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Securing Intel PC for FIDO support: Industry standard to remove passwords

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Session Topics

- Why password-based user authentication creates security challenges
- How FIDO* helps solve user authentication without passwords
- The security role of Intel hardware & firmware in a PC that supports FIDO

Hardware plays a strong role in security

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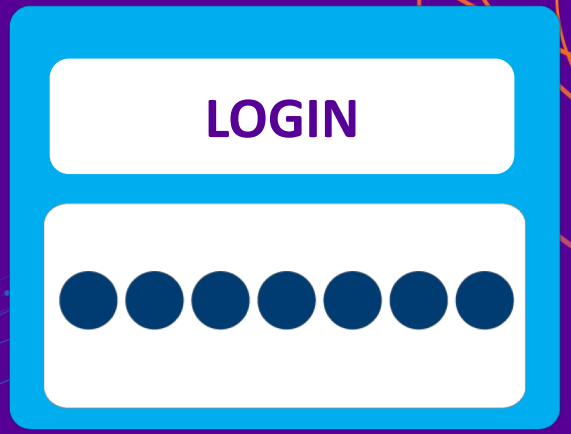
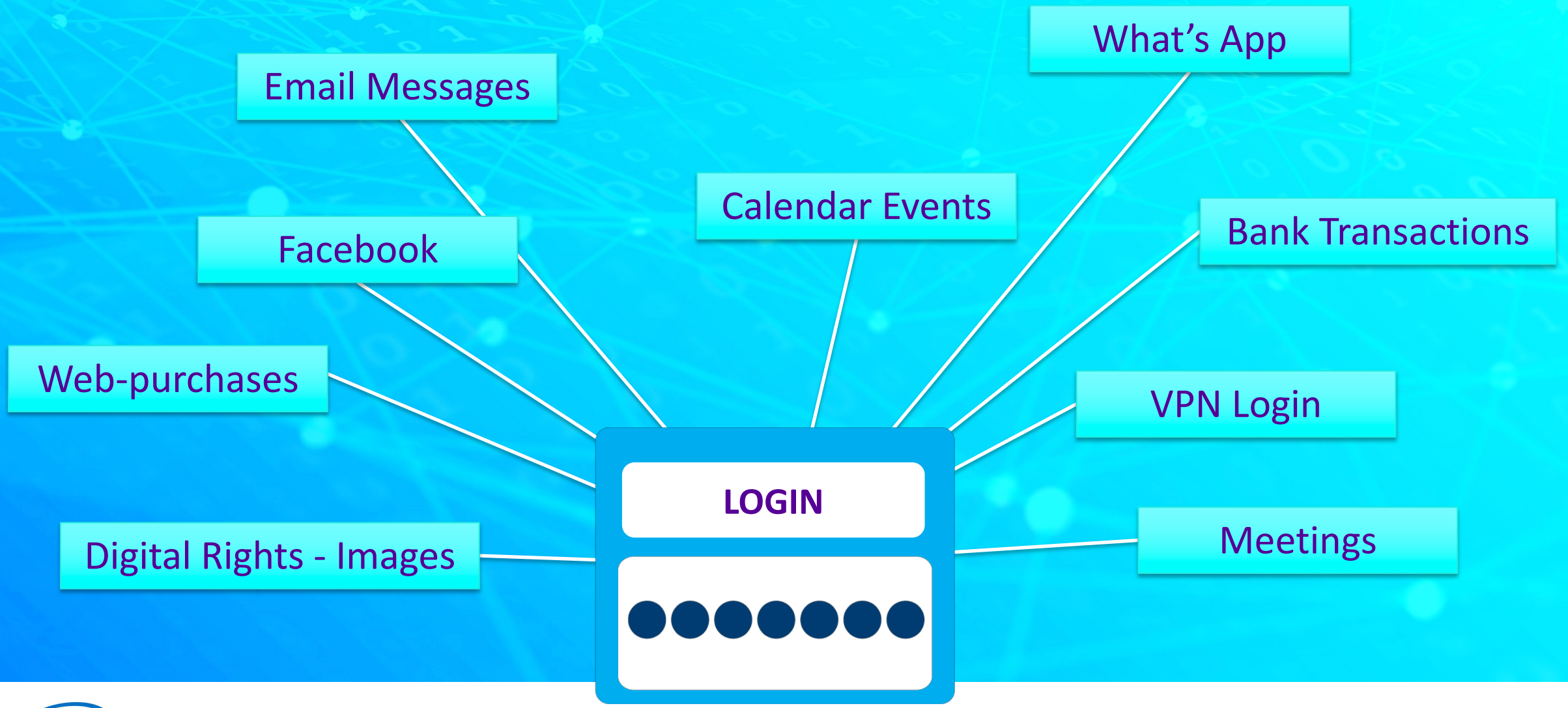
Why password-based user authentication creates security challenges



Day in the life of a password user



Why passwords create a security nightmare?

- Password re-use, no update, poor strength
- Social engineering & key-logger hacks
- Sophisticated password guessing tools
- Unsecure transmission over networks
- Direct server attacks on central user-store
- Lack of ability to recognize fraudulent activity from stolen credential

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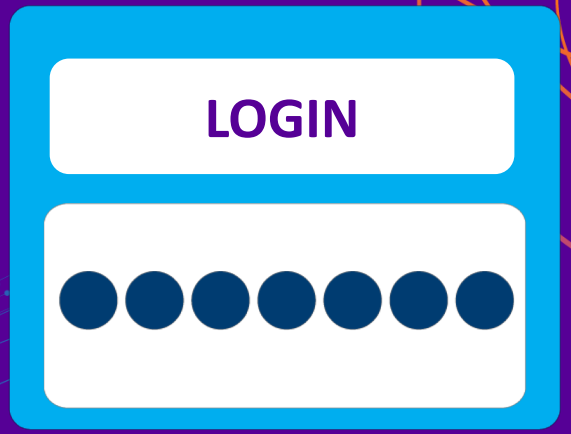
How FIDO helps solve user authentication without passwords



International Standards efforts to address authentication.

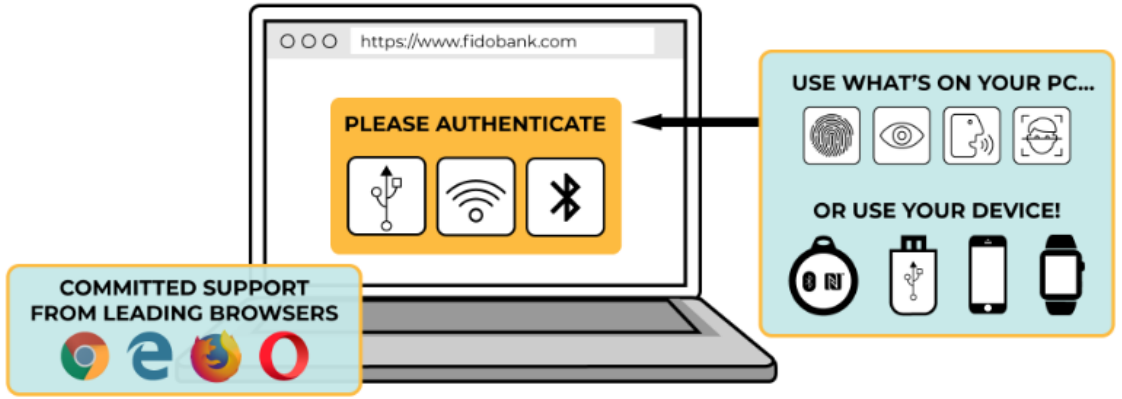
- NIST800-63-3 Digital Identity Guidelines
  - NIST 800-63-B Authentication and Lifecycle Management
- PKI
  - Public key infrastructure
  - ASIA PKI Consortium: Korea, Taiwan, Thailand, Macao, India
- ITU-T (SG17)
  - International Telecommunications Union, Security Study Group
- ISO/IEC JTC1 (SC27)
  - International Standards Organization IT Security Techniques

FIDO Introduction

- FIDO stands for Fast Identity Online
- FIDO protocol is adopted by W3C WebAuthn WG
- WIP Collaboration with
  - ITU-T (SG17) X.1277 & X.1278
  - ISO/IEC JTC1 SC37/SC27
- World's Largest Ecosystem for Standards-Based, Interoperable Authentication

(*) Source: FIDO Alliance

FIDO as a Solution



FIDO Targeted Solutions

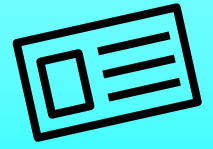
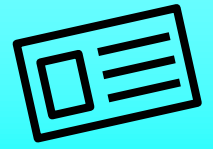
- Social engineering email messages
- Bank transactions
- Web-purchases
- VPN login for enterprise

FIDO can be a component to combat "in the news" attacks

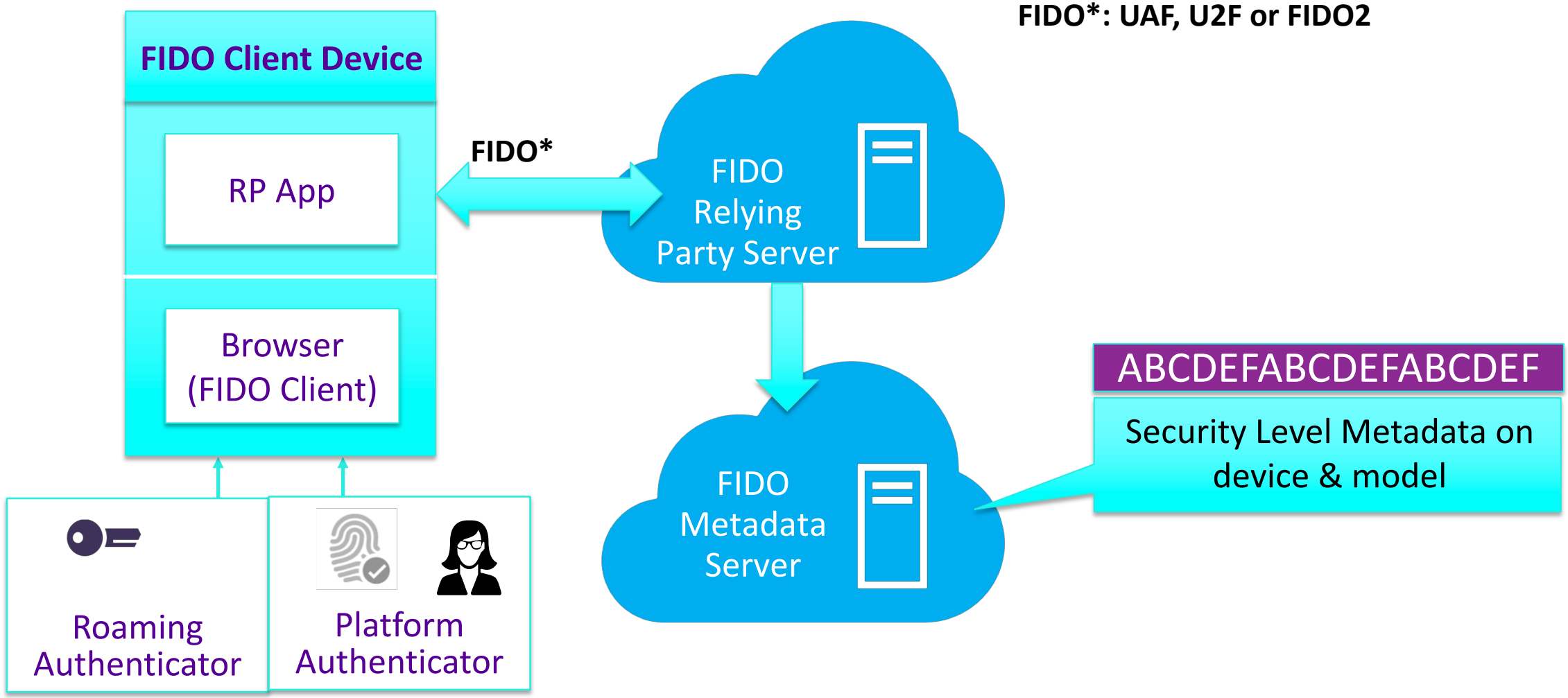
- Spreading fake news articles
- Creating cyber-attacks on infrastructure
- Voter fraud

Better user authentication will help address password related security challenges

FIDO Authenticator

	Platform authenticators		Roaming authenticators	
Multi factor authentication (possession + knowledge/inherence)	 PC with TPM & biometric or pin capture	 Smart phone with TPM & biometric or pin capture	 Smart card with PIN or fingerprint sensor	 Security key with PIN or fingerprint sensor
2nd factor (Login & Password + possession factor)	 PC with TPM only		 Smart card	 Security key

