



# High Performance Packet Processing With QorIQ

**FTF June 2010 - Orlando**

*Eric Carmes, CEO, 6WIND*

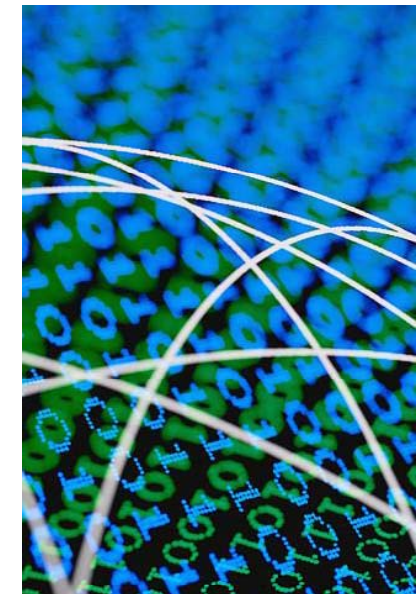


# Challenges for Next Generation Networks



**Billions of Devices**

**Flat IP-based  
architecture leads  
to telecom / IT  
convergence**

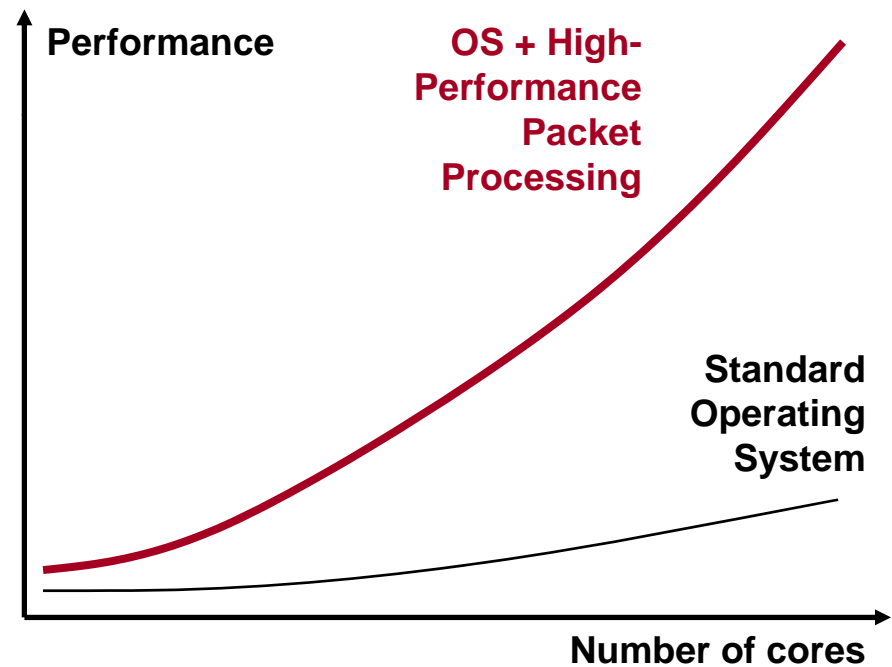


**Green Computing**

**New Generation of Internet Services**

# High-Performance Packet Processing for NGN

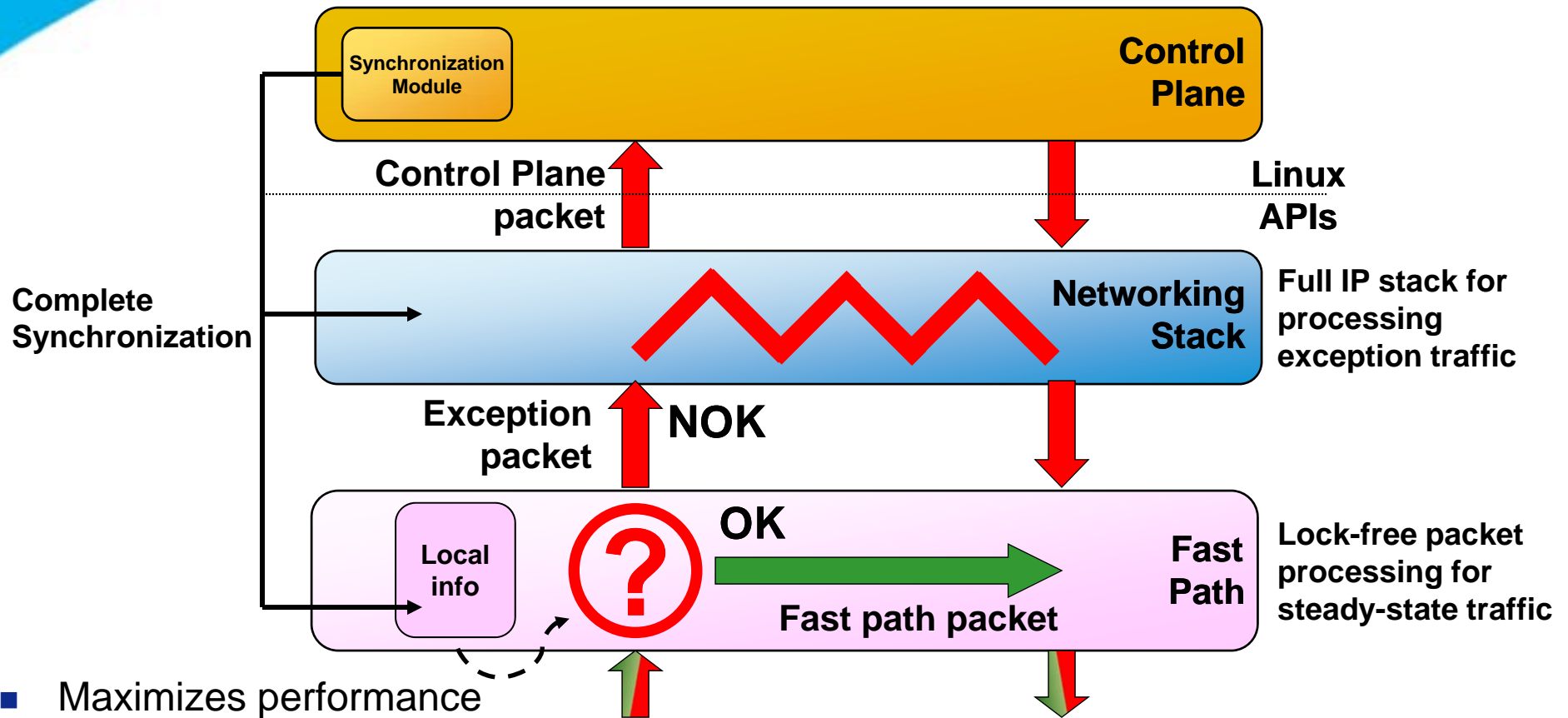
- **Converged, all-IP networks require high-performance packet processing**
  - A standard OS cannot sustain multi-10Gb/s of complex network traffic that requires deep inspection to implement advanced services.
- **An OS networking stack uses OS services**
  - OS's limitations such as preemptions, threads, timers, locking, etc.
  - Performance bottlenecks including L1/L2 CPU cache misses and pipeline mis-predictions



# Design Challenges for Multicore Packet Processing Software

- **Developing packet processing under an executive environment outside the Operating System environment**
  - Modern IP networking stack is more complex than the initial IP-UDP-TCP stack
  - Developing a new stack from the ground up is very expensive
  - Porting an OS stack under the executive environment is a faster alternative but
    - This only removes the OS scheduling limitations
    - Still requires development of APIs to synchronize control plane and data plane.
  
