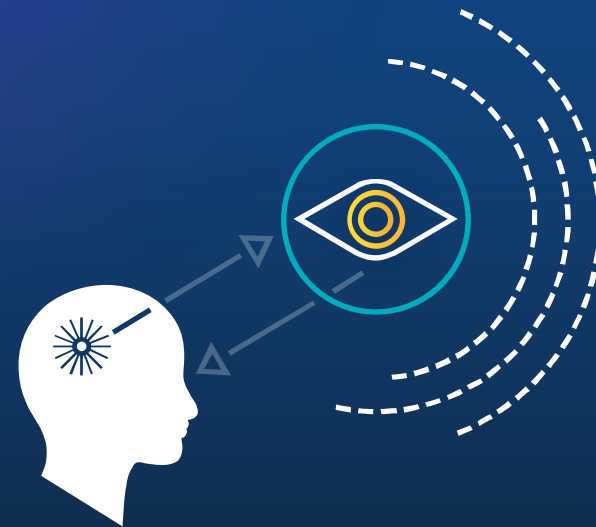Qualcomm Technologies, Inc.
March 2016
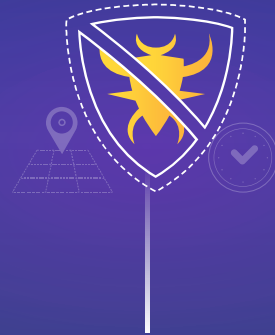
Mobile Security Solution

Qualcomm®

Increasing privacy and security concerns

Malware Attacks

- Proliferation of malware
- Challenging malicious attacks
- Timely detection of new and unknown malware attacks

Authentication Issues

- Passwords are not working
- Current biometric challenges, e.g. spoofing and consistency
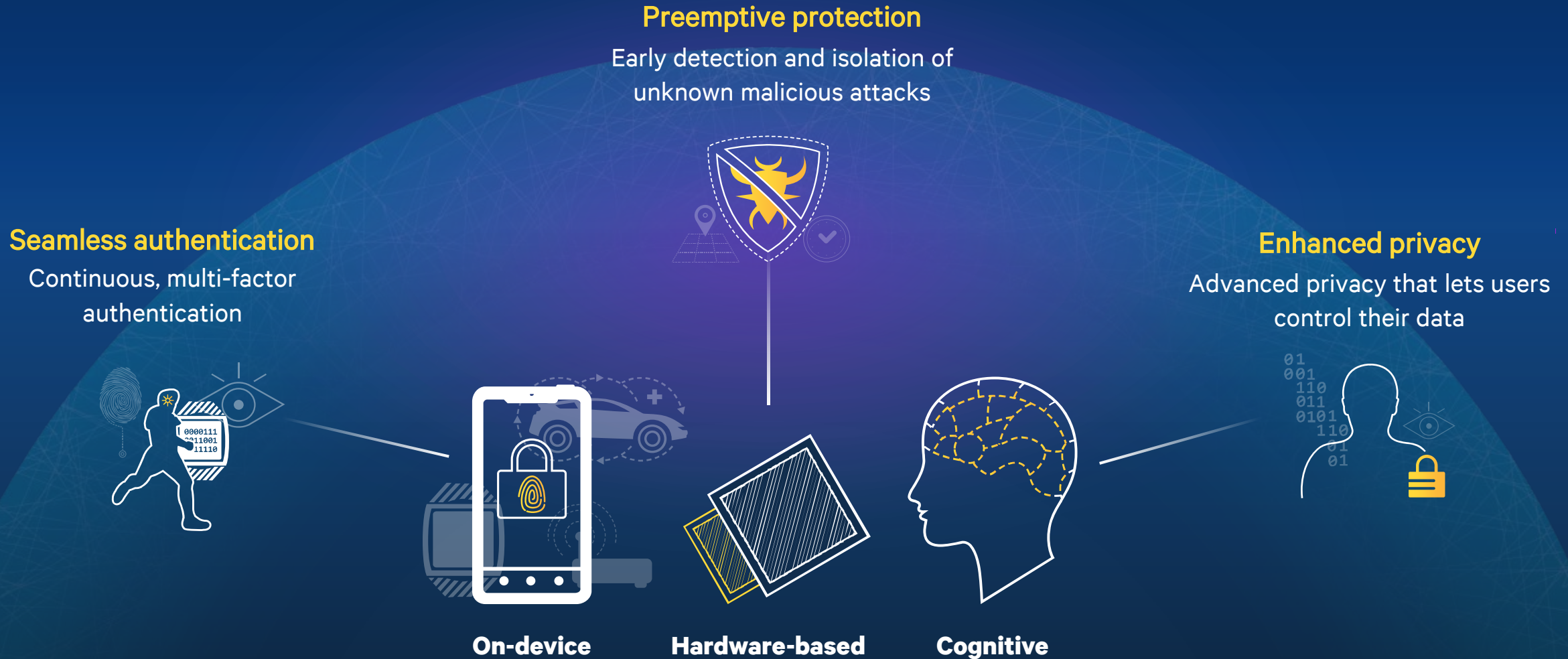- Device credibility/reputation

