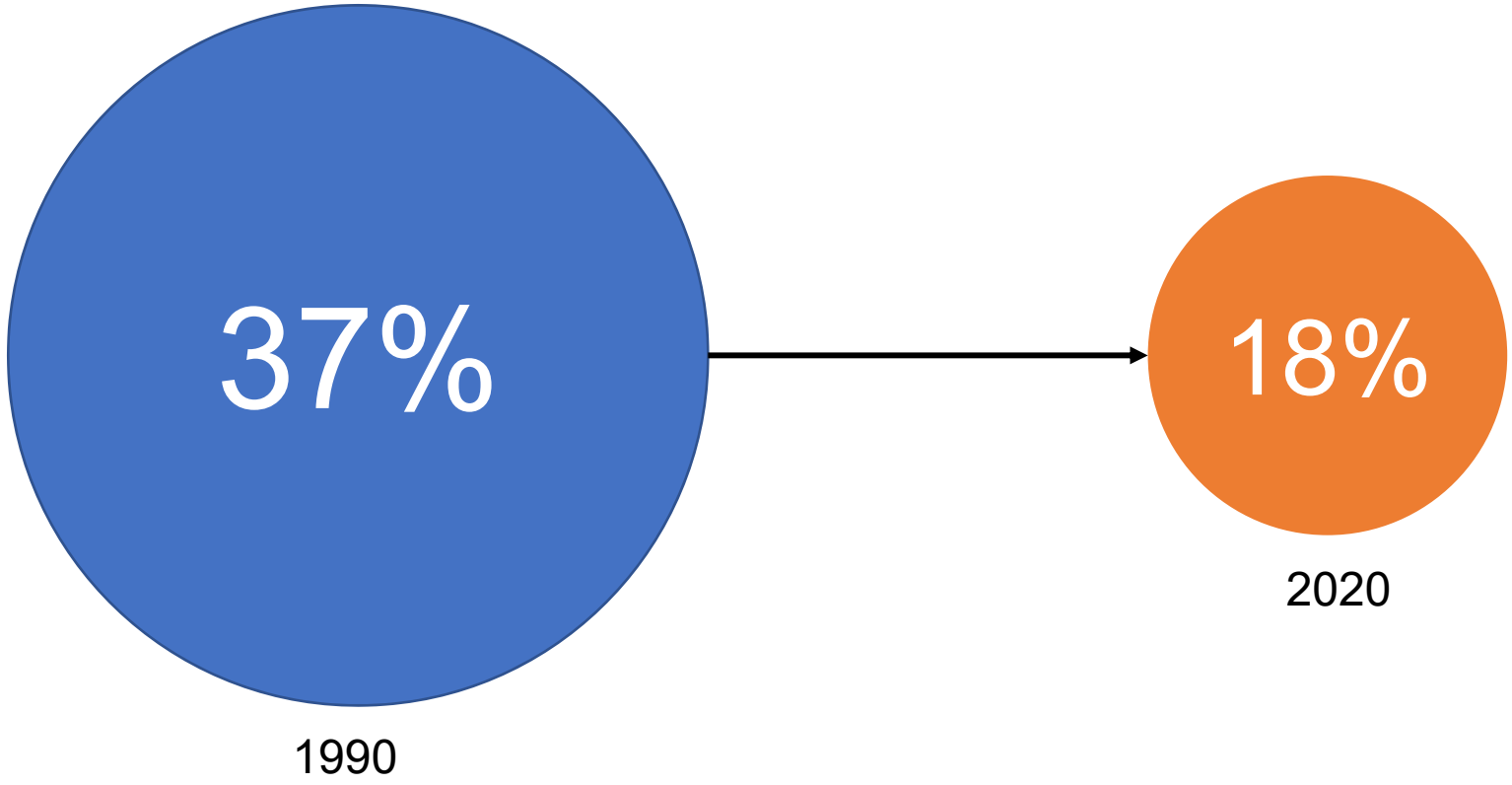
US Global Chip Production Market Share

Video



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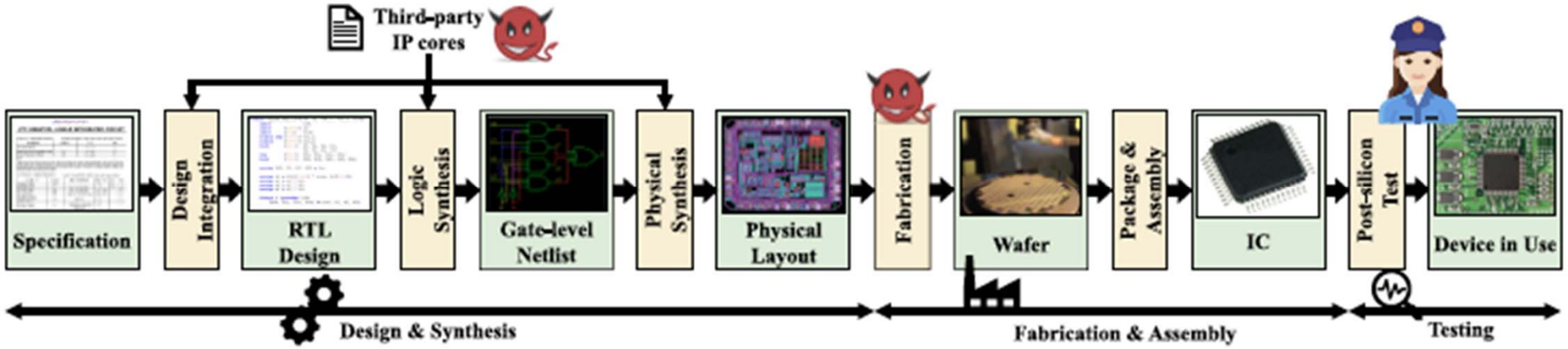
So, What could *possibly* go wrong?

Video

- Hardware *Trojans*!



*images were taken from Faezi et al., “Brain-Inspired Golden Chip Free Hardware Trojan Detection,” TIFS’21.

Is get any better?

- ***NO!***

Video