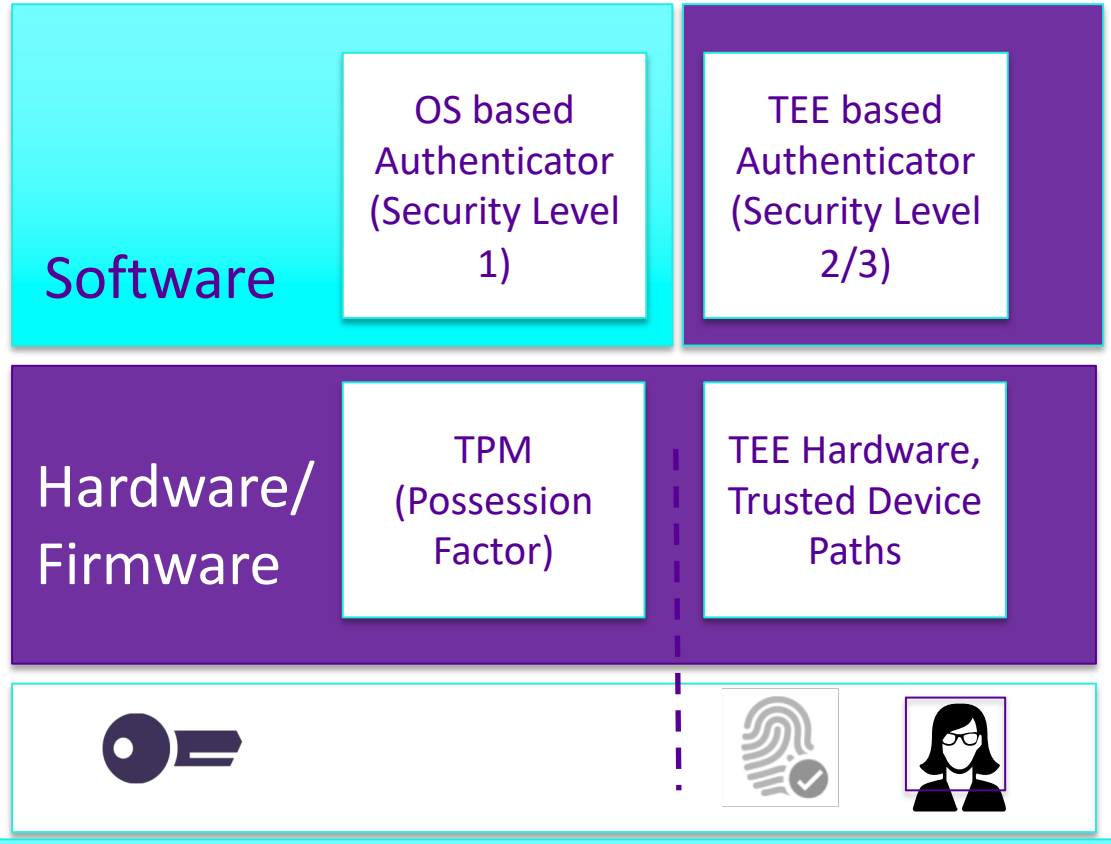
FIDO System Architecture



FIDO* Authenticator Security Considerations

Software | Hardware/ Firmware

Block Diagram



- **Extensions**
  - Distinguishing Knowledge Factors: pin, biometric (face, fingerprint)
  - Multiple Factors
- **FIDO Authenticator Metadata service**
  - Security Level 1: OS
  - Security Level 2: TEE + TPM + Trusted IO
  - Security Level 3: hardware attack protected TEE
- **Revocation/Lifecycle Management**
  - Security flaws discovered post field deployment by performing software/firmware updates

Hardware plays a strong role in security

FIDO* Benefits

- **Better security for online services**
  - Service provider can perform proper risk assessment of FIDO user authentication security
- **Reduced cost for the enterprise**
  - Enterprise can deploy devices with properly maintained certified FIDO authenticator machines.
- **Simpler and safer for consumers**
  - Consumers do not have to worry about complex passwords as long as they use a properly maintained certified FIDO device.

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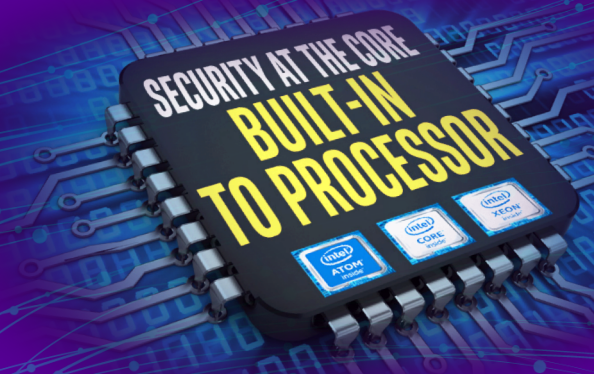
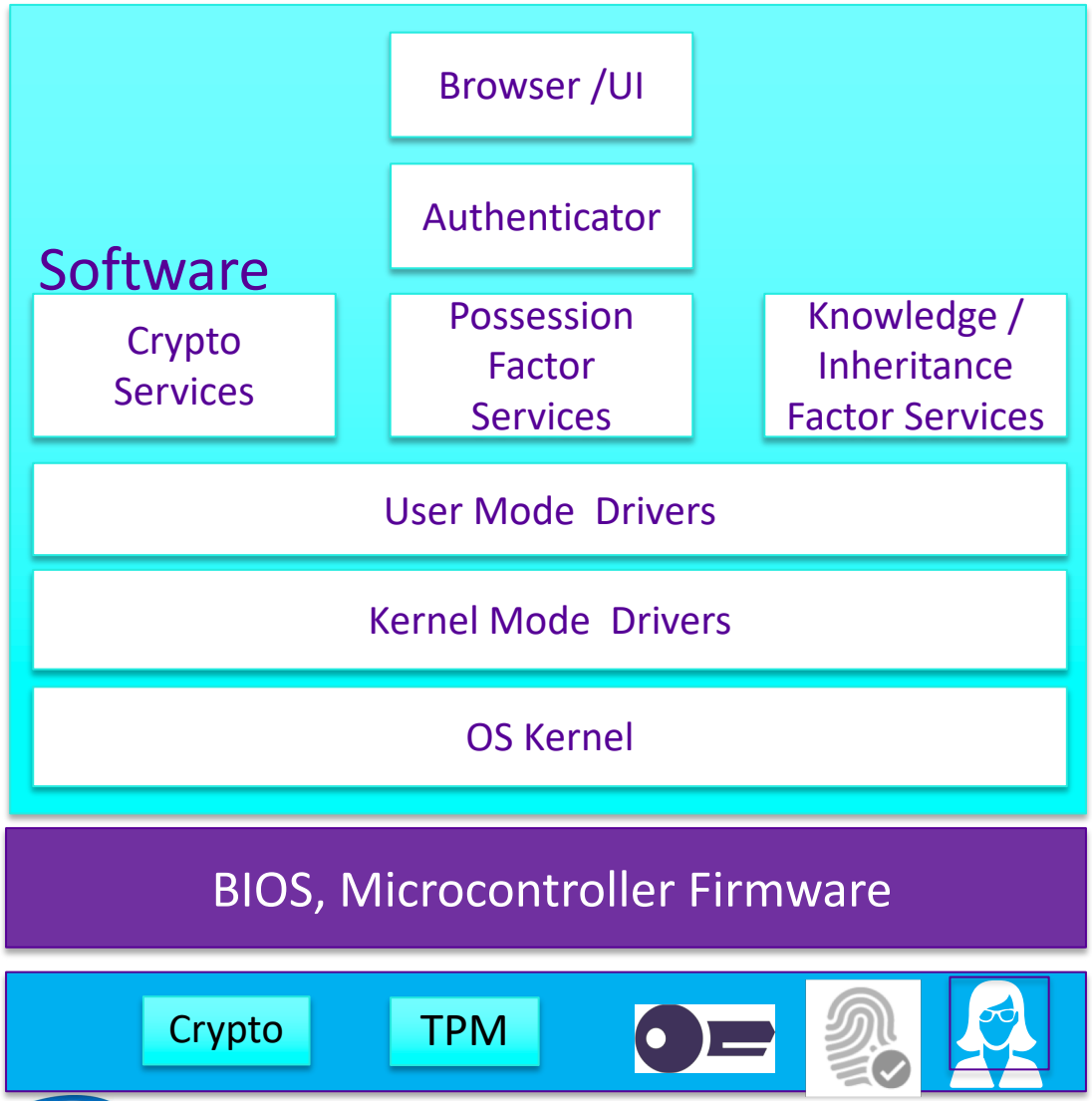
The role of Intel hardware & firmware in FIDO* security



