Webinar begins at 2:05PM, London Time

Dr. Angelo Corsaro ***[angelo.corsaro@prismtech.com]***

OpenSplice DDS Product Marketing Manager, PrismTech

Angelo co-chairs the OMG Data Distribution Service (DDS) Special Interest Group and the Real-Time Embedded and Specialized Services (RTESS) Task Force. He is a well known figure in the distributed real-time and embedded systems middleware community and has a wealth of experience in hard real-time embedded systems, large-scale and very large-scale distributed systems, such as defense, aerospace, homeland security and transportation systems. Prior to joining PrismTech, he worked for the SELEX-SI CTO Directorate, a FINMECCANICA company, where his responsibilities included mapping business requirements to technology capabilities, strategic standardization and technology innovation.

Hans van't Hag ***[hans.vanthag@prismtech.com]***
OpenSplice DDS Product Manager, PrismTech

Hans has extensive experience in applying an information approach towards mission-critical and real-time net-centric systems. He is a co-author of the OMG DDS specification and has presented numerous papers on DDS and publish subscribe middleware technologies. Prior to joining PrismTech he worked for 23 years at Thales Naval Netherlands (TNN) where he was responsible as Product Manager for the development of the data-centric real-time middleware (SPLICE) as applied in TNN's TACTICOS combat system in service with 15 Navies worldwide.

PRISMTECH
Productivity Tools & Middleware

OpenSplice DDS in Defence and Aerospace

The Right Data to the Right Place at the Right Time
– All the Time –

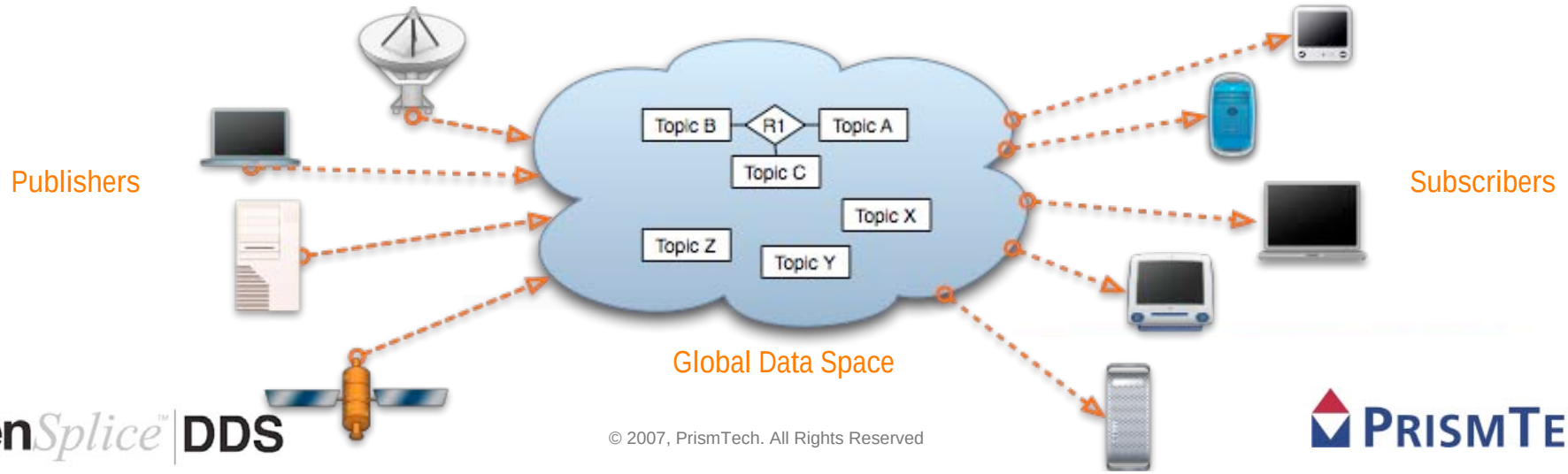
Agenda

- **OpenSplice DDS Overview**
- **Characterizing the Domain**
- **Applicability of OpenSplice DDS in the D&A Domain**
- **Objective Evidence: 'The Naval CMS usecase'**
- **What's Next**
- **Concluding Remarks**

Dr. Angelo Corsaro

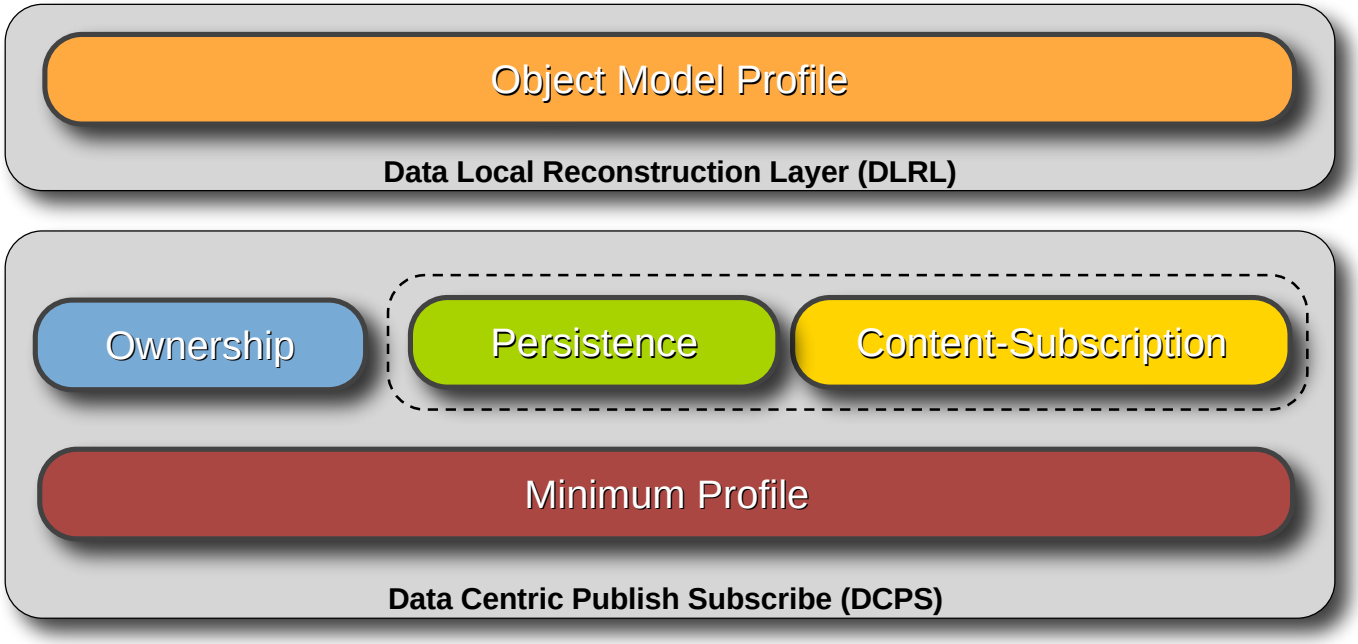
OpenSplice DDS

- **An High Performance Real-Time Data-Centric Publish/Subscribe Middleware**
  - *The right data, at the right place, at the right time -- all the time!*
  - *Fully distributed, high performance, highly scalable, and high availability architecture*
- **Unparalleled support for Data-Centric and real-time Publish/Subscribe features**
  - *Content based subscriptions, queries and filters, DLRL*
  - *Fine grained tuning of resource usage and data delivery and availability QoS*
  - *Optimal networking and computing resources usage*
- **Loosely coupled**
  - *Plug and Play Architecture with Dynamic Discovery*
  - *Time and Space Decoupling*
- **Open Standard**,
  - *Complies with the full profile of the OMG DDS v1.2*



Standard Compliance

- OpenSplice DDS is compliant with the full profile specified in the OMG DDS Specification v1.2



OpenSplice™ DDS Overview

Deployment

Development

OpenSplice PowerTools™

- Views & Editors: UML | DDS-DSL
- Modeling-Plug-ins: Information Modeling | Application Modeling | Deployment Modeling
- Roundtrip-Engineering: OpenSplice Tuner & Remote-connect
- Foundation & Framework: Eclipse

soap

OpenSplice™ DDS product-line

SECURITY

- Monitor & Control (Tuner) | Logging & Replay | Configuration — High-level Services
- DDS API's C/C++/Java | CORBA cohabitation C++ / (RT)Java | Dynamic XML-based API — Middleware-Integration
- Minimum | Ownership | Content-Subscription | Persistence | DLRL; DCPS — OMG-DDS Profiles
- Webservice Gateway | Network Scheduler | Fault-tolerant Durability | DBMS Gateway — Pluggable-Services
- Enterprise (Windows, Solaris, Linux, AIX) | Embedded (vxWorks, QNX, LynxOS) — Supported Platforms

OpenSplice™ DDS

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OpenSplice™ DDS v3 - In Summary

OpenSplice™ DDS

Functionalities

- Full OMG-DDS specification coverage *(DCPS and DLRL)*
- Provision of a true 'fault-tolerant information backbone' *(content-aware and FT-durability)*
- Wide Cohabitation and Connectivity with other Technologies *(Corba, RT-Java, DBMS, SOAP, XML)*
- Availability of (remote) deployment tools *(Tuner™ offering total & remote control)*
- Support for Information/application/deployment modeling *(DCPS/DLRL-specific roundtrip development)*

Performance

- **Scalability** w.r.t. number of applications as well as computing nodes and topics
- **Real-time determinism** by urgency (latency-budget) & importance (priority) based network-scheduling
- **Fault-tolerance** by FT-durability and reliable network-service shielding faulty applications from the network

Pedigree

- **Maturity.** Product proven, fielded, In service in 15 Navies world-wide
- **Fractal Architecture.** Large-scale, real-time, fault-tolerant, embedded, all in one system!
- **High Standard of Quality Assurance.** Process/procedures, QA-artefacts and regression testing w.r.t. number of applications as well as computing nodes and topics

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Hans van’t Hag

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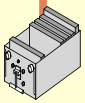
SYSTEM SCOPES

Platform-centric systems

Mission Computer

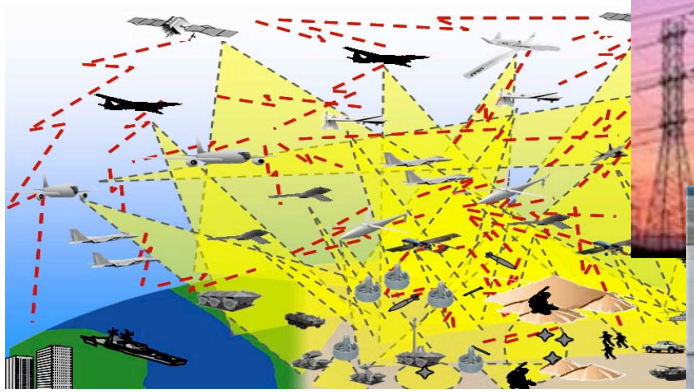


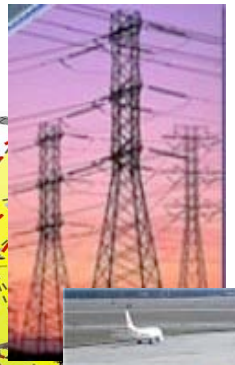
Vehicle Management

Net-centric systems

C2, C4I and NCW REQUIREMENTS

Net-centric systems-of-systems





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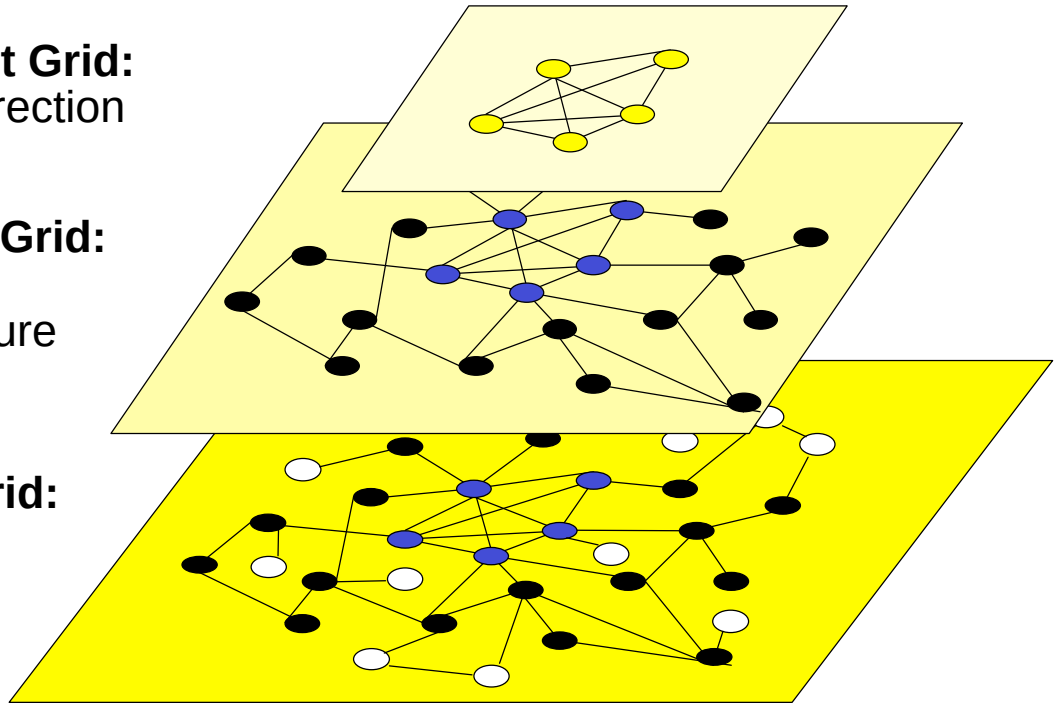
Definition: information grids & processing domains

Engagement Grid:
Weapons Direction

Awareness Grid:
Common
Tactical Picture

Planning Grid:
Common
Operational
Picture

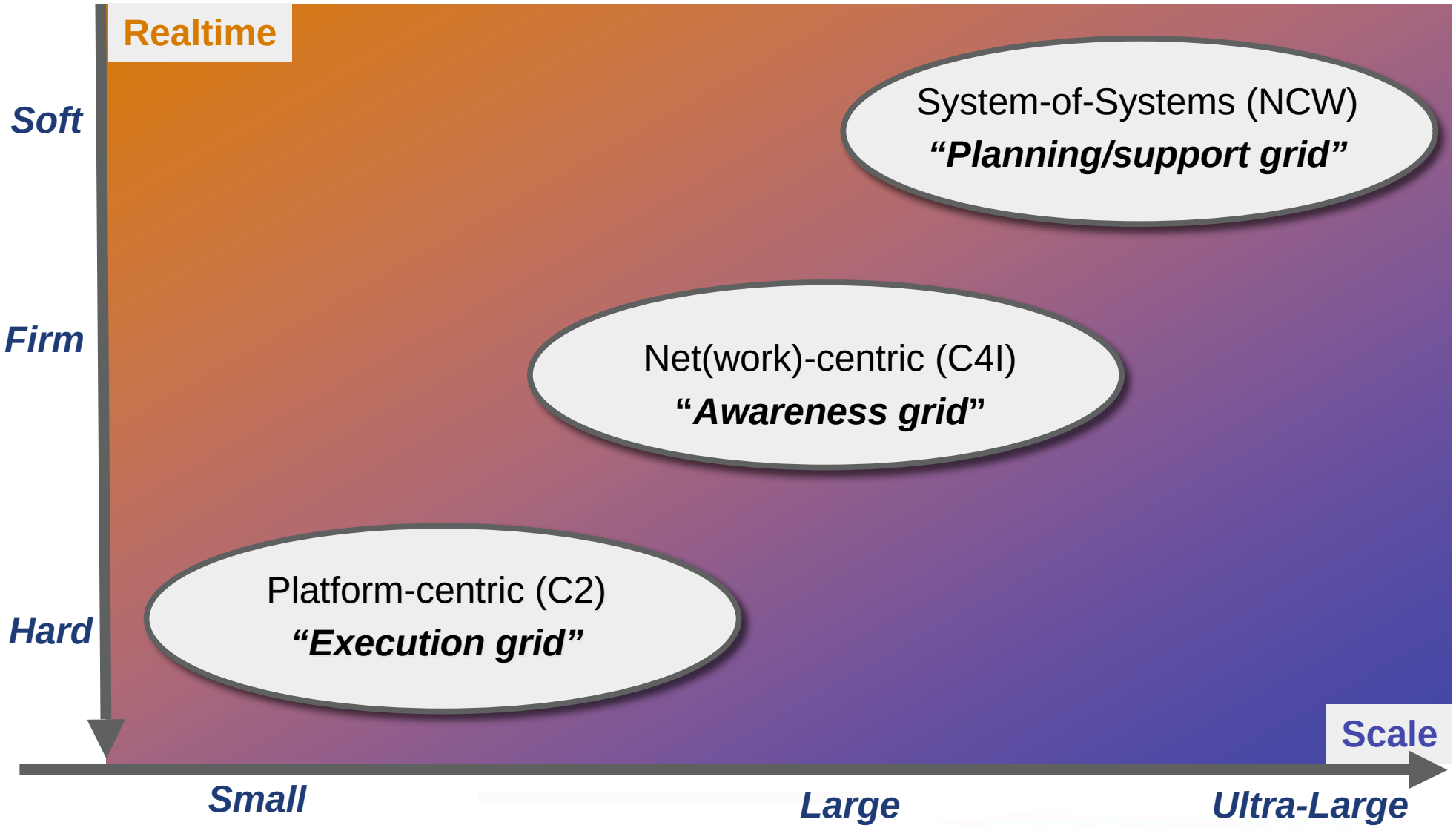


Combat Execution (CE)

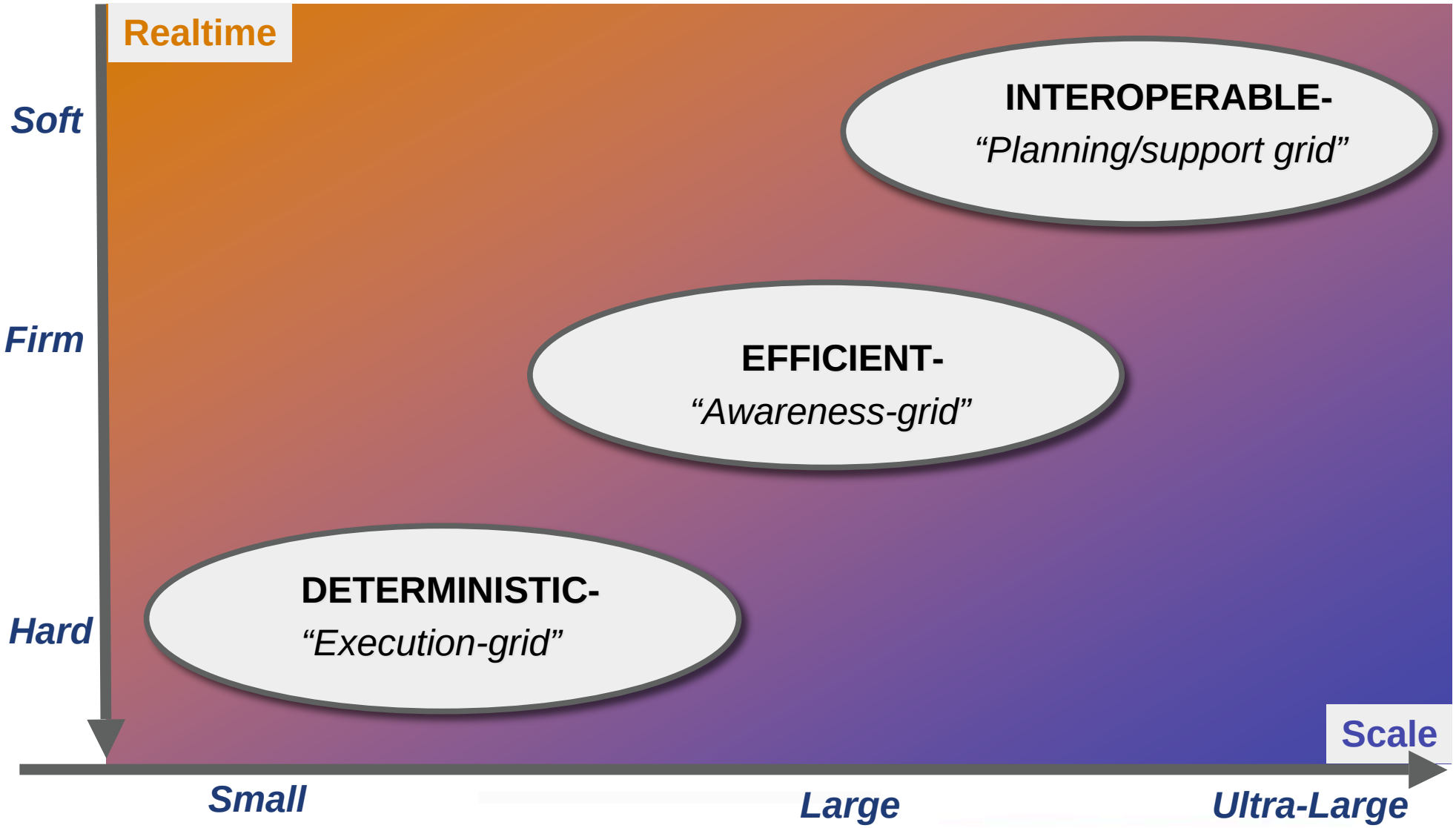
Command & Control (CC)

Command Support (CS)

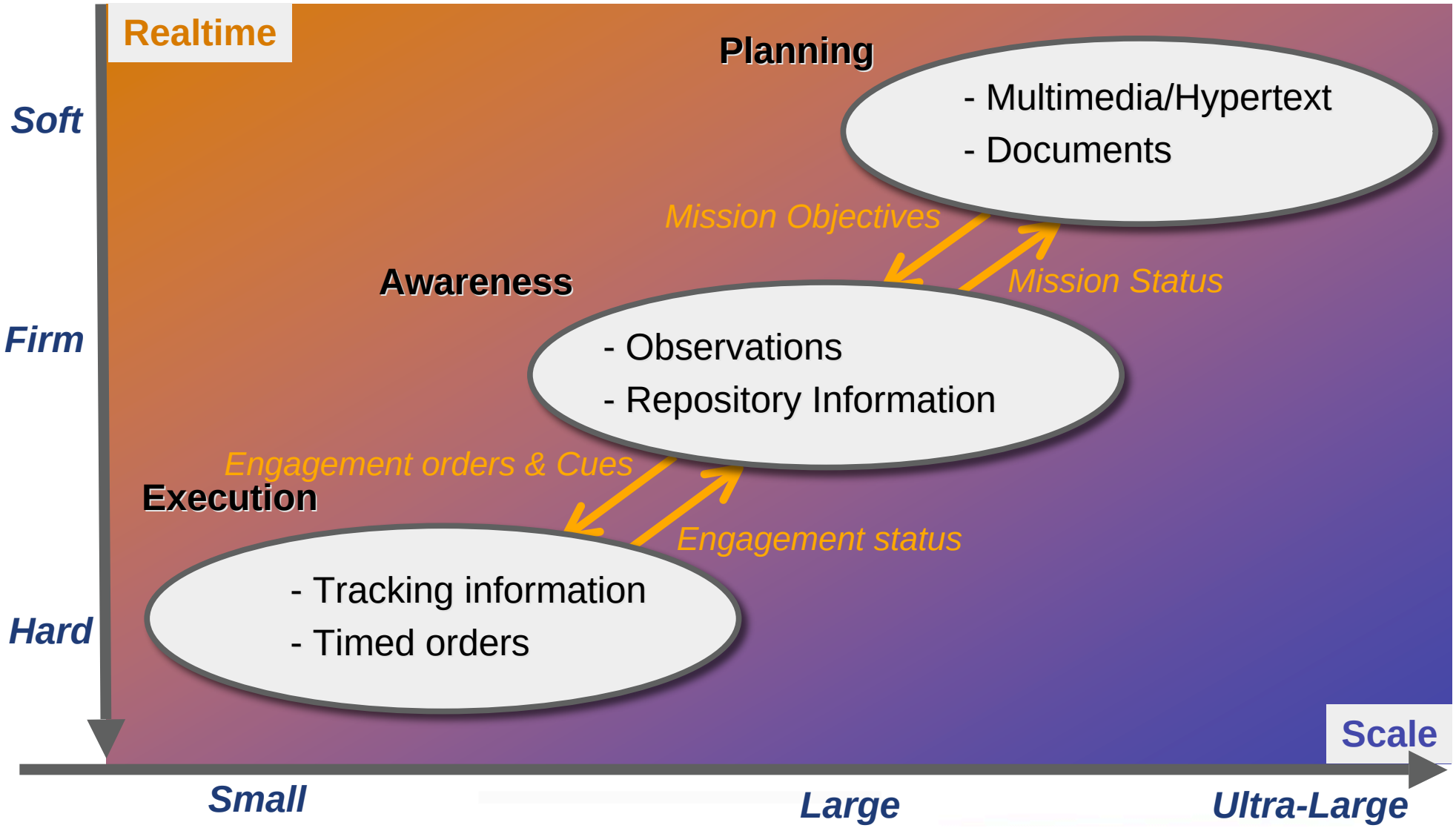
A SCOPING MODEL



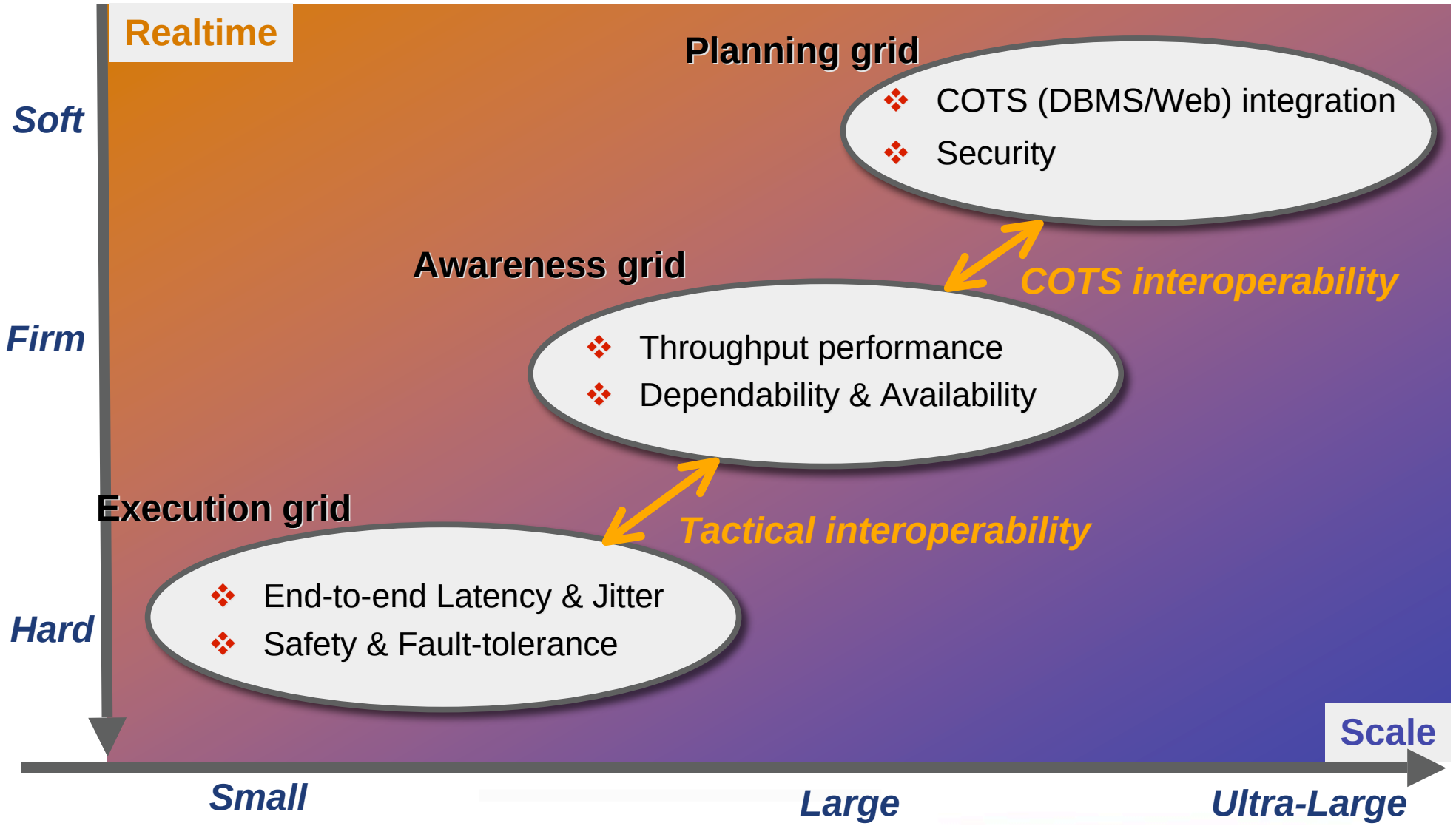
MAIN CHARACTERISTICS



INFORMATION ARTEFACTS



SYSTEM REQUIREMENTS



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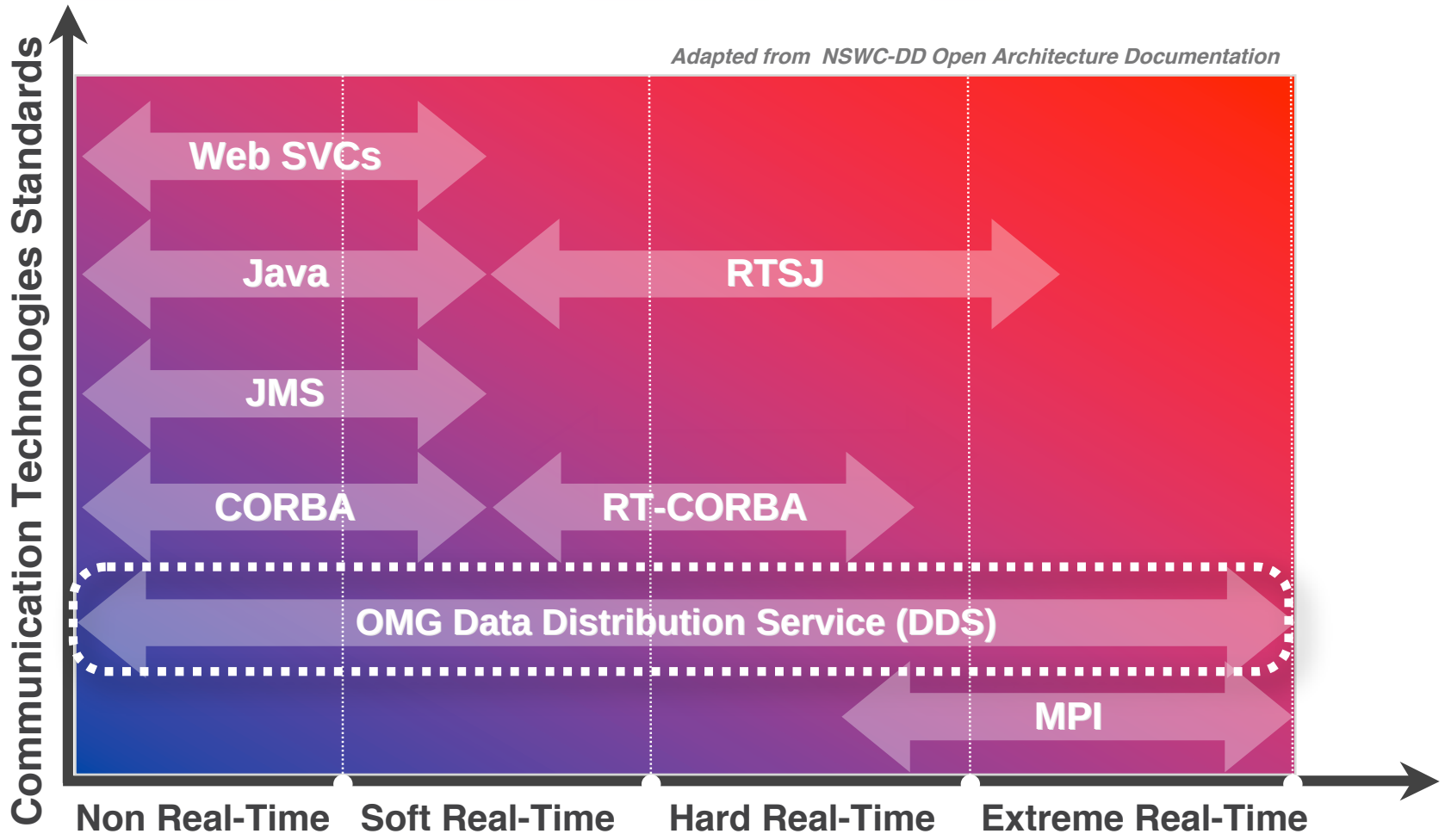
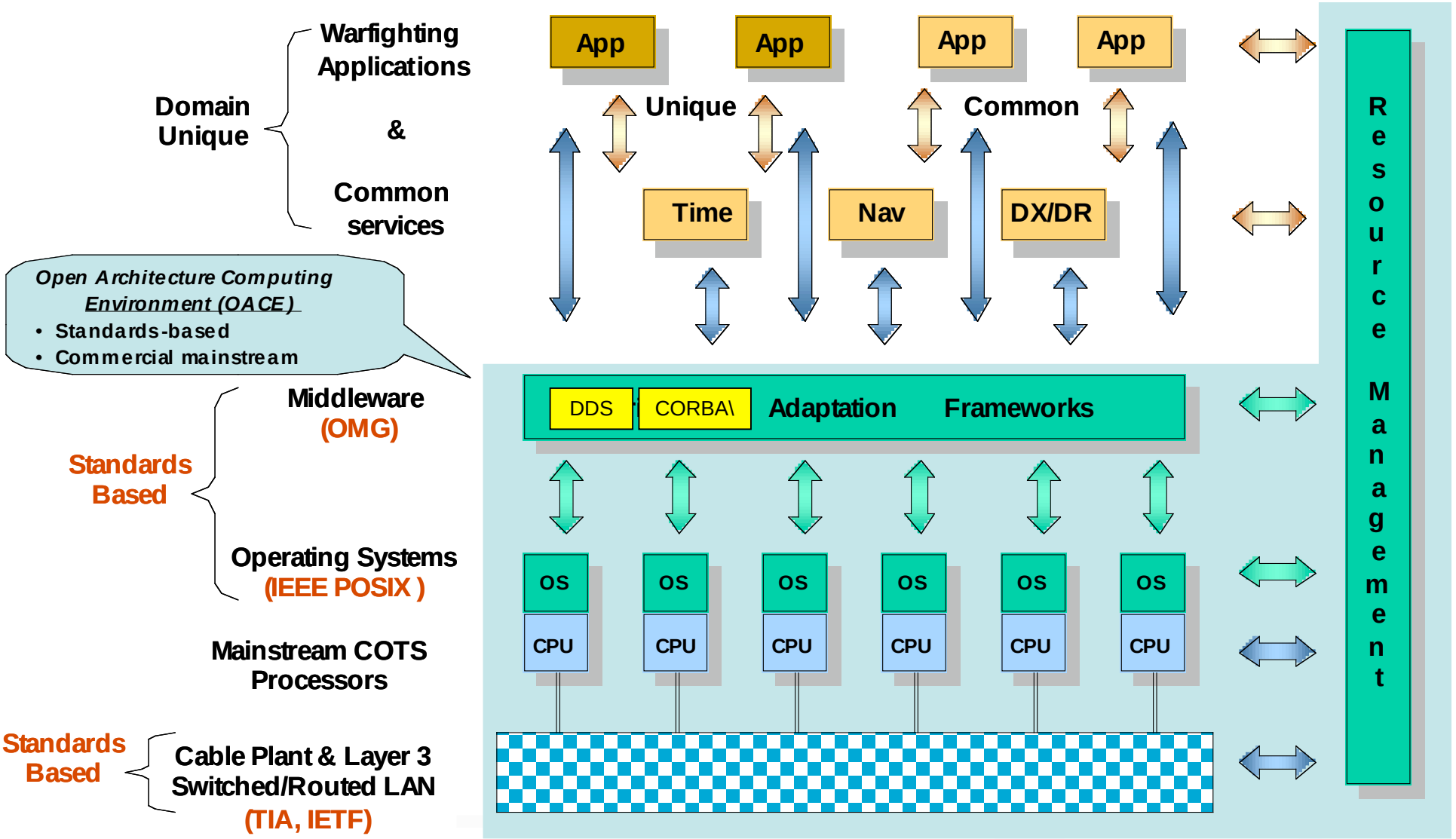
DDS Applicability

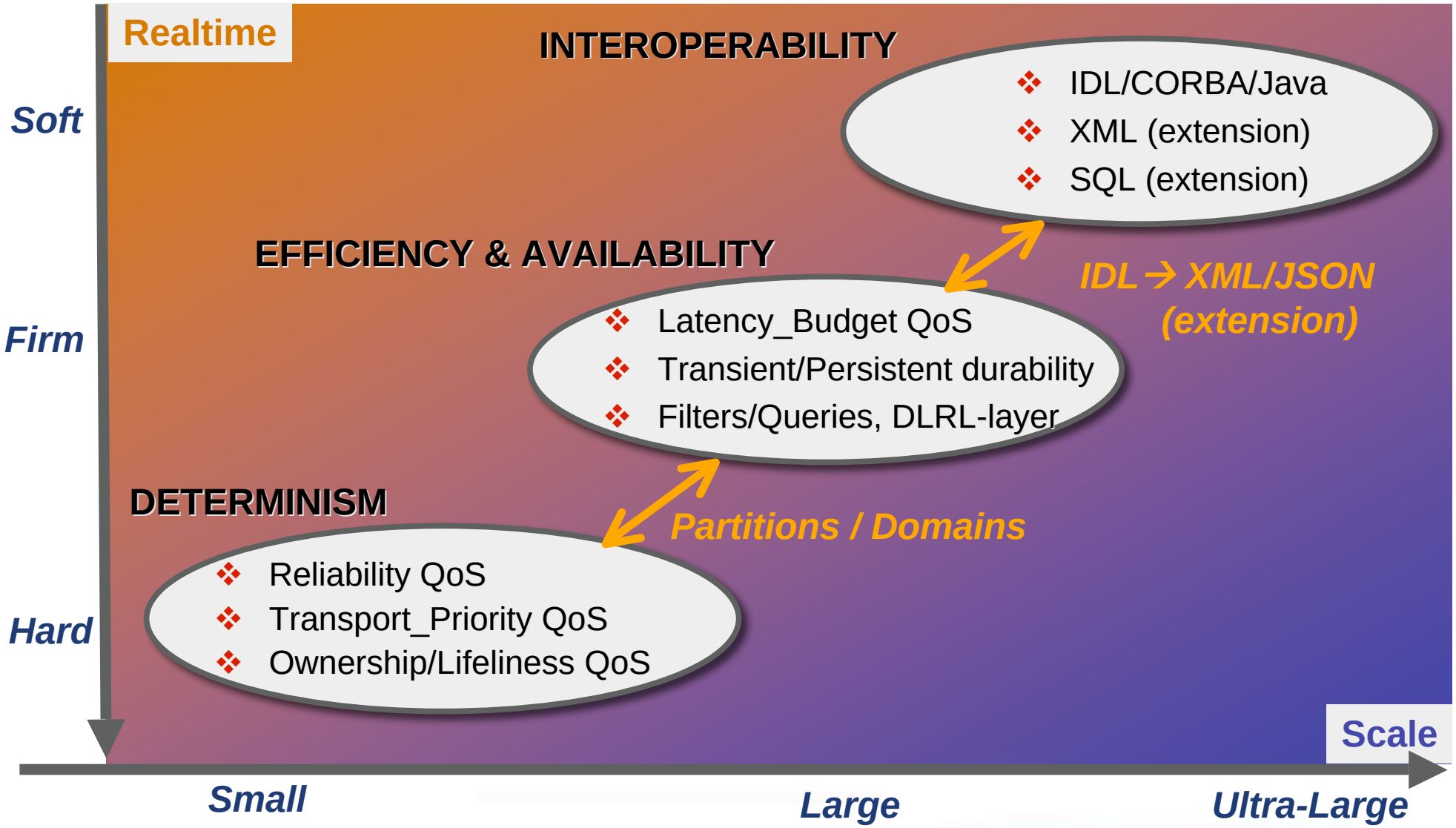


The DDS is the only technology that spans across the board -- It guarantees exceptional real-time behavior, while providing unparalleled level of throughput !

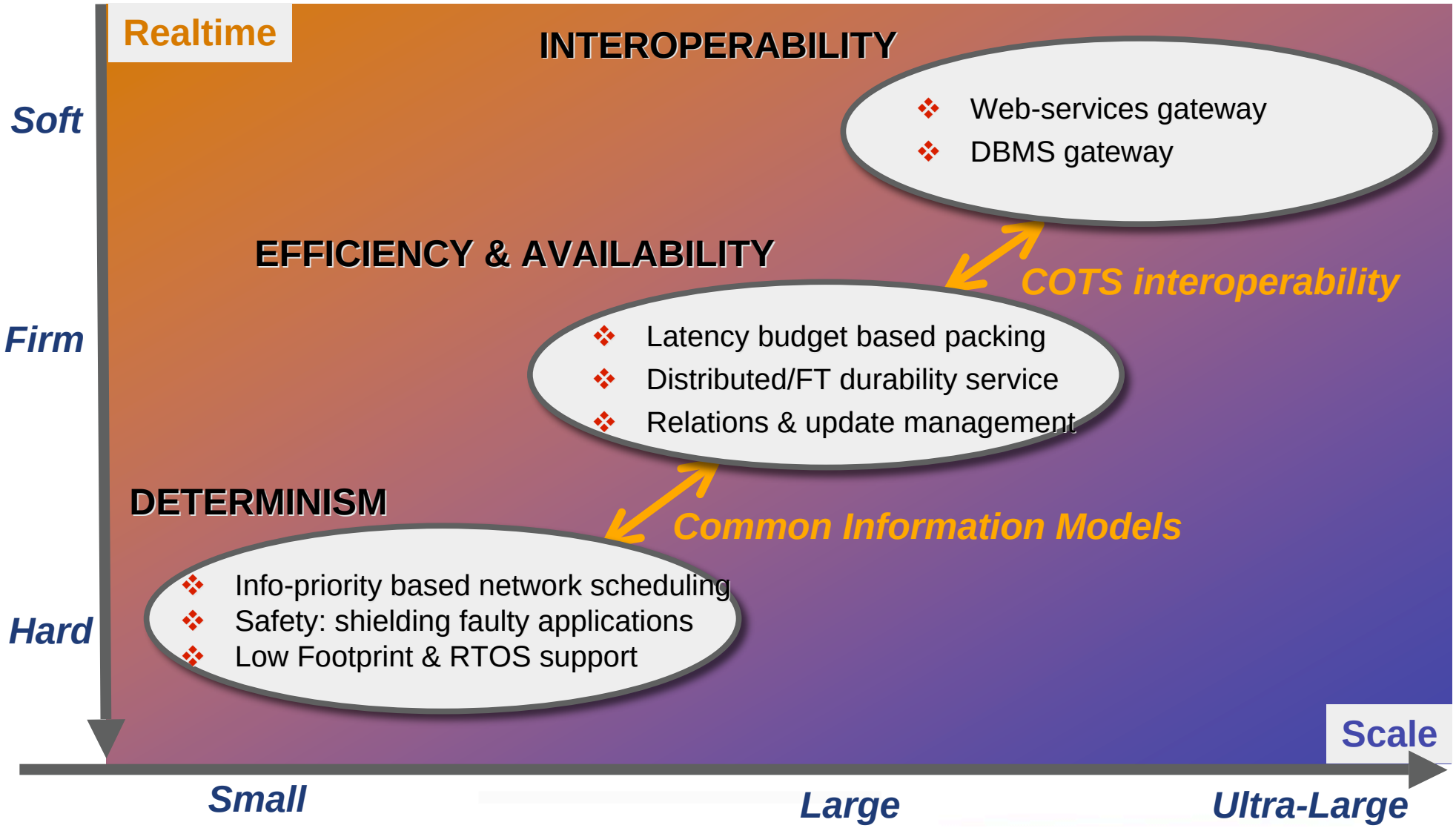
DDS in the OACE



DDS APPLICABILITY: FUNCTIONALS (Specification & QoS)



DDS SUITABILITY: OpenSplice™ DDS Implementation (1)



OpenSplice DDS

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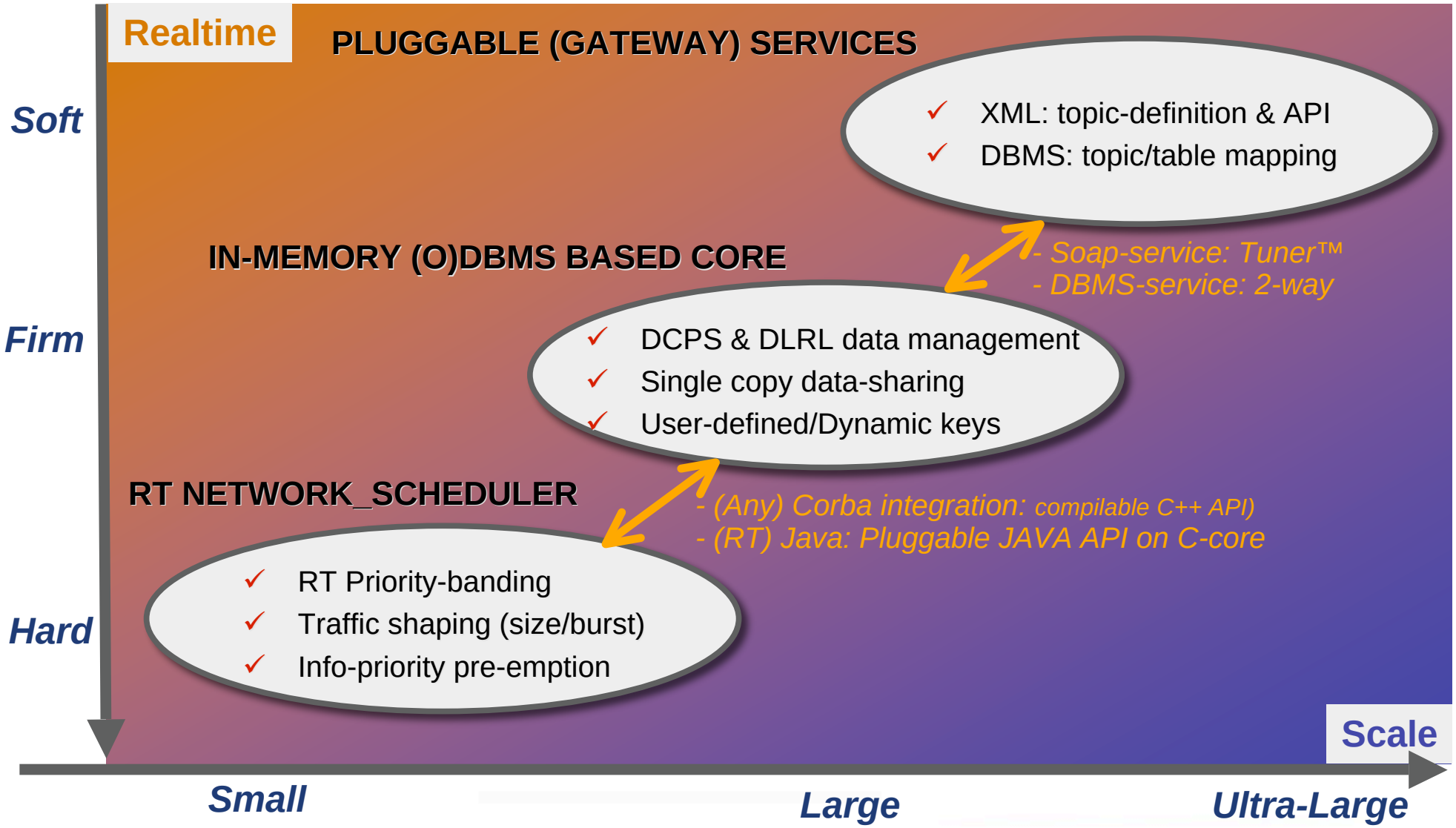
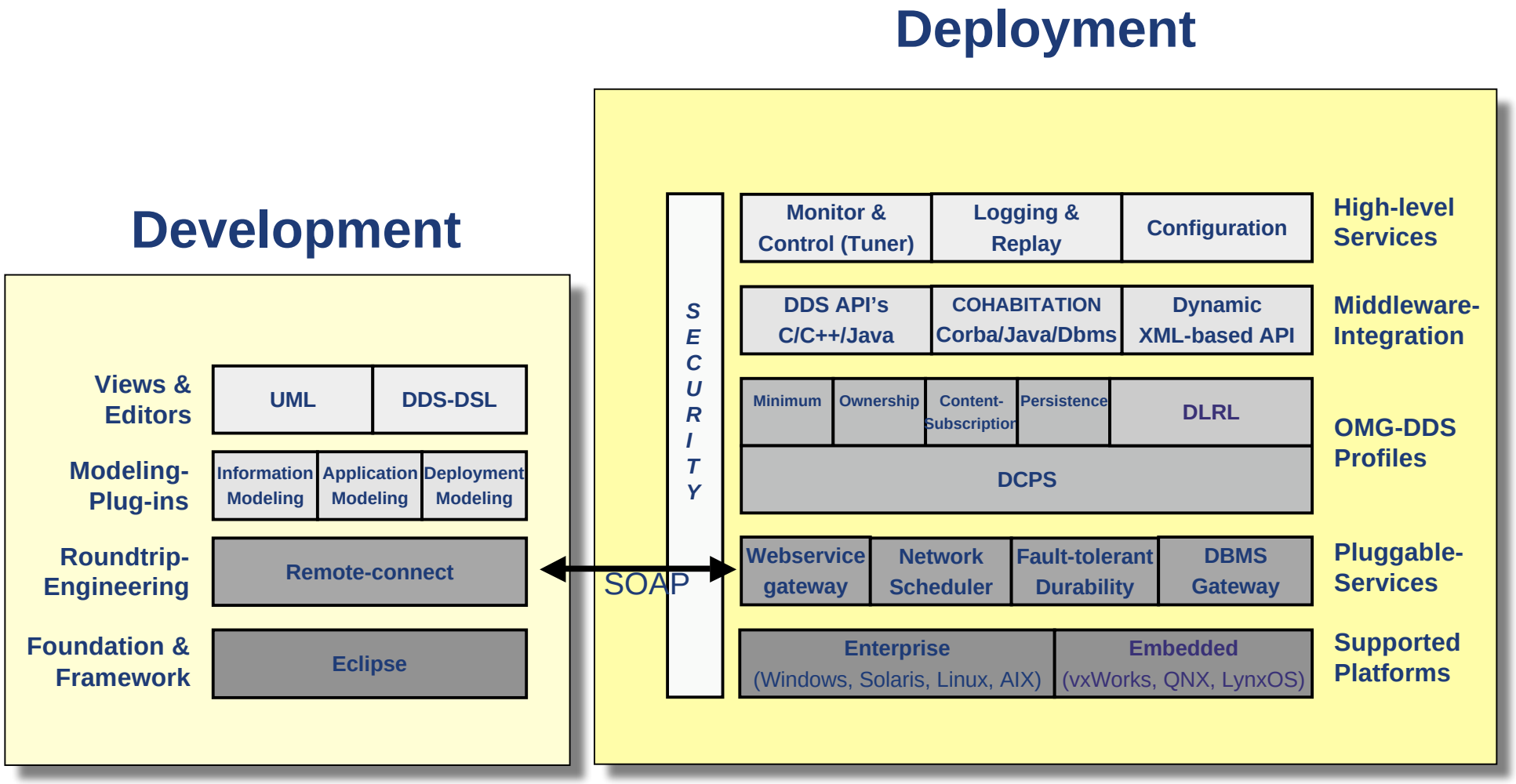
DDS SUITABILITY: OpenSplice™ DDS Implementation (2)



OpenSplice DDS Product Line



OpenSplice in Defense & Aerospace

- OpenSplice DDS Overview
- Characterizing the Domain
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Trends & Requirements in CMS

Operational:

- **nature of missions:**
  - littoral, non-military
  - asymmetric
  - joint/combined/coalition
- **reduced manning:**
  - "do more with less":
    less manning, multi-mission platforms
  - more information at the same time: new missions
  - "information overload" :
    induces more automation
- **Network-Centric Warfare**
  - Information-grids
  - increased awareness

Technical:

- **Requirements**:
  - non-functional requirements drive the architecture
- **Models**
  - focus on models, not on source code:
    model-driven engineering & code generation
- **Components**
  - build software as "plugable" components:
    component-based development

Industrial:

- **Development by consortia**
  - multi-site, "coalition-based development"
- **Technology decoupling**
  - technology cycles much shorter
    than product cycle

Overall Architectural Requirements:

- **Open/Mature Standards** : ***'right Technology** at the **right place'***
- **RT QoS & Data Driven** : ***'right Information** at the **right time'***
- **MDE Tool-suite** : ***'right Tools** for the **right problem'***

The TACTICOS CMS Success Story: *Overview*

CHARACTERISTICS

Many different customers:	*fielded in over 15 Navies world-wide*
Many different ships/missions:	*tens of Ships classes (patrol boats to destroyers)*
Large-scale & mission-critical:	*>150 CPU's, >2200 applications, >4.000 tracks/sec*
Real-time and Fault-tolerant:	*Battle-damage resistant, deterministic, reliable*

OpenSplice DDS

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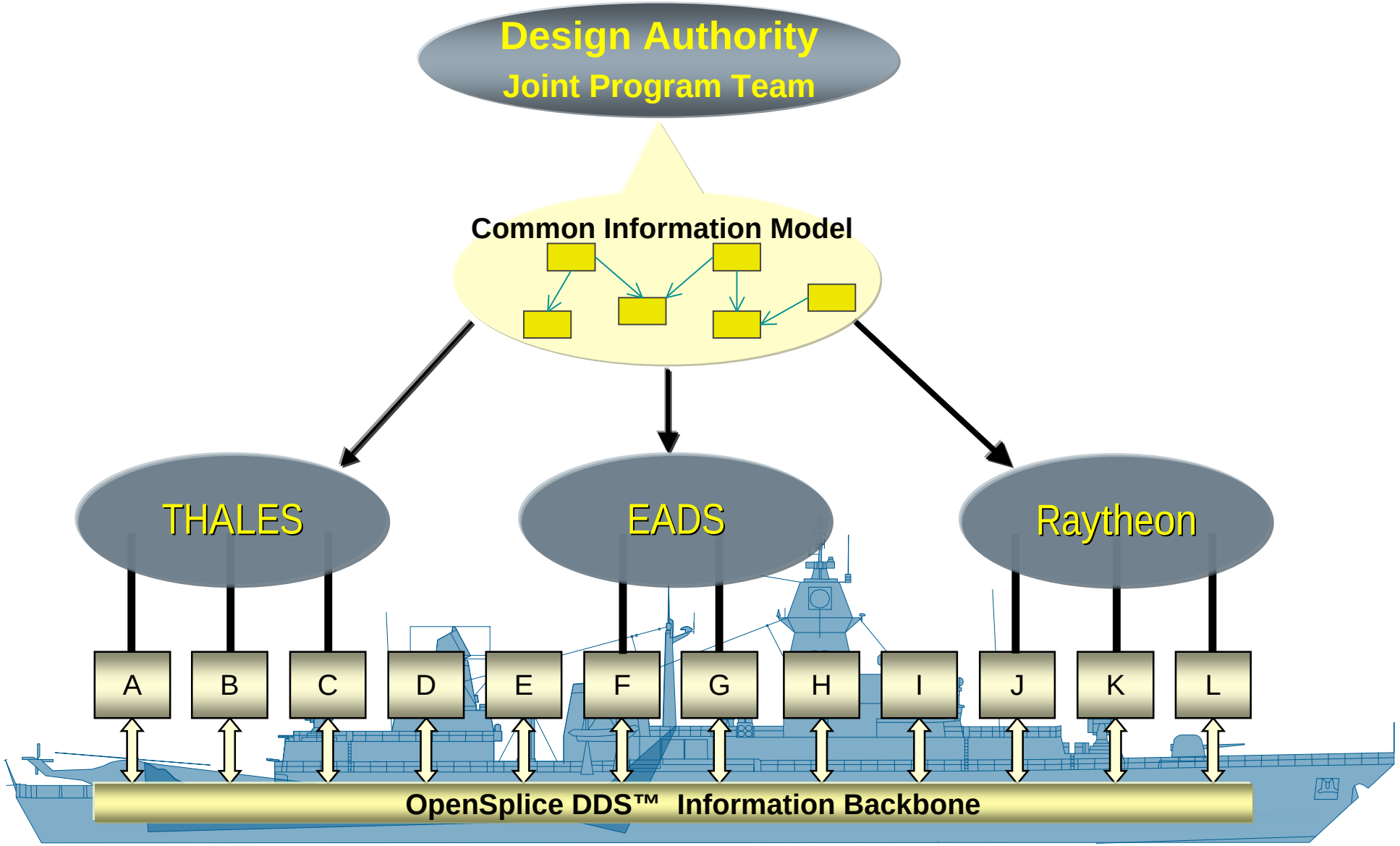
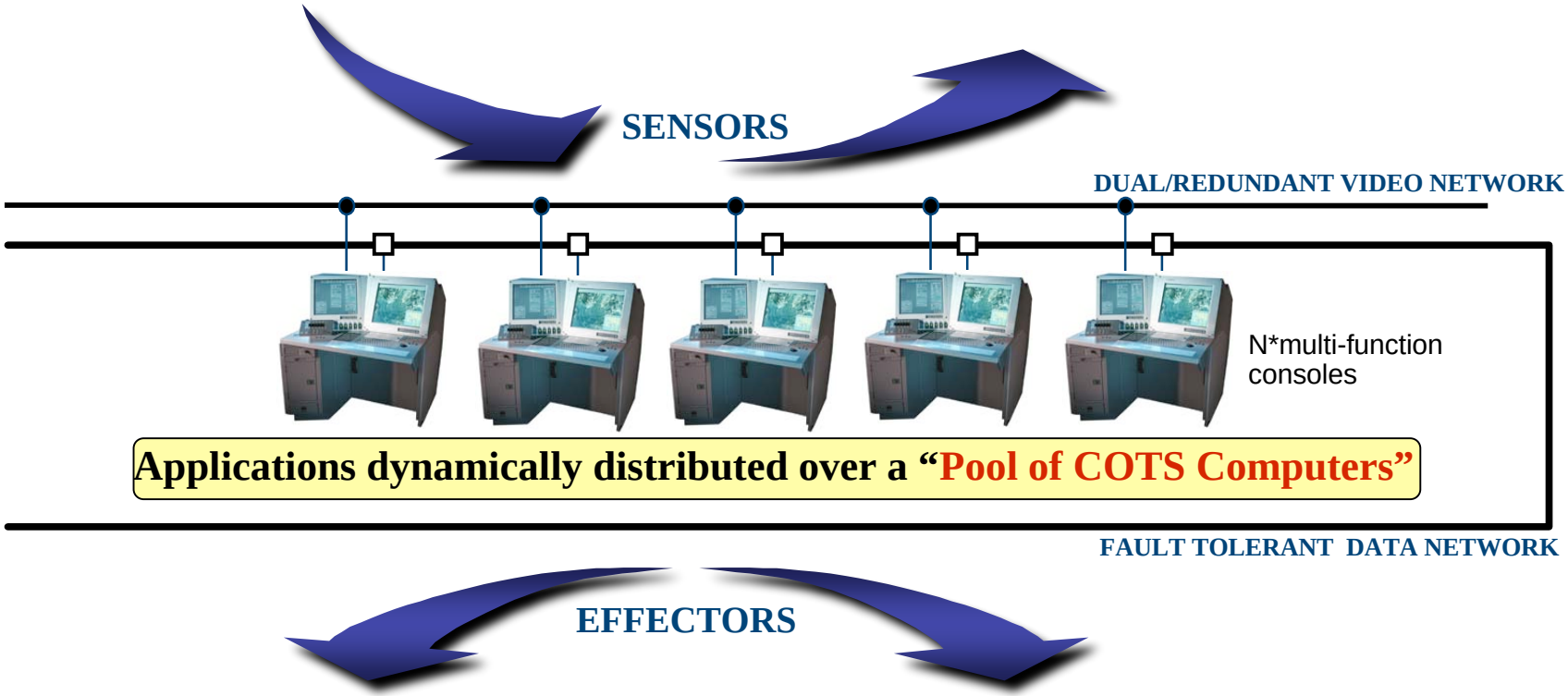
The TACTICOS CMS Success Story: *Coalition based development*

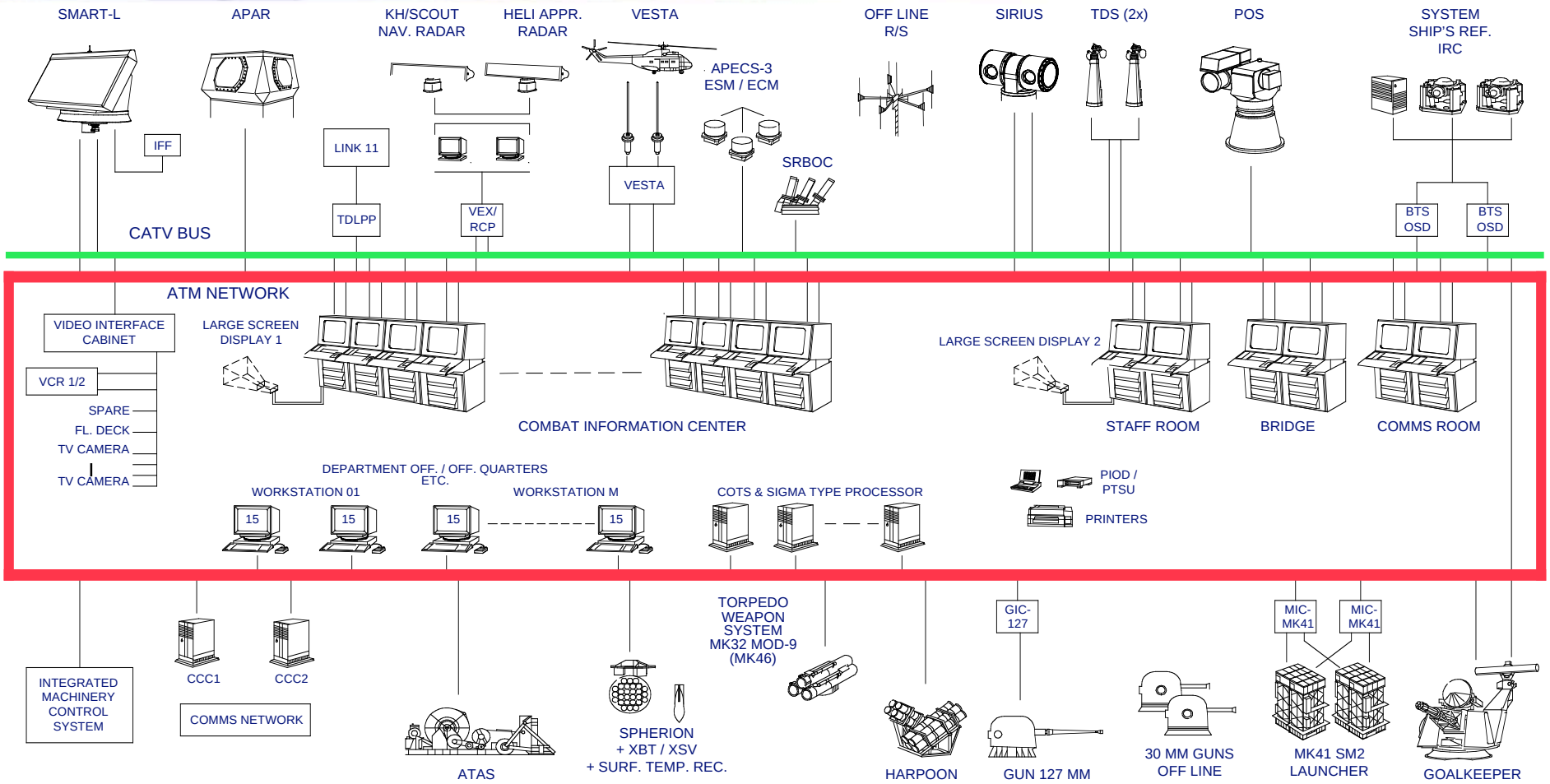


CMS ARCHITECTURE: Starting points



Fault-tolerant:	*High combat survivability & maintainability (no single-point-of-failure)*
Flexible:	*Mission-based configuration, on-board training & simulation*
Evolvable:	*Evolutionary upgrading based on COTS & Open Standards*
Scalable:	*From patrol-boats up to destroyers*

The TACTICOS CMS Success Story: *Metrics*

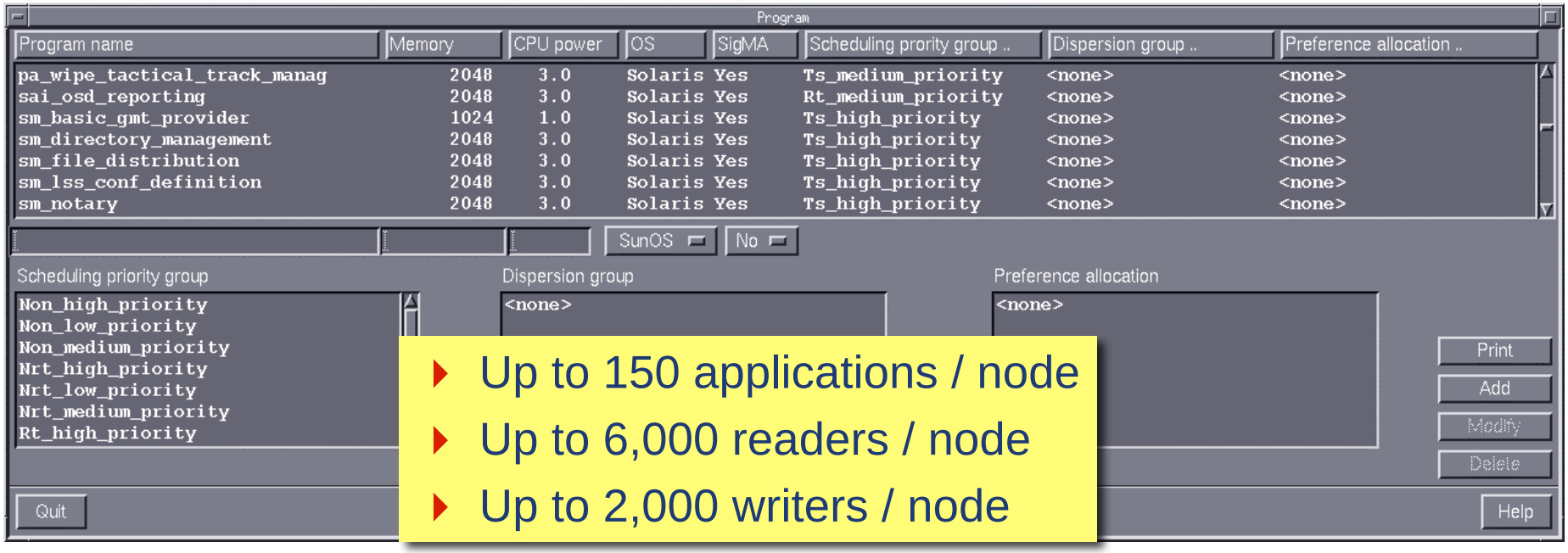


Data-traffic: ***>4.000 publications per second over the system data bus***

Programs : ***2.200 programs allocated over 150 processors***

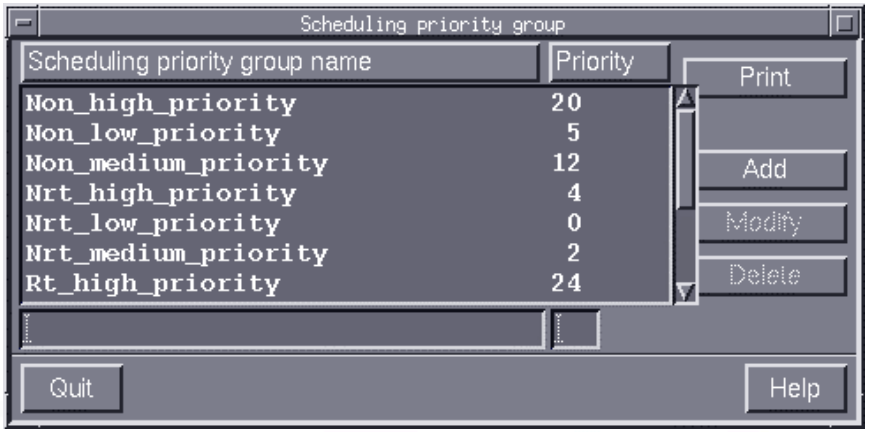
Data flows : ***urgent & non-urgent data (latency), important & less-important data (priority)***

The TACTICOS CMS Success Story: *DRM*



- Up to 150 applications / node
- Up to 6,000 readers / node
- Up to 2,000 writers / node

- **'pool-of-computers' utilization (Allocation schemes)**
  - **Allocation driven by resource-needs and availability (CPU-power, Memory)**
  - **'Dispersion groups' to force geographical separation (battle-damage resistance)**
  - **'Preference allocation groups' to advice co-location (efficiency)**
  - **Degradation driven by 'Functional Priorities' (importance)**



CMS Requirements Summary for DDS

Functionality

- **Fault-tolerant 'Information Backbone'** demanding full OMG-DDS support
- **Secure communication** for specific information-flows ("secure partitions")
- **Seamless cooperation** with other middleware (CORBA, RTJAVA, DBMS)

Performance

- **Scalability** : supporting embedded (low footprint) & high volume (many nodes/applications)
- **Determinism** : supporting '*urgency*' and '*importance*' for information-priority pre-emptive networking
- **Safety** : supporting traffic shaping/scheduling to bound impact of misbehaving applications

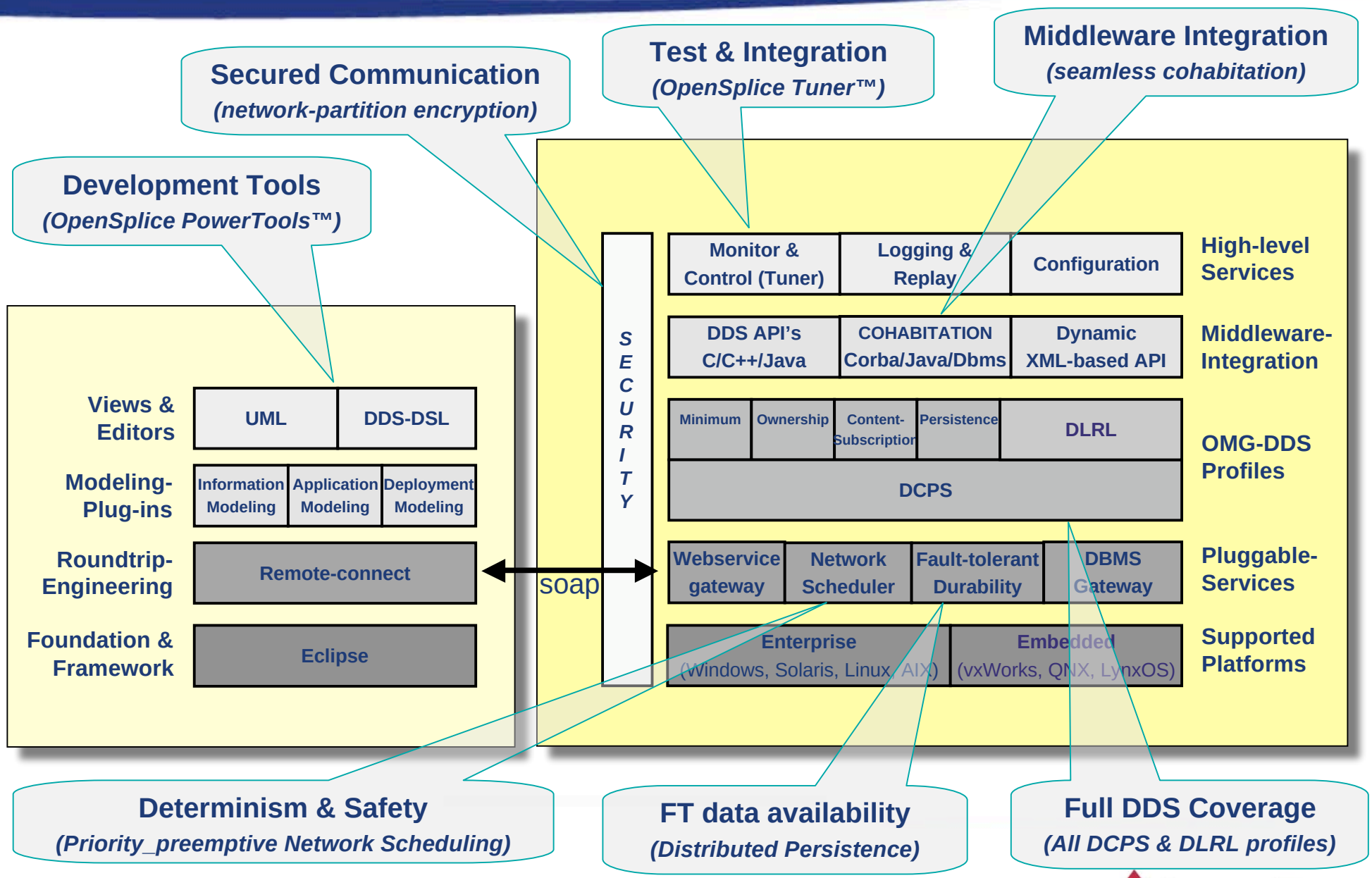
Tooling

- Proper **Development Tools** to allow distributed/coalition-based modeling & development
- Proper **Deployment Tools** to support easy integration, test & tuning of distributed target systems

Quality Assurance

- Proven (**fielded**) applicability in the CMS domain
- Institutionalized (regression) **testing** of *design* (white-box) & *requirements* (black-box)
- **Objective Evidence** (Configuration management plans, Test plans/results)

OpenSplice DDS Product Line



OpenSplice DDS

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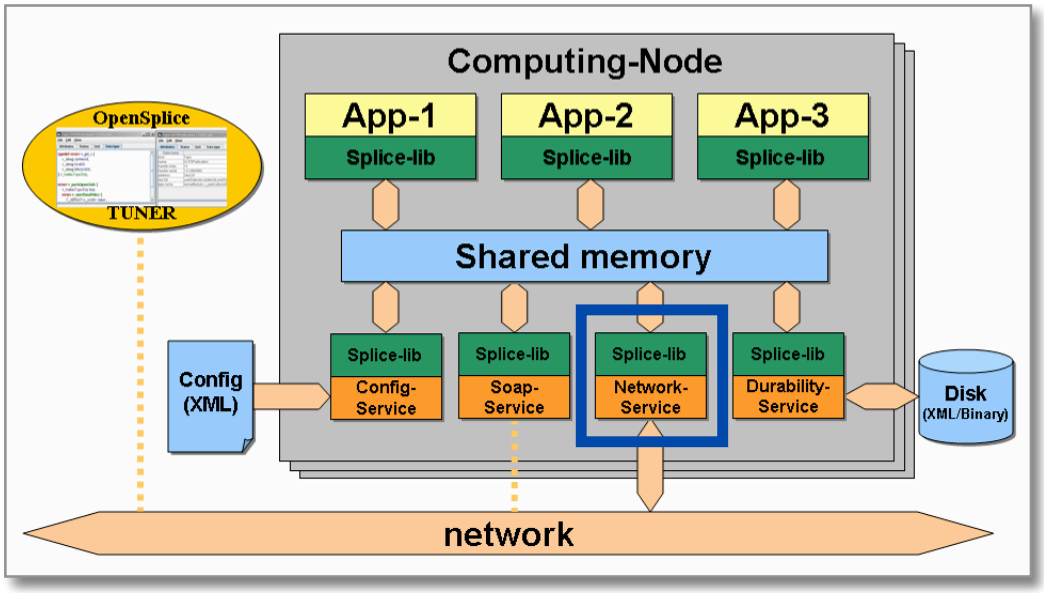
OpenSplice™ DDS Network Architecture

Architecture

- Network-channels
  - Priority bands
- Network-partitions
  - Multicast Groups
- Traffic-Shaping
  - Burst/Throughput



Scalability and Efficiency

- Single shared library for applications & services *(code-footprint)*
- Ring-fenced shared memory segment *(single copy regardless of nr. of applications)*
- Data urgency driven network-packing *(Latency_budget QOS drives packing per channel)*

Determinism & Safety

- Pre-emptive network-scheduler *(traffic-shaping per priority-band)*
- Data importance based network-channel selection *(Transport_Priority QoS of actual data)*
- Partition based multicast-group selection *(dynamic mapping of logical DDS partitions)*
- Managed critical network-resource *(limited impact/damage of faulty-applications)*

OpenSplice™ DDS: “proven suitability”

Functionality

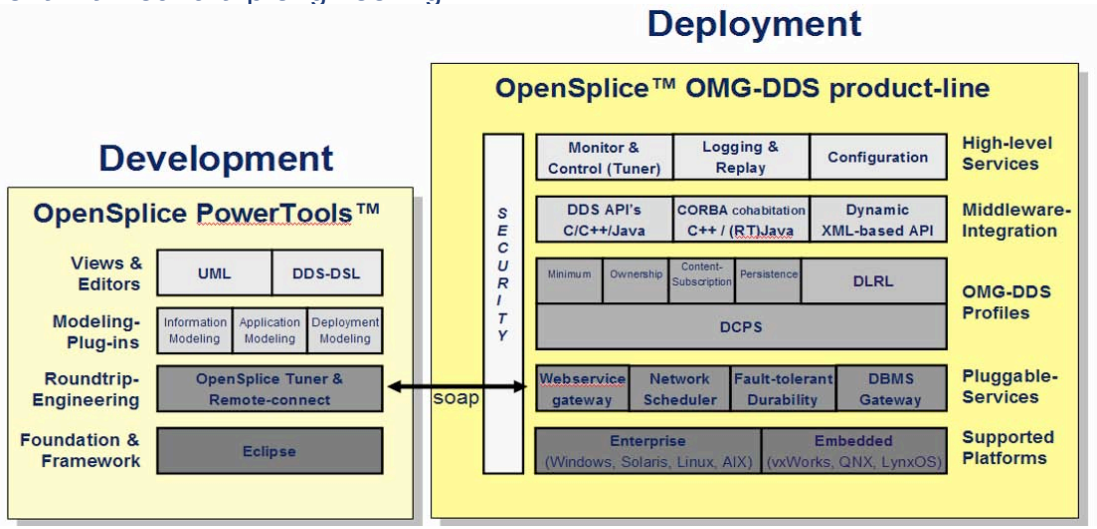
- Only product with full OMG-DDS coverage *(DCPS and DLRL)*
- Providing a true ‘secure & fault-tolerant information backbone’ *(FT-durability & secure networking)*
- Supporting seamless cohabitation and connectivity with other Middleware *(Corba, RT-Java, DBMS, SOAP)*
- With ‘superior deployment’ tools available today *(Tuner™ for total & remote control)*
- Information/application/deployment modeling & Code-generation *(Powertools™ MDE suite)*

Performance

- Superior scalability w.r.t. number of applications as well as computing nodes and topics
- Superior real-time determinism by urgency(latency-budget) & importance (priority) based network-scheduling
- Superior fault-tolerance by FT-durability and reliable network-service shielding faulty applications from the network
- Superior tooling for design/development/deployment with round-trip engineering

Pedigree

- CMS background:
  Only product proven, fielded,
  In service in 15 Navies world-wide
- CMS characteristics:
  large-scale, real-time, fault-tolerant,
  embedded, all in 1 (combat-)system !
- Military QA
  Developed in ISO-9000/CMM-3 organization
  Process/procedures, QA-artefacts and
  testing adopted by PrismTech



OpenSplice is THE ONLY battle-tested DDS implementation !!

OpenSplice DDS

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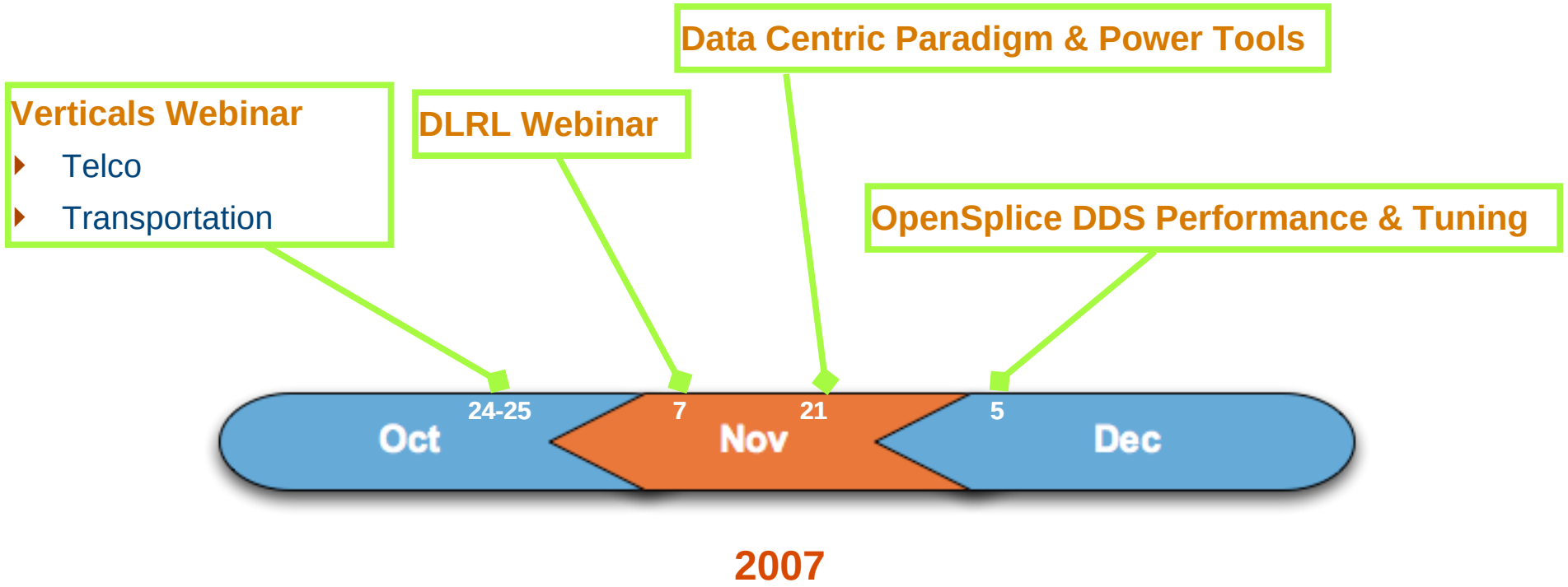
Upcoming Webinars



Registration: http://www.prismtech.com/section-item.asp?id=731&sid=29&sid2=15&sid3=289

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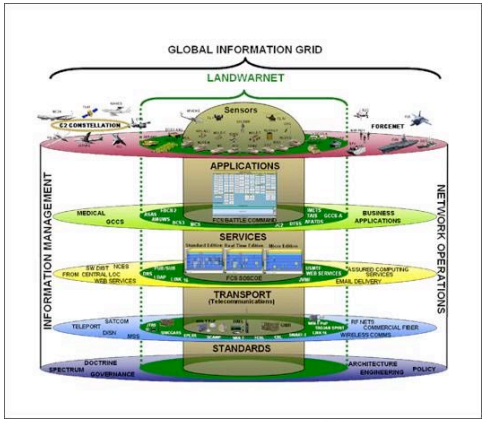
Concluding Remarks

Addressing the Challenges

- OpenSplice DDS optimally blends functional and non-functional requirements for next generation Defense & Aerospace, enabling to securely and efficiently deliver the right data to the right place at the right time -- all the time
- OpenSplice DDS rich data-centric support enables the vision of the real-time shared operational picture, at a global scale, *e.g.*, GIG



Open Architecture

- OpenSplice DDS is the only implementation in the world which fully implements the OMG DDS v1.2 standard
- The DDS standard has been adopted/mandated by US Navy, DISR, FCS, etc.

Technology Ecosystem

- OpenSplice DDS' rich technology ecosystem allows for seamless cohabitation and integration with both legacy and enterprise technologies

OpenSplice DDS is the best solution available on the market for addressing next generation Defense & Aerospace data distribution and management problems!

Contact Us

OpenSplice™ DDS

- OpenSpliceDDS Home Page
  - http://www.prismtech.com/opensplice-dds/
- For Information on OpenSplice DDS contact:
  - opensplicedds@prismtech.com -or-
  - sales@prismtech.com
- OMG DDS Information
  - http://www.dds-forum.org/
  - http://portals.omg.org/dds/