

# Polaris

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## Polaris

SiliconCentric | Product overview

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# Independent Verification & Validation

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# Independent Verification & Validation

Independent Verification & Validation (IV&V) is independent proof that a system performs as specified and as intended, carried out by a team with no stake in the design. On safety- and mission-critical programs, it is how test results become defensible evidence.

- Verification confirms the system is built to specification; validation confirms it does the job it was built for.
- Assessment is independent of the design team — technically, managerially, and financially.

# Independent Verification & Validation

- Independence keeps design-team assumptions and conflicts of interest out of the test record.
- Findings hold up with auditors, customers, and regulators because the assessor has nothing to defend.
- ISO 26262, DO-178C, IEC 62304, and IEC 61508 programs all require independence in verification.
- Applied at the hardware level, IV&V establishes the board is sound before software investment begins.

# Independent Verification & Validation

- Defects surface on the bench — the earliest and cheapest point in the program to correct them.



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# What is Polaris

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# What is Polaris

Hardware validation before software. Polaris is a complete, production-ready IV&V platform that proves your hardware on the bench — before your software investment begins.

- Production-ready today: validated on real hardware and used in active engagements.
- Independently validates every core, memory region, peripheral, bus, sensor, and module on the board.
- Runs on Jetson, Raspberry Pi, Zynq, i.MX, Sitara, and x86 SBC hardware, with OTA updates, A/B partitions, and secure boot built in.

# What is Polaris

- Works from your hardware design package alone — no access to your source code required.
- A custom OS and HAL are built per board; every layer above them is board-agnostic.
- Ships as a full platform: client, server, web dashboard, and Python SDK.
- Every run writes to an append-only records store — timestamped, operator-attributed, audit-ready.
- Delivered tailored to your board and silicon, with full source and no lock-in.





# Why Polaris

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# Why Polaris

Hardware faults belong on the bench, not in the software backlog. Polaris proves the silicon first, so your software team builds on hardware that is known to work.

- Independent by design: no source-code coupling to the team that designed or programmed the board.
- Unproven hardware costs the wrong people time — software engineers debugging a board they did not design.
- Faults surface on the bench, before they reach the software backlog or the field.

# Why Polaris

- Software development starts on proven silicon, recovering months otherwise lost to hardware debugging.
- Every run produces records that prove the board behaved — your evidence, not our claim.
- The platform and workflow carry forward unchanged as your hardware revs.

An abstract graphic on the left side of the slide. It features two sets of concentric circles in a dark red color. The upper set has a small white dot at its center, from which a horizontal red line extends to the left. A large, stylized red number '4' is positioned in front of the circles.

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# Architecture

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A large, dark red, curved shape that occupies the right edge of the slide, resembling a quarter-circle or a large arc.

# Architecture

Port one layer, keep everything else. A custom OS and HAL are the only board-specific pieces — the client, the server, the operator console, and every test suite carry forward unchanged across hardware revisions.

- Polaris OS: a Yocto-based, OTA-enabled image with A/B partitions and rollback.
- Polaris HAL: the only board-specific layer, exercising every peripheral on the board.
- Polaris client: a lightweight agent on the device under test, driving tests through the HAL.
- Polaris server: orchestrates runs and writes every artifact to the records store.

# Architecture

- One server validates many boards in parallel.
- The dashboard is the operator console; the SDK and API automate everything the console does.
- The records store is append-only, timestamped, and operator-attributed.



# Polaris OS

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# Polaris OS

Your validation infrastructure is production infrastructure. A custom Yocto Linux built per platform — OTA-enabled, A/B partitions, rollback built in — and the same base your product can ship on.

- A custom Yocto Linux image, minimal, hardened, and reproducible, built for your platform.
- OTA updates with A/B partitions and automatic rollback.
- Read-only rootfs, hardened system services, and secure boot — device security built into the validation stack.



# Polaris OS

- BSP, bootloader, and device tree built for your exact silicon.
- A full SBOM is generated per build, with CVEs tracked against it.
- Companion microcontrollers run FreeRTOS- and Zephyr-based RTOS builds under the same validation stack.
- The same OS is the base your product can ship on.



# Polaris HAL

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# Polaris HAL

The only board-specific layer in the stack. The HAL exercises every CPU core, memory region, peripheral, bus, sensor, and module — and keeps everything above it portable. Porting to your exact part is a short, well-defined step, not a rewrite.

