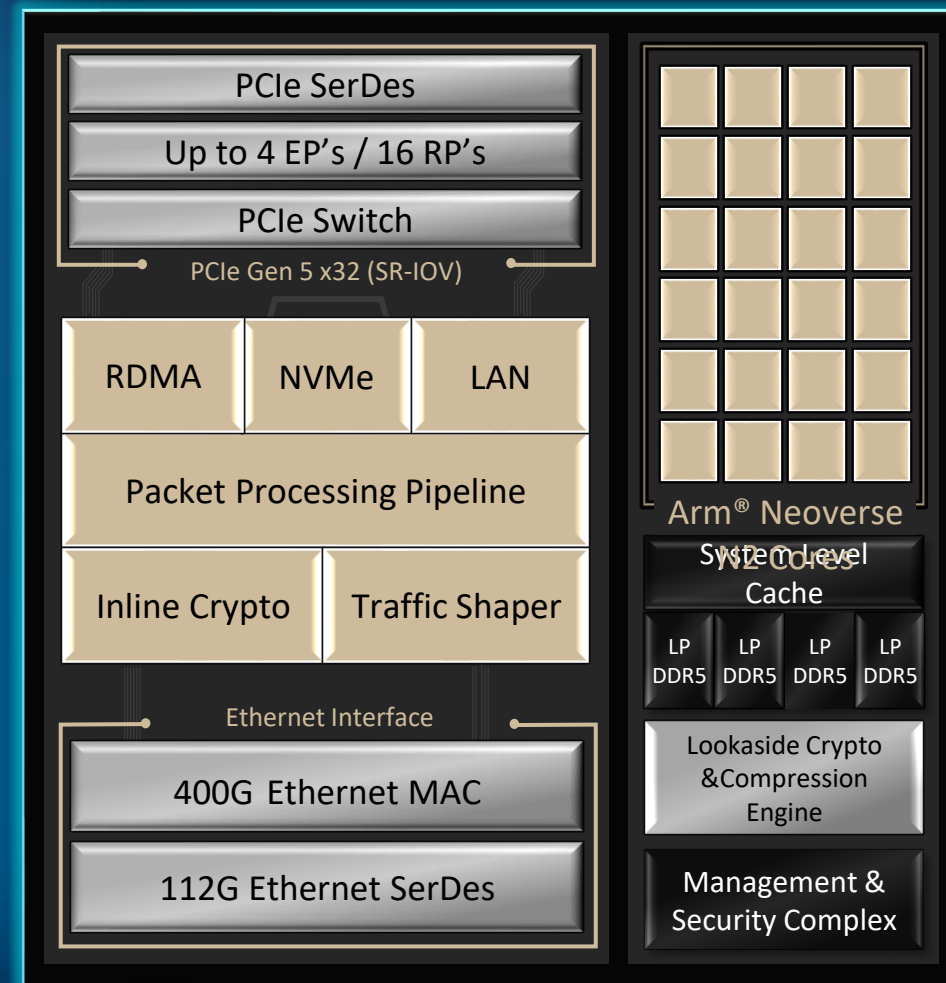




Intel® IPU E2200: Second Generation Infrastructure Processing Unit (IPU)

Pat Fleming
Intel Senior Principal Engineer

***Co-Authors:** Chihjen Chang, Derek Collier, Anjali Singhai, Stephen Doyle, Eliel Louzoun, David Lee, Vetrivel Ayyavu, Sarig Livne, Robert Hathaway, Tony Hurson, Jackson Ellis, Tamar Bar-kanarik, Jonathan Kenny, Cristine Dumitrescu, Yaron Wolberger*



