



# Middleware and Data Plane Multi-core Processors



# The Whole Solution: Carrier Class Network Equipment Software Platform

## Thesis:

1. Multi-core devices with specialized IP packet processing HW support are supplanting traditional IP Network Processors and DSPs on the data plane for high performance packet processing for NextGen/IMS core/edge/access "all IP" based networking equipment
2. HA/Systems Management Middleware provides a standardized and rich set of services with a common framework for management and control of all system wide HW/SW assets
3. **However, true integration of existing standards based middleware solutions to the user/data plane does not currently exist**

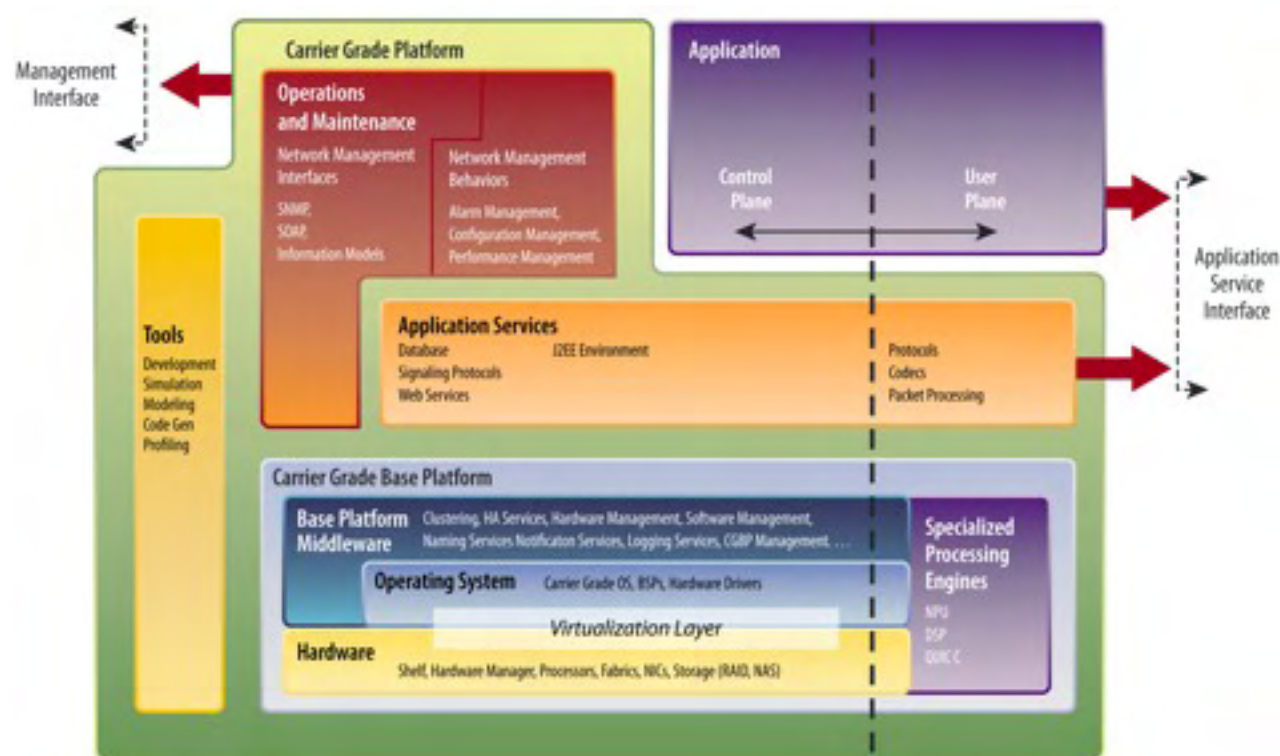


Diagram courtesy of the SCOPE Alliance

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# Multi-core Data Plane System Level challenges:

## Current situation:

Current solutions focus on raw performance (packet processing)

Most solutions are proprietary

Bare metal or lightweight “executive” from the silicon vendor with perhaps some Linux “controller” on one or more cores

When “performance is King” there is no standard or in most cases even robust implementation for management of the multi-core data plane device(s) from the control plane

Little focus on standards based management – most implementations are proprietary

## Issues:

Proprietary solutions lack a robust programming and debug model, and one that is common to the control plane

Multiple engineering teams for different subsystems – control and data plane

Proprietary solutions lack a common communications model that may seamlessly interact with the control plane

Other:

Logging

Instrumentation and statistics – run time

***More important than source code debug***

Performance profiling

Fault reporting and management

Software load and configuration management

Integration with overall embedded management solutions on the control plane  
– i.e. northbound interfaces (SNMP, CLI, WebUI, NetConf, etc)



*Performance vs Robustness??*

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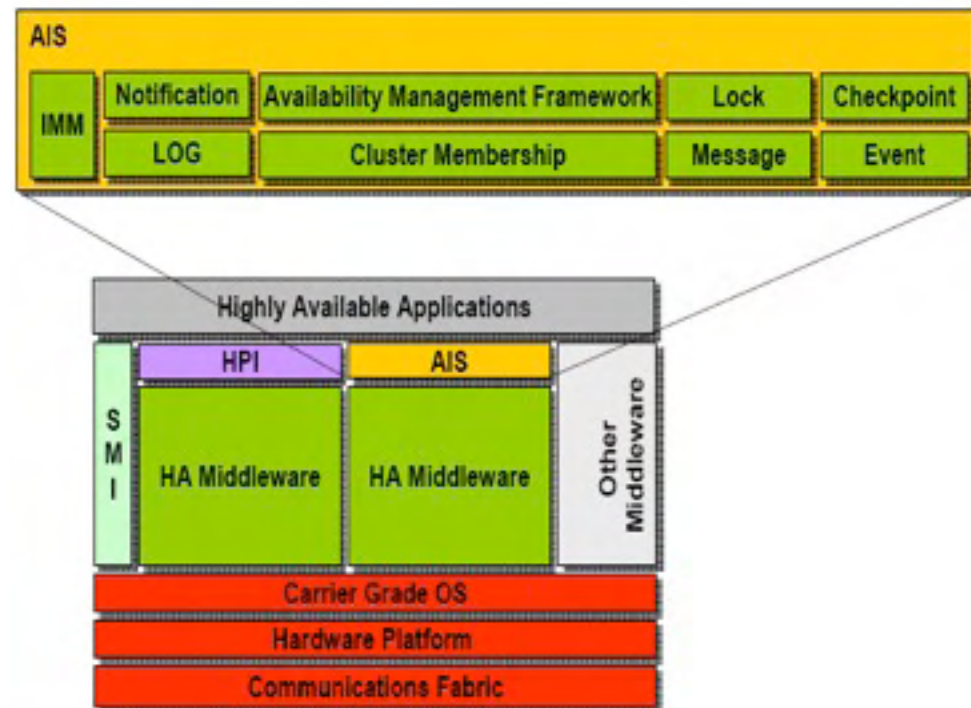
# What Middleware Provides, and Lacks

## Provides Standards based solutions for:

- Common communications framework (IPC)
- Logging
  - At the minimum, fault management
  - At the maximum, true HA
- Fault management and HA
- Software management
- System configuration management
- Embedded Management framework – i.e. integration with northbound management interfaces
- HPI/IPMI support (mostly HW oriented)

## Lacks

- Well standardized on the control plane but for data plane, little or no real implementation from any vendor
- Standards tend to “blur” the lines between control plane and data plane, leaving implementation up to the supplier



# New "Battleground" for Multi-core SW

## Current situation:

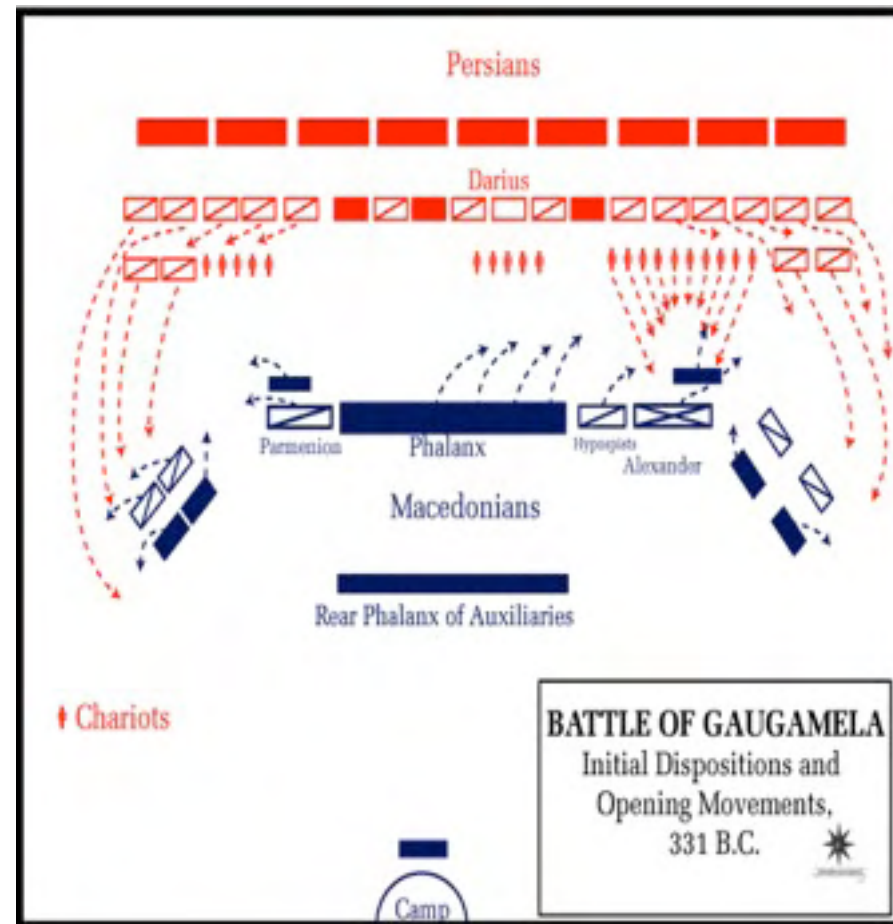
- Most OEM/TEM suppliers of data plane solutions require some "control plane" component of their solution
- But rather than take advantage of current, well established control plane solution, they must "invent" their own solution due since the industry does not yet provide a real implementation for the larger issue
- The best answer to this are COTS based solutions so the user does not have to develop the complete solution themselves

## Problem:

- Most COTS middleware implementations assume some robust underlying operating or execution environment on top of which the services shall run
- But this "robust" execution environment does NOT exist for high performance multi-core based data plane HW solutions

## Solution

- Provide a lightweight implementation of standards based control plane services, including a common IPC, for multi-core data plane applications



Alexander the Great vs Darius and the Persian Empire

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# New framework for middleware on the data plane

## Three main areas

- Common IPC
- Middleware Services
- Device Management

## Common IPC

- Messaging
- Naming Services (transparent IPC)
- Events (Publish/Subscribe)

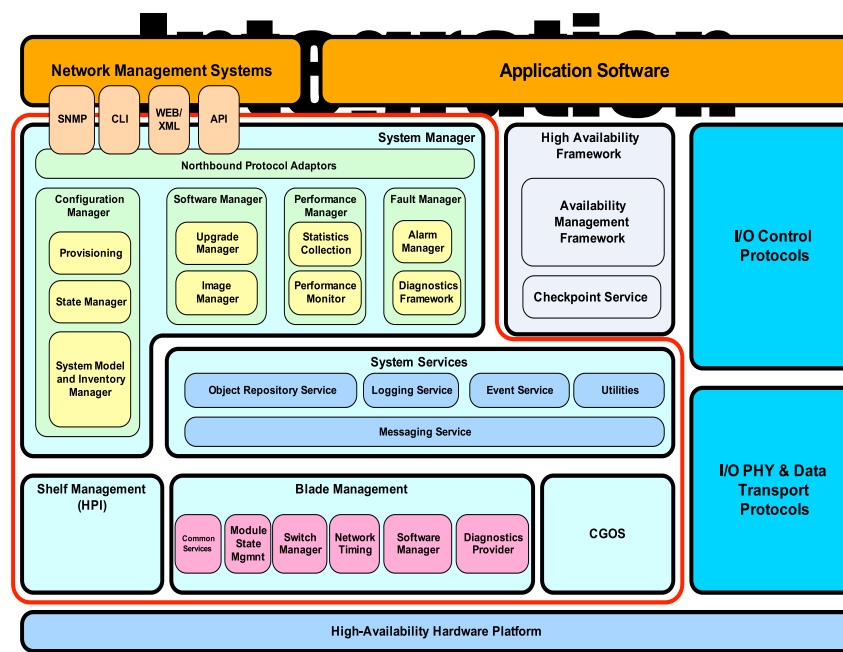
## Middleware Services

- SAF AMF (Availability Management Framework)
- Software loading and configuration
- Notifications and Alarms
- Northbound EMS support
  - SNMP
  - CLI
  - WebUI

## Device Management

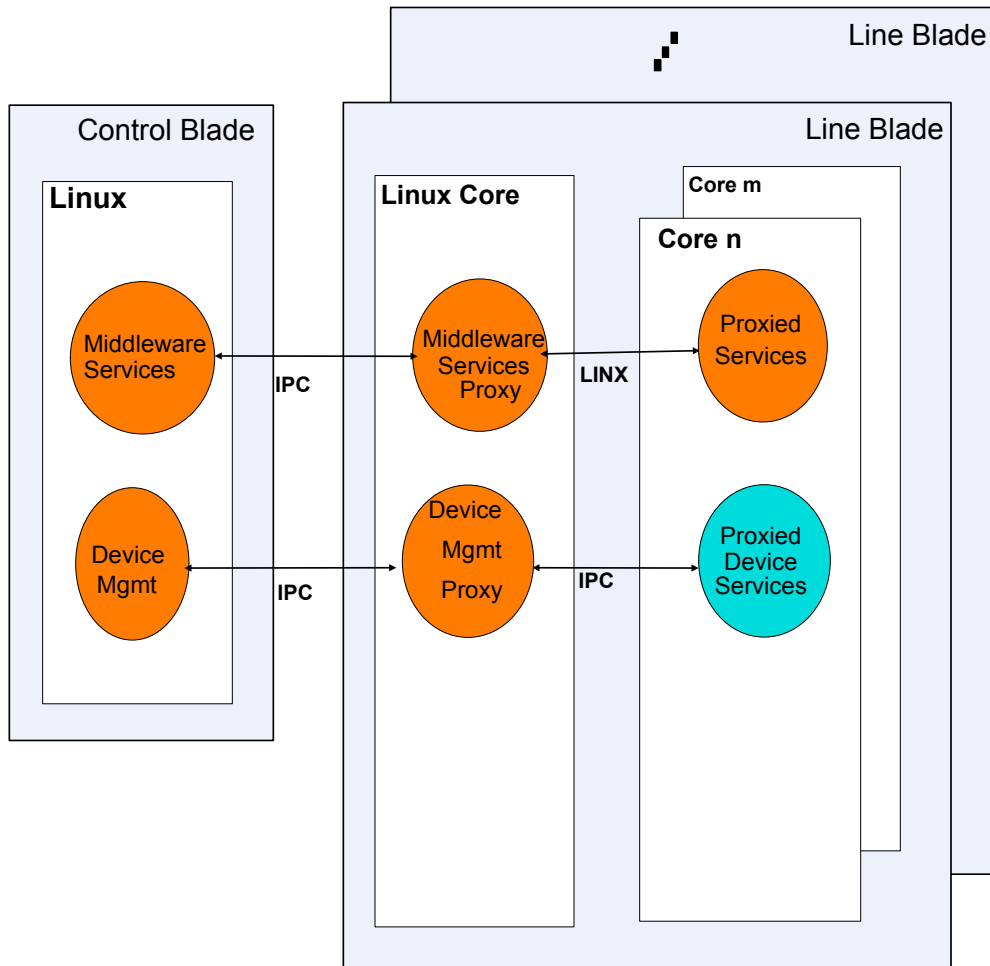
- Logging
- Statistics and instrumentation
- Bootload/reset control

# It's All About



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# Integration w/ Control Plane is the new frontier for Data Plane



## Device Management features

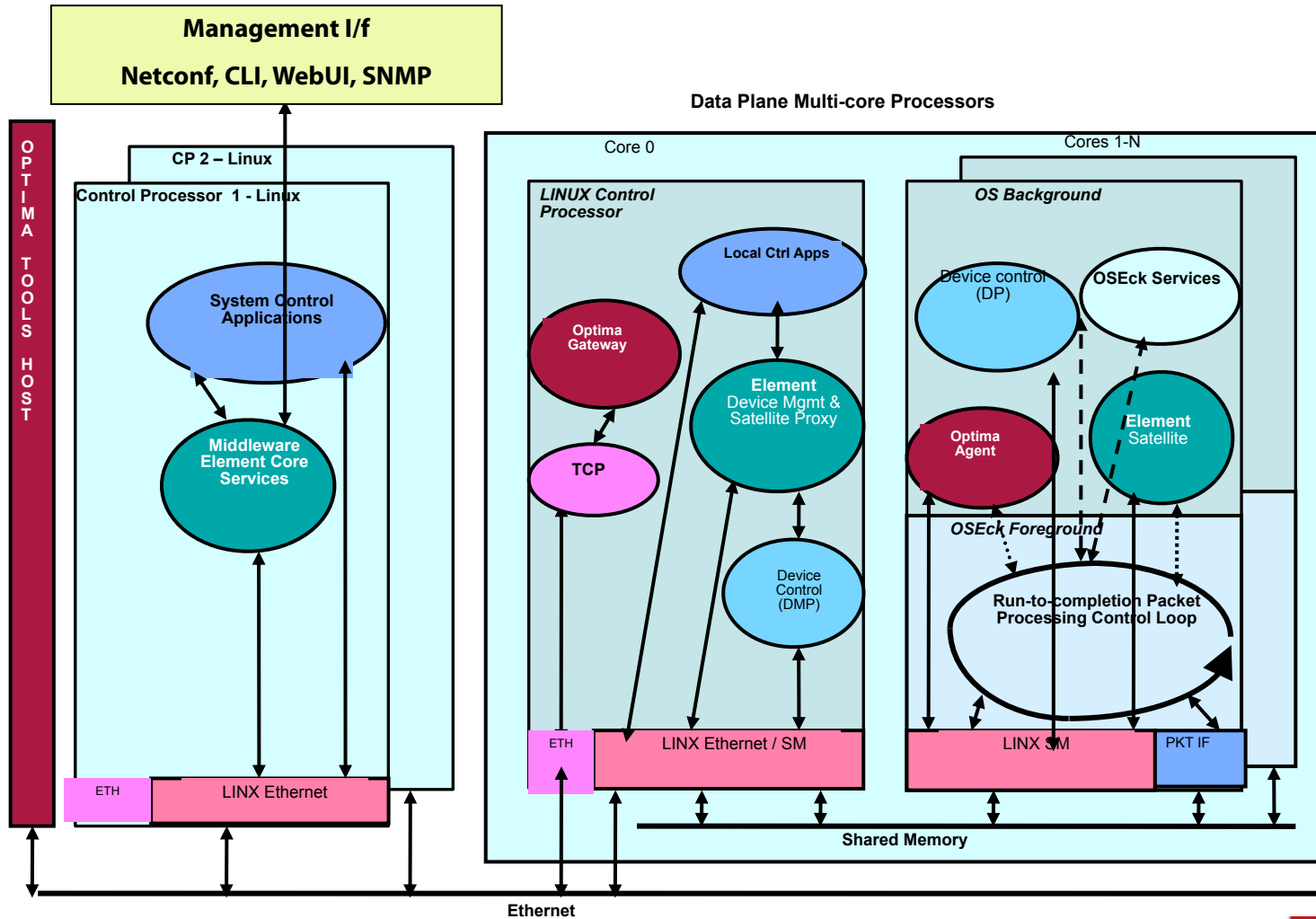
- Boot, initialization, and configuration
- Persistent device configuration and state
- Logging
- Statistics and event trace
- Core dump
- Supervision, reset, reload
- Shell

## Middleware features

- Common hi-performance IPC, Naming Service, Event Publish/Subscribe, Endian Conversion
- Command service and instrumentation
- SAF AMF (Availability Mgmt)
- SAF Notifications and Alarms
- SMF (Software Mgmt)
- Embedded Management (northbound)



# Enea Solution – Brief Overview





## Conclusion

Take advantage of the robust application, systems management, and HA framework that is well established on the control plane

Provide the same set of services via lightweight implementations for the “less than robust” OS implementations for the data plane

- Focus most of the services on the Linux core, wherein performance is not as much of an issue

- Lightweight “proxied” services provided for the packet processing cores

*Don't “re-invent the wheel” – extend technology that exists on the control plane to the burgeoning solutions for the data plane involving multi-core technologies*

*Note: Virtualization is coming, but not specifically applicable yet to most data plane applications*





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