Welcome to the RSA Security Web Seminar Series

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Securing the Network of the Future

Presented by RSA Security's

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Agenda

- Introduction
- What applications will drive broadband?
- Securing the next-generation network:
  - Security vulnerabilities
  - Development challenges
  - Standards
- Case Study: CableLabs PacketCable
- What solutions are available?
- Q&A

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Market Overview

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Market Opportunities and Issues

Broadband and wireless consumer devices

- **Manufacturers and system operators have new business opportunities**
  - New devices to manufacture and sell
  - High-speed internet connection services – wired and wireless
  - New transactional services for operators (cable and wireless)
  - New "content" to deliver to users: Voice over-IP and Video on Demand
  - Secure code updates to hardware
- **…that bring new risks**
  - Service theft
  - Liability through privacy breeches
  - Malevolent code introduced causes network or subscriber damage
- **Requiring that security is serious for both broadband cable and wireless consumer devices**

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New Consumer Devices that Require Security

- **New consumer devices:**
  - Wireless phones and PDAs
  - Set-top boxes
  - VoIP phones connected to MTAs
  - Gaming devices
  - Networked appliances
  - Residential Gateways
  - Securing Wireless Networks in the home
- **Infrastructure**
  - Switching and routing infrastructure equipment that merges voice, video and data networks
  - Security now being required at the network level:
    - IPSec implementations are increasing
    - IPv6 will push the adoption of IPSec
    - 802.11 standards in wireless

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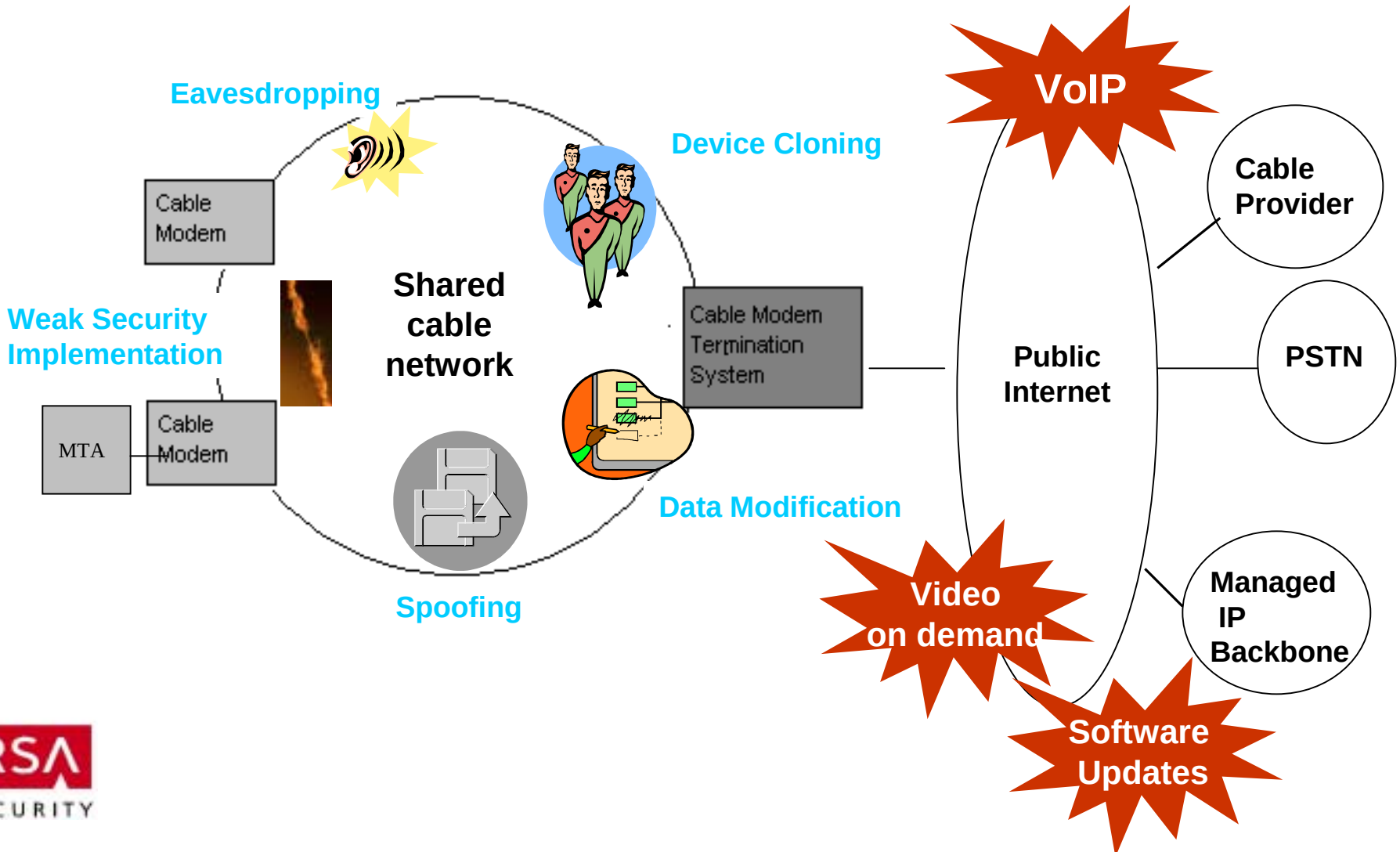
Security Essential to Deployment of New Applications