- The only board-specific layer in the stack.
- Exercises every CPU core, memory region, peripheral, bus, sensor, and module on the board.
- Built from your hardware design package — schematics, interface control documents, and bills of materials — with no access to your source code.

# Polaris HAL

- Presents a uniform interface, so test suites run unmodified across peripherals and platforms.
- Porting to your exact part is a short, well-defined step, not a rewrite.
- Maintained by us and carried forward as your board revs.



# Polaris Client

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# Polaris Client

A lightweight agent on the device under test. It drives every test through the HAL with no meaningful load on the board — the board under test behaves like the board in the field.

- Runs on the device under test and drives every test through the HAL.
- Relays to the server over gRPC on Linux; FlatBuffers on FreeRTOS and Zephyr bare-metal targets.
- Adds no meaningful load to the board — measured behavior reflects field behavior.
- Captures every event with three timestamps: origin, relay, and server.

# Polaris Client

- Runs launched from the client produce the same records as the dashboard.



# Polaris Server

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# Polaris Server

Scale from one bench to a validation lab without new tooling. The server orchestrates runs and writes every artifact to the append-only records store — one server validates many boards at once.

- Orchestrates and executes runs; configures and schedules test campaigns.
- Writes every artifact, log, and event to the append-only records store.
- Validates many boards in parallel from a single server.
- Records are timestamped, operator-attributed, and version-pinned.



# Polaris Server

- Hosts the dashboard and the API.
- Optional cloud sync centralizes records across sites and fleets.



# Polaris Dashboard

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# Polaris Dashboard

A web console for connecting boards, running tests, watching live telemetry, and reviewing results — the same dashboard on every program, so your operators learn it once.

- Connects a board and brings it online; tests are configured and launched from the console.
- Live telemetry streams during every run; time-series results are reviewed after.
- Records are browsed, queried, and exported for review and submission.
- Every state-changing action is attributed to an operator.

# Polaris Dashboard

- Run health and drop counts are surfaced explicitly.
- Accessible from anywhere on the bench, scoped to your environment.



# Polaris PySDK

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# Polaris PySDK

Validation becomes part of every build, not a separate event. The Python SDK drives Polaris from scripts and CI pipelines; C/C++ and Rust bindings are supported for teams that need them.

- Ships with every Polaris engagement, documented and handed over.
- Automates configuration, execution, streaming, and results retrieval.
- Integrates into your existing CI pipeline with no new tooling.
- A direct API path reaches the client and HAL for quick single-board checks.

# Polaris PySDK

- Runs launched via the SDK produce the same records as the dashboard.
- The SDK and API stay stable across platforms and releases.





# Test Modes

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# Test Modes

From a one-minute acceptance gate to a multi-day soak — one tool, one audit trail. Four run shapes write the same record format across all of them.

- One-shot: configure, execute, capture, and return a single result — the acceptance gate.
- Monitoring: sampling at a configured rate — continuous background validation.
- Event-based: fires on configured conditions — threshold crossings, faults, and state changes.
- Long-running: hours or days with periodic snapshots — endurance and soak.

# Test Modes

- Suites are portable across peripherals and platforms without modification.
- Event captures carry three timestamps: origin, relay, and server.
- Every mode writes the same record shape to the same store — one audit trail spans every run type.



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Test Types

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# Test Types

The full range — functional, performance, thermal, endurance, power, and environmental — including the failures a short bench test never reaches.

- Functional: every core, memory region, peripheral, and bus validated — I2C, SPI, UART, PWM, ADC, RS-422 / RS-485, CAN-FD, and beyond.
- Performance: PCIe, Ethernet, and camera pipelines driven under sustained load.
- Thermal: continuous sampling across the rated temperature range.
- Endurance and burn-in: multi-day runs with periodic snapshots.

# Test Types

- Power: power-electronics stages, brown-out, and power-cycle behavior exercised over time.
- Bus saturation and link quality held under load to expose marginal behavior.
- Vibration sweeps run under continuous monitoring.
- Findings correlate with bench instrumentation — oscilloscope and logic analyzer captures anchor electrical-level evidence.
- Every test type writes to the same append-only records store and audit trail.



# What We Deliver

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# What We Deliver

A complete validation platform tailored to your board and your silicon — every engagement produces the same deliverables. Full source, your records, no lock-in.