FIDO* Authenticator Trusted Computing Block Analysis

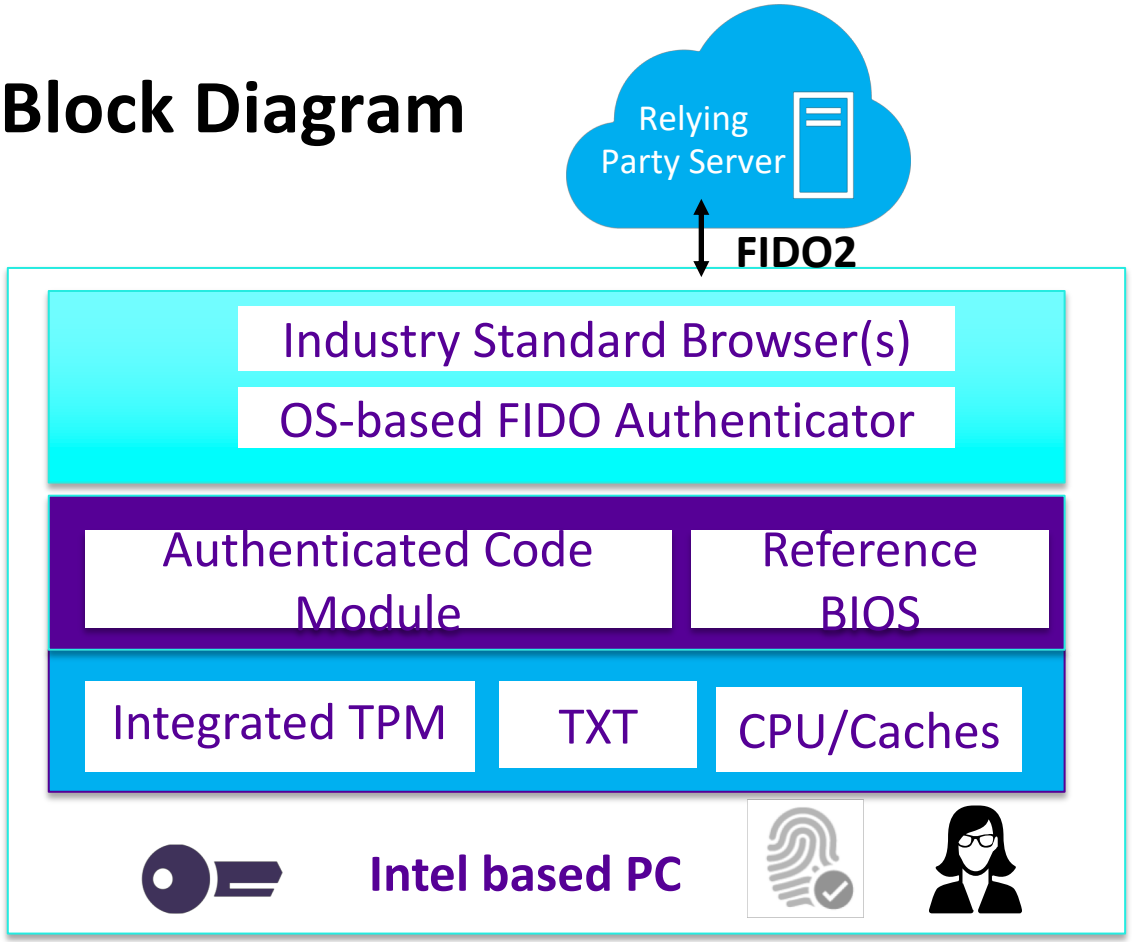


- **Potential Threats**
  - Disabling security features: Secure Boot, TPM
  - Unsigned software or firmware launch
  - Unsigned / Delayed firmware or software update containing vulnerability fixes
  - Interface Intrusion across various interfaces such as addition of filter drivers
  - Untrusted IO (Camera, Finger Print) drivers
  - Replay of previously captured data