Driving Network Evolution With Dynamic, Intelligent Infrastructure

Efficient and secure data Ingest

Frontend AI with performance at scale

Adaptable

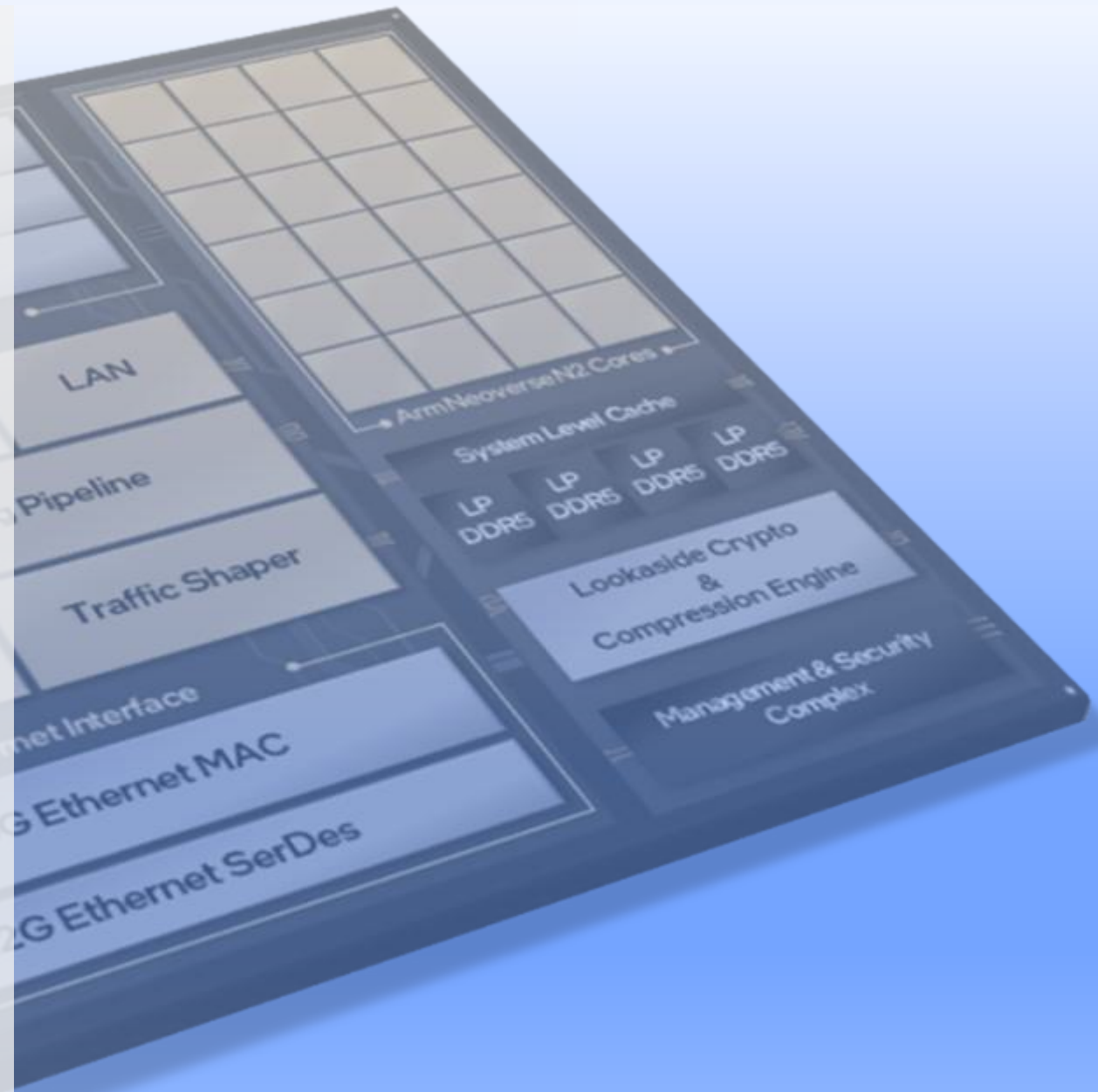
while maintaining
performance

Highly Secure

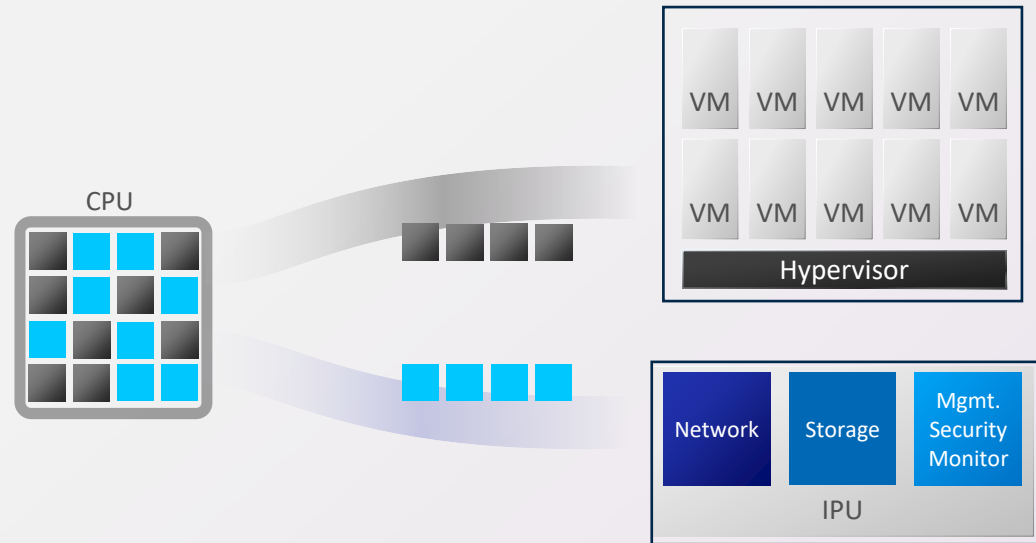
Deliver end to end
security isolation

Flexible

Build for platform flexibility and scalability

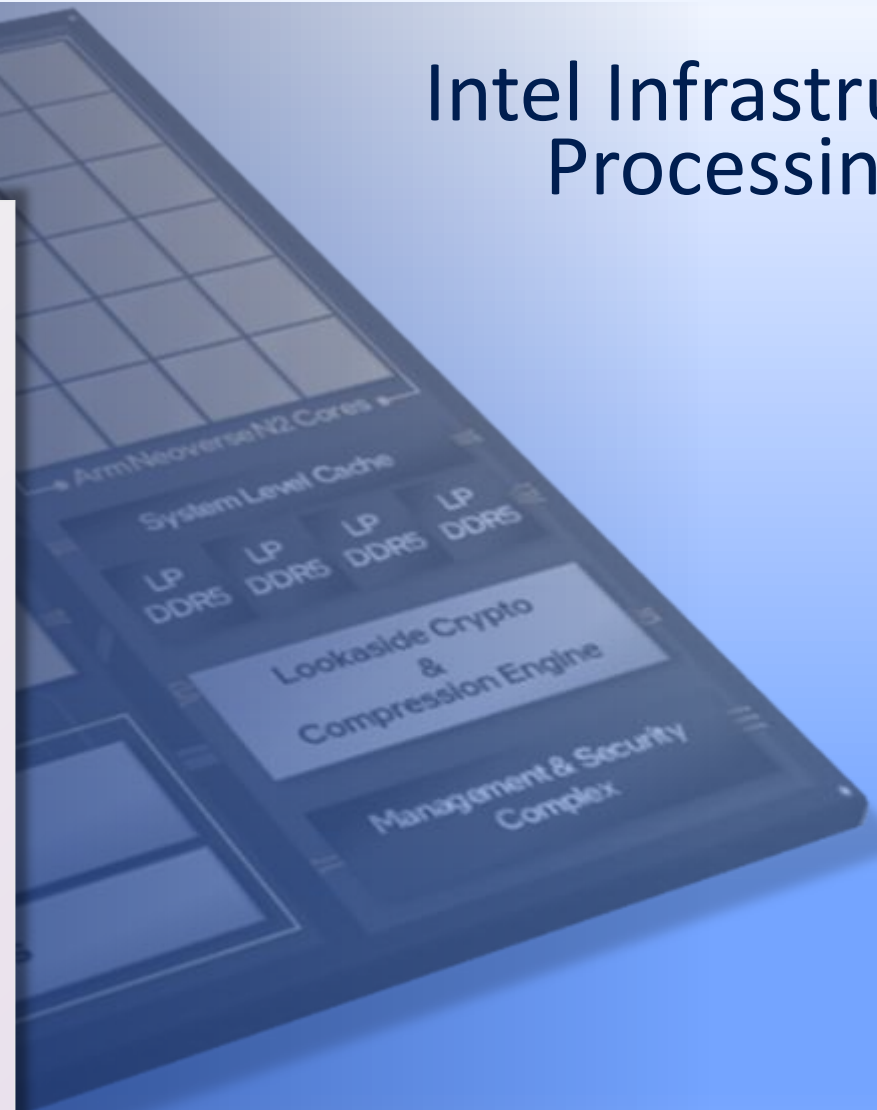


Intel® IPU E2200



Infrastructure Offload efficiency

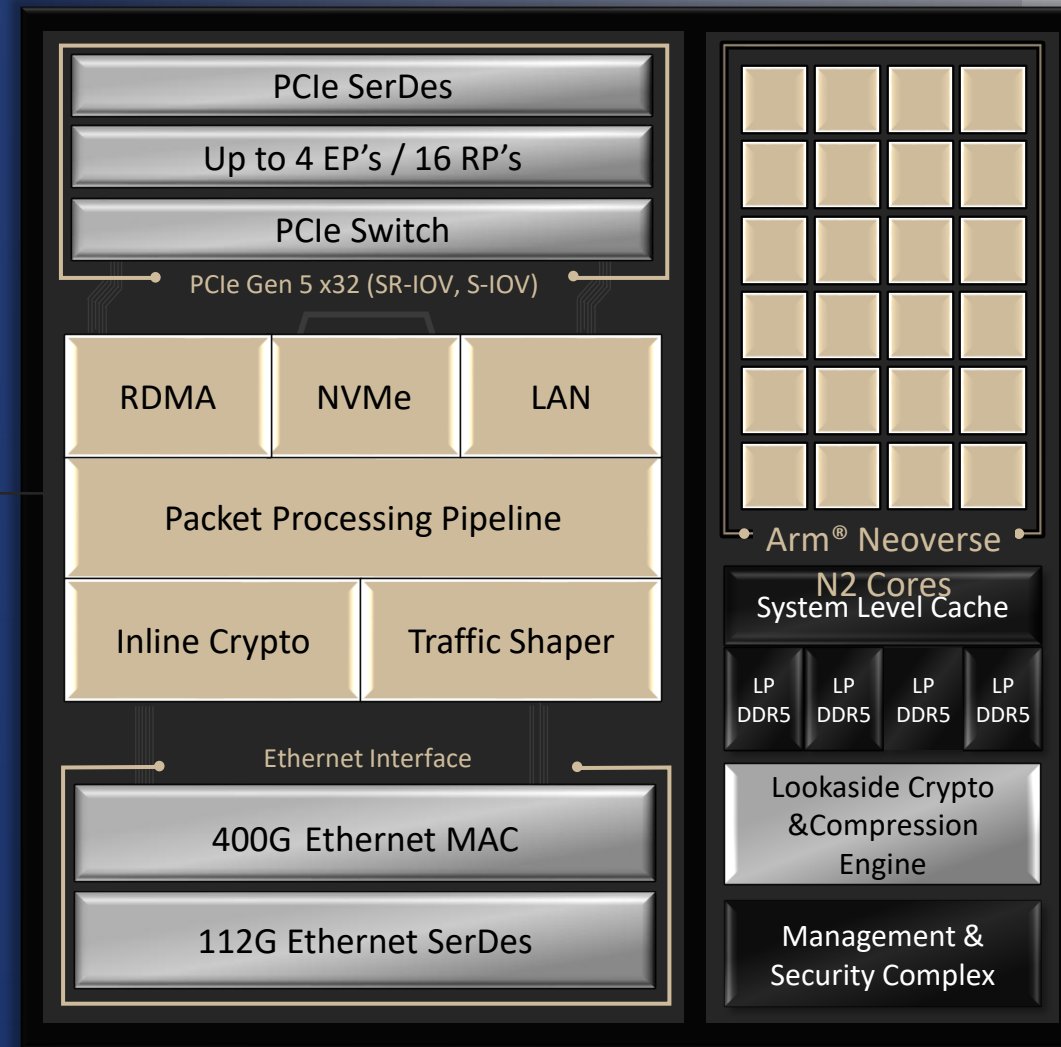
- **Efficiently scale** infrastructure and customer workloads.