- A custom Yocto OS and a HAL covering every peripheral on your board.
- A client-server architecture with a web dashboard as the operator console.
- A Python SDK that integrates test runs into your CI.
- Live telemetry, time-series review, and report export.
- Performance, thermal, and reliability testing as part of the engagement.



# What We Deliver

- The append-only records store, delivered as your evidence and your property.
- Full source, documentation, and no lock-in.
- We work alongside your hardware team from bring-up through production.



# Platform Integration

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# Platform Integration

Polaris runs on all six SiliconCentric platforms and inherits every platform capability — your validation infrastructure is production-grade from day one.

- Runs on Jetson, Raspberry Pi, Zynq, i.MX, Sitara, and x86.
- Inherits the platforms' BSP, kernel, RTOS, and middleware.
- Inherits the platforms' OTA and fleet management, with A/B partitions, golden recovery, and secure boot.
- Inherits the platforms' cloud/IoT platform connectivity for telemetry and records sync.

# Platform Integration

- Validation runs on production-like infrastructure from day one.
- The OS under your validation stack is the same base your product can ship on.
- One OS lineage spans all six hardware platforms and every SiliconCentric product.



# Reference Platforms

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# Reference Platforms

Polaris runs on six in-house platforms covering the silicon families most embedded products are built on. Porting the HAL to a specific board is a short step, not a rebuild.

- Arches runs on the NVIDIA Jetson SoM with an STM32 co-processor for AI, vision, and robotics.
- Acadia runs on the Raspberry Pi CM4 / CM5 with an RP2040 co-processor for industrial nodes and kiosks.
- Zion runs on the Xilinx Zynq-7000 / UltraScale+ MPSoC for SDR, DAQ, motor control, machine vision, and ASIC prototyping.

# Reference Platforms

- Pinnacle runs on the NXP i.MX with 10–15 year availability for medical and infrastructure programs.
- Joshua runs on the TI Sitara with a 200 MHz PRU subsystem for industrial control, EtherCAT, and PLCs.
- Sequoia runs on Intel / AMD x86 SBCs for edge servers, GPU vision, and x86-only software stacks.
- Together they span the silicon families behind most embedded products — a customer board is typically a derivative of one of them.



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Industries

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# Industries

One platform and one records store across nine regulated and demanding verticals.

- Automotive / ADAS: ISO 26262 and ASIL-B/D, CAN-FD, road-load capture in MDF4.
- Aerospace & defense: DO-178C / DO-254, IRIG-106, MIL-STD-1553, tamper-evident records.
- Medical devices: IEC 62304 and FDA submissions, encrypted storage, EDF output.
- Industrial automation: IEC 61508 SIL-2/SIL-3, EtherCAT, PROFINET, OPC UA.

# Industries

- Robotics: AGV LiDAR, real-time control systems, and motor controllers validated independently on the bench.
- Electric vehicles: ASIL-D BMS validation with charge–discharge cycle records.
- Rail & transportation: EN 50128, MVB/WTB, and vital I/O with fault-response records.
- Space & satellite: ECSS, with power-rail validation across temperature.
- Energy & utilities: IEC 62443, IEC 61850, and DNP3 for smart-grid validation.



# Compliance

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# Compliance

Every test, log, and event is captured audit-ready — timestamped, operator-attributed, append-only. Evidence for ISO 26262, DO-178C, IEC 62304, and IEC 61508. We produce the evidence; your assessor judges it.

- Records are timestamped, operator-attributed, and append-only.
- ISO 26262: fault-injection results mapped to ASIL requirements.
- DO-178C / DO-254: repeatable structural test records and tool-qualification data.
- IEC 62304 / FDA: SOUP mitigation records and lifecycle-aligned logs.

# Compliance

- IEC 61508: functional-safety integrity records across SIL tiers.
- Bidirectional traceability links requirements, tests, and records.
- Schemas are version-pinned and runs are reproducible.
- SiliconCentric is not a certification body, DER, or accredited assessor — we produce the evidence; your assessor judges it.



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Contact

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# Contact

Tell us your silicon, your board, and where you are in the cycle — we'll tell you what we can do, and what we can't.

- We can demonstrate Polaris on our hardware within days.
- Validation starts from your hardware specification — there is nothing to prepare.
- You'll speak with an engineer, not a sales team.
- Reach us at [soccentric.com](https://soccentric.com).

PRODUCT



LET'S TALK

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# Polaris

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Built by SiliconCentric

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