Security Level 1 Authenticator

Software | Firmware | Hardware

Block Diagram



OS-based authenticator

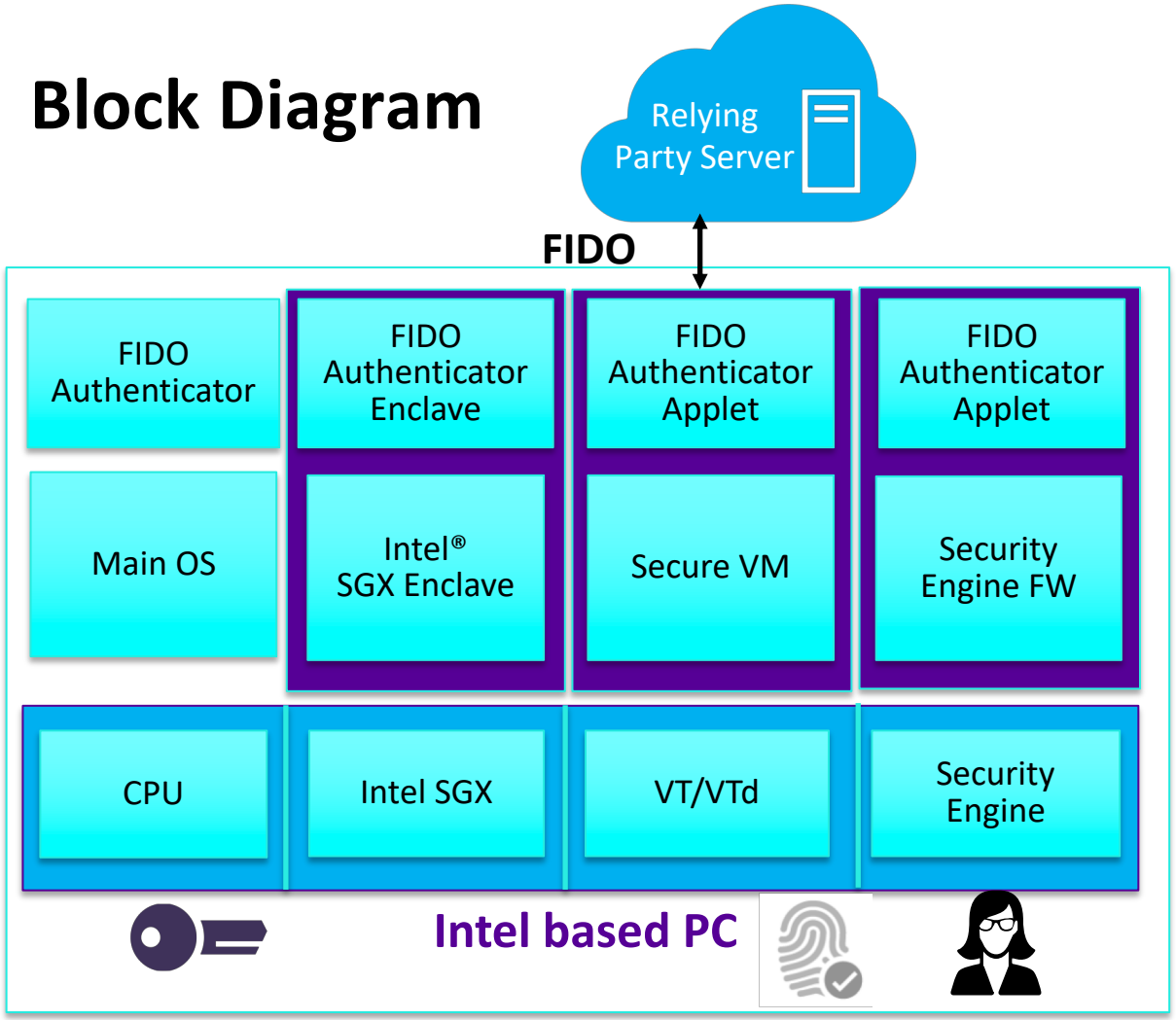
- Trusted Computing Block (TCB) relies upon OS security features
- Intel hardware & firmware security features:
  - Root of Trust for measurement: Trusted Execution Technology (TXT), Authenticated Code Module (Boot Guard)
  - Private key storage, Measured OS Boot, Integrated TPM (PTT)
  - Secure OS Boot: Intel reference BIOS
- Productized use cases
  - Apple MacBook*, Chromebook*, Windows* PCs

