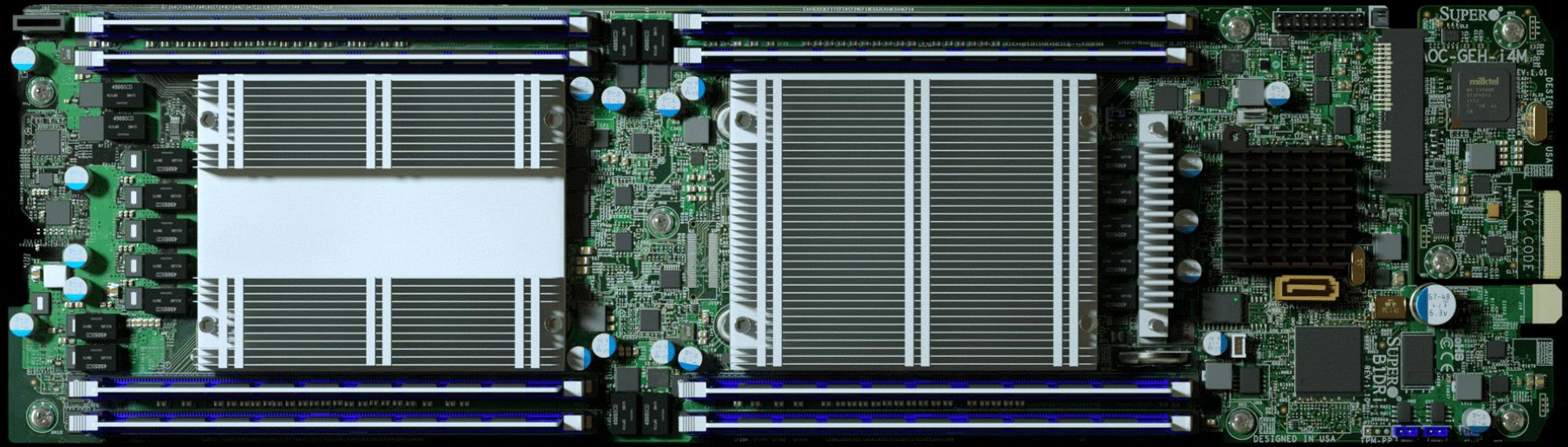
TRUSTED COMPUTING GROUP

Foundational Trust for IoT

Dennis Mattoon, Microsoft

The importance of a secure supply chain…



35C3 - https://youtu.be/C7H3V7tkxeA

TRUSTED® COMPUTING GROUP

THE SEVEN PROPERTIES

Property	Hardware-based Root of Trust	Small Trusted Computing Base	Defense in Depth	Compartmentalization	Certificate-based Authentication	Renewable Security	Failure Reporting
Key Questions	 Does the device have a unique, unforgeable identity that is inseparable from the hardware?	 Is most of the device's software outside the device's trusted computing base?	 Is the device still protected if the security of one layer of device software is breached?	 Does a failure in one component of the device require a reboot of the entire device to return to operation?	 Does the device use certificates instead of passwords for authentication?	 Is the device's software updated automatically?	 Does the device report failures to its manufacturer?

TRUSTED COMPUTING GROUP

Cloud Provider

Security controls
Device Management
Device Provisioning Service

Choice of Secure Hardware

- Secure silicon vendors MCUs, SoCs, etc.
- Secure silicon standards
  - DICE
  - TPMs

and Device Firmware

- Language and OS agnostic
- Secure silicon hardware
- Critical security services

Device Security

Hardware Root of Trust in secure silicon + High-integrity software operations

TRUSTED® COMPUTING GROUP

WHY HARDWARE SUPPORT?

- Serious problems with software-only solutions
- If a bug leads to disclosure of Device Identity secret, then how do we securely (and remotely) recover and re-provision a device?
- Cannot trust software to report its own health (Attestation)
- Roots of Trust (RoT), data encryption, entropy, etc.
  - How do we securely extend trust chain, store keys, etc.?
  - Need a hardware RoT