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Is get any better?

Video

- ***NO!***

-- *Why?*

Even more heterogenous technologies.

- *Complex SoCs*
- *Motherboards*
- ***Dielets/Chiplets***

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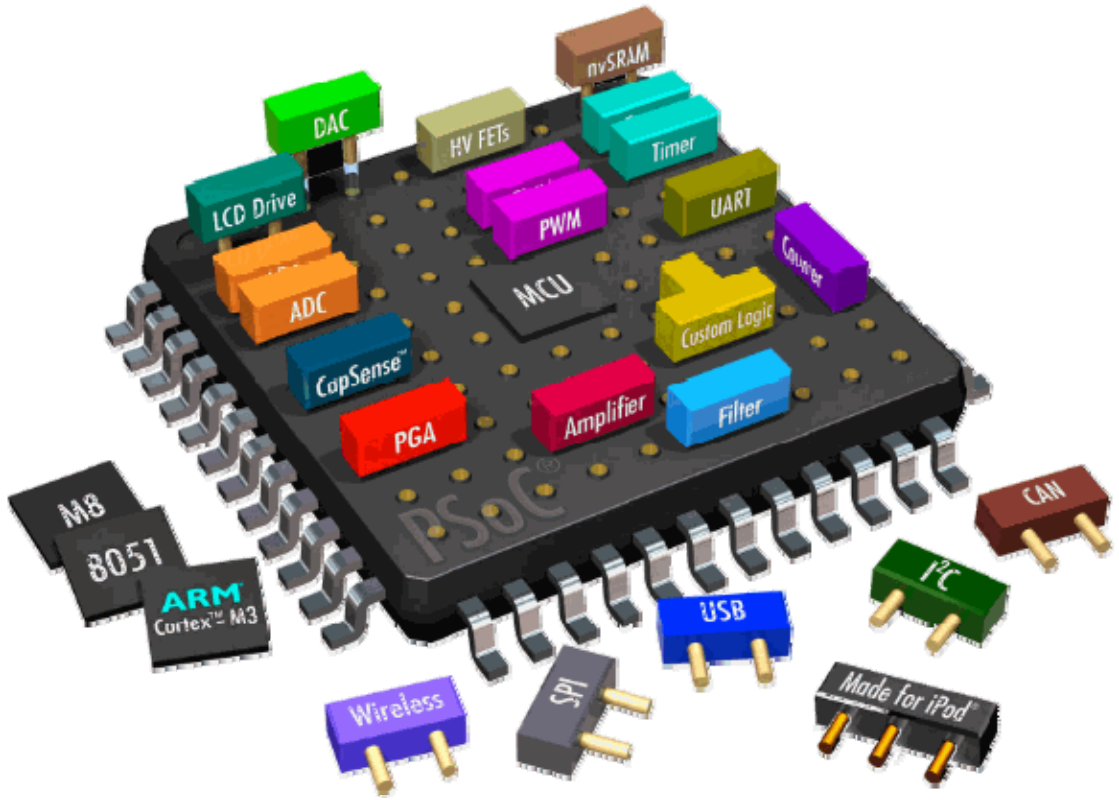
Future Systems



*images were taken from https://microcontrollerslab.com/system-on-chip-soc-introduction/.