Mass deployment adoption model

Security Level 2, 3 Authenticator

Software | Firmware / TEE App | Hardware

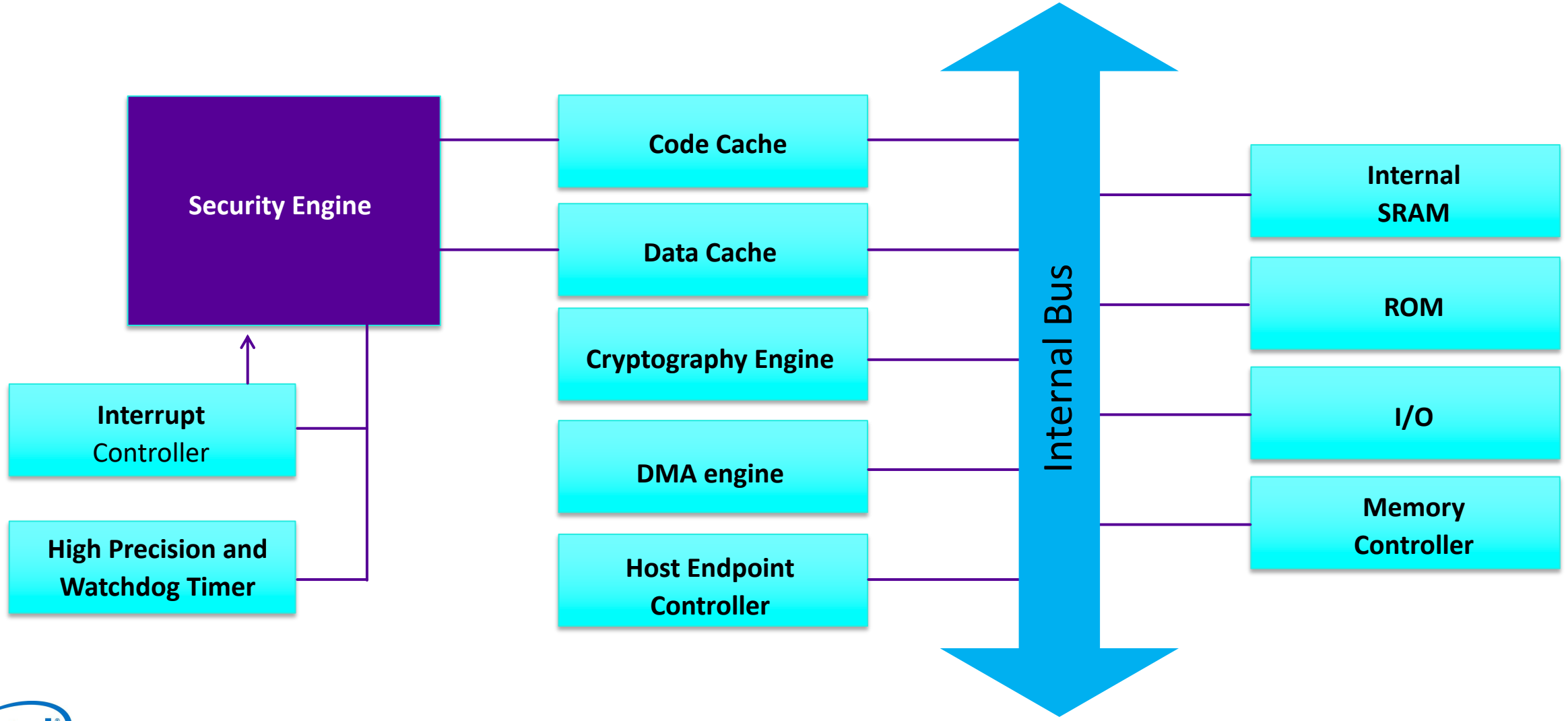
Block Diagram



TEE-based Authenticator

- Security Level 1 OS-based FIDO* authenticators can be compromised by sophisticated attackers on various interfaces between different OS modules due to large attack surface
  - E.g. Key-logger, TPM Key disable
- Security Level 2, 3 can be achieved by enabling Trusted Execution Environment (TEE) based Authenticators with smaller TCB + achieving additional requirements (e.g. software).
- Intel provides three hardware options for potential TEE
  - Security Engine
  - Intel* Software Guard Extensions (Intel® SGX)
  - VT/VTd