- **Deliver low latency** with deterministic performance.
- **Securely separate** infrastructure and tenant.
- **Accelerate common** infrastructure workloads.
- **Enable flexible** custom data processing pipelines.



Intel IPU E2200

Architectural Breakdown

Network
Subsystem



Compute
Complex

Intel IPU E2200

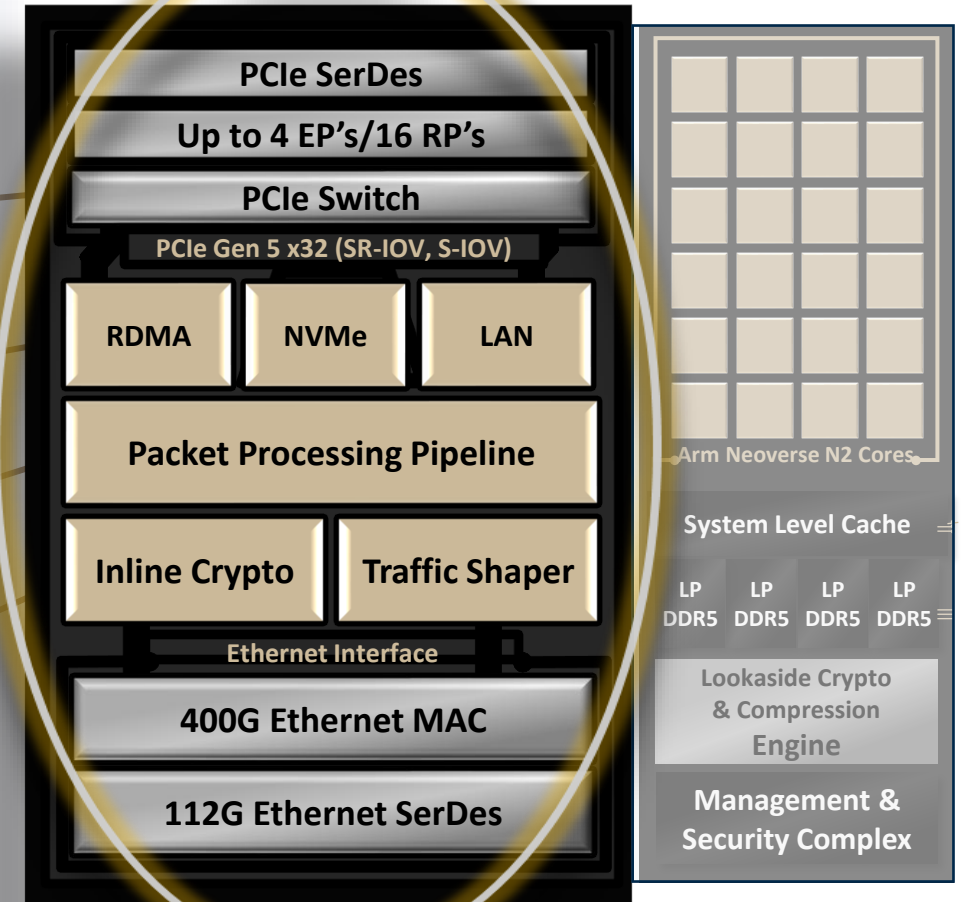
Network Subsystem

Flexible Connectivity support multiple hosts and endpoints

Low-latency and at scale reliable transport

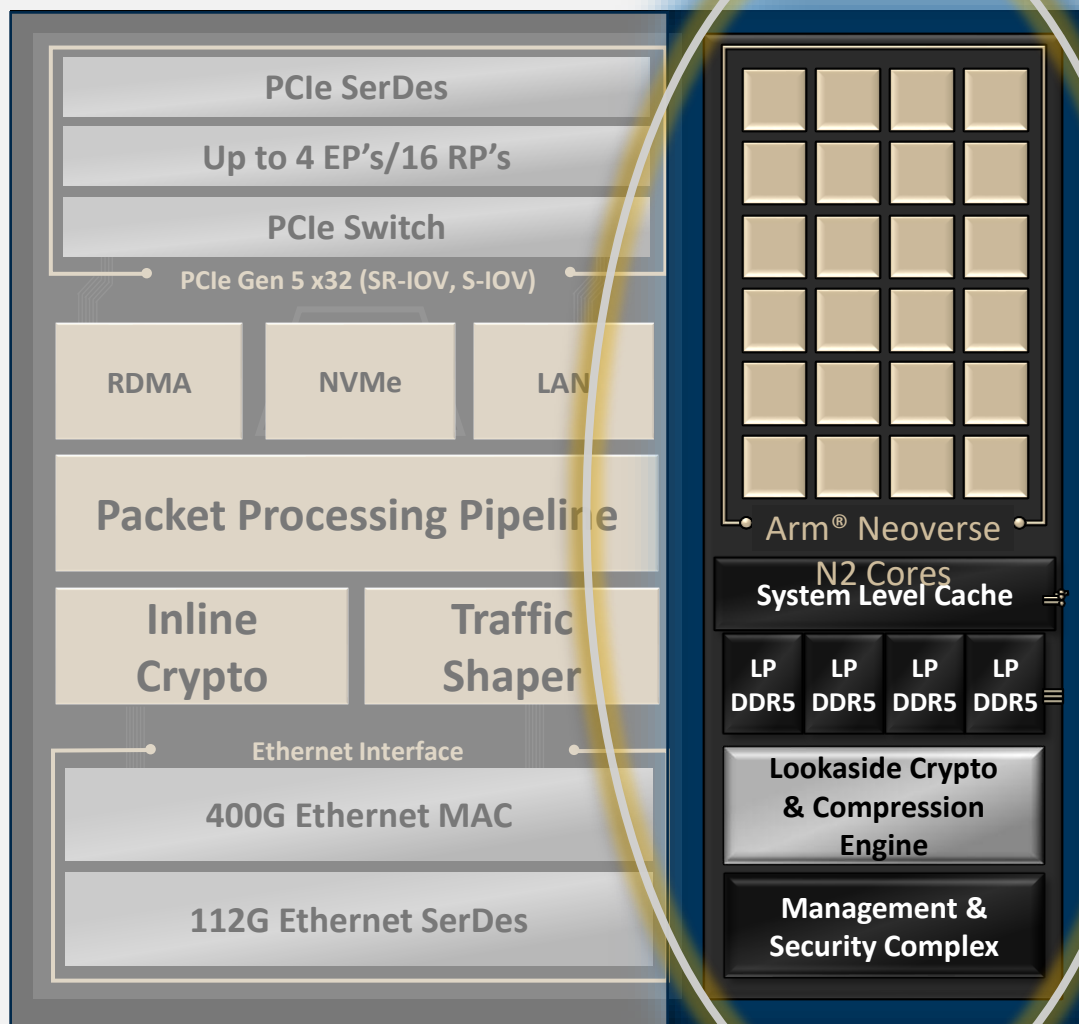
Advanced P4 Programmable Packet Processing Pipeline

