VOYAGER

SPACE EDGE™

PDK

Bring mission capability to Space Edge through a unified foundation for integration, deployment, and operations.

- Accelerated payload integration
- Scalable architecture for mission compute
- Intelligent workload orchestration

ACCELERATE DEVELOPMENT | SIMPLIFY INTERGRATION | MAXIMIZE CAPABILITIES

THE FOUNDATION FOR MISSION COMPUTE

PDK transforms Space Edge into a mission-aware computing platform with the hardware reference designs, platform software, and intelligent orchestration infrastructure needed to integrate, deploy, and operate mission capabilities. The architecture scales from card-level compute to coordinated operations across spacecraft.

INTEGRATE

Bring hardware and software together into an integrated payload environment.

DEPLOY

Package and validate mission workloads for consistent deployment across Space Edge.

OPERATE

Orchestrate workloads with resource scheduling, health monitoring, and fault management.

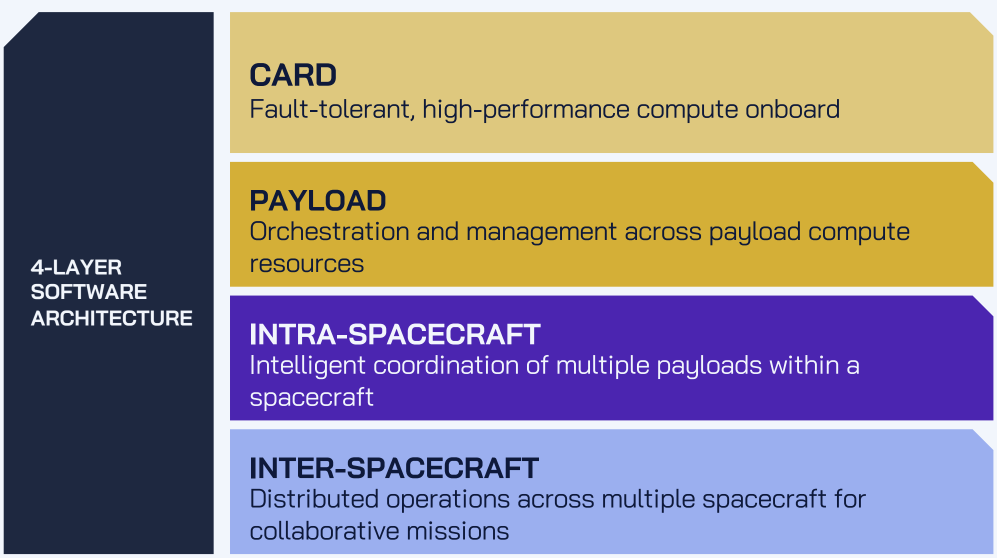

FIGURE 1 |SPACE EDGE SOFTWARE ARCHITECTURE

INSIDE PDK

Hardware Integration
- BSP
- Device Drivers
- Bootloader
- Device Trees
- Reference Bitstreams
- Hardware Test Apps

Platform Software
- Containerized Workloads
- Mixed OS Support
- Heterogenous Compute
- Dynamic Reconfiguration
- Resilient Boot & Recovery

Workload Deployment
- Processor Emulation
- APIs and Code Examples
- Mission Workload Packaging
- Test & Validation
- Deployment Manifests

Mission Operations
- Workload Orchestration
- Resource Scheduling
- Health Monitoring
- Fault Management
- Power Management

CARD-LEVEL STACK

Voyager Nebula Software Core	
Containerization and App Reliability:	Docker and k3s support for isolated, multi-tenant, and resilient workload execution
Mixed OS Support:	Concurrent operation across real-time and general-purpose operating environments
Heterogeneous Compute:	Unified software interface across diverse on-card processing resources
Dynamic Reconfiguration:	Reconfigure on-card compute resources (e.g. FPGA bitstreams, power modes, memory allocation)
Fault Management:	Monitors, logs, and corrects on-card faults (e.g. radiation-induced bit flips, hardware anomalies)
IPMC / RHM API:	Card-specific commands for power, health, and fault management
Resilient Boot and Recovery:	Redundant boot images, watchdog integration, and chain of trust

Board Reference Design		
BSP/OS Image	Device tree	Boot loader
Standard drivers	Reference Bitstreams	Base Card Test App

Processors			
VSPARC	FLEXO	CORTEX	
VC1902 [Versal ACAP]	**LX2160** [16-Core ARM] **KU115** [Large-Size FPGA]	**LS1046A** [Quad Core] **KU040** [Large-Size FPGA] **Jetson Orin Nano** [GPU]	**& more**
Intelligent Platform Management Controller (**IPMC**) and Radiation-Hardened Monitor (**RHM**) [**PolarFire SoC**]			

PAYLOAD ORECHESTRATION & MANAGEMENT

Intelligent orchestration extends the card-level software stack across payload compute, enabling workloads and resources to be dynamically managed as mission needs evolve.

WORKLOAD DISTRIBUTION AND SCHEDULING
Intelligently map mission workloads to processing resources to maximize on-orbit capability.

APPLICATION FAULT TOLERANCE AND ANOMALY RESPONSE
Detect, isolate, and respond to application faults in real time to maintain mission continuity.

POWER AND RESOURCE MANAGEMENT
Dynamically optimize compute and power allocation to maximize performance and efficiency.

SYSTEM HEALTH MONITORING
Maintain visibility into system and payload health to enable rapid response and recovery.