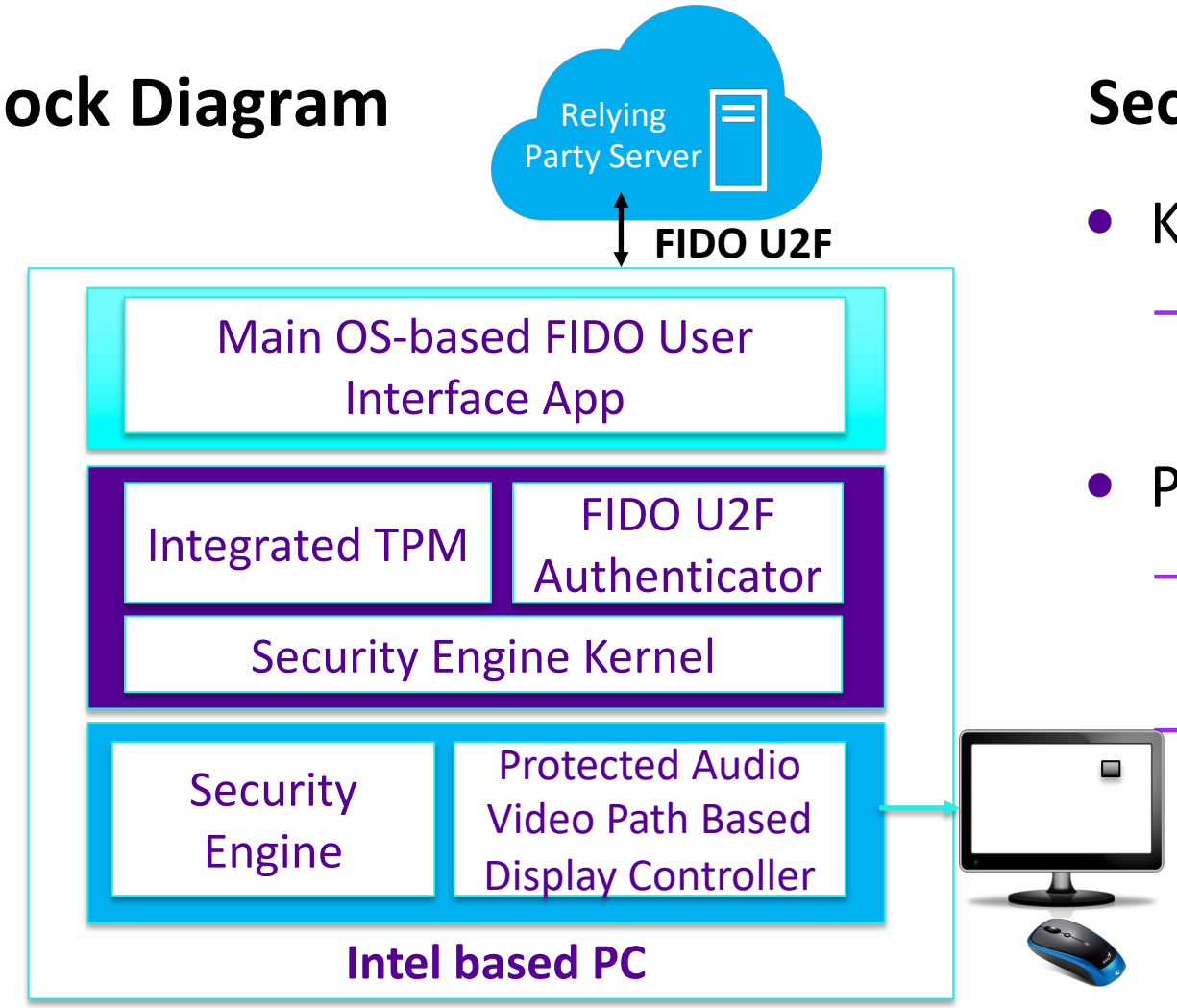
Security Engine Micro-architecture



Security Engine Architecture

Software | Firmware Apps | Hardware

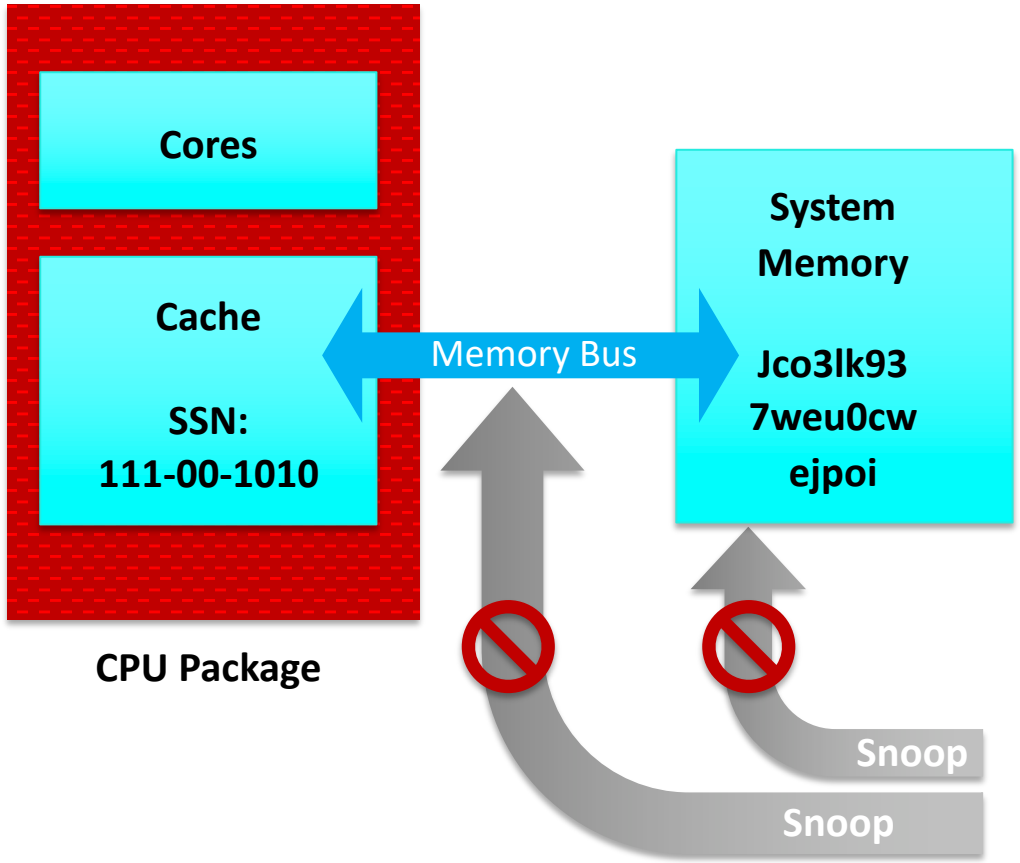
Block Diagram



Security Engine based Authenticator

- Key Benefits
  - Embedded Secure Element inside Intel SOC
- Productized use cases
  - Integrated TPM: Possession Factor for Host OS and VT/VTd based solution
  - FIDO U2F : Intel IOC
    - Displays OK button in a random location using Protected Audio Video Path, mitigates remote SW attacks

Intel Software Guard Extensions (Intel SGX) Micro-Architecture

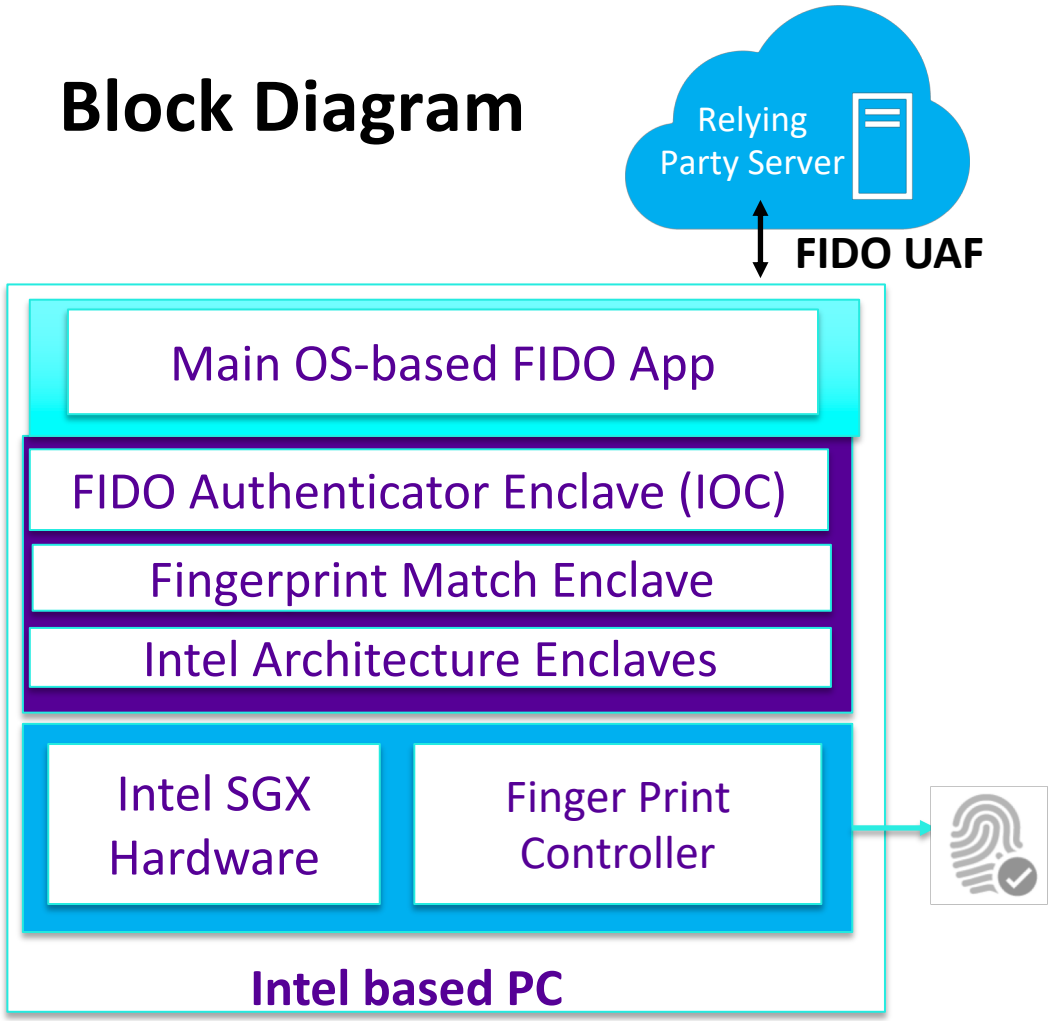


- CPU Hardware assisted Trusted Execution Environment
- Intel SGX supports 17 new instructions on CPU
- Applications (Enclaves) can set aside private regions of code and data.
- Better protection against direct attacks on executing code or data stored in memory.