High performance Inline Crypto at scale



Compute Complex

Intel IPU E2200



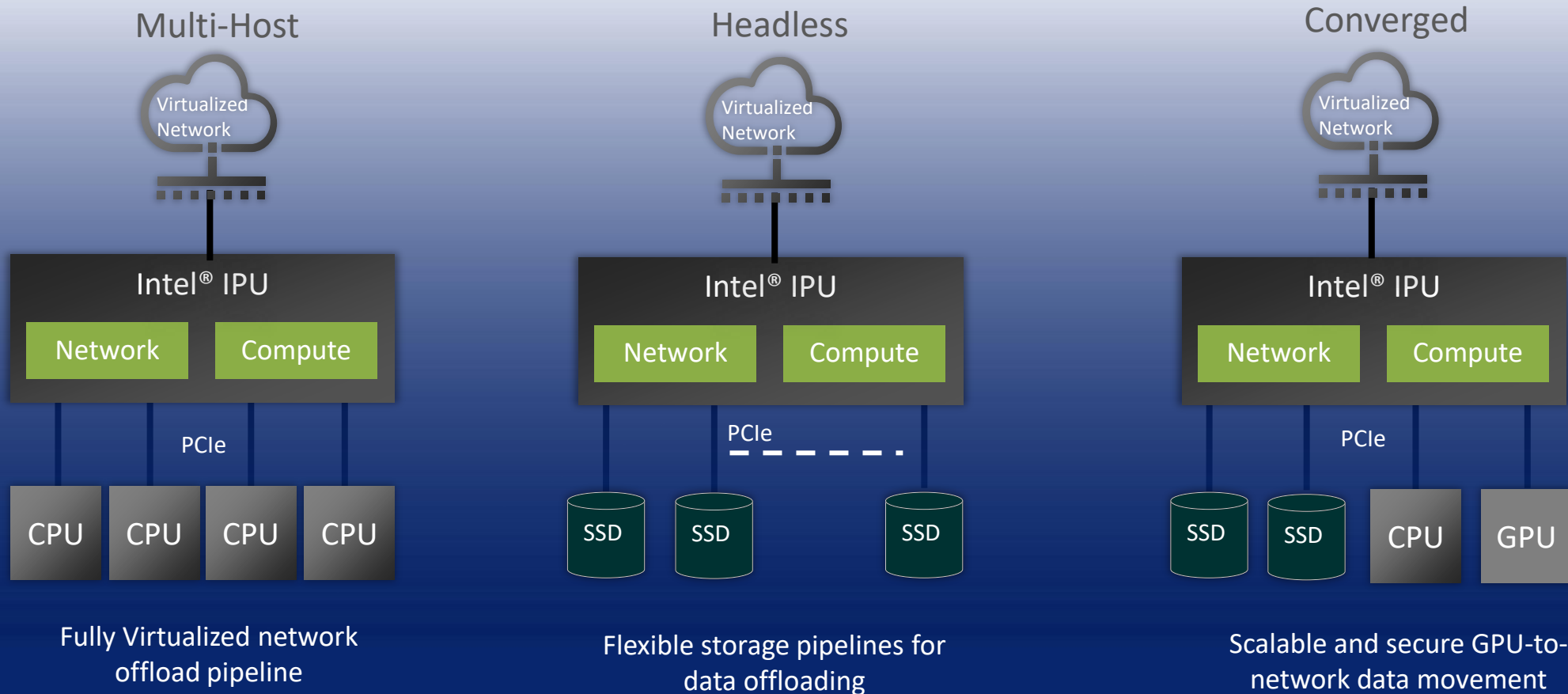
Up to 24 Arm® Neoverse N2 Cores for a wide variety of infrastructure apps

32MB System Level Cache backed by 4 channels of LPDDR5 @6400MT/s

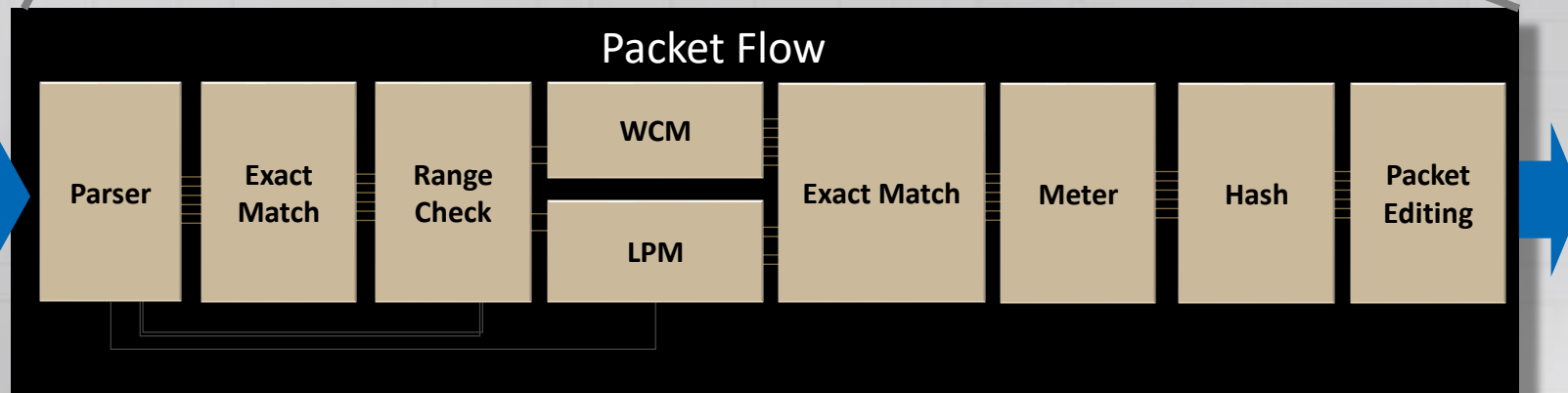
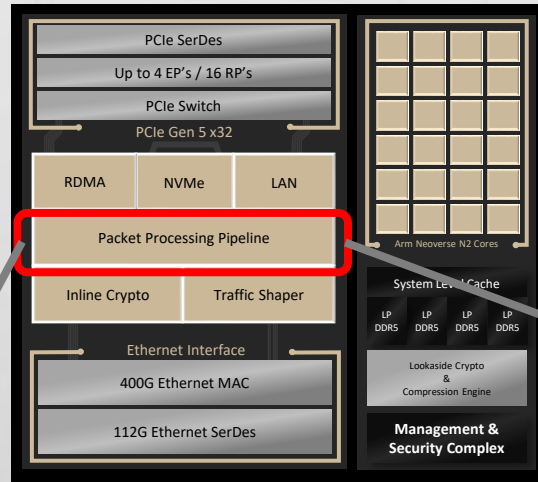
Lookaside Crypto and compression engine for host or compute complex use