- **Having a complete networking stack under the executive environment is not efficient**
  - Only the processing performed on each packet has to be improved
  - It is useless to try to accelerate the processing of complex signaling protocols at the executive level as this is only a small fraction of the overall traffic.
  
- **An OS networking stack provides some stable APIs for applications**
  - Change of the design of the networking stack could lead to costly integration and validation steps, delaying adoption of the multicore architecture.

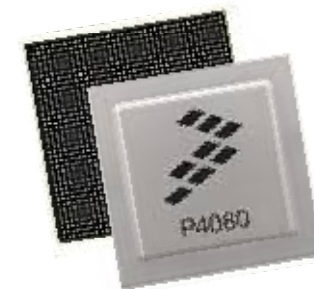
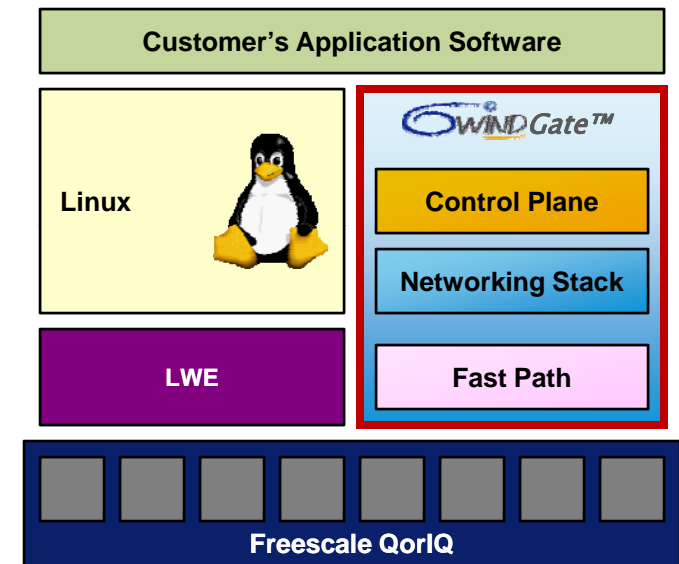
# Fast Path Architecture: the Best of Both Worlds for Optimized Performance



- Maximizes performance
- Preserves the API of the OS networking stack
- Requires complete synchronization of Fast Path, networking stack and Control Plane

# 6WINDGate

- **6WINDGate™ is 6WIND's packet processing framework**
  - **Fast path** is a high-performance simplified stack that processes and forwards the majority of packets without involvement by the stack or the control plane, maximizing the performance of the platform
  - **Networking stack** is a commercial-quality Linux stack with all standard networking features such as IPsec, firewall, NAT, QoS, filtering etc.
  - **Control plane** provides application-level signaling protocols such as routing, security, connectivity etc. and Fast Path synchronization modules
  
- **Support for industry-leading multicore architectures**



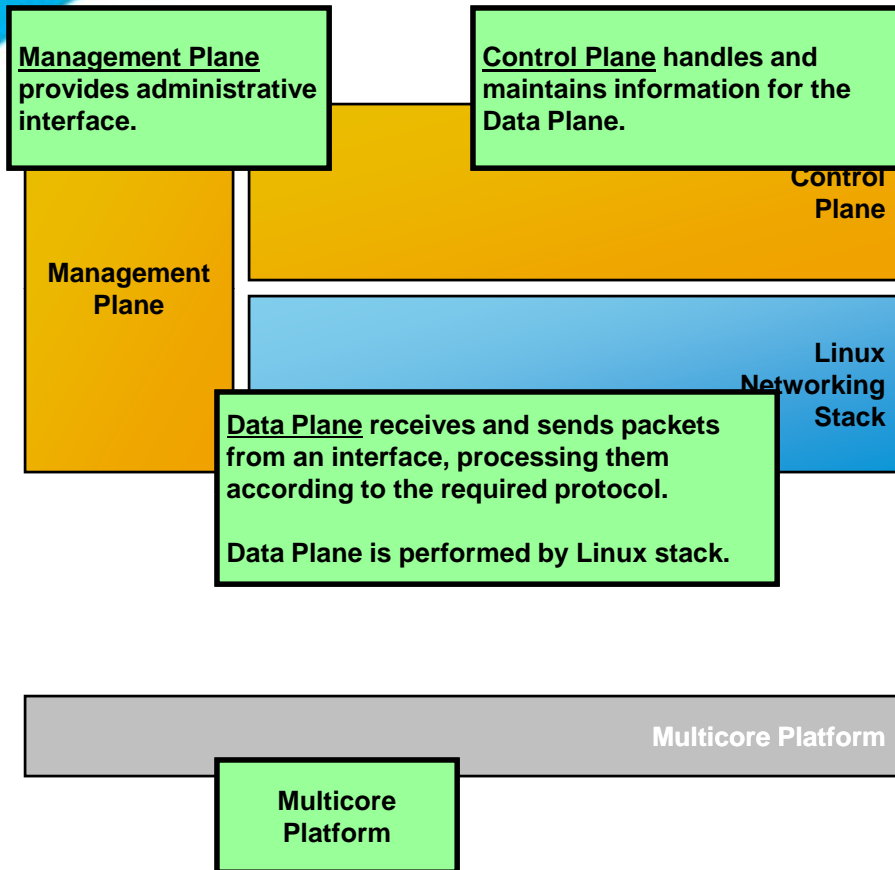
## Note for Readers

***The next few slides are a highly-animated explanation of how 6WINDGate works.***

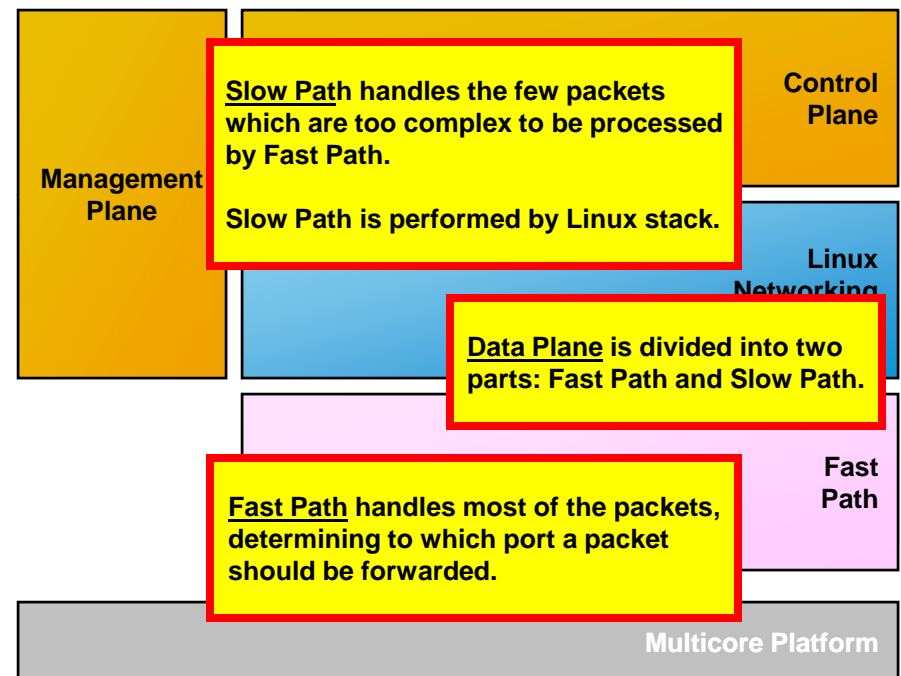
***If you are reviewing a .pdf version of this presentation you will not see the animation and the slides will be somewhat confusing.***

# How 6WINDGate Works

## Standard Linux

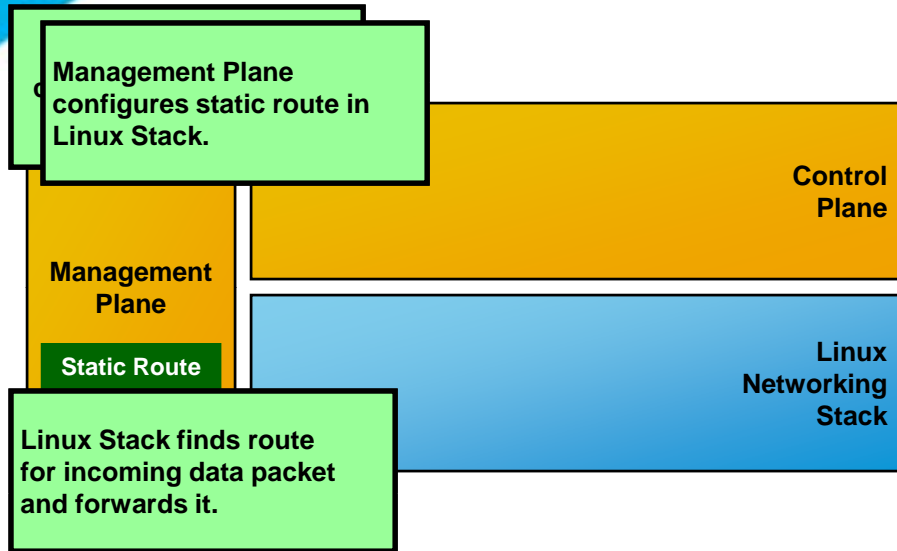


## 6WINDGate

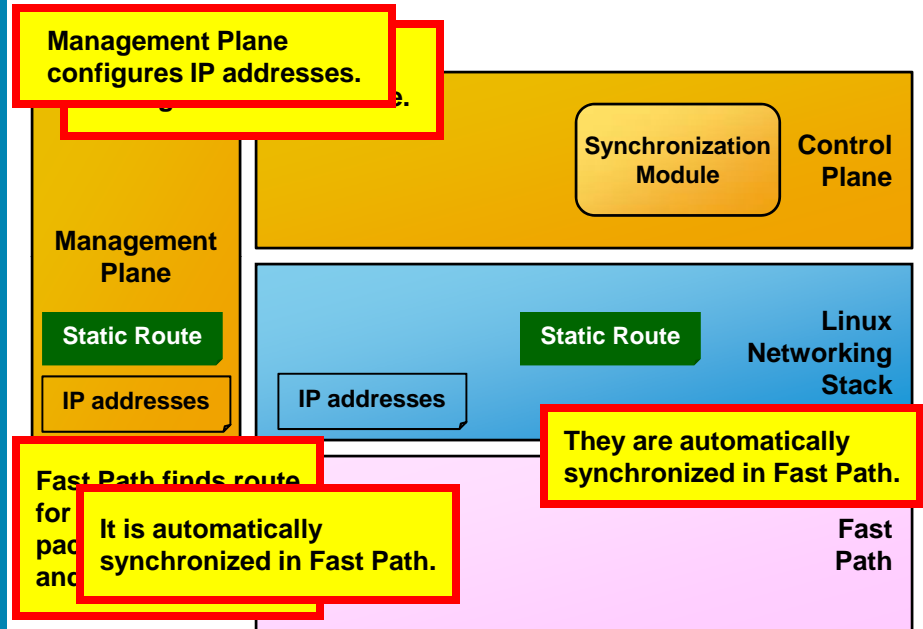


# IP Forwarding (Static Routing)

## Standard Linux

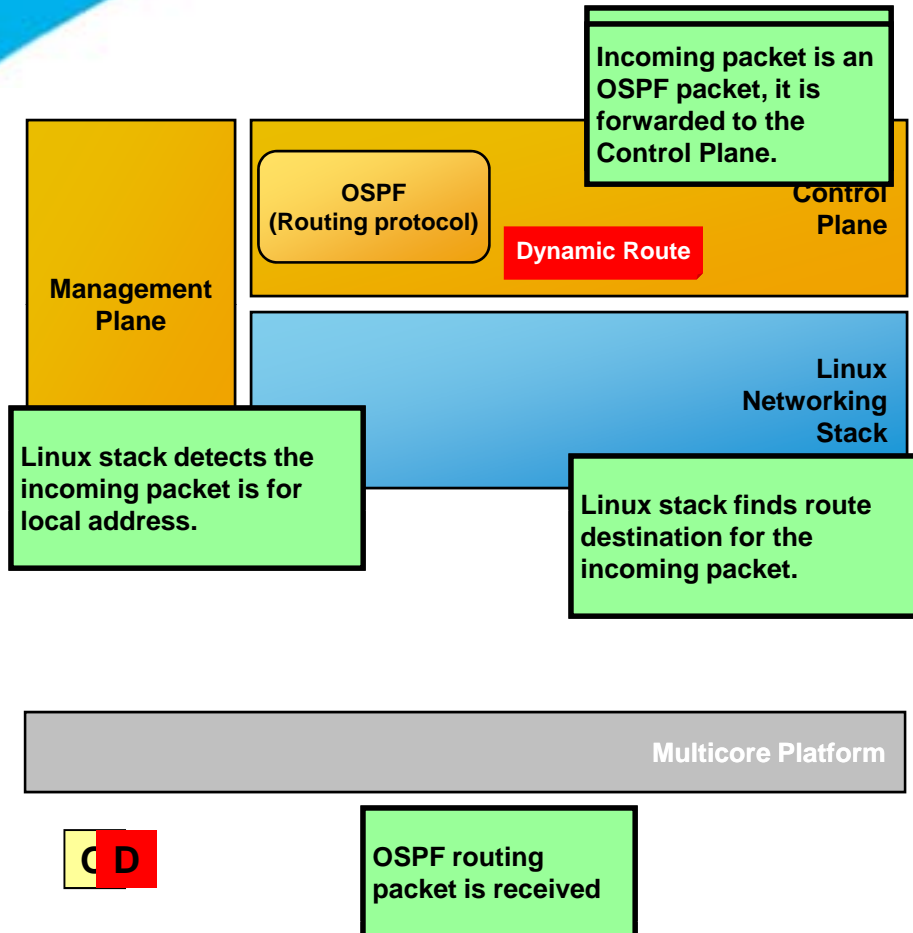


## 6WINDGate

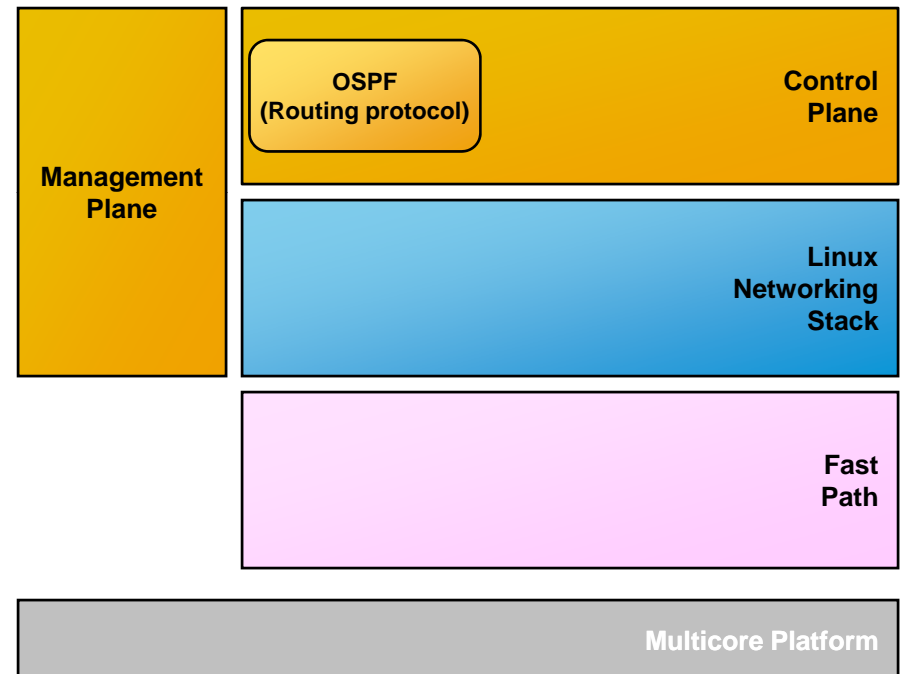


# Routing

## Standard Linux

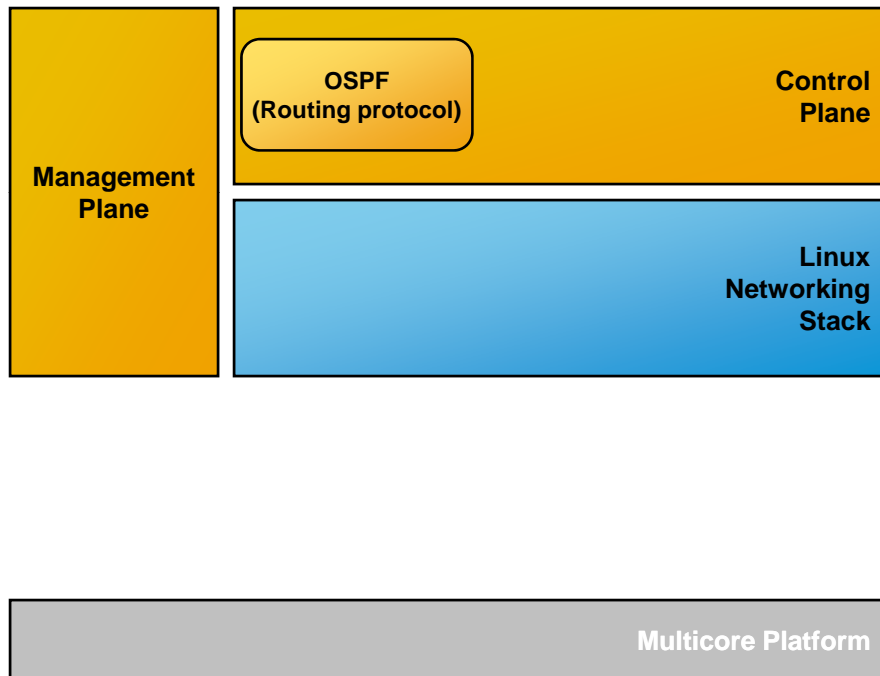


## 6WINDGate

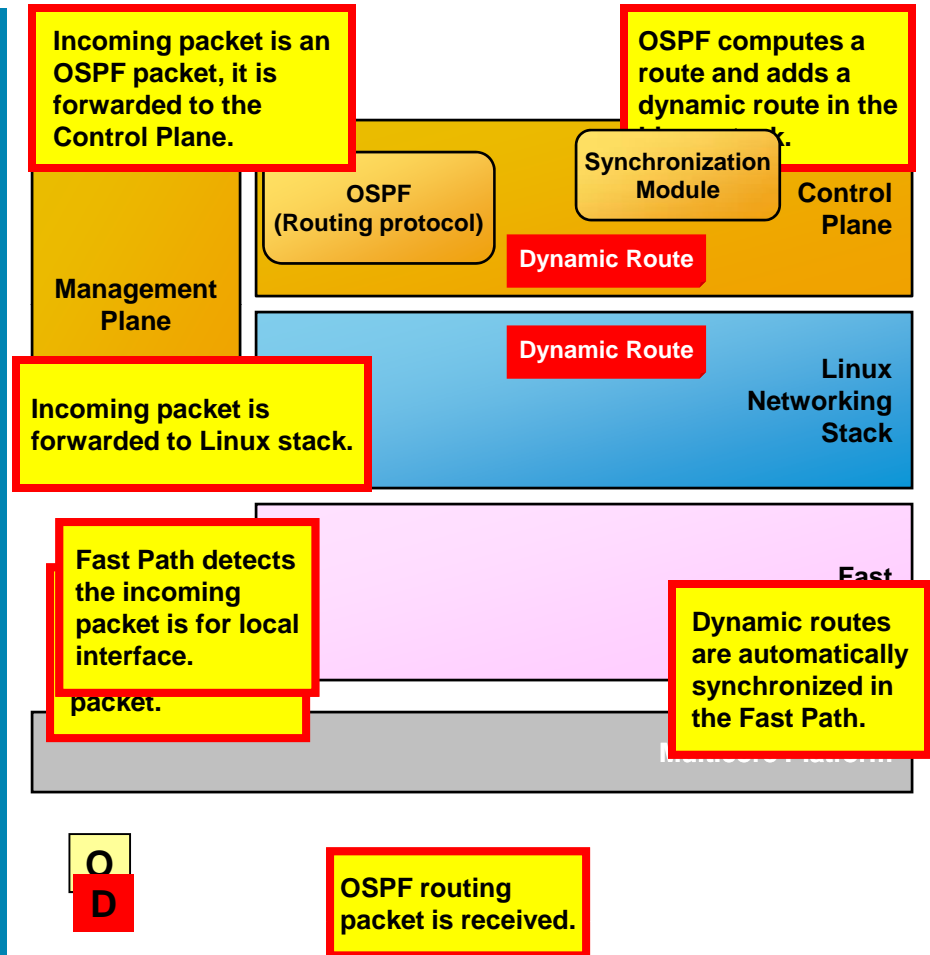


# Routing

## Standard Linux

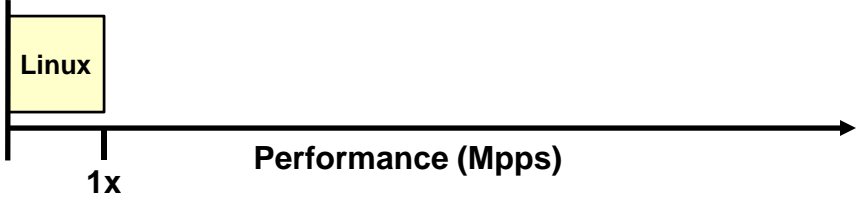


## 6WINDGate

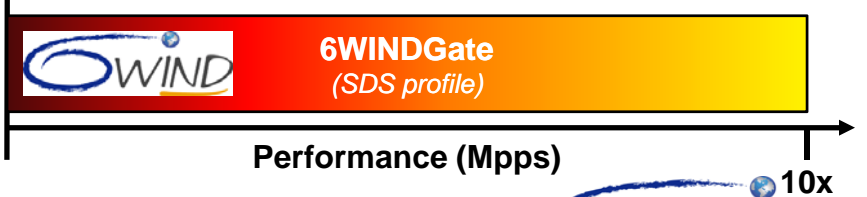
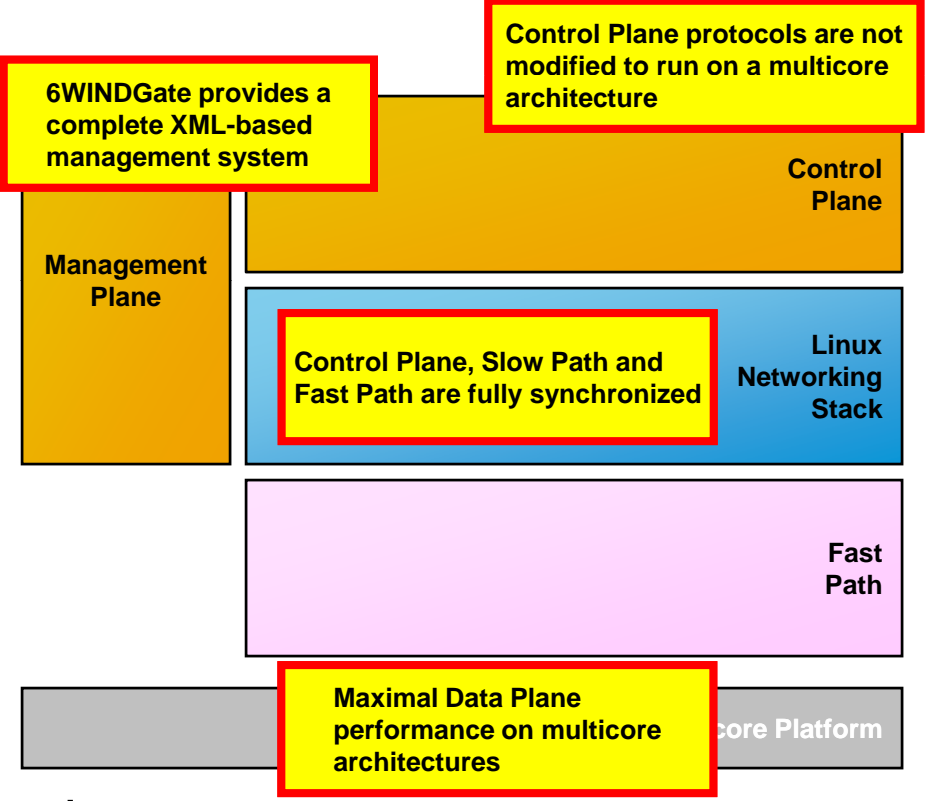


# Architecture Benefits

## Standard Linux

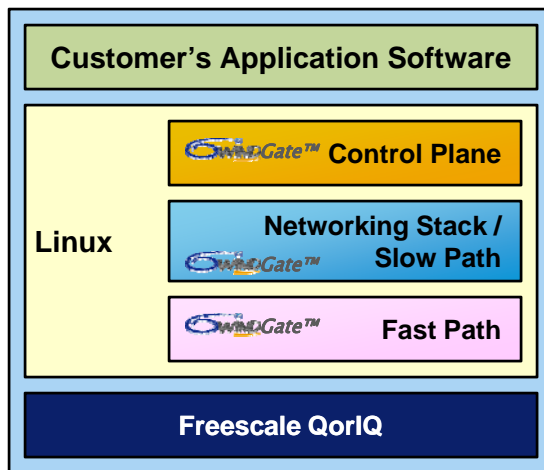


## 6WINDGate

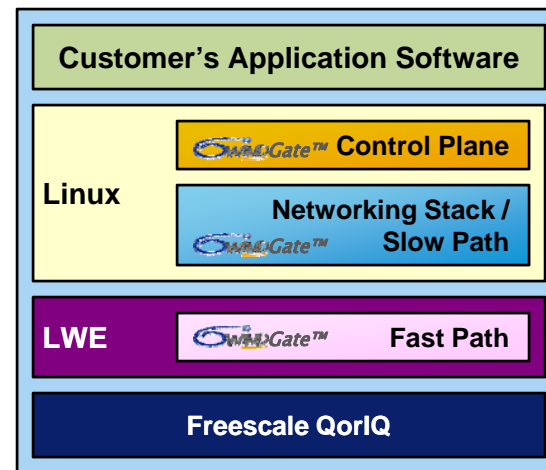


# 6WINDGate Profiles Match Multiple Customer Scenarios

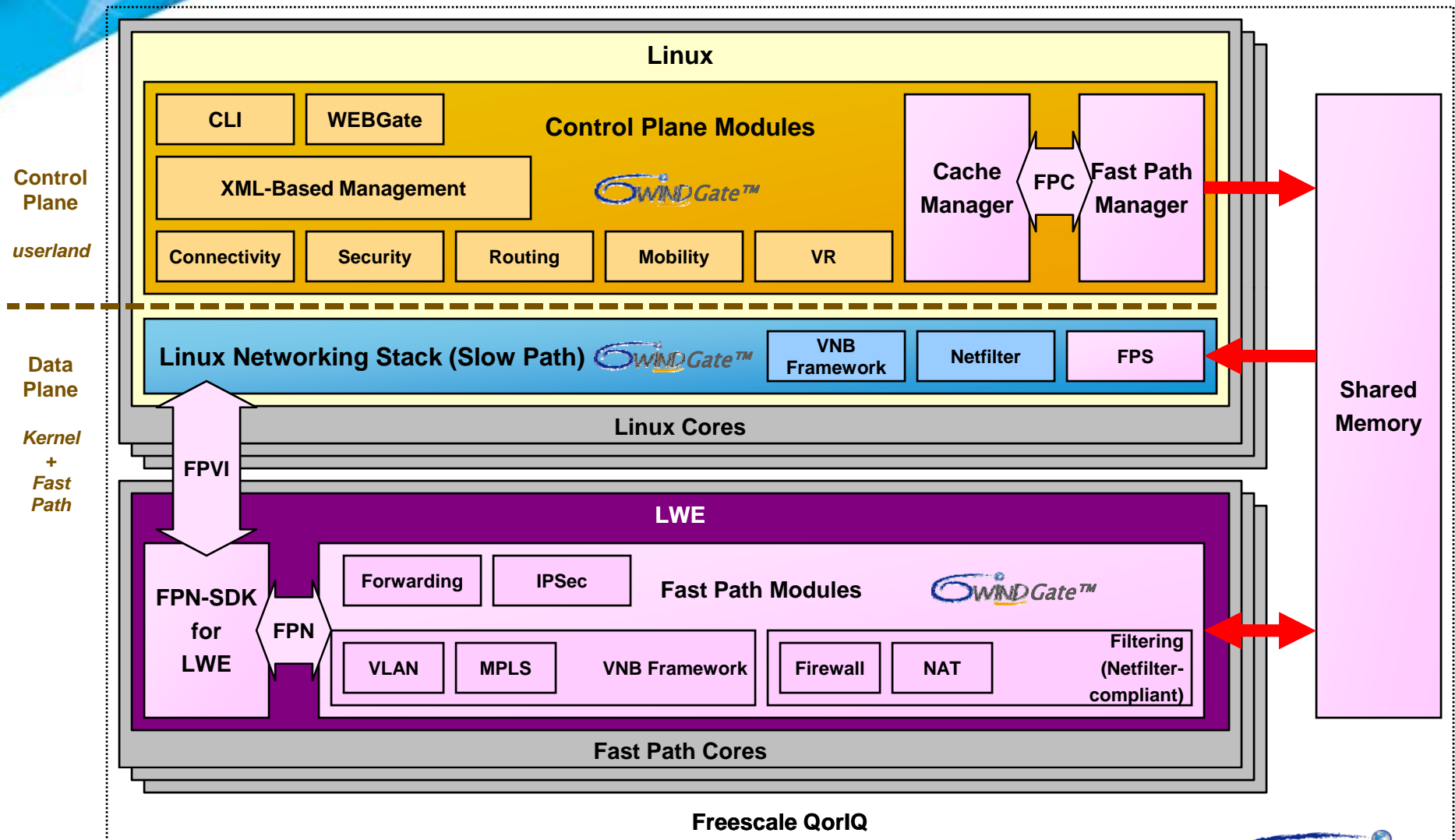
- **EDS** profile accelerates packet processing within pure Linux environment
  - Networking functions divided into “slow path” and “fast path”, with fast path running as kernel module
  - All cores run Linux.



- **SDS** profile provides maximum multicore performance
  - Control plane and networking stack (slow path) run on Linux on dedicated core(s)
  - Fast path runs on LWE on remaining cores
- Optimum configuration for high-performance systems.

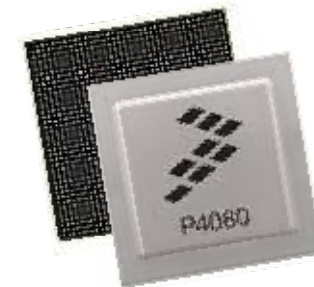
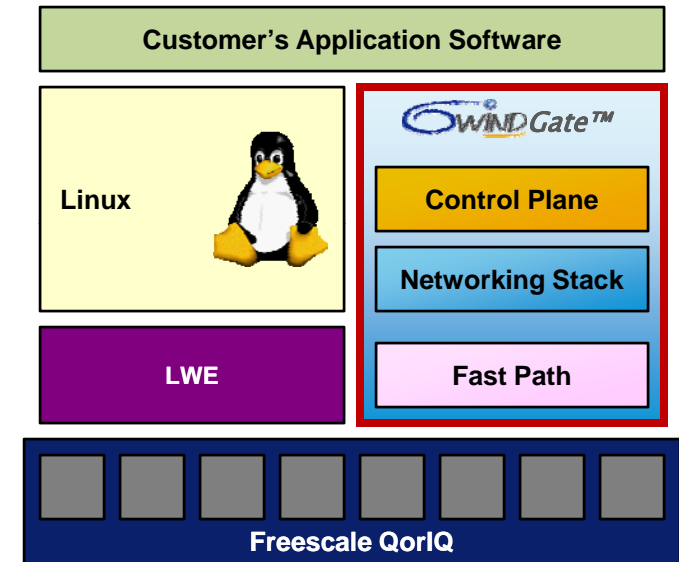


# 6WINDGate SDS Details



# 6WINDGate for QorIQ Processor

- Core allocation for Linux and LWE is flexible and done at runtime
- Fast Path is using LWE services and run-to-completion model
- Leverages use of DPAA
  - BMAN and BMAN for buffer and packet handling
  - FMAN for the IOs
  - SEC 4.0 for IPsec acceleration
  - Context pre-fill (stashing)
- Zero overhead packet buffer
- Linux running in SMP mode (on one or more cores)
- Each protocol has been optimized for QorIQ with Fast Path implementation
- Crypto-engines support for IPsec / IKE maximal performance
- Ensures linear scalability over cores

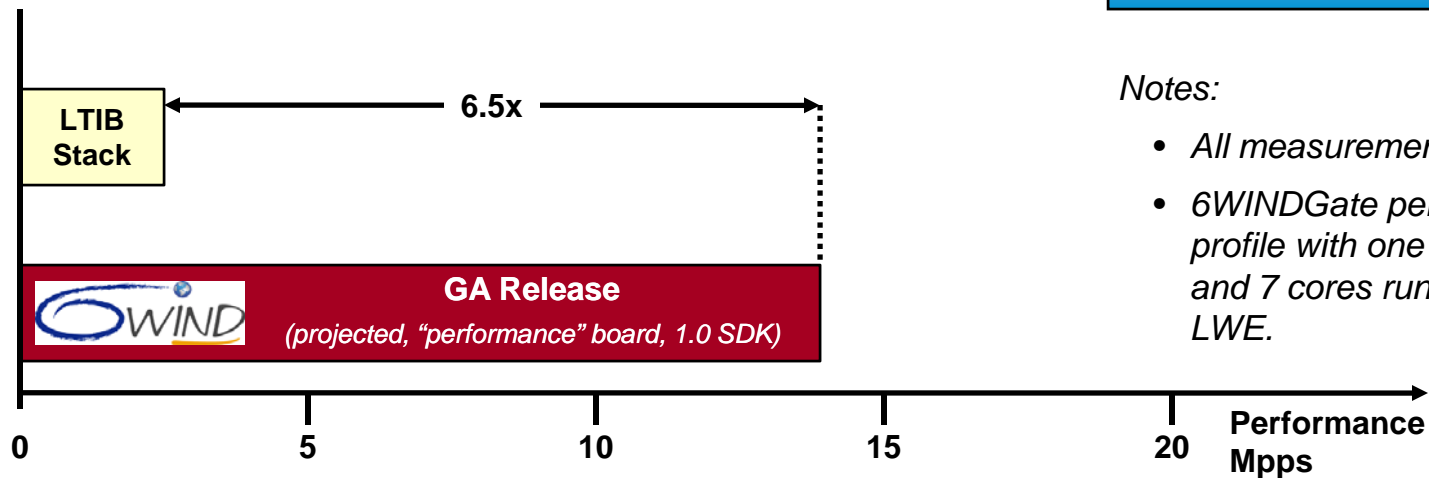
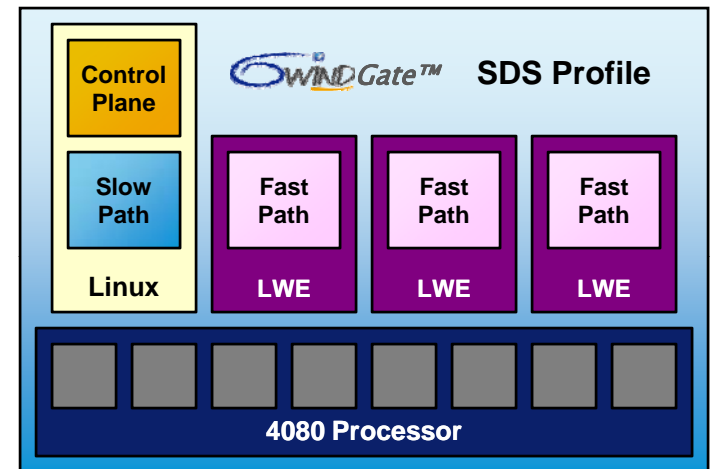




# 6WINDGate for QorIQ 4080

## ■ Performance improvement

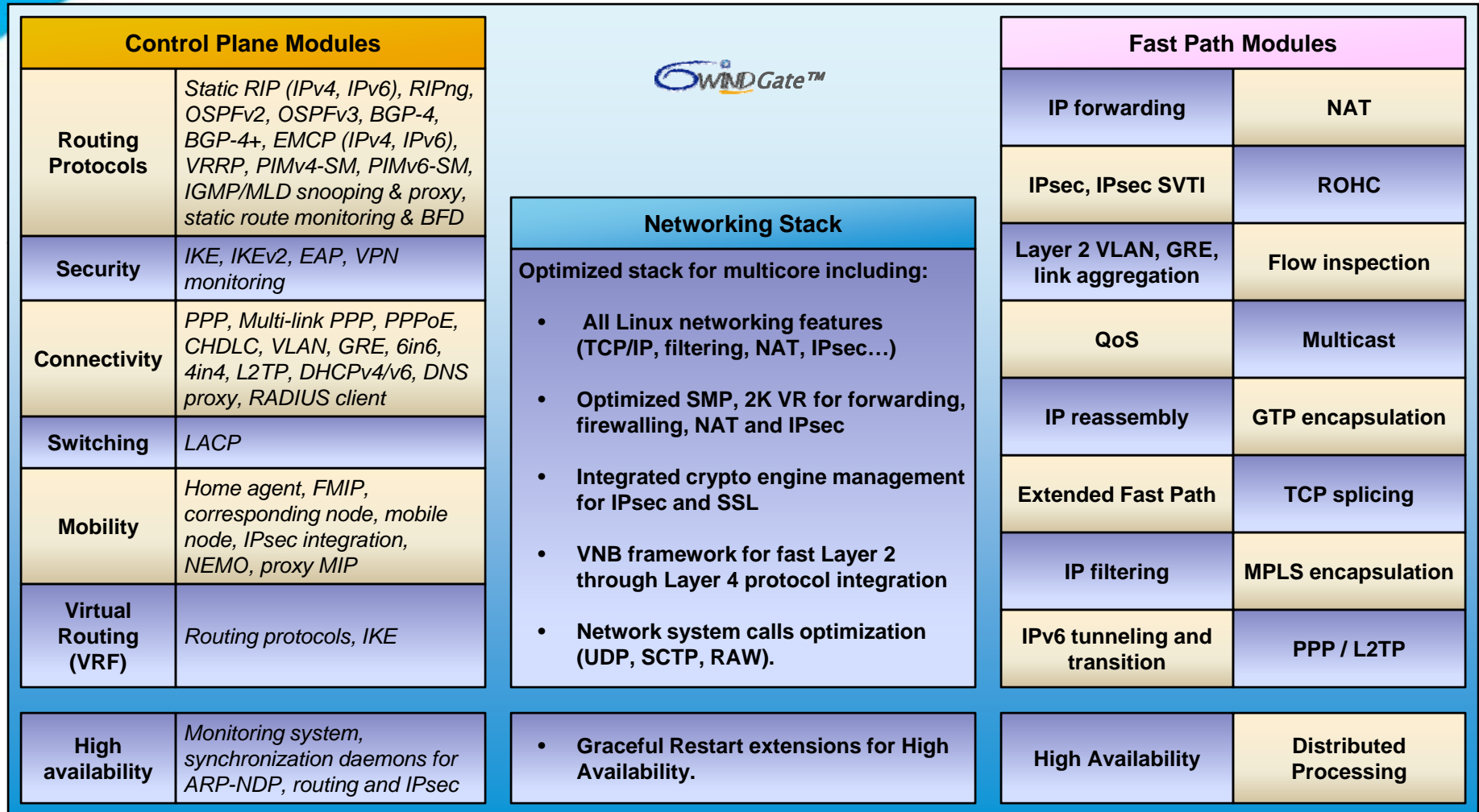
- ~6.5x performance compared to standard Linux network stack (16Mpps vs. 2.4Mpps)
- On packet forwarding with full-featured networking stack.



### Notes:

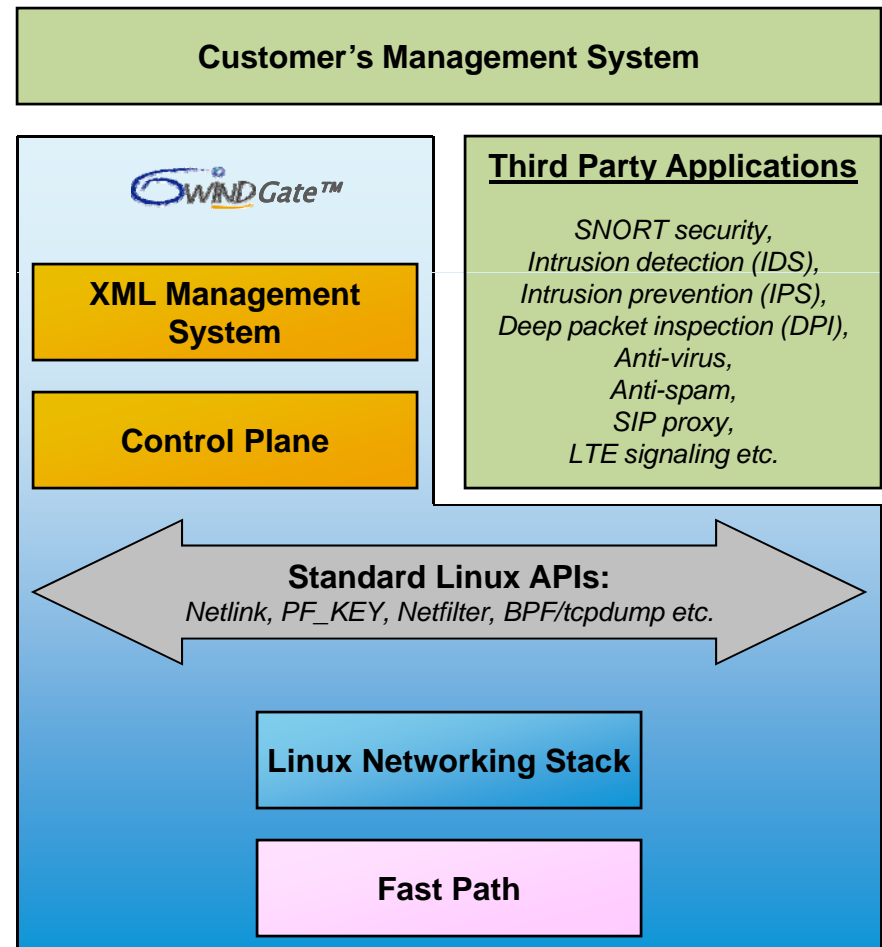
- All measurements on 64B packets
- 6WINDGate performance using "SDS" profile with one core running Linux and 7 cores running the Fast Path on LWE.

# 6WINDGate Includes a Full Set of Networking Protocols



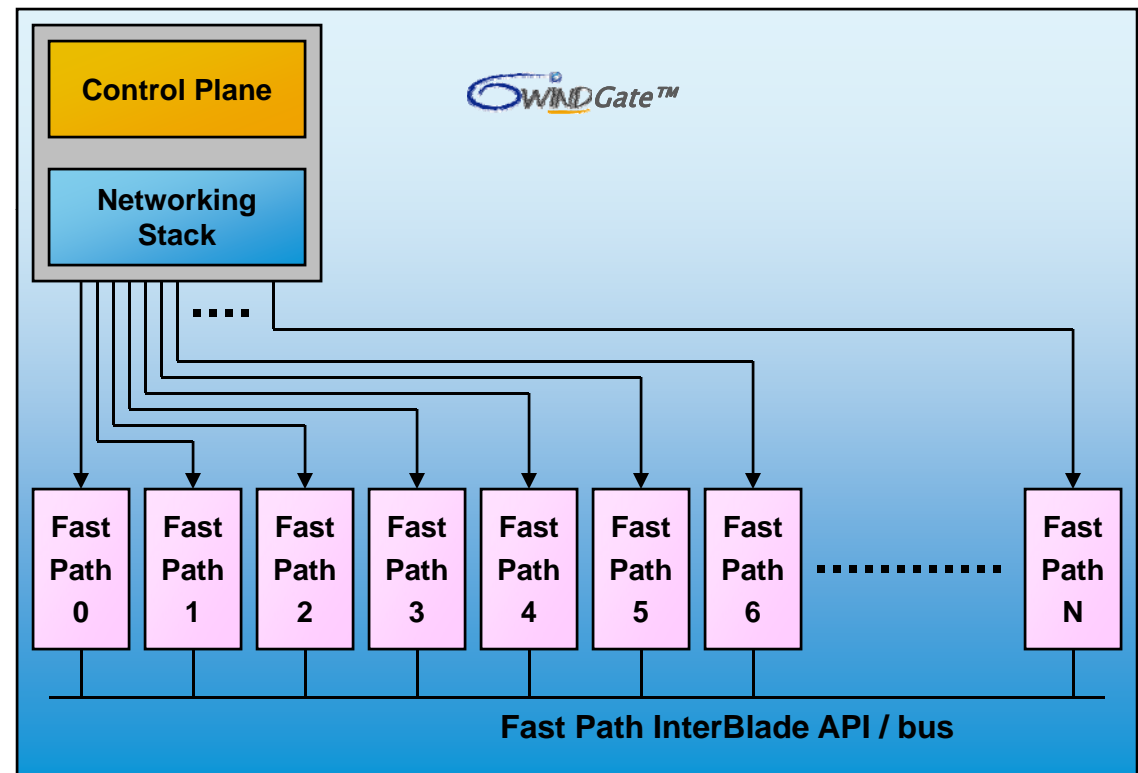
# 6WINDGate Simplifies Application Integration

- **Standard Linux APIs are preserved making Fast Path-based architectures fully transparent to application software**
  - Maximizes customer's software reuse
  - Minimizes time-to-market.
- **6WINDGate XML-based management system simplifies integration with customer's management system.**



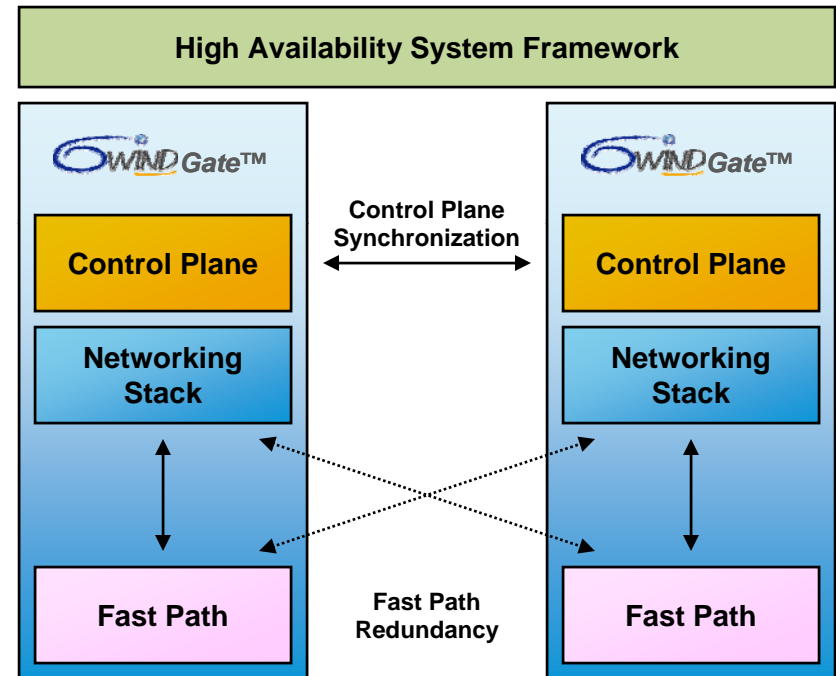
# Distributed Fast Path Configuration

- **6WINDGate architecture extensible to increase system capabilities**
  - A single Control Plane manages multiple Fast Paths
  - Communication between Fast paths implemented through high-speed inter-Fast Path API
  - This extension can be combined with High Availability features.



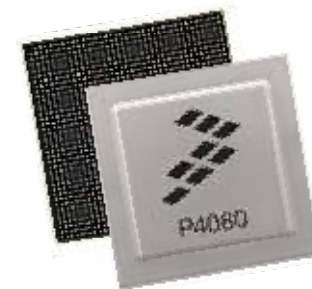
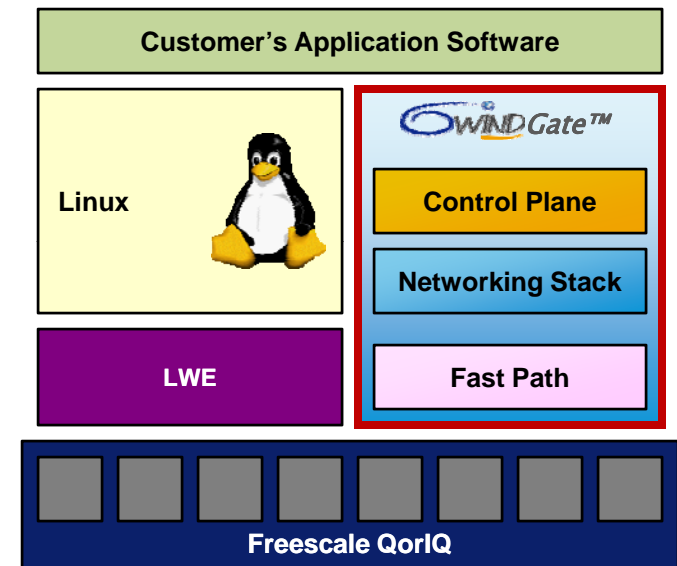
# Full Support for High Availability System Architectures

- **6WINDGate meets the requirements of High Availability (HA) systems**
  - For networking and telecom equipment where five-nines reliability or zero downtime is critical.
- **HA support fully integrated into 6WINDGate software architecture.**
- **Two industry-standard failover modes**
  - Redundant hardware platforms, each running 6WINDGate with Control Planes maintaining coherent view of overall system
  - Dual active Fast Path subsystems, providing redundancy between network interfaces for Non-Stop Forwarding (NSF).



# Summary

- **6WIND provides multicore packet processing software that extracts the highest possible networking performance from QorIQ processor**
- **Fully-compatible with existing Linux application software: no need for developers to rewrite their code to take advantage of 6WINDGate performance and features**
- **Comprehensive set of optimized networking, routing and security protocols provides the ideal platform for a myriad of applications based on multicore including LTE, WiMAX, UTM, DPI, IPTV...**
- **Binary evaluation upon request.**



# High Performance Packet Processing With QorIQ



**Thank YOU**

**[www.6wind.com](http://www.6wind.com)**

**[www.multicorepacketprocessing.com](http://www.multicorepacketprocessing.com)**