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Securing the Network of the Future

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Security Vulnerabilities on Public Networks

Common security vulnerabilities that exist on public networks:

- ✓ **Eavesdropping**
- ✓ **Device cloning/impersonation**
- ✓ **Denial-of-Service (DoS)**
- ✓ **Data modification**
- ✓ **Replay attacks**
- ✓ **Spoofing**
- ✓ **Protocol or application security weaknesses**

Note: Many of these may result in *theft of service*.

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Groups Most Affected by Threats

Groups:

- **End-Users (Consumers)**
- **Service Providers**
- **Device Manufacturers**

Note: Each group has their own concerns and responsibilities.

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End-Users

- **Concerns:**
  - **Protect personal and/or customer information**
  - **Protect online accounts**
  - ***Should not* be concerned with security of underlying network infrastructure**
- **Responsibilities:**
  - **Education and security awareness**
  - **Use of personal firewall, anti-virus, SSL-enable browser, and desktop encryption**

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Service Providers

- **Concerns:**
  - **Protect user and provider data in the access, distribution, and backbone networks**
  - **Reduce or eliminate theft of service**
  - ***Should not* be concerned with securing data outside the network (e.g. cable modem or CPE)**
- **Responsibilities:**
  - **Securely implement underlying network infrastructure**
  - **Maintain performance and availability of services**
  - **Choose interoperable (certified?) network components**
  - **Implement proposed security standards closely**

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Device Manufacturers

- **Concerns:**
  - **Limit cost of production – maintain price point/increase profit**
  - **Correctly implement standards within devices**
  - **Maintain high level of device performance (balance cost and security)**
- **Responsibilities:**
  - **Develop products that conform to security standards**
  - **Certify devices when appropriate**

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Current Challenges

- **Service providers and manufacturers face a number of challenges in securing broadband services and devices.**
- **Transparency to end-users and ease-of-use is paramount – security cannot hinder usage**
- **Other areas of concern:**
  - **Network operation and performance**
  - **Embedded device limitations**
  - **Standards development, acceptance, and deployment**

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Network Operation Challenges

- **Implement multiple protocols: signaling, QoS, billing, and security**
- **Maintain appropriate performance (QoS) levels:**
  - **Bandwidth**
  - **Latency**
  - **Jitter**
  - **Packet loss**
  - **Availability**
- **Protect services that cross multiple network boundaries, architectures, and providers**
- **Field equipment upgrades**

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Embedded Device Challenges

- **Maintain profit margin (e.g. balancing cost vs. value-added functionality)**
- **Limited processing power - hardware or software?**
- **Limited memory**
  - **Flash memory - code footprint**
  - **RAM - runtime memory**
- **Physical protection of credentials**
- **Choice of security implementation: build or buy?**

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Standards Challenges

- **Choosing security appropriate for the environment (e.g. link layer vs. end-to-end security, associated performance)**
- **Competing standards – maintaining vendor neutrality**
- **Nonexistent implementation of security components**
- **Lack of test environment to validate standard**

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Case Study:
Securing the Cable Industry

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Cable Television Laboratories

- **Consortium of *multiple systems operators (MSOs)***
- **Develop standards to promote the advancement and interoperability of cable services**
- **Proposed standards for securing:**
  - **Interactive set-top services - OpenCable Copy Protection System**
  - **Cable data services - DOCSIS BPI+**
  - **IP telephony - PacketCable Security**

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What is PacketCable?