Video

- *Integrated* either on the
  - (i) same chip
  - (ii) same silicon die
  - (iii) on a PCB

Formulating the Problem

- Two *issues*:

  1- Individual chips *cannot* be trusted *(known unknown)*.

Video

Formulating the Problem

- Two *issues*:

  1- Individual chips *cannot* be trusted *(known unknown)*.

  2- Due to complexity of the system, the adversary *can add extra functionalities/chips* to the system. (*unknown unknown*).

Video

What can we do?

Video

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What can we do?

Video

- Define the ‘trust model’ – *who can/cannot we trust?*

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What can we do?

Video

- Define the ‘trust model’
  - Can we trust the foundry?
  - Can we trust the designer?

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What can we do?

Video

- Define the ‘trust model’
  - Can we trust the foundry?
  - Can we trust the designer?

- What do we have?
  - ‘Golden’ Model?
  - Design files?
  - Many samples of the same chip?

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State-of-the-Art Trojan Detection

Video

- Reverse-Engineering / Physical Inspection
  - Imaging
  - Functional/netlist extraction

State-of-the-Art Trojan Detection

Video

- Reverse-Engineering / Physical Inspection
  - Imaging
  - Functional/netlist extraction

-- Very effective for extracting Trojans

-- Destructive/Semi-Destructive

-- May need sophisticated equipment

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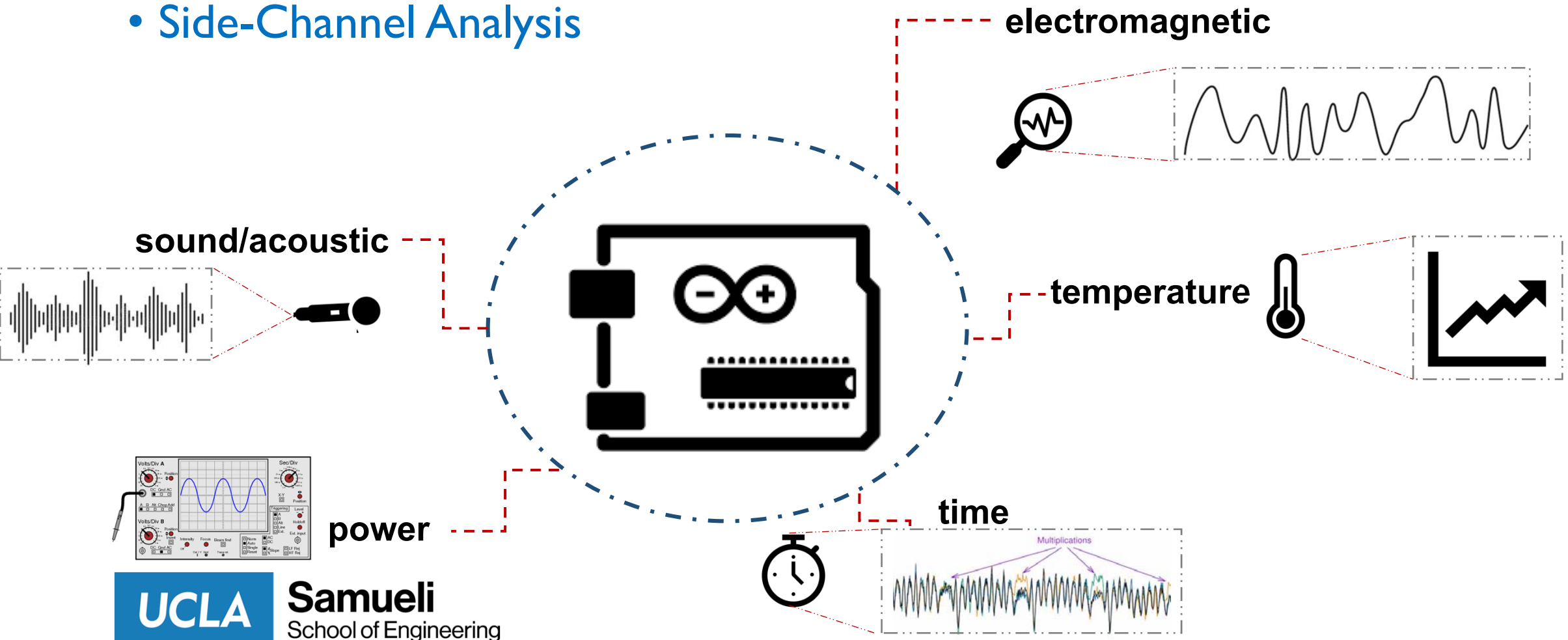
State-of-the-Art Trojan Detection

Video

- Side-Channel Analysis



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State-of-the-Art Trojan Detection

Video

- Side-Channel Analysis

  -- *Non-Destructive / low-cost*

  -- *Cannot detect subtle changes*

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Current Challenges

Video

- IF a golden-chip is *available*:
  - Testing results can be compared to a *reference*.

