High Performance Cryptographic Acceleration
The SafeXcel™180-PCI Card is a highly integrated, high speed network security PCI-X plug-in card targeted to VPN applications in mid to high-range network devices and appliances.

With the SafeXcel 180-PCI Card accelerator card installed, system applications can off-load the burden of time-consuming crypto applications that can have a serious effect on system performance. This means that the host processor has more free cycles to perform its main tasks and leaves room for additional features to be implemented.

Efficient Data, Control, and Management Architecture
The SafeXcel 180-PCI Card incorporates separate interfaces for data, control, and security association (SA) database access, enabling both fast packet processing and highly efficient control and SA management systems. The SafeXcel 180-PCI Card also incorporates convenient

The SafeXcel 180-PCI Card has the best price/performance value in the industry

The SafeXcel 180-PCI Card delivers complete IPSec processing, including full header and trailer handling for ESP and AH. It also provides acceleration for IKE handshaking, including the very processor-intensive public key computations.

Designed for the VPN Appliance Market and Optimized for IPSec
With the acceleration of VPN performance in mid to high-end network devices and appliances as a design focus, the SafeXcel 180-PCI Card provides powerful and efficient IPSec processing. By accelerating only the critical and processor-intensive security functions, the SafeXcel 180-PCI Card delivers high security and common hardware interfaces, supporting PCI-X and S/DRAM memory interface capabilities to ensure easy integration with the widest variety of network and host processors, such as Intel IXP 2400 and Agere APP5xx.

Broad Platform Support
Full driver support is available immediately for development on most common Operating Systems, including Windows, Linux and VxWorks. A variety of other OSs are already supported, and additional OS driver support can be delivered on request.
**Complete VPN Security Features**
The SafeXcel 180-PCI Card incorporates a complete suite of security features in hardware, including:
- IPSec Security Protocols: ESP and AH
- Basic (bulk) encrypt/decrypt and hash operations
- SSL, TLS, and MPPE cryptographic operations

Not only are the core algorithms supplied in the SafeXcel 180-PCI Card, but the surrounding protocol handling, including header insertion and stripping, is also incorporated in the design. Several features are implemented in hardware that are unavailable with other competitive PCI-X solutions including:
- ESP header insertion/validation, including SPI and replay counter processing
- Full AH 'mutable bit' processing, including IPv4 options fields and IPv6 extension headers
- HMAC ICV validation on inbound packets
- Automatic IV generation and insertion
- ARC4 key replication, key scheduling, and MPPE-specified key update

**Full Suite of Algorithms**
The SafeXcel 180-PCI Card incorporates all of the necessary algorithms for IPsec and SSL applications:
- AES, DES, Triple-DES and ARC4 encryption
- MD-5 and SHA-1 Hashing with HMAC
- Public Key computations:
  - Diffie-Hellman Key Negotiation
  - RSA Encryption & Signatures
  - DSA Signatures
- Random Number Generation

**Power, Flexibility, and High-Assurance**
The SafeXcel 180-PCI Card offers plenty of design flexibility with a variable-rate public key operations clock that allows trade-offs between public key processing speed and power consumption. And as a feature of SafeNet’s commitment to high assurance design, the SafeXcel-1840 chip contained on the SafeXcel 180-PCI Card has all been implemented with FIPS compliant cryptographic algorithms allowing our customers to achieve FIPS 140-2 certification for their appliances.

**Gigabit Throughput**
The SafeXcel 180-PCI Card achieves high throughput not only with fast core processing engines, but also with an integration strategy that has been carefully designed to remove performance bottlenecks. A hardware-enabled Descriptor Ring, located in on-chip Dual-Port Memory, is used to control packet movements. This allows asynchronous processing between the Host and the SafeXcel 180-PCI Card. Descriptor Ring processing also allows multiple packets to be queued for processing, thereby; 'starving' of the SafeXcel 180-PCI Card is avoided.

An on-chip DMA controller intelligently allocates the packet requests among the multiple packet engines. Each packet engine contains dedicated core crypto and hashing engines, allowing them to function independently. Each engine also contains its own pair of 2K-byte packet buffers that provide for efficient burst transfers of data.

A high speed Host bus interface (PCI-X) is provided to support efficient data paths to the chip. As a result, the SafeXcel 180-PCI Card design can support full-duplex OC-12 when processing IPSec with the worst case algorithms (Triple-DES and SHA-1) and 1500-byte packets.
SafeNet QuickSec Toolkit
Customers wanting to deploy the SafeXcel 180-PCI Card can also reduce development time by licensing SafeNet's proven QuickSec Toolkit. Unique in the security market, QuickSec can seamlessly interface with any SafeXcel security processor and be configured for any combination of host processor and operating system. Capable of taking full advantage of the features in the SafeXcel 180-PCI Card, QuickSec also provides a rich suite of commands for IKE and key management features while also transparently providing a path for future upgrades of software and hardware.

The QuickSec Toolkit leverages SafeNet's track record and experience in developing IPSec / IKE / X.509 solutions to the leading vendors in the industry. QuickSec provides application specific, high value network access features, allowing quick time to market with guaranteed and proven interoperability.

The QuickSec Toolkit implements the following for Access Networks:
- IPSec security layer functionality:
  - IPSec packet layer
  - IKE authentication protocol
  - X.509 certificate based authentication
  - TCP/IP firewall

QuickSec is targeted to access networks such as:
- Edge gateways, access concentrators
- Access devices, CPE products

**Development Support**
SafeNet offers developers a simple, low-cost development kit that allows OEMs to get up and running with the SafeXcel 180-PCI Card quickly and easily. The developers kit includes a Universal Driver Module (UDM) for Win NT/2000/XP, Linux, VxWorks, and Solaris platforms, documentation, sample applications and test code.

**Applications**
- Crypto Engine for Internetworking Devices
- Routers & Switches
- VPN Gateways
- Firewalls
- Server IPsec or SSL accelerator
- iSCSI Storage Security
- Workstation Security Module

**Diagram:**
- Software components: Policy Manager, Certificates, IKE, SafeNet QuickSec IPSec Toolkit, (CGX) SafeNet Cryptographic Library, (UDM) SafeNet Universal Driver
- Hardware components: SafeXcel 180-PCI Card, PCI-Express
**SafeXcel 180-PCI Specifications**

**IPSec Performance**
- Sustained ESP: PCI-X (data) + EMI(SA):
  - AES and SHA-1
    - 1.0 Gbps (1500-byte pkts)
    - 700 Mbps (350-byte pkts)
    - 350 Mbps (64-byte pkts)
  - 3DES and SHA-1
    - 960 Mbps (1500-byte pkts)
    - 640 Mbps (350-byte pkts)
    - 300 Mbps (64-byte pkts)

**MPPE Performance (ARC4, 1500 byte packets)**
- 970 Mbps sustained Stateless PCI-X

**Crypto Block**
- 2.1 Gbps Single-DES
- 1.4 Gbps Triple-DES
- 1.9 Gbps AES (256-bit key)
- 1.6 Gbps ARC4
- Supports modes: ECB; CBC
- Multi-mode Padding support

**Hash Block**
- 1.9 Gbps MD-5
- 2.2 Gbps SHA-1
- Implements IPsec AH and HMAC
- Includes mutable bit handler for AH, including IPv4 option and IPv6 extension headers

**Public Key Accelerator**
- Accelerator for math-intensive public key operations up to 2048-bit modulus.
- Diffie-Hellman negotiate: 1760 ops/sec (1024-bit modulus, 180 exponent)
- RSA 1024-bit: 1220 ops/sec
- RSA 1024-bit verify: 3790 ops/sec
- DSA Sign 160-bit: 1250 ops/sec
- DSA Verify 160-bit: 620 ops/sec

**Protocol Support**
- Full IPsec transforms including ESP, AH and bundled header/trailer processing
- Basic Encrypt, Decrypt, Hash and HMAC operations

**Random Number Generator**
- Hardware-based, Non-deterministic Random Number Generator
- Used to internally generate session keys, IV’s nonce’s, cookies, public & private keys, etc.

**PCl-X/PCI Interface**
- 32/64-bit 3.3V bus, 5V tolerant
- PCI: 33 or 66 MHz bus speeds
- PCI-X: 66 or 100 MHz bus speeds
- Up to 6.4 Gbps burst throughput

- **On-board Memory**
  - SDRAM
  - 8 MBytes (16 MBytes optional)

- **Electrical**
  - PCI Voltage: 3.3V / 5V ±10%
  - PCI Bus Signaling: 3.3V (5V tolerant)
  - Power Consumption: 4.0W Max
  - Dynamic power reduction by programming lower clock speeds

- **Mechanical**
  - Universal PCI form factor (short card)
  - 17.5 cm x 10.7 cm (6.875” x 4.2”)

**QuickSec IPSec Toolkit (license required)**
- Dynamic addressing and config.
  - L2TP
  - IKE Configuration
  - Legacy authentication
  - XAUTH
  - RADIUS client
  - NAT (Network Address Translation)
  - Application layer gateways
  - NATT (NAT Traversal)
  - Enables IPsec connectivity over NATed networks
  - TCP/IP Firewall
  - Application layer Gateways for common applications

**CGX Library (license required)**
- Advanced cryptographic library, with Integrated Key Management support
- Targeted to Host processor
- Symmetric Algorithms
  - DES/3DES (HW accelerated)
  - AES Rijndael (HW accelerated)
  - ARC4 (HW accelerated)
  - RC5
- Hash Algorithms
  - SHA-1 (HW accelerated)
  - MD5 (HW accelerated)
  - RIPEMD-128
  - RIPEMD-160
- Compression Algorithm
  - Deflate
  - Protocol Support
  - IPsec ESP, AH (HW accelerated)
  - IPsec IKE (HW accelerated)
  - IPcomp
  - SSL/TLS, WTLS

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