Intel® Software Guard Extension FIDO Architecture

Software | Trustlet | Hardware

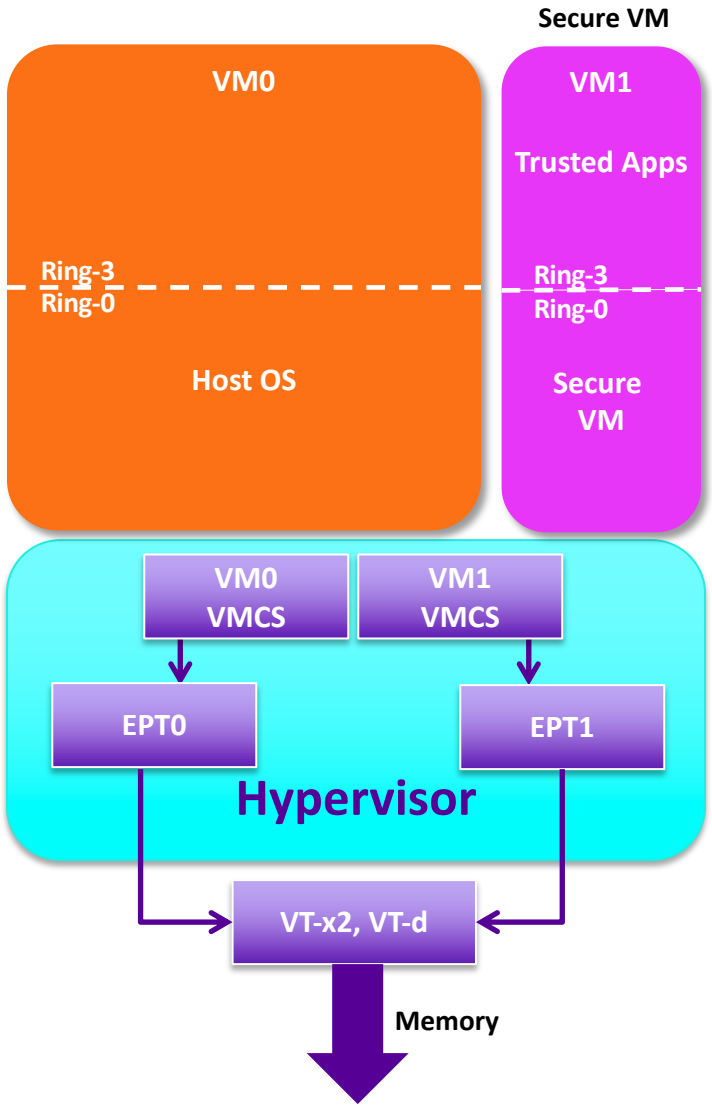
Block Diagram



Intel SGX based Authenticator

- Key Benefits
  - Small TCB that includes architectural enclaves and Intel HW/FW
  - Completely isolated from main OS, VMM and BIOS
- Productized use cases
  - FIDO UAF : Intel IOC
  - Performs fingerprint match inside IOC Authenticator enclave.

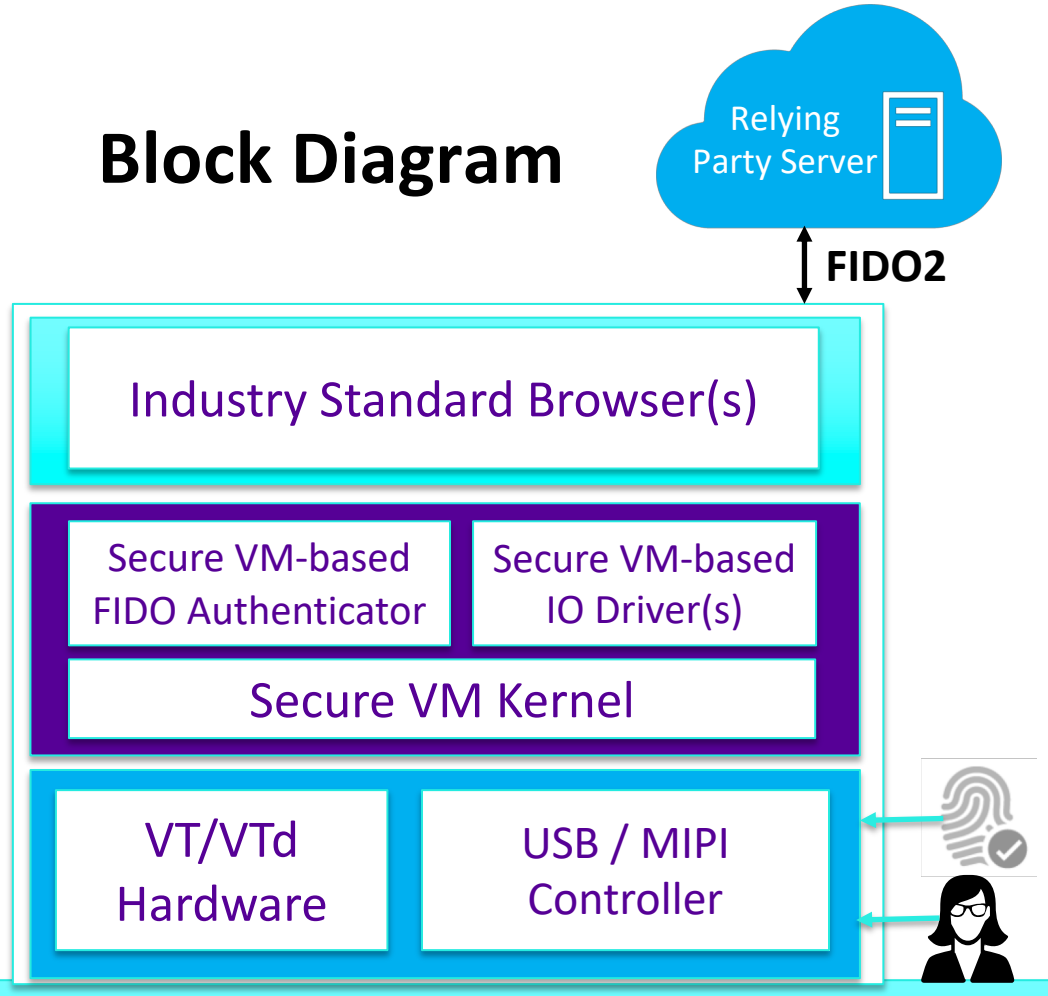
Virtualization Technology Architecture Overview



- VT HW provides memory space Read/Write/Execute access control as defined by Extended Memory Page Tables
- VTd HW support consists of ensuring DMA memory space access control as defined by the VTd Page Tables
- Enabled with Hypervisor and Trusted Applications running in a more secure VM

Virtualization Technology FIDO Architecture

Block Diagram



VT/VTd Based Authenticator

- Key Benefits
  - Synergistic with OS & Browser initiatives (e.g. Windows VSM)
  - Enables more secure IO paths: Better protected from Host OS based replay attacks
- WIP use cases
  - Virtualization based protection WIP with customers / partners

To Summarize

- Today we covered essentials of FIDO Security
  - Single factor: TPM only
  - Multiple factors: TPM + pin or TPM + biometrics
  - Level 1 (OS based), Level 2 and above (TEE based)
  - Revocation/Life-cycle management
- Intel hardware and firmware role in FIDO security.
  - CPU, TXT, TPM, VT/VTd, Intel SGX, Security Engine
  - Microcode, ACM, Security Engine Firmware, BIOS

Hardware has a strong role in FIDO security

Call to Action

- Stop by at Intel and FIDO booths to look for product demos
- Short Term
  - Encourage use of certified FIDO products on your client and server solutions
  - Ensure FIDO solutions are deployed with proper security configurations
  - As a relying party learn to discriminate between security levels
- Long Term
  - Deploy platforms with higher security levels of FIDO security
  - Help solve major security challenges facing the industry together

Q & A

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