-- What if such a model is not available?

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Current Challenges

Video

- We can find known-unknowns (e.g., a modification in a given chip), but *how about unknown-unknowns?*

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Current Challenges

Video

- We can find known-unknowns (e.g., a modification in a given chip), but *how about unknown-unknowns?*

-- Dielet-Level / Motherboard-Level Security and Detection

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- Finding new methods to tackle these challenges.

– *Two main research questions:*
  - *How to utilize side-channel in a golden-chip-free setting?*
  - *New hardware/software methods for dielet security?*

CHIPS
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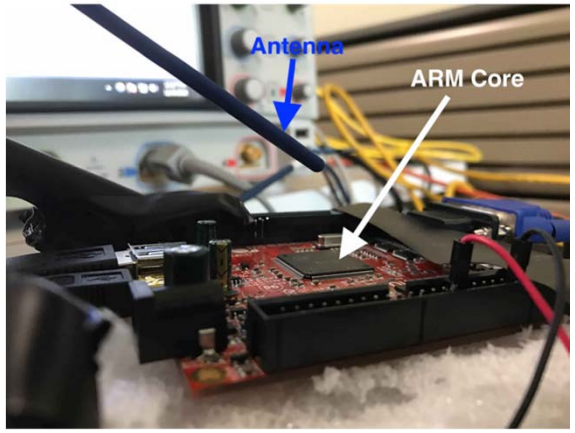
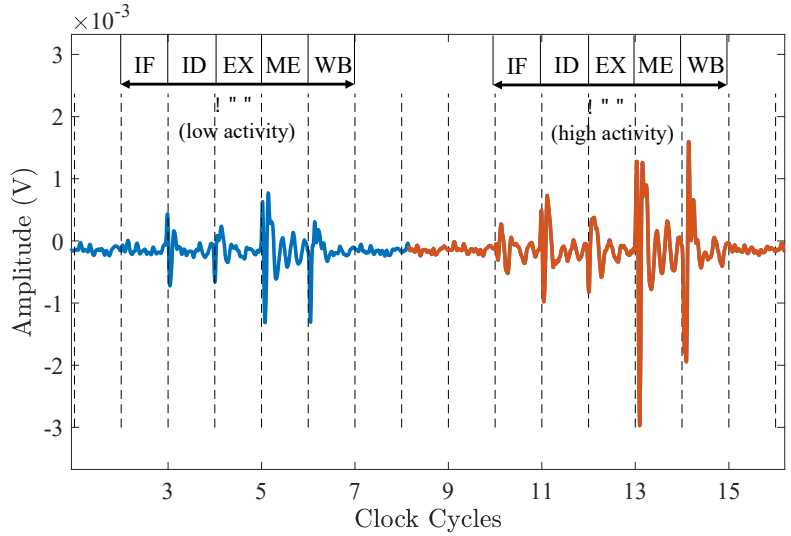
- Better understanding the side-channels for modeling, detection, and fingerprinting





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Video

- How to establish trust between (active) chips (similar to the software counterpart)?
  - Hardware/software protocols to establish trust among different chiplets. Can we use established techniques such as ***physical*** attestation to establish trust?

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Video

- How to establish trust between (active) chips (similar to the software counterpart)?
  - Hardware/software protocols to establish trust among different chiplets. Can we use established techniques such as ***physical*** attestation to establish trust?
  - Are there new, previously unexplored, vulnerabilities?

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Contact Information

Video

Building the next-generation secure heterogenous systems.

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Twitter: @SehatNader

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— **Risto Puhakka**, President VLSIresearch

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Advanced Micro Devices

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Keysight Technologies

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Virtual Event Schedule

Join us for two online sessions

Wednesday	April 28, 2021	8:00 - 11:00 am PDT
Thursday	April 29, 2021	8:00 - 11:00 am PDT

Your personal Zoom link is the same for both days.
Zoom will send you a reminder before the start of each session.