Dedicated management processor providing secure boot, life cycle management and overall manageability

IPU E2200 Platform Flexibility

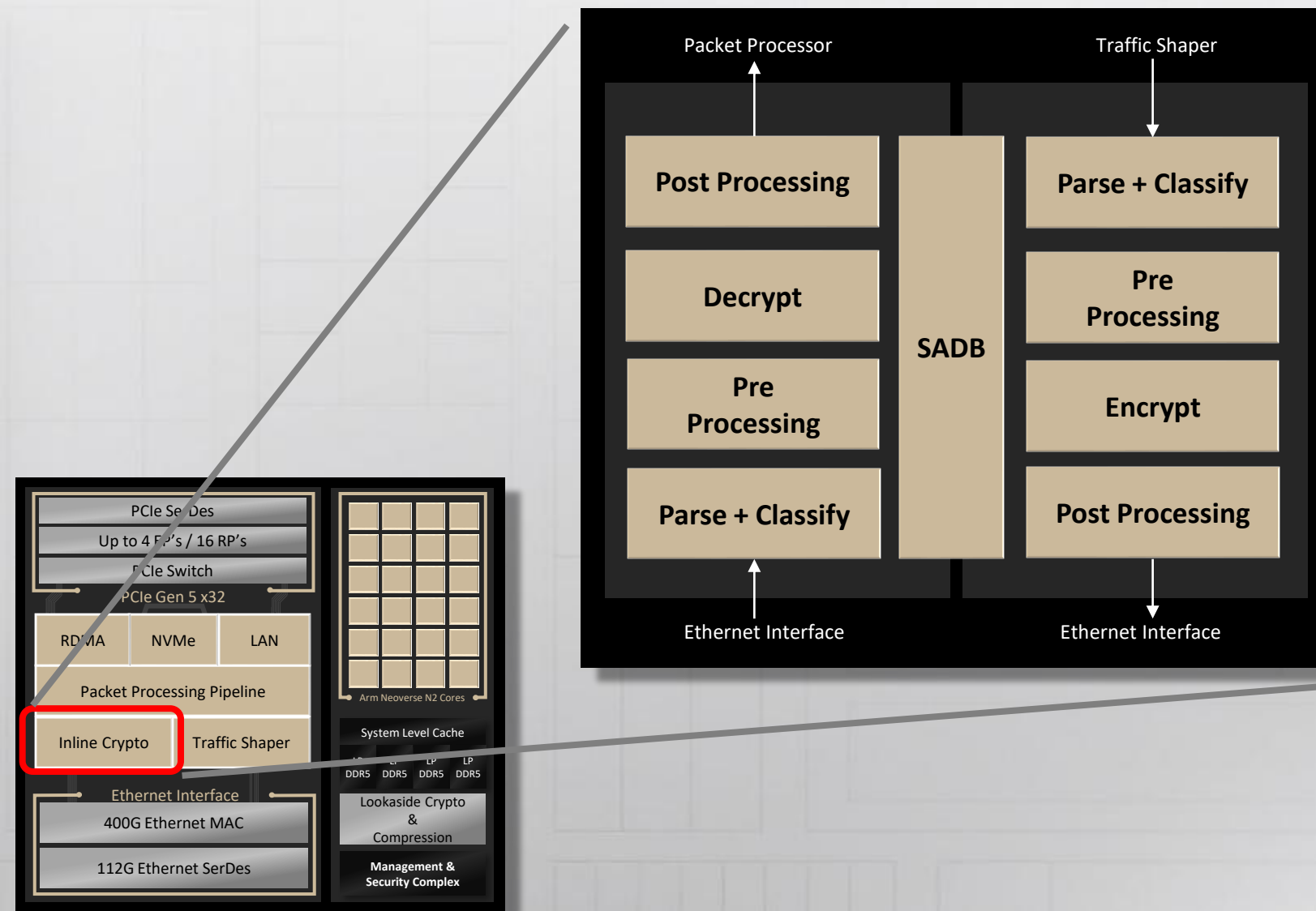


Intel IPU E2200 FXP Packet Processor



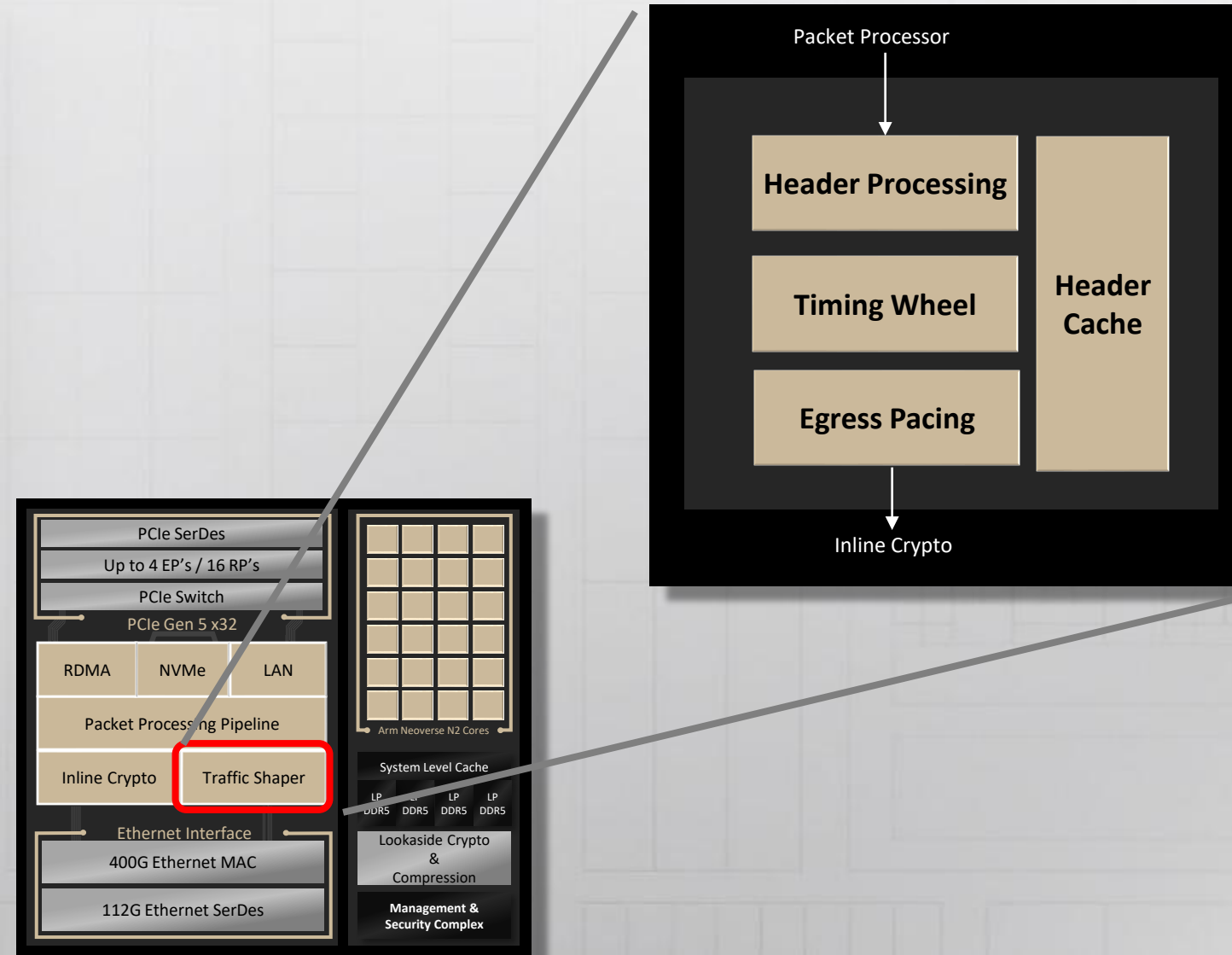
- General purpose packet processor
- High-performance design with flexibility for current and future applications.
- Software programming
 - P4-based software for enhanced features
- Enables high-performance networking
 - For virtual, microservice, and physical environments

Inline Crypto



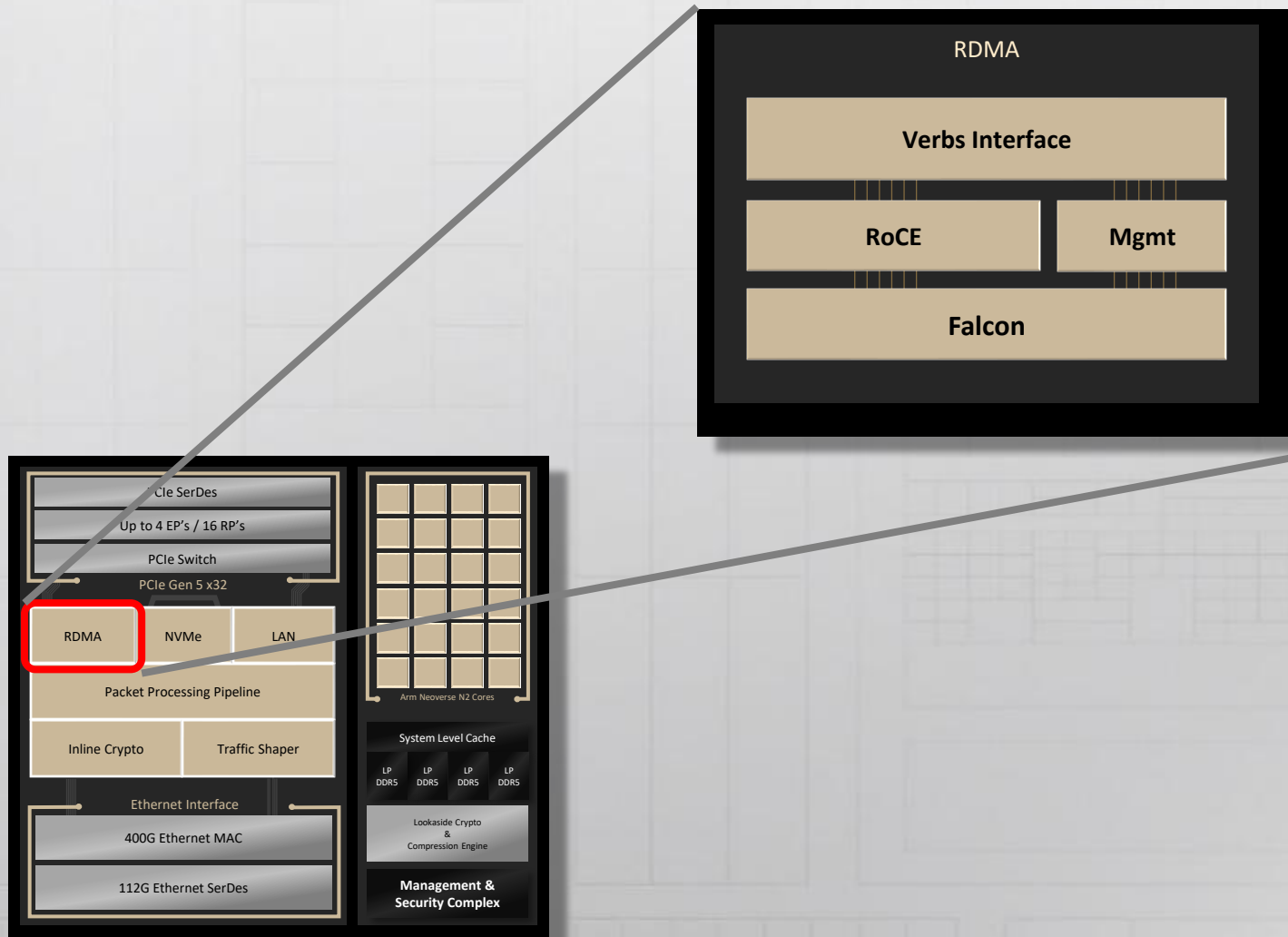
- Security @ Performance
 - 2x Performance
 - Predictable Low latency
- Configurable per Flow
 - IPSec and PSP Protocols
 - AES-{GCM, GMAC, CMAC}, ChaChaPoly
 - P4 Programmable
- Memory backed Scalability
 - 4x Increase in Security Associations

Traffic Shaper



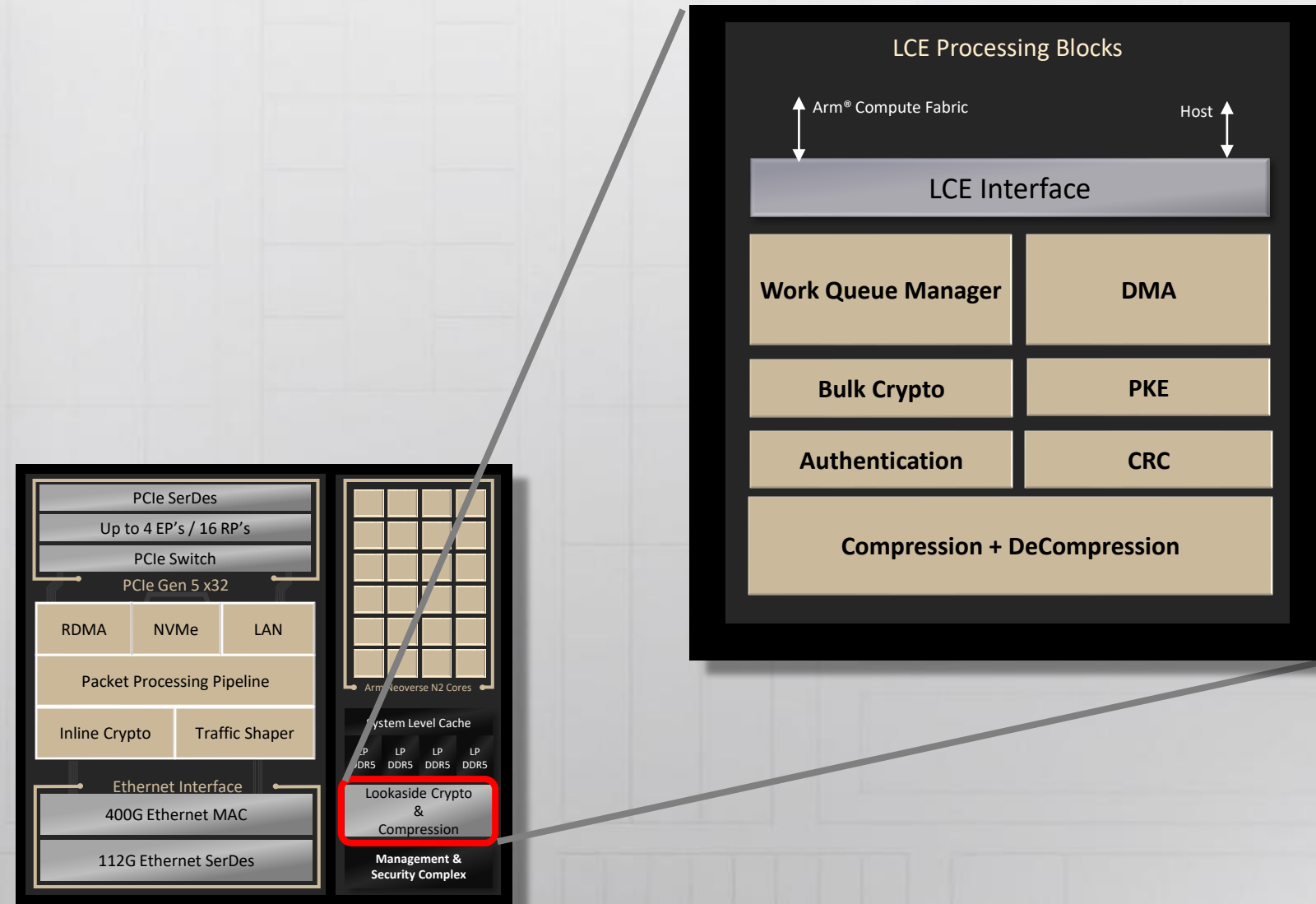
- Accurate Rate Enforcement
 - Scheduled by timing wheel algorithm.
 - Accurate rate enforcement based on departure time.
- Flexibility
 - Departure time can be set based on SW or Packet Processor.
 - Also supports DCB network arbitration mode.

Intel IPU E2200 RDMA Transport



- Tail Latency Optimized
 - HW Congestion Control
 - Selective Ack, Multi-Path
- Secure and Performant
 - Per flow security and traffic shaping.
- Deployment Simplicity
 - Flow isolation with fine grained telemetry and statistics.

Look-A-Side Crypto and Compression



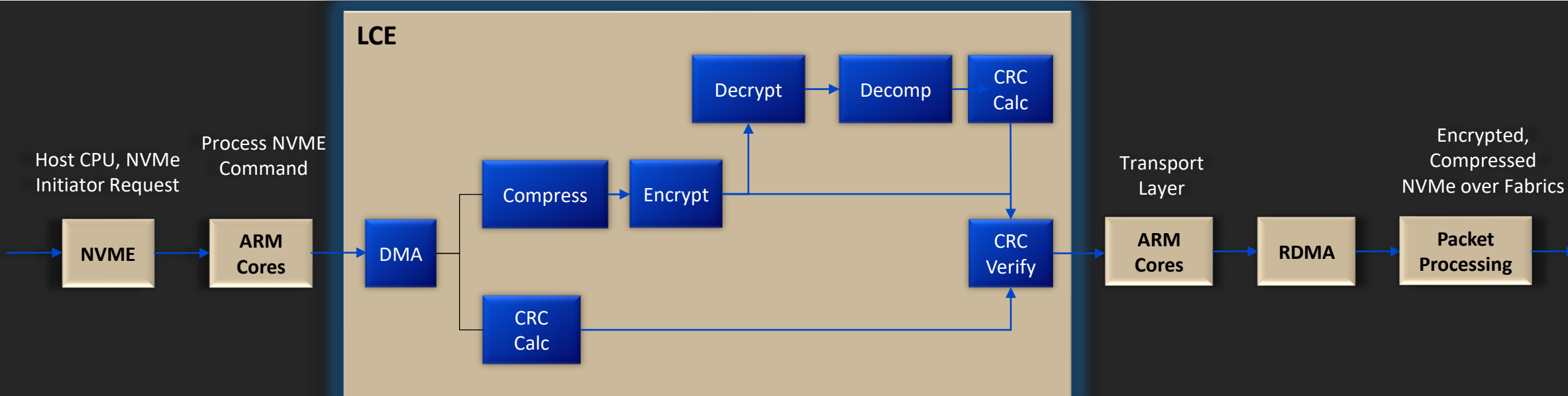
- Host Connectivity
 - Supports virtualization across multiple hosts with advanced QoS and Scheduling.
- Custom Offload
 - Chaining of offloads to build custom hardware pipelines.
- Crypto
 - AES-{GCM, XTS, CTR, GMAC}, SHA{1,2,3}+HMAC
 - RSA, DH, DSA, ECDH, ECDSA.
- Compression
 - Z-Standard, Deflate, Snappy
 - Compress + Verify

Custom Programmable Offloads

Complete infrastructure offload with security isolation and low latency data movement.

Customizable single pass operations using configurable accelerators and Arm® cores.

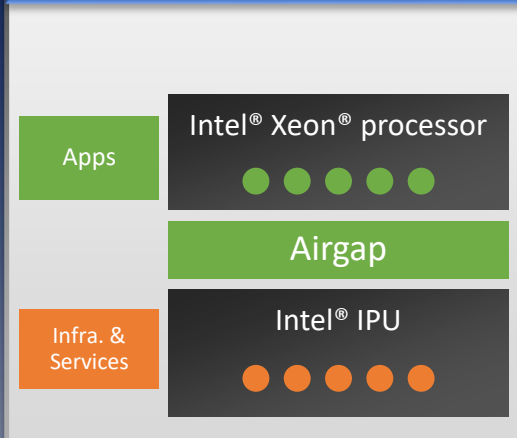
NVME OVER FABRICS: INLINE COMPRESS + ENCRYPT + VERIFY + TRANSPORT + PACKET PROCESSING