Privacy Concerns

- User control of personal data
- Lack of transparency
- Stolen personal data

An unprecedented number of intelligent, connected things

On-device processing is key for security and privacy

User privacy

Ability to enjoy services without the need to upload sensitive personal data to the cloud

Critical data protection

On-device storage of keys and biometric data

Always-on protection

Ability to deal with zero-day malware and phishing attacks

Personalized security

Adapting to device capabilities and user preferences

On-device

Hardware-based security is the foundation
Security embedded into the silicon and firmware

Enhanced security
Ensuring overall system security and device health

Rich user experience
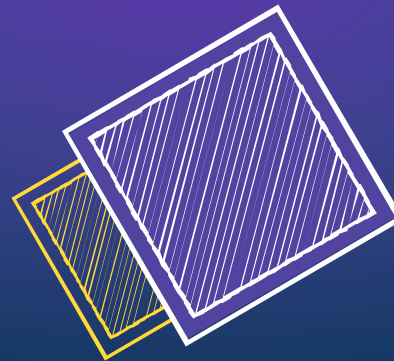Providing unobtrusive, efficient solutions

Extensible platform
Providing security services through open standards

HW firewall to isolate security functions from HLOS

Secure execution environment

Robust storage of keys

HW cryptography engines

Detection of rootkits* and malware

Hardware-based security

* Malicious code that gains low level access and remains hidden from apps and OS

Cognitive technologies support better Security
By applying behavioral analysis

Behavioral classification

Classifies device and user activity based on
pre-defined behavior models

Behavioral observation

Monitors device software activities, as well as
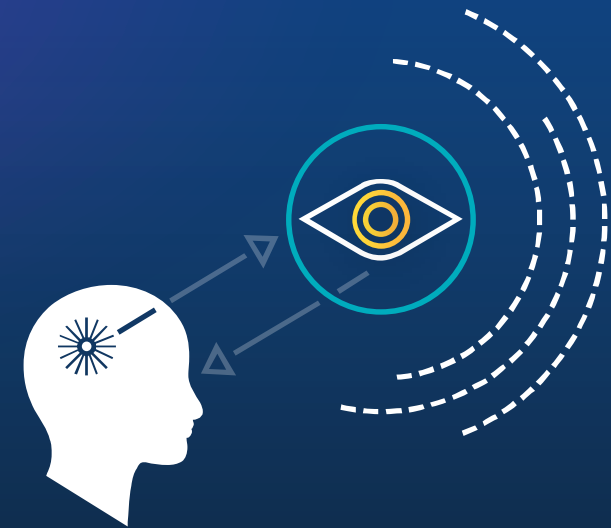apps and user behaviors

Actuation

Takes intuitive actions to enable robust and
convenient security

Learns and adapts

Mobile Security vision & Qualcomm Solution

Providing preemptive protection and seamless authentication, while protecting user privacy

Qualcomm Haven Security Solution

Built on the foundation of SecureMSM Technology

Qualcomm SafeSwitch™ technology

Qualcomm® Snapdragon™ Smart Protect

Qualcomm® Snapdragon Sense™ ID biometrics

Qualcomm® Snapdragon StudioAccess™ content protection

Theft Deterrence

Privacy Protection & Malware Detection

Authentication

Content Protection

Hardware-based foundation

Other existing and upcoming security features
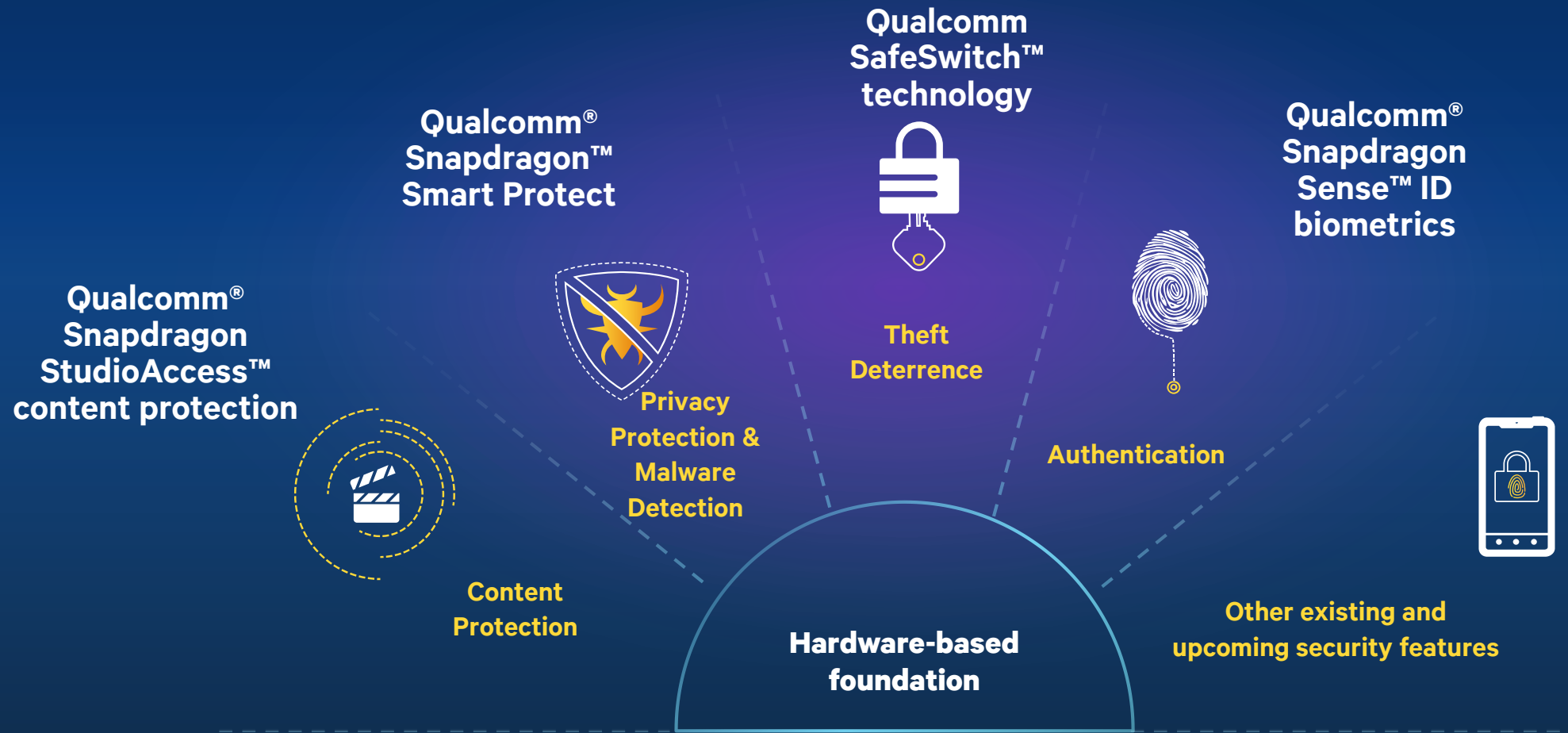
SecureMSM technology
Hardware-based foundation for all Qualcomm Haven technologies

- Secure boot

- Secure debug

- Secure storage

- Secure key provisioning

- Hardware encryption & random number generator

- Hardware firewall

- Qualcomm® Secure Execution Environment
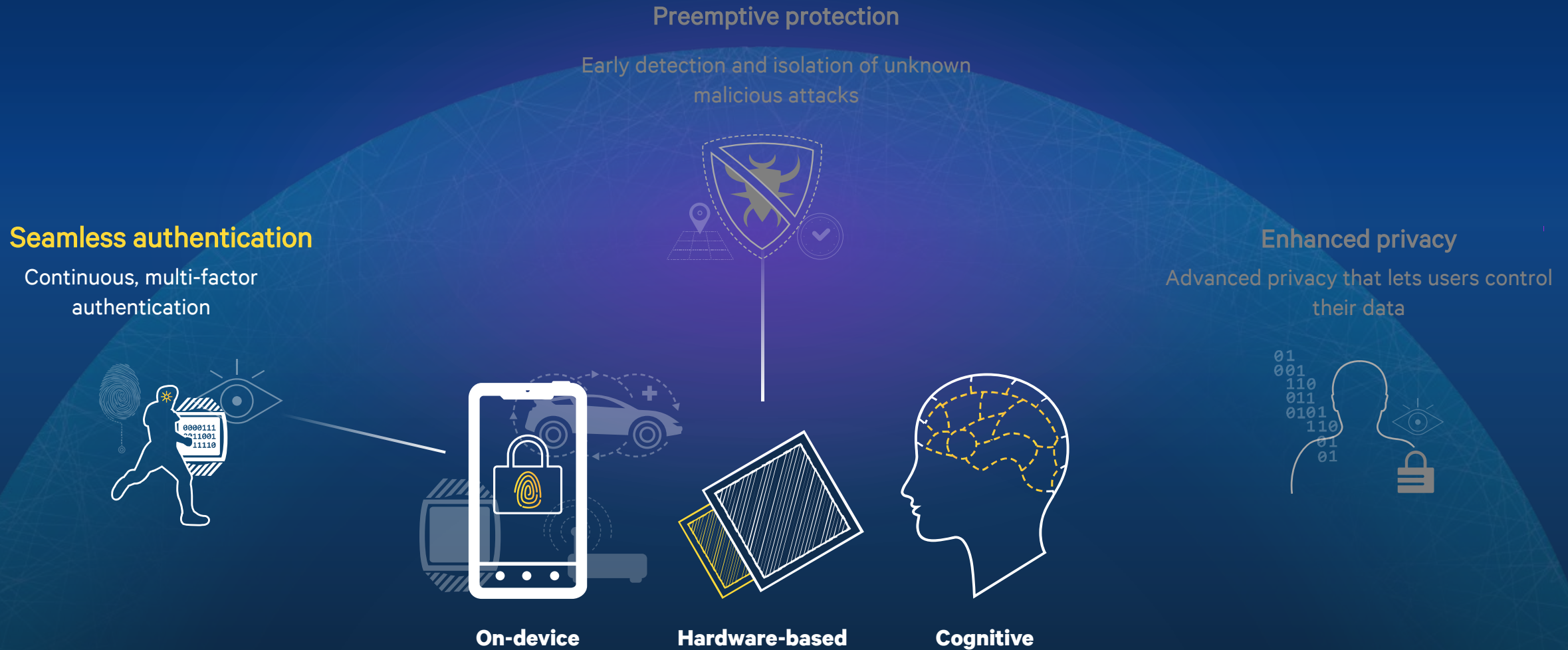
What it is

- The security foundation for devices powered by Qualcomm® Snapdragon™ processors and Snapdragon modems.

- Uniquely based on a powerful combination of hardware and software

Benefits

- Designed to provide a high level of security and robustness, while maintaining high performance and power efficiency

A vision for seamless and preemptive security

Enhancing security and privacy, while providing convenient user experience

Preemptive protection

Early detection and isolation of unknown malicious attacks

Seamless authentication

Continuous, multi-factor authentication

Enhanced privacy

Advanced privacy that lets users control their data

On-device **Hardware-based** **Cognitive**

Snapdragon Sense ID 3D fingerprint technology
An industry leader with new capabilities

Stronger Material Penetration

Authentication on Wake-up

Liveness Detection

Difficult to spoof

Actual finger

Even stronger ultrasonics penetrate through thicker metal (up to 400 μm) and cover glass (up to 400 μm), allowing for more design options
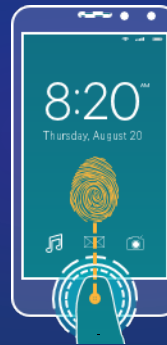
Placing the ultrasonic sensor under the cover glass at the home/wake-up touch point allows for convenient, frequent and secure authentication

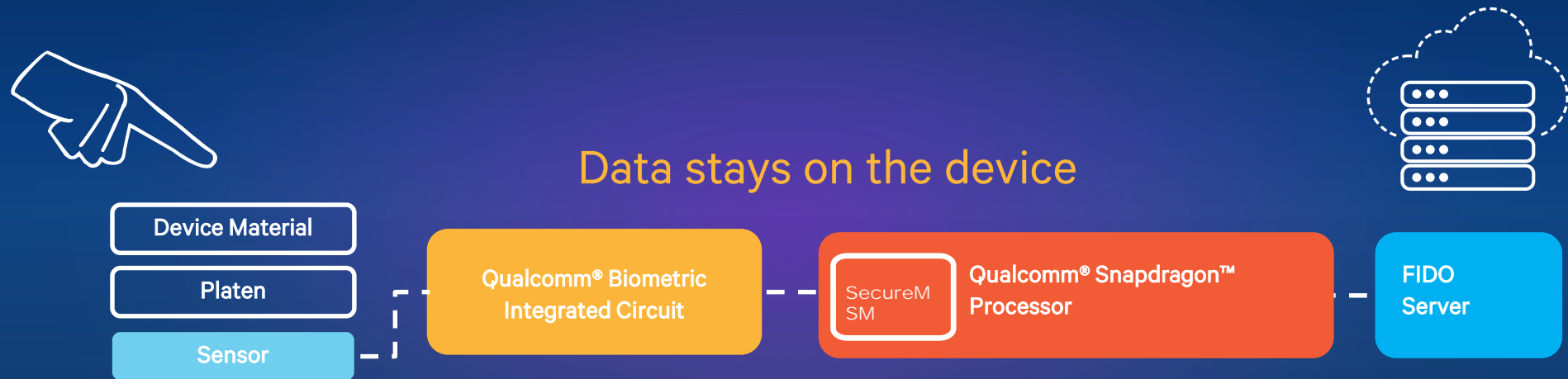Ultrasonic verify that an actual finger is being used for authentication

Snapdragon Sense ID 3D fingerprint technology

The mobile industry's first end-to-end ultrasonic-based biometrics solution

Data stays on the device

| Device Material |
| Platen |
| Sensor |

Qualcomm® Biometric Integrated Circuit

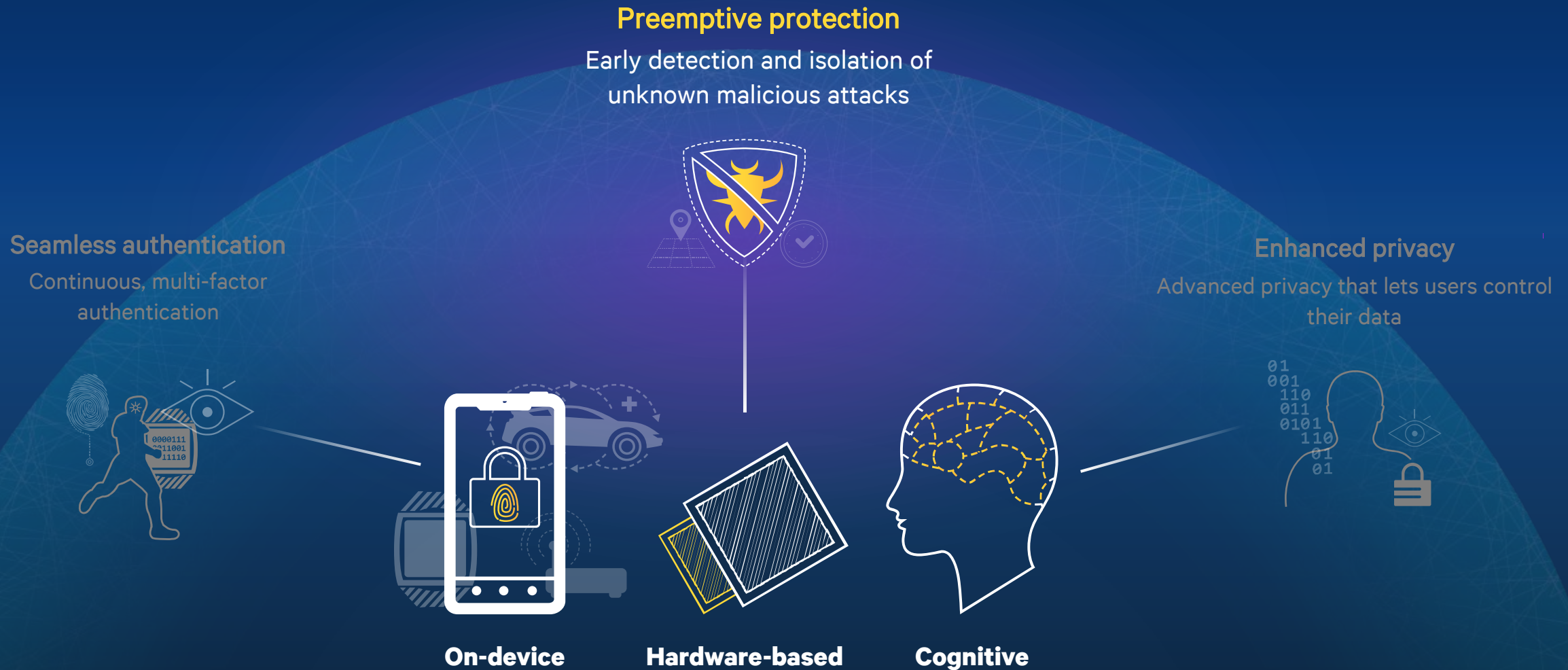SecureM SM — Qualcomm® Snapdragon™ Processor

FIDO Server

Captures three-dimensional acoustic detail within the outer layers of skin

Superior imaging detail for accurate detection of unique fingerprint characteristics

Less likely to be spoofed than capacitive-based sensors

Qualcomm Snapdragon and Qualcomm Biometric Integrated Circuit are products of Qualcomm Technologies, Inc.

A vision for seamless and preemptive security

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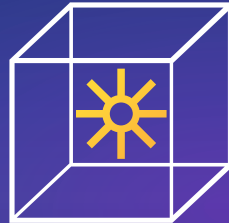**On-device**   **Hardware-based**   **Cognitive**

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Providing preemptive protection from zero-day malware

Protecting users before they see an issue

Detection
- System-wide behavioral analysis
- Detection of rootkits

Blocking
- Block malicious activities

Removal
- Uninstall malware

Zero-day protection

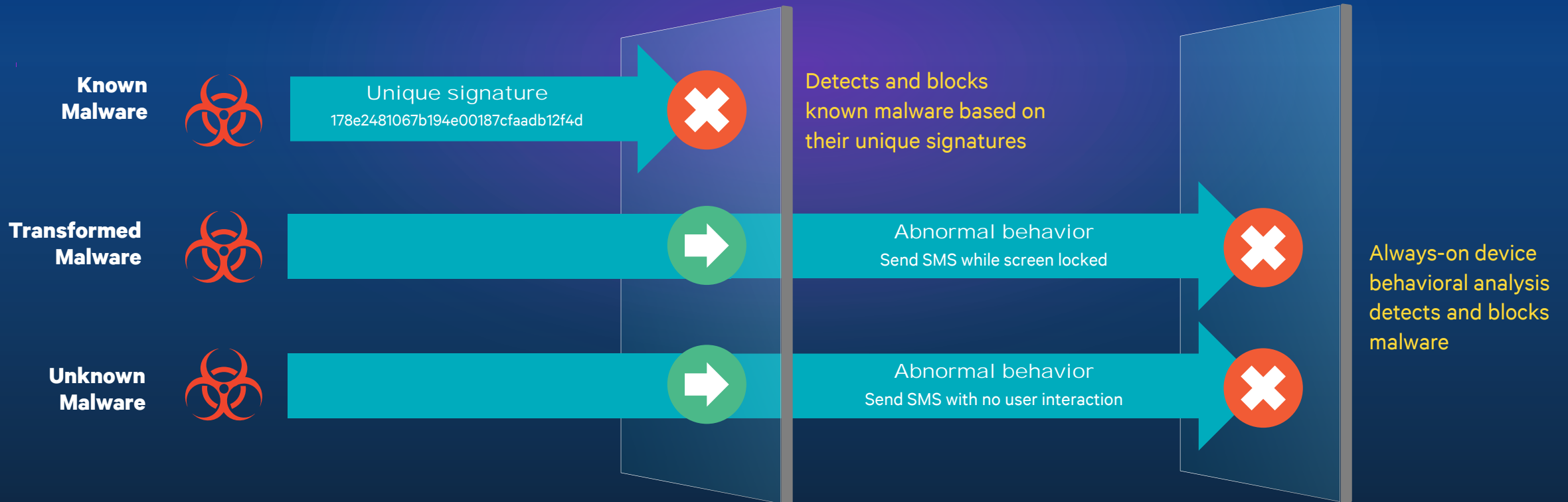# Snapdragon Smart Protect - Behavioral analysis complements signature-based detection
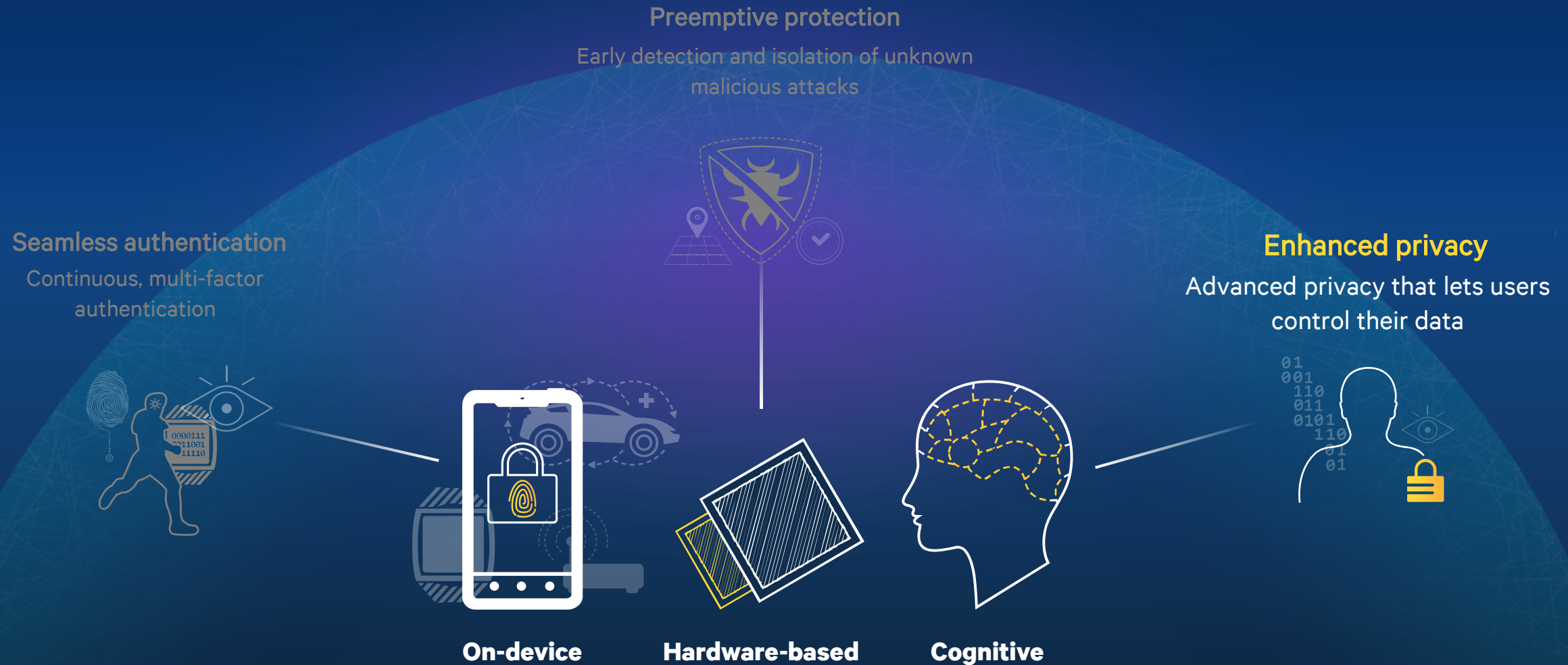
Malware attack

Signature-based detection

Searches for a known virus identity or signature

Behavioral-based detection

Searches for suspicious or anomalous software activity

Known Malware

Unique signature
178e2481067b194e00187cfaadb12f4d

Detects and blocks known malware based on their unique signatures

Transformed Malware

Abnormal behavior
Send SMS while screen locked

Always-on device behavioral analysis detects and blocks malware

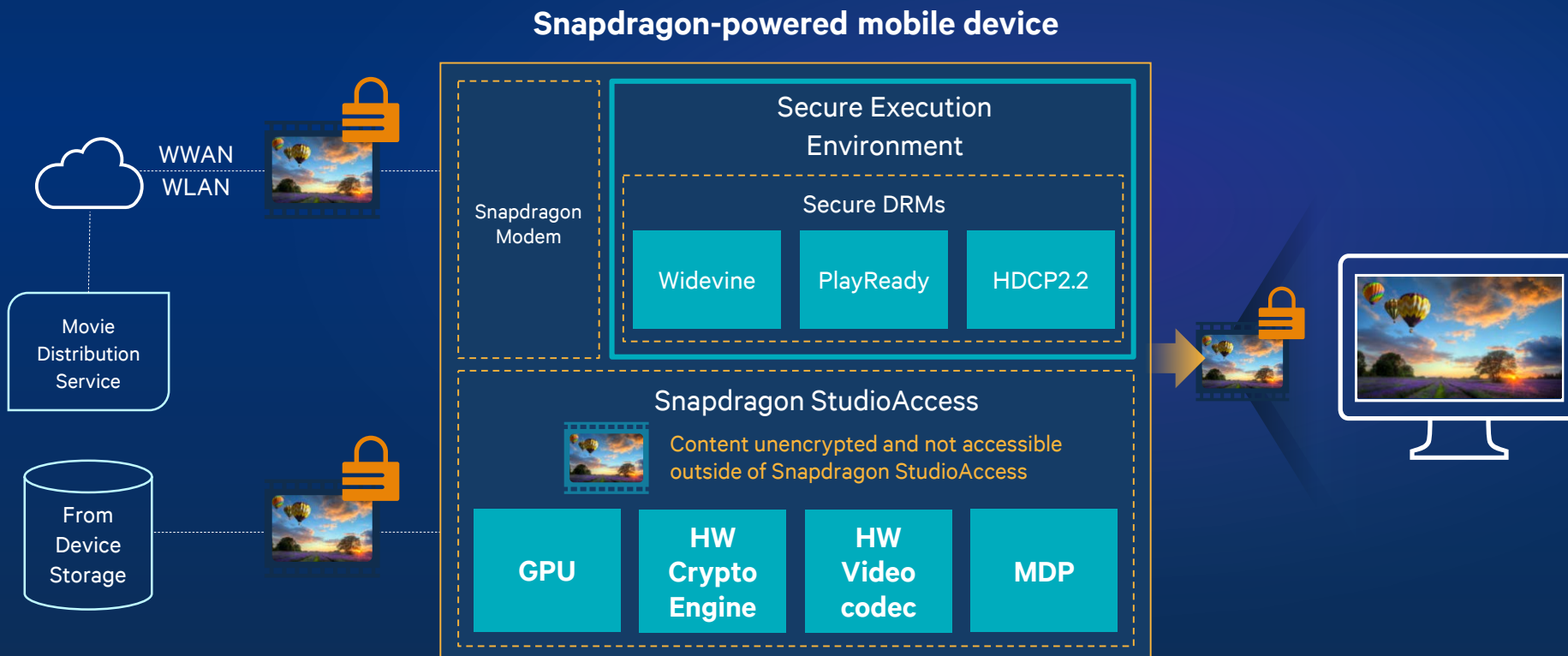**Unknown Malware**

Abnormal behavior
Send SMS with no user interaction

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Preemptive protection

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malicious attacks

Seamless authentication

Continuous, multi-factor
authentication

Enhanced privacy

Advanced privacy that lets users
control their data

On-device   **Hardware-based**   **Cognitive**

Snapdragon StudioAccess content protection
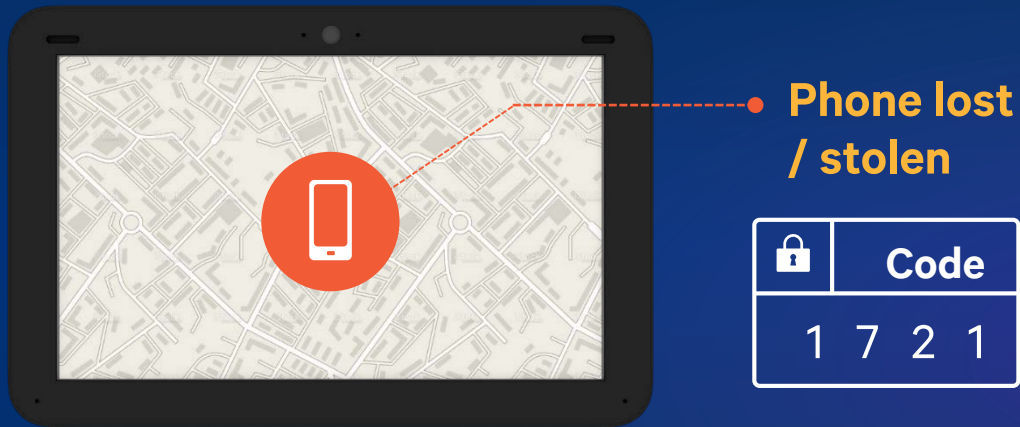## Comprehensive content security

What it is

- Utilizes SecureMSM foundation to support comprehensive protection of premium video content

- Supports popular industry DRM (digital rights management) solutions

- Recognized by major Hollywood film studios

Benefits

- Users of Snapdragon powered devices can enjoy the latest premium studio content, at up to 4K Ultra HD resolution*

Snapdragon-powered mobile device

WWAN
WLAN

Movie Distribution Service

From Device Storage

Snapdragon Modem

Secure Execution Environment

Secure DRMs

| Widevine | PlayReady | HDCP2.2 |

Snapdragon StudioAccess

Content unencrypted and not accessible outside of Snapdragon StudioAccess

| GPU | HW Crypto Engine | HW Video codec | MDP |

* where such content is offered.

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Qualcomm SafeSwitch technology

Phone lost / stolen

🔒	Code
1 7	2 1

Phone found

`1 7 2 1` **Unlock**

What it is

- Technology that helps enable users to remotely disable their mobile devices if they're lost or stolen and re-enable them if they're found

- Includes hardware SIM Lock to disable connectivity if owner's SIM is removed

Benefits

- Designed to help prevent device theft and protect user data and privacy

- Built to confirm that device lock requests are coming from a trustworthy source, decreasing the likelihood of malicious device lock attacks

Conclusion

Qualcomm Technologies security leadership

By building on its hardware-based foundation, Qualcomm has been offering proven security solutions for billions of devices since 2008
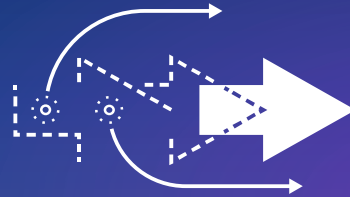
Qualcomm Technologies security leadership

Uniquely positioned to address security issues

Industry traction

- Qualcomm security powers billions of devices

History of success

- Qualcomm® Snapdragon SecureMSM™ technology first introduced 2008
- 1st to receive Common Criteria's Mobile Device Fundamentals Protection Profile (MDFPP) certification

Holistic system approach

- End-to-end solutions
- Hardware-based security foundation
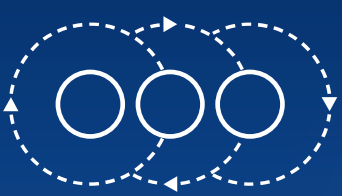- Custom hardware engines and integrated software

Ecosystem support

- Active participants in many open standards
- Working with leading security application providers

Qualcomm to offer broad ecosystem support
Driving end-to-end security solutions through collaboration and support

Industry organizations	**Public policies**	**Software and services**	**OEM and operator support**	**Ecosystem partners**
• FIDO	• Certification (e.g. Common Criteria, FIPS 140-2)	• Open standards	• Manage unique keys per device	• Studios
• SCSA	• Data protection and privacy regulations (e.g. HIPPA)	• Provisioning and signing services	• Key provisioning and services	• Financial institutions
• GlobalPlatform		• Software development kits	• Sensor porting kits	• Enterprise services
• Trusted Computing Group	• Phone theft, fraud (e.g. Kill Switch)	• Trusted execution environment porting kits		• Public sector (e.g. healthcare)
• W3C	• Cybersecurity			• Distributors

Thank you

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