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Speakers April 28

Saverio Fazzari
Booz Allen Hamilton

Supply Chain Challenges for Defense Systems

Sridhar Swamy & Akash Malhotra
Advanced Micro Devices

Securing Supply Chain

Nader Sehatbakhsh
University of California Los Angeles (UCLA)

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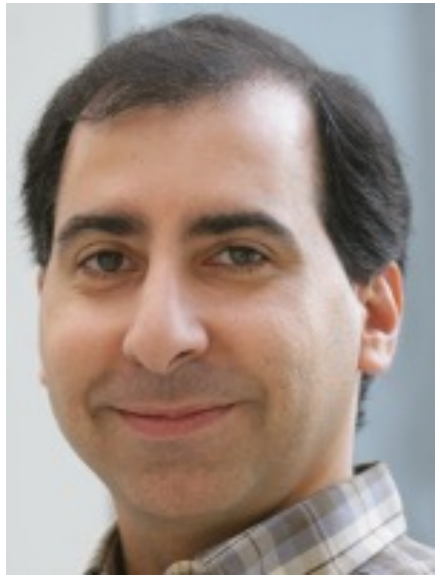

Michael Azarian
University of Maryland

Hardware Trojans and Counterfeit Microelectronics: Detection and Diagnosis

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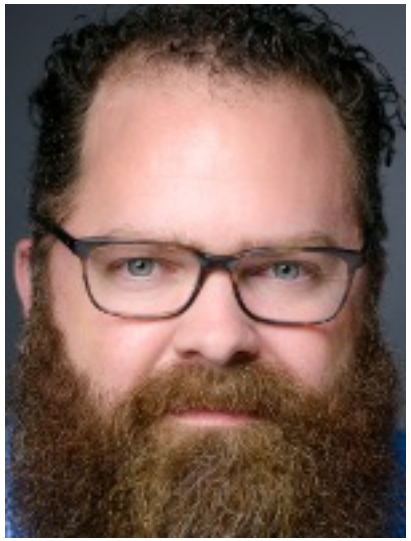
Speakers April 29



Matthew Areno
Intel
Identifying Supply Chain Threats – An Honest Assessment

Ajay Sattu
Amkor Technology, Inc.
Automotive Semiconductor Unit Level Traceability

Navid Asadi
University of Florida
Physical Assurance and Inspection of Electronics

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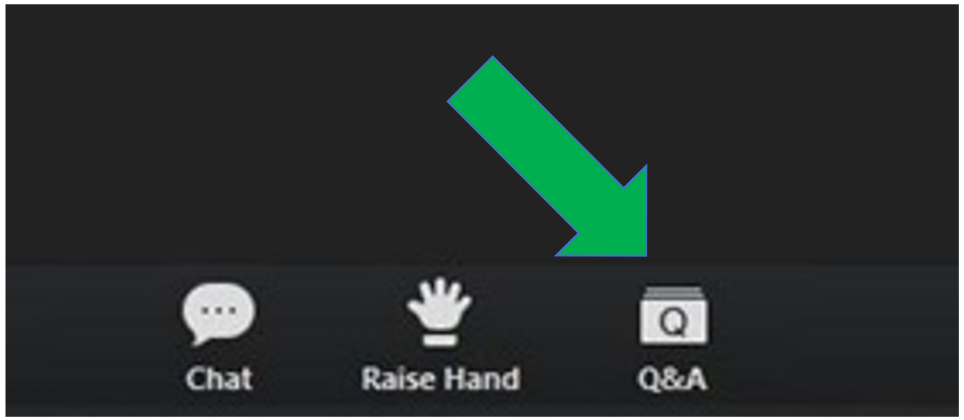
Reminders

Slides & Videos will be posted next week

http://events.meptec.org/supply-chain-security-2021 /

youtube.com/MEPTECpresents

Please use the Q&A window for your questions



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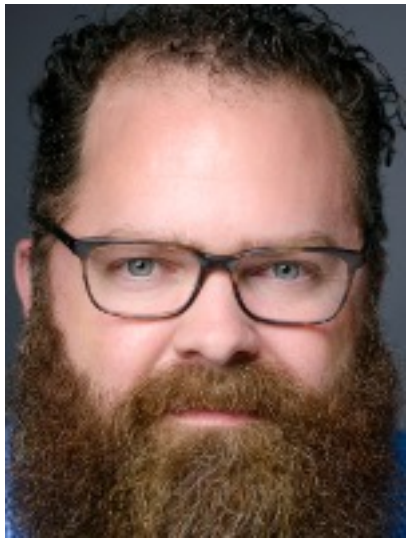
Speakers April 29



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