Intel IPU Use Cases for Data Center

Security

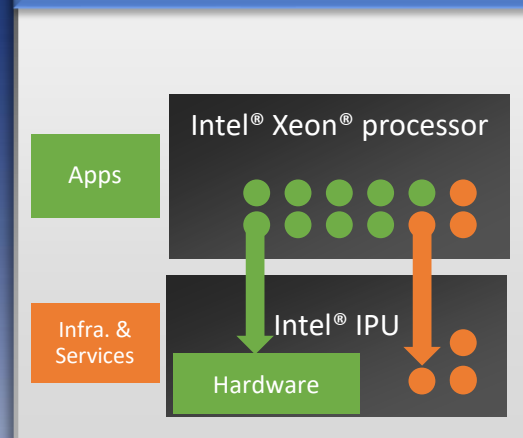
Increased Infrastructure Security



Isolation from Infrastructure

Infrastructure Offload/ Acceleration

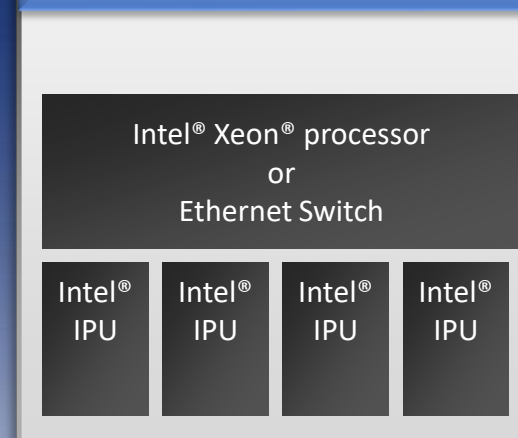
Lower Server Overhead



Reduce Host Compute Cycles

Network Appliance

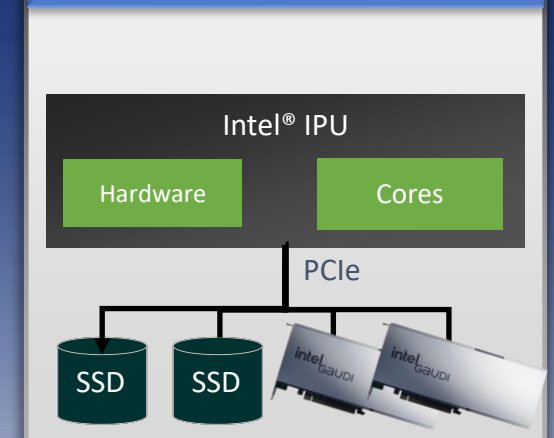
Improved Network Processing



Scale out Packet Processing

Headless

Simplified Design

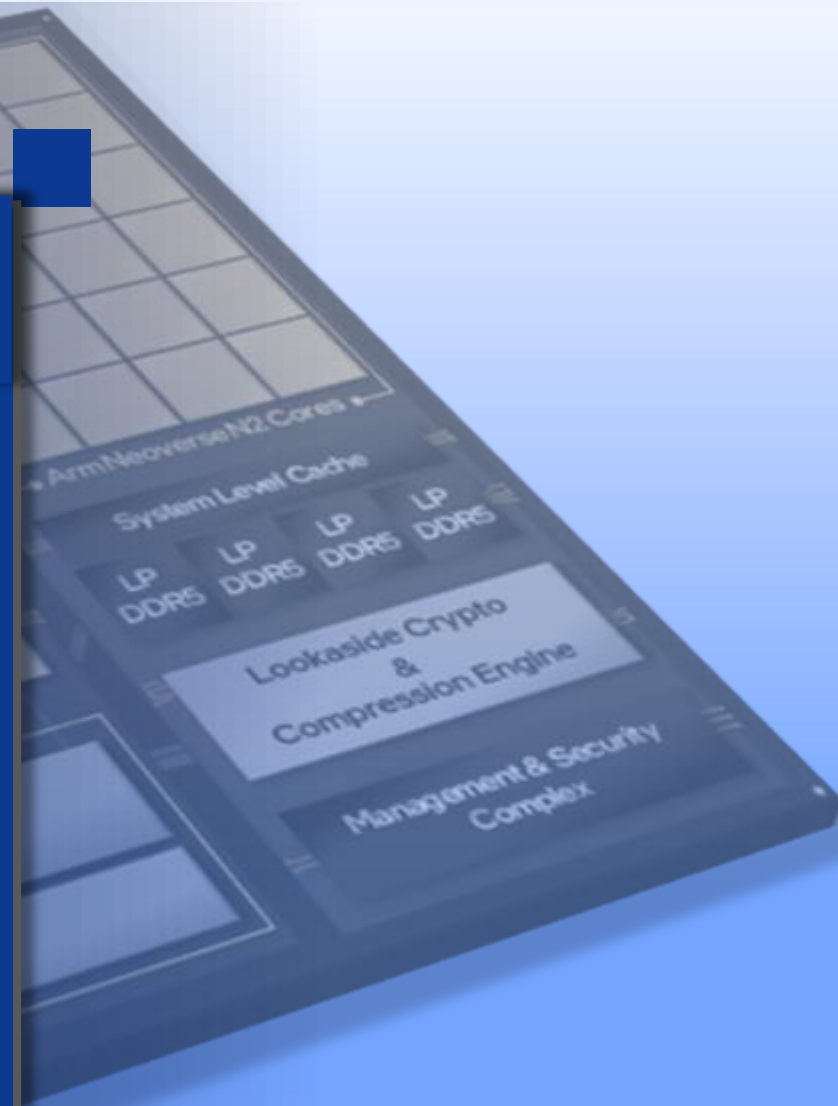


Consolidate and accelerate

intel x

HOT
CHIPS

Learn more about Intel IPU



Forward Looking Statements

This presentation contains forward-looking statements, including with respect to our business plans and strategy and anticipated benefits therefrom; our AI strategy and AI accelerators; our open platforms approach and ecosystem support with respect to AI; and other characterizations of future events or circumstances. Such statements involve many risks and uncertainties that could cause our actual results to differ materially from those expressed or implied, including those associated with: the high level of competition and rapid technological change in our industry; the significant long-term and inherently risky investments we are making in R&D and manufacturing facilities that may not realize a favorable return; the complexities and uncertainties in developing and implementing new semiconductor products and manufacturing process technologies; our ability to time and scale our capital investments appropriately and successfully secure favorable alternative financing arrangements and government grants; implementing new business strategies and investing in new businesses and technologies; changes in demand for our products; macroeconomic conditions and geopolitical tensions and conflicts, including geopolitical and trade tensions between the US and China, the impacts of Russia's war on Ukraine, tensions and conflict affecting Israel, and rising tensions between mainland China and Taiwan; the evolving market for products with AI capabilities; our complex global supply chain, including from disruptions, delays, trade tensions and conflicts, or shortages; product defects, errata and other product issues, particularly as we develop next-generation products and implement next-generation manufacturing process technologies; potential security vulnerabilities in our products; increasing and evolving cybersecurity threats and privacy risks; IP risks including related litigation and regulatory proceedings; the need to attract, retain, and motivate key talent; strategic transactions and investments; sales-related risks, including customer concentration and the use of distributors and other third parties; our significantly reduced return of capital in recent years; our debt obligations and our ability to access sources of capital; complex and evolving laws and regulations across many jurisdictions; fluctuations in currency exchange rates; changes in our effective tax rate; catastrophic events; environmental, health, safety, and product regulations; our initiatives and new legal requirements with respect to corporate responsibility matters; and other risks and uncertainties described in this release, our most recent Annual Report on Form 10-K and our other filings with the U.S. Securities and Exchange Commission (SEC). All information in this release reflects management's expectations as of the date of this release, unless an earlier date is specified. We do not undertake, and expressly disclaim any duty, to update such statements, whether as a result of new information, new developments, or otherwise, except to the extent that disclosure may be required by law.