TRUSTED® COMPUTING GROUP

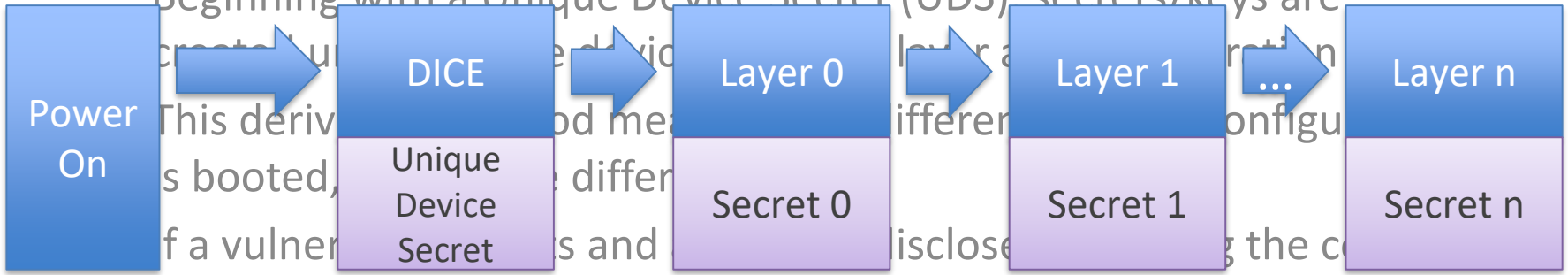
BEWARE SIMPLE HW SOLUTIONS

- Why not just store Device Identity key/secrets in fuses?
  - If malware can manage to read the fused key, then you are no better off than with a software-based key
- TPMs are great but, especially in IoT solutions, systems and components probably won't have TPMs or similar silicon-based capabilities (cost, complexity, physical space on the MCU/SoC)
- We need something different

TRUSTED COMPUTING GROUP

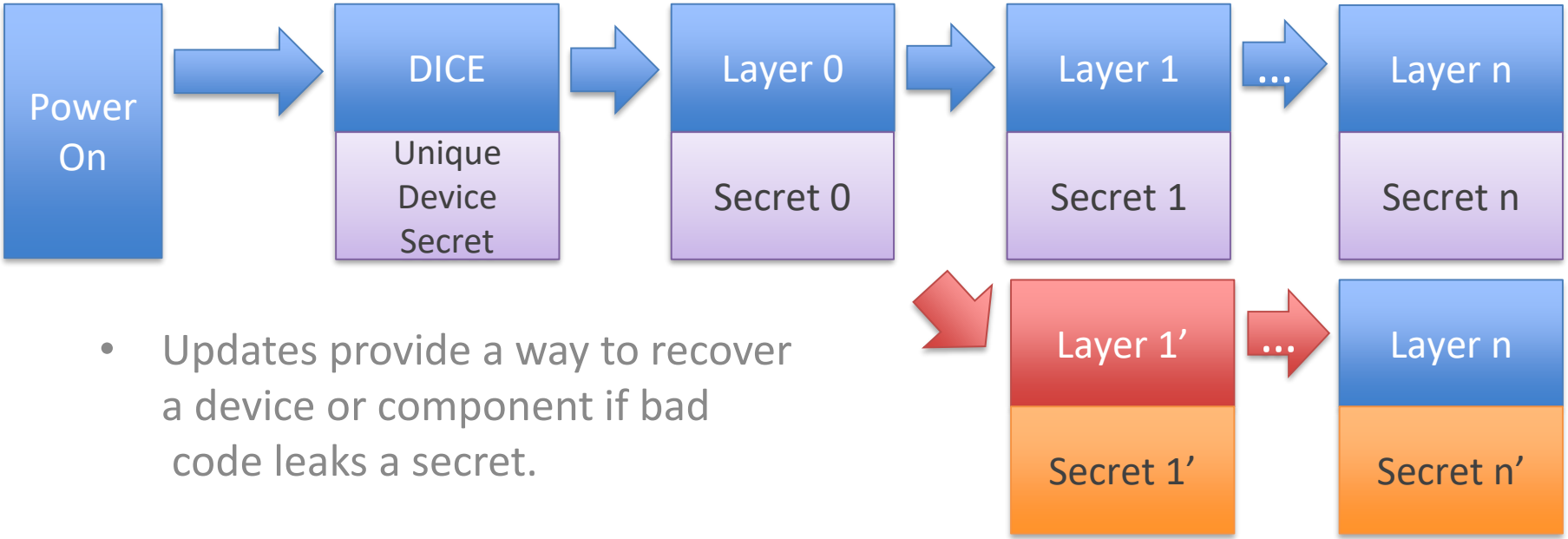
THE DICE MODEL

- In a DICE Architecture device startup (boot) is layered
- Beginning with a Unique Device Secret (UDS), secrets/keys are
- This deriv od mea ifferen onfigu
  s booted, differ
  f a vulner s and isclose g the c
  automatically re-keys the device