*"PacketCable is a set of **protocols** and associated element **functional requirements** developed to provide the capability to deliver **Quality-of-Service (QoS) enhanced secure communications services** using **packetized data** transmission technology to a **consumer's home** over the **cable television** hybrid fiber coax (HFC) data **network**."*

"While the initial service offerings in the PacketCable product line are anticipated to be Packet Voice and Packet Video, the long-term project vision encompasses a large family of packet-based services."

- CableLabs

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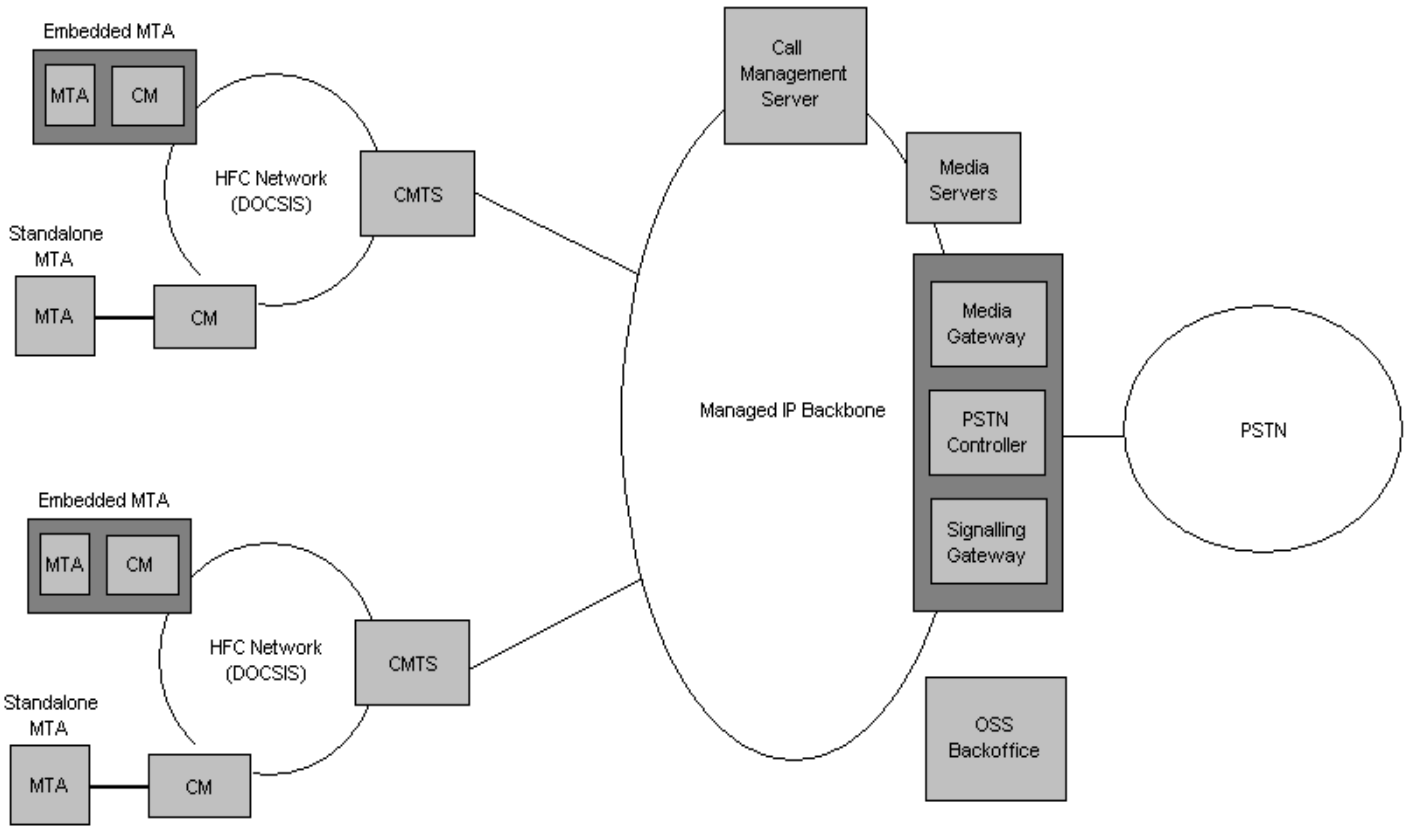
PacketCable Network Infrastructure



