

SenzrOS™ — Next-Generation Autonomous Edge AI OS

Product Brief & Commercial Solutions Guide · Edge OS Specification

"Zero-Latency Intelligence. 100% Offline Autonomy. Enterprise Security at the Edge."

1. Executive Summary

In mission-critical security, access control, and smart facility management, traditional cloud-dependent systems suffer from three fatal flaws: **network latency, recurring cloud compute fees, and catastrophic failures during internet outages**. When a cloud link drops, gates freeze, turnstiles halt, and premises become vulnerable.

SenzrOS™ is the breakthrough edge operating system engineered to eliminate cloud reliance entirely. Built to harness the multi-core power and 6.0 TOPS Neural Processing Unit (NPU) of industrial ARM64 edge processors (Rockchip RK3588/RK3588S), SenzrOS delivers **instant on-device computer vision, millisecond physical barrier actuation, and crash-resilient local decision-making**—all while operating continuously whether connected to the internet or completely offline.

2. Why Choose SenzrOS? The Four Pillars

1. True Offline Autonomy - Sub-ms local validation against encrypted whitelists. - Zero downtime during severed fiber lines or cloud outages. - Crash-resilient SQLite WAL ledger auto-syncs upon reconnect.	2. 6.0 TOPS Neural Acceleration \$0/mo cloud vision bills — all inference runs locally on NPU. - Sub-15ms YOLOv8 person detection @ 30 FPS. - High-speed vehicle ANPR (MoRTH & BH) in under 1.2 ms. - Adaptive contrast & headlight glare immunity.
3. Industrial Self-Healing - Dual-slot A/B updates (RAUC) with automatic rollback. - Independent hardware watchdog timer eliminates bricking. - Optical safety beam interlock aborts barrier on obstruction.	4. 60-Second Field Provisioning - Standalone Wi-Fi 6 hotspot with auto captive portal. - Wireless BLE provisioning from mobile maintenance apps. - Embedded web dashboard (:8000) & senzr-ctl CLI.

3. Commercial Impact & ROI

Metric	Traditional Cloud Systems	SenzrOS Edge Solution	Business Benefit
Gate Opening Latency	800 ms – 3500 ms (Cloud Round-Trip)	Under 20 ms (Local NPU + Relay)	Eliminates traffic queues; frictionless entry
Cloud Bandwidth & API Fees	\$15–\$60 / camera / month recurring	\$0 / month (Local edge NPU)	Saves up to 85% in operating costs
System Uptime in Outages	0% (Gates paralyzed without WAN)	100% Autonomous Function	Zero business disruption or security vulnerabilities
Field Maintenance Calls	High (Truck rolls for failed updates)	Near Zero (A/B atomic rollback + Watchdog)	Drastically cuts field service callouts
Data Privacy & Compliance	Raw video streams leave premises	Local Processing (Only metadata leaves)	Built-in GDPR & Indian DPDP compