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Providing E2E Security in Linux

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Agenda

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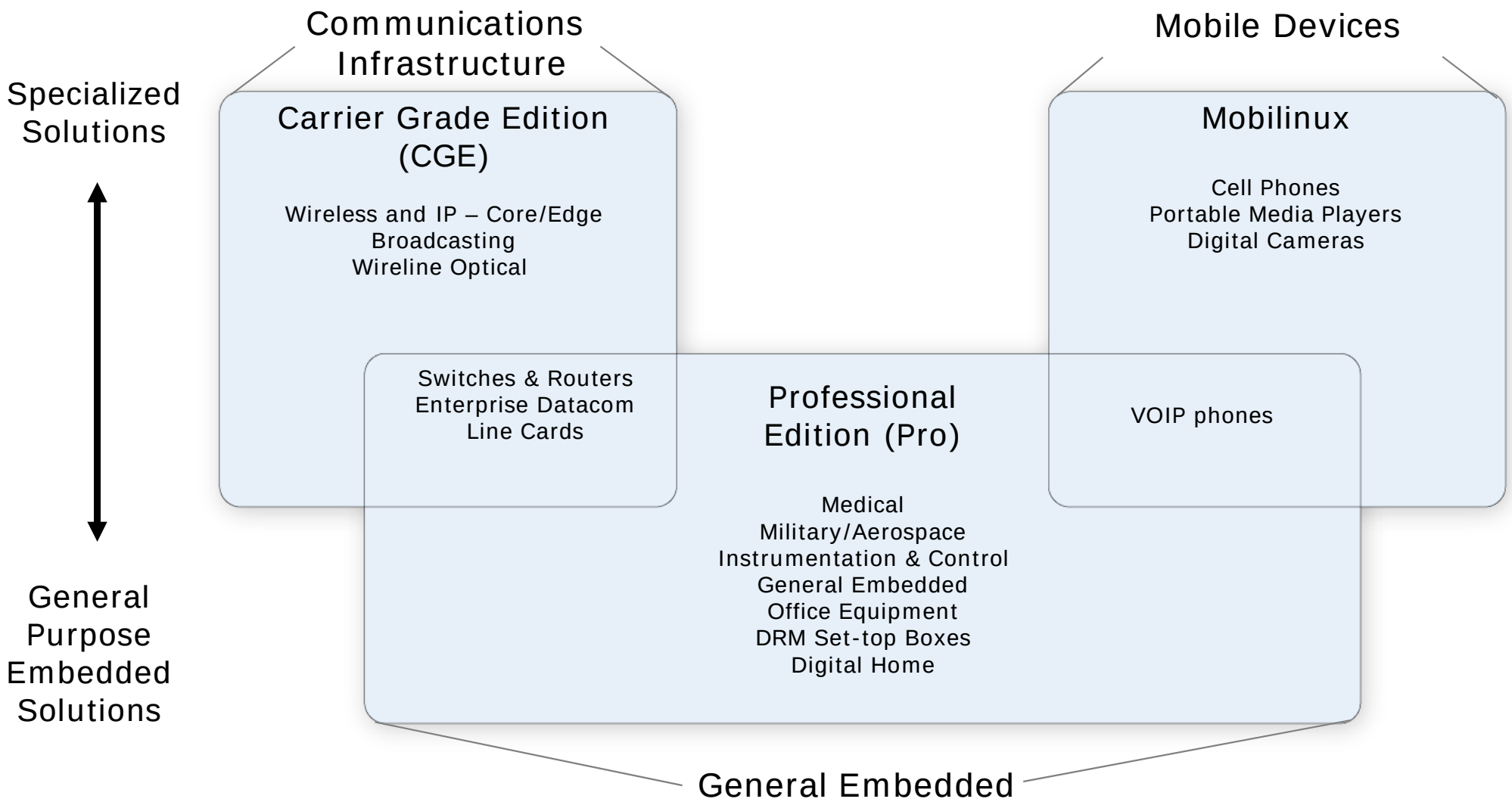
- Introduction
- Objectives
- Discussion
- Conclusion

MontaVista Software, Inc.

- Leading Global Supplier of Production-quality Embedded Linux OS and Development Tools
- Expert in Developing Software-intensive Products: Mobile Phones, Telecom Infrastructure Equipment, Other Embedded Devices
  - Over 20 Million Phones Shipped with MV Mobilinux
  - DoCoMo Infrastructure Built with MV CGE Linux
- Results in Increased Software Development Productivity and Reduced Time-To-Market

MontaVista Linux Products



Linux: Not Just Desktop & Server!

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- **Linux Is Highly Active In Embedded World**
- **Embedded Linux Developers' Facts:**
  - Estimates Are 70% Of New Semiconductor Devices Are Linux-enabled
  - 100,000~150,000 Embedded Linux Developers
  - Emerging Software Professionals Are Linux-savvy And Linux-comfortable
  - A Great Number Of Them Enjoy Hacking!

Myth Buster (10 Cardinal Sins...)

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- Security Means Different Things To Different People
- Closed Source More Secure Than Open Source
- Security Could Be Achieved By Obscurity
- Software-Only Security Is Good Enough
- Security Staff Are Pain In The Neck
- Security Is A Set Of Components
- Can Protect Against All Attacks
- Encryption Equals Security
- Can Add Security Later
- Hackers Are Clueless

Objectives

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- Fundamental Definitions
- Describing Problem Domain
- Proposing Possible Solution

Fundamental Definitions

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- **Security Requirements?**
  - What's to be Achieved.
- **Security Assets**
  - Identify Them First!
- **Attacks**
  - Compose Attack Tree Next!
  - Devise The Protection Profile
    - What About Hardware Attacks?
- **Multilevel Security (MLS)**
  - A Must!
  - But What Does It Mean?
- **MAC & DAC**
  - What Are They? Always Need MAC?
- **Protection Strategy**
  - Access Control Mechanisms
  - Infrastructure, Application, Framework, Middleware Security
  - Intrusion Detection/Prevention Services (IDPS)
  - Hardware Security (HSM, TPM, …etc)
  - …

Objectives

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- Fundamental Definitions
- **Describing Problem Domain**
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What's Needed

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- **Security Infrastructure Should Provide**
  - Static/Dynamic Security Asset Protection
  - Strong Authentication Mechanisms *(e.g. Secure Key Management)*
  - Access Control Mechanisms *(e.g. **Role/Name/Lattice/Vector Based Access Control**)*
  - Effective Containment *(i.e. Jailhouse Execution Environment)*
  - Secure Update Mechanism *(i.e. Verification Prior To Installation)*
  - Secure-Vault, Encrypted Filesystem
  - Remote Sensitive Data Destruction Services
  - Virtualization/Container Security
  - Distributed Security Infrastructure
- **And Be**
  - Simple
  - Flexible & Extensible
  - Layered & Scalable
  - Light-weight & High-performance

Objectives

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Challenge: Establishing Trust

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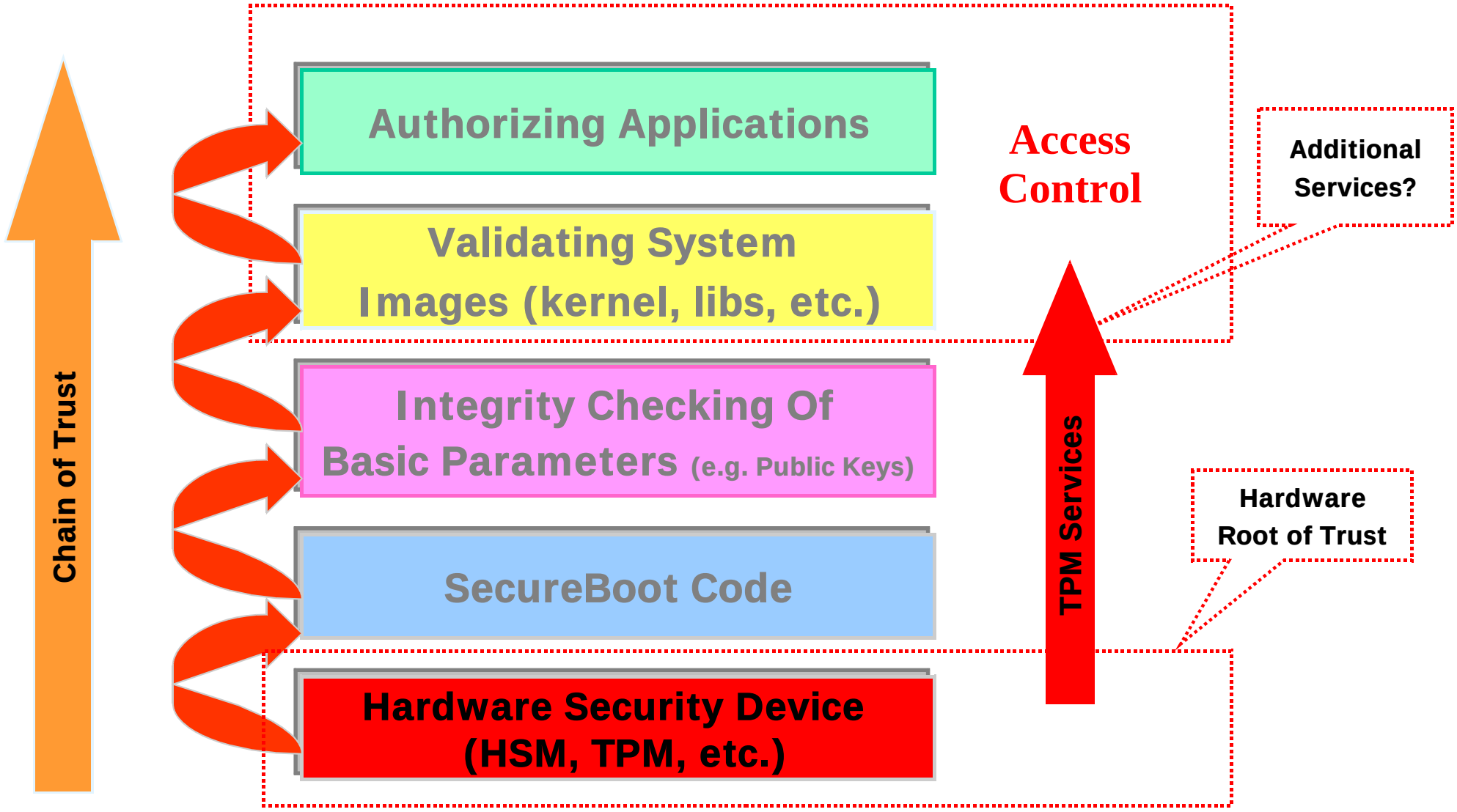
Leveraging "Root Of Trust" To Augment "Chain of Trust"



But, What About Virtualization?

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- **The Notion of Identity**
  - security_context(Dom_n_id)
    - Lacks Individual Application Identification Within a Domain
  - security_context(Dom_n_id, App_id)
    - Individual Applications Within a Domain Identified
    - But Who Handles
      - Identity Management?
      - Access Control Definition & Enforcement?
    - What's The Mediation Mechanism Across Domains??
    - Who Arbitrates & Attests The Identities?
      - Hypervisor? Could It Still Be Considered “microkernel”?

Virtualized Trust Chain

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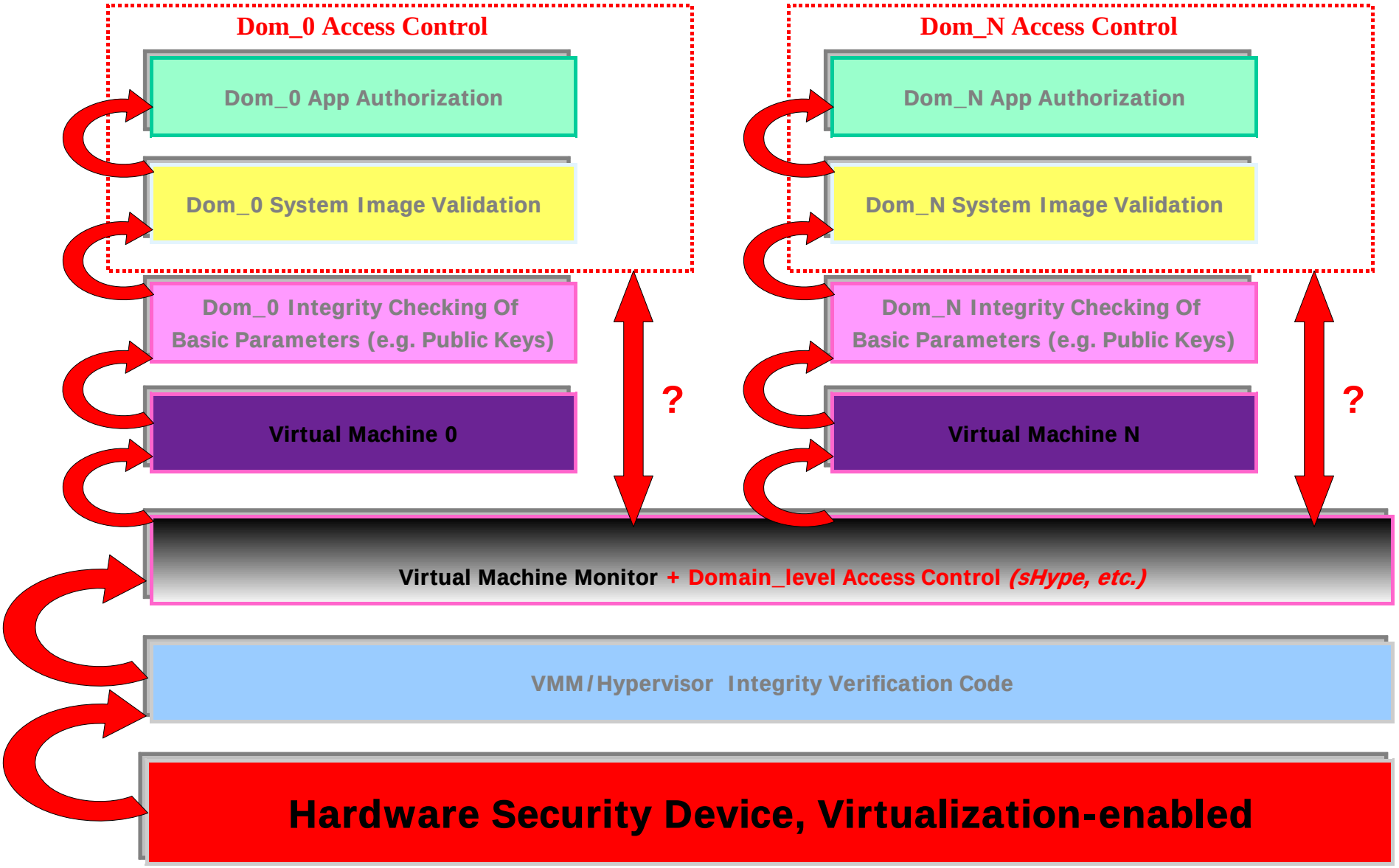

Virtualized Trust Chain

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- **Granularity Is Important**
- **IBM's sHype Is a Step In The Right Direction**
  - Available on Xen
  - VMWare ESX & Microsoft Viridian Likely to Adopt The Same Style
  - Still Not Fine-grained Enough
- **Not Ready Yet: More Work Needed**

Thank You

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