Application
Presentation
Session
Transport
Network
Data Link
Physical

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PacketCable Security in Detail

- **Eavesdropping:**
  - **Uses IPSec for traffic encryption (3DES, RC5, CAST, IDEA, Blowfish transforms)**
  - **Real-Time Protocol (RTP) messages secured using AES (MTA-to-MTA traffic)**
- **Device Cloning and Impersonation:**
  - **RSA key pair embedded within MTA in write-once memory – identification and key exchange between MTA and numerous other PacketCable devices**
  - **X.509 certificate installed during manufacturing**
  - ***Limited* use of digital signatures**

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- **Device Cloning and Impersonation:**
  - RSA key pair embedded within MTA in write-once memory – identification and key exchange between MTA and numerous other PacketCable devices
  - X.509 certificate installed during manufacturing
  - Some use of digital signatures

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PacketCable Security in Detail (2)

- **Data Insertion/Modification:**
  - IPSec provides varying degrees of integrity for *all* data packets
  - HMAC SHA1 and HMAC MD5 algorithms
- **Spoofing:**
  - Certificate-based authentication combined with encrypted (IPSec) communication
  - Relies on DOCSIS 1.1 authentication as well to bind to MAC address
- **Message Replay – IPSec anti-replay service**

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PacketCable's Use of IPSec

IPSec provides:

- **Encryption:**
  - ✓ **Transport and Tunnel modes - PacketCable uses *only* Transport mode**
  - ✓ **PacketCable uses only Encapsulating Security Payload (ESP) – no Authentication Header (AH)**
- **Message Integrity – IPSec ESP mode incorporates HMAC functionality**
- **Authentication/Key Management:**
  - ✓ **RSA key pairs/X.509v3 digital certificates or pre-shared keys**
  - ✓ **Internet Key Exchange (IKE)**
  - ✓ **Kerberos (PKINIT and KINK)**
  - ✓ **Inter-domain authentication provided by PKCROSS**
- **Routable for end-to-end security**

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PacketCable and Public Key Infrastructure (PKI)

- **PKI and Digital Certificates provide:**
  - **Device authentication = reduced service theft**
  - **Simplified key management**
  - **Centralized trust for MSOs**
  - **Secure software upgrades**
- **PKI provides mechanism for developing trust between various communication devices (a trust domain)**

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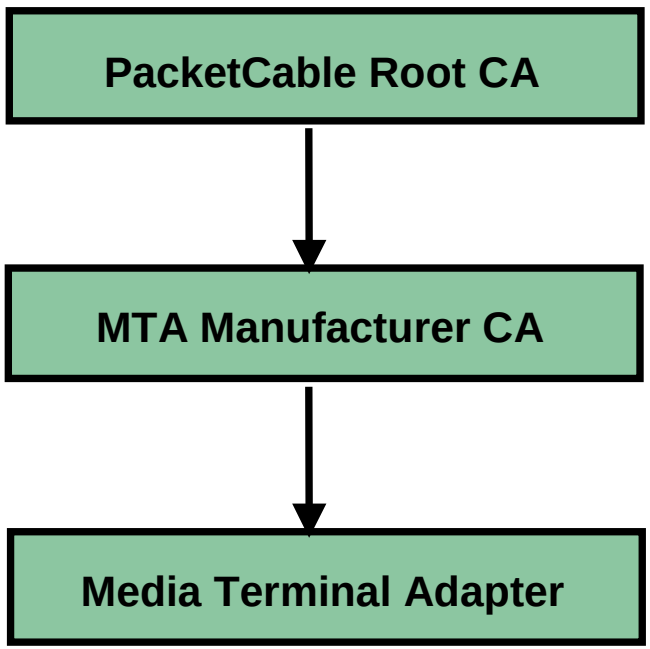
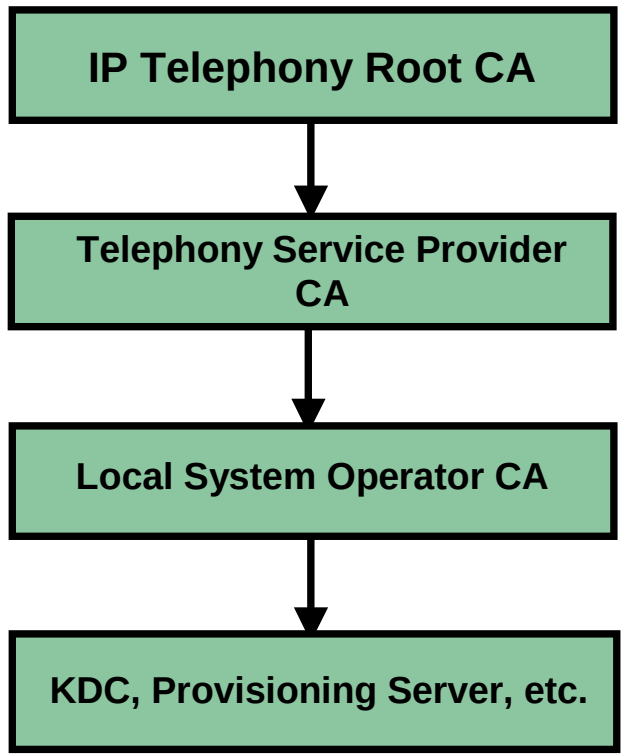
PacketCable PKI Hierarchies

MTA Device PKI Hierarchy



Telephony PKI Hierarchy



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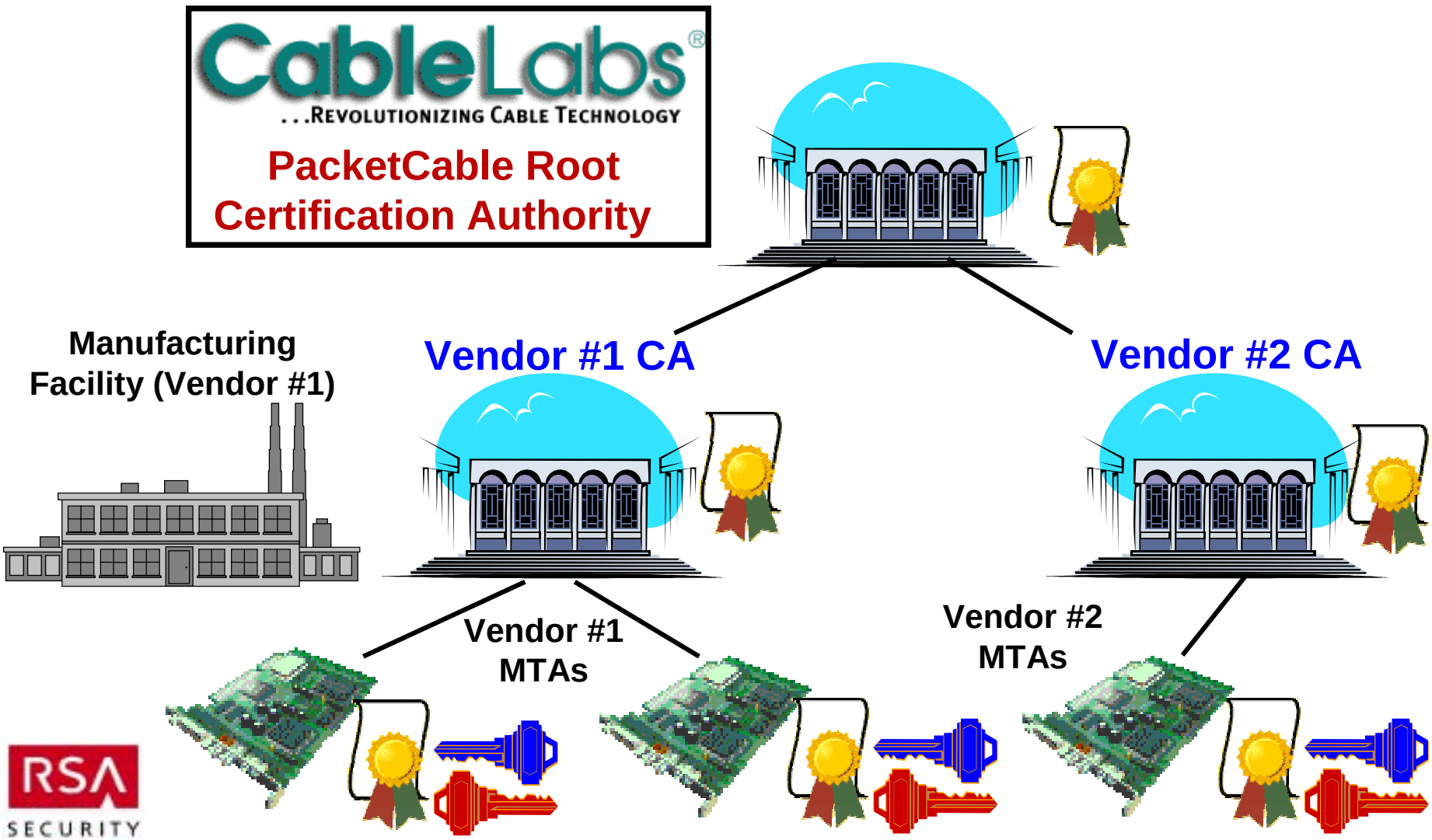
PacketCable Manufacturing CAs



Signed Software Upgrades

- **PacketCable currently specifies MTAs embedded within cable modems (no standalone MTAs)**
- **Embedded MTAs utilize signed software upgrade functionality built into DOCSIS 1.1**
- **Standalone MTAs must implement software upgrade signature verification**

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Signed Software Upgrades (2)

- **PKCS#7 formatted software upgrades distributed by manufacturer**
- **Code is digitally signed by manufacturer and optionally by MSO**
- **MTA must verify signatures before installing software upgrade**
- **Requires an additional PKI hierarchy for Code Verification Certificates (CVCs):**
  - **PacketCable Root CA issues Manufacturer and MSO CVCs (one level hierarchy)**

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PacketCable Security Design Considerations and Challenges

- **Many traffic encryption algorithms to choose from:**
  - **3DES is a standard, but relatively slow**
  - **RC5 is *fast* and *highly secure***
- **New form of IPSec key management:**
  - **Kerberos PKINIT and KINK**
  - **Many manufacturers lack a Kerberos test environment**
- **Must secure communications across multiple cable provider networks (more than one Kerberos domain)**
- **Must secure communication with telephony providers (disparate network architectures)**

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What Solutions are Available?

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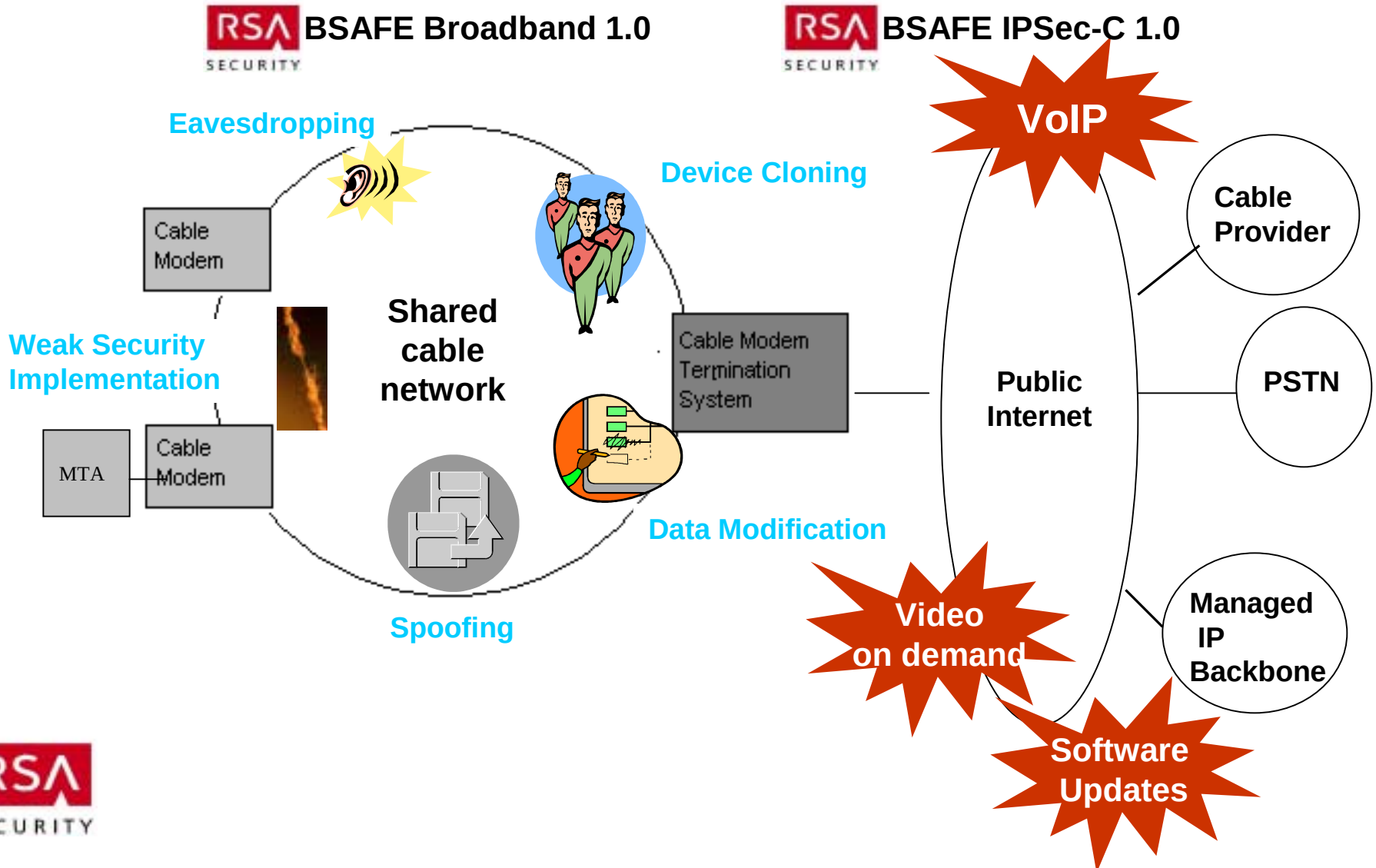
Security Essential to Deployment of New Applications



RSA Security Products for Broadband Security

Modem, Chipset and Consumer Electronic Manufacturers

RSA BSAFE® Broadband SDK

- Currently Available
- Announcing in Europe
- Reduces risk and allows rapid compliance with DOCSIS
- Part of complete manufacturing solution

Carrier Class Gateway and Consumer Electronic Manufacturers

RSA BSAFE® IPSEC-C

- Currently available
- Tested and interoperable implementation of protocol
- One-stop shop for complete standard support
- PacketCable and VoIP opportunities today

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RSA BSAFE Broadband Features

- All crypto and certificate handling features in DOCSIS 1.0 and 1.1 specification
  - Unwrap PKCS#7 signed secure code updates
  - Verify multiple signatures attached in PKCS#7 messages
  - Parse and verify ASN.1 DER encoded X.509 certs
- Optimized cryptography for ARM and MIPS processors
  - RSA encrypt/decrypt
  - RSA with SHA-1
  - DES, AES
  - MD5
  - Diffie-Helman
- Plug & play support for VxWorks/ARM
- Compact code size

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Key Benefits of RSA BSAFE Broadband-C

- **Enables innovation while reducing risk**
  - Memory management features allows manufacturers to focus differentiating product rather than security
- **Eases and facilitates compliance with DOCSIS security standards**
  - Reduces risk, eases compliance and accelerates time to market
- **Optimizes performance and accelerates testing cycles**
  - Manufacturers using RSA Broadband 1.0 can benefit from a 10x performance enhancement
  - Performance optimizations accelerating testing at production facility
- **Trusted by CableLabs**
  - Manufacturers can now embed two decades of security experience optimized to their unique manufacturing environment

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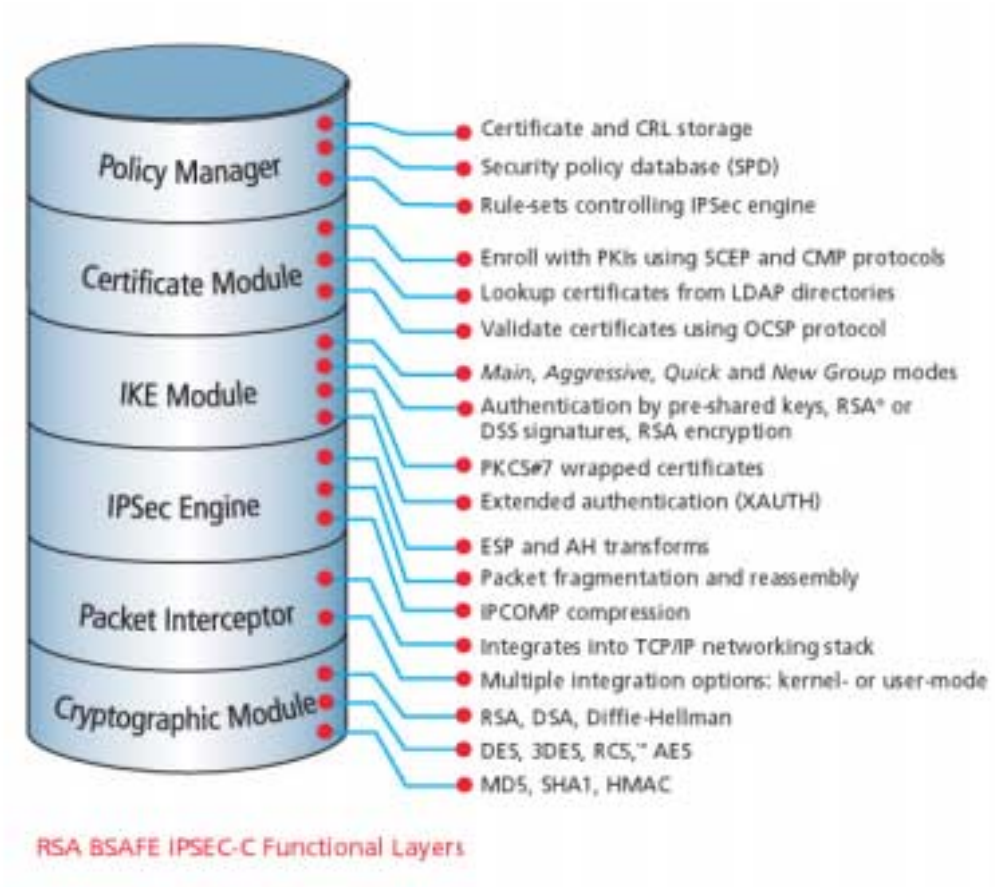
RSA BSAFE IPSEC-C Features



RSA BSAFE IPSEC-C Functional Layers

- **Policy Manager**
  - Certificate & CRL storage, rules-set IPSec engine
- **Digital certificate support:**
  - SCEP, OCSP, CMP and LDAP protocols
- **IKE Module**
  - Authentication by RSA, pre-shared keys or DSS signature
- **IPSec Engine**
  - ESP and AH, Packet fragmentation and reassembly
- **Cryptographic Module:**
  - RSA, DSA, Diffe-Hellman, DES, 3DES, RC5, AES, SHA1, HMAC

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Key Benefits of RSA BSAFE IPSEC-C SDK

- **Simplified development**
  - **Tested and complete implementation of IPSec protocol suite**
  - **Proven quality, reliability and interoperability**
- **The industry's leading, high-performing encryption algorithms**
- **Worldwide developer support and documentation**

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RSA Security Broadband Solution

The only “one stop shop” for broadband security:

- **RSA BSAFE SDKs**
- **PKCS#7 signing tool for manufacturers to sign software downloads**
- **Broadband Certificate Authority designed to allow manufacturers to build-in trust at the point of manufacture**
- **Interoperable APIs to support third party CA services**
- **Professional Services to customize the solution**

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Software Downloads and White Papers

- **Free Software Downloads:**
  - RSA BSAFE Broadband SDK:
    http://www.rsasecurity.com/go/bbwebcast
  - RSA BSAFE IPSEC-C SDK:
    http://www.rsasecurity.com/go/bbwebcast
  - Sygate Personal Firewall SDK:
    http://www.sygate.com/partners/rsa_spf.htm
- **White Papers**
  - A Guide to Securing Cable Broadband Networks Part I: DOCSIS Security

    http://www.rsasecurity.com/products/bsafe/whitepapers/CBB1_WP_0601.pdf
  - A Guide to Securing Cable Broadband Networks Part II: PacketCable Security

    http://www.rsasecurity.com/products/bsafe/whitepapers/CBB2_WP_0601.pdf

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For more information…

- CableLabs - http://www.cablelabs.com
- RSA Security's Developer Solutions

  http://www.rsasecurity.com/solutions/developers/cablenetworks/index.html
- Cable Data News: http://www.cabledatacomnews.com

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