TRUSTED COMPUTING GROUP

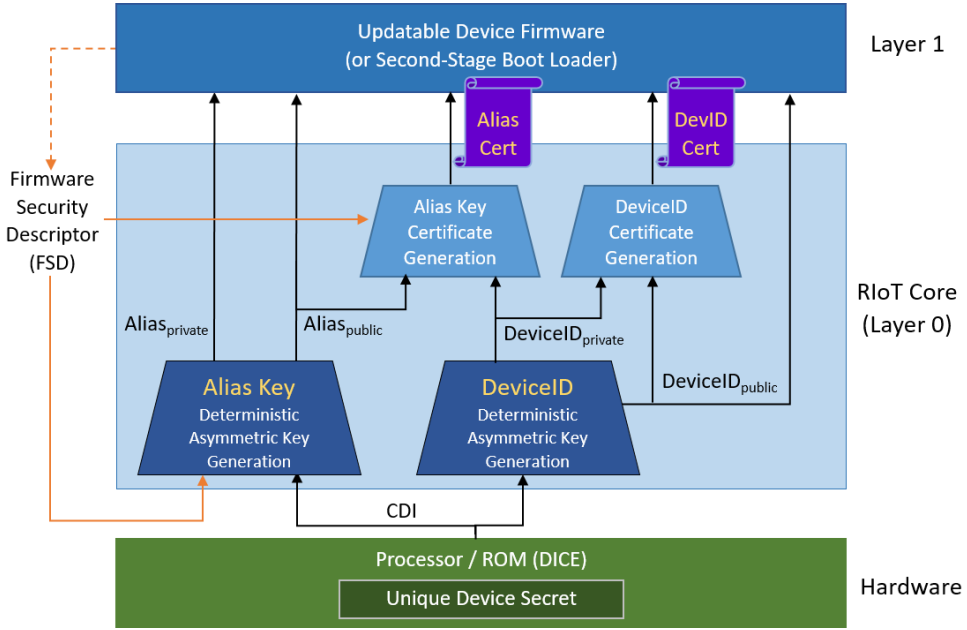
WHEN SOMETHING CHANGES



- Updates provide a way to recover a device or component if bad code leaks a secret.

TRUSTED COMPUTING GROUP

A DICE ARCHITECTURE (RIOT)



- Underlying architecture for HW-based Device Identity and Attestation (Azure)
- DeviceID – Stable and well protected long-term identifier for a device or component
- Alias Key – Derived from combination of unique device identity (HW) and identity of Device Firmware (SW)
- Integrates DICE-enabled HW with existing infrastructure

TRUSTED® COMPUTING GROUP

ENABLES KEY SCENARIOS

- Flexible security framework to enable many high-value scenarios
- Secure remote device recovery (Cyber Resilient Technology Initiative)
  - Recover unresponsive (i.e., p0wned, hung, etc.) devices
  - Greatly reduced cost: no need for physical device interaction
- Supply chain management (DICE-enabled components, e.g. Cerberus)
  - Several recent damaging cyber-attacks were the result of malware introduced in the supply chain
  - DICE attestation lets end-customers trust far less of the supply-chain, e.g., just the storage-subsystem or flash vendor
- Strong cryptographic identity, authenticity, licensing, and many more

TRUSTED® COMPUTING GROUP

ADOPTION

- Microsoft Azure IoT – Device Provisioning Service, imx-iotcore BSP
- Microchip – CEC1702 and CEC1302, SecureIoT
- NXP – i.MX and beyond, Layerscape LS1012
- WinBond – TrustME Secure Flash Memory
- Micron – Authenta Secure Flash Memory
- STMicroelectronics – SDTM32L0/L4 MCUs
- Others we can’t talk about yet (but they’re here at the show!)
- Open source – Project Cerberus, ARM Trusted Firmware (prototype)
- More announcements soon!

TRUSTED® COMPUTING GROUP

DICE TAKEAWAYS

- Flexible security framework, not one size fits all
- Minimal silicon requirements, low barrier to entry
- Foundation for strong cryptographic HW-based device identity and attestation, data at rest protection (sealing), and secure device update and recovery
- Public announcements from SoC, MCU, and flash memory vendors so far with more on the way
- Represents the ongoing work of the DICE Architectures Workgroup (DiceArch WG) in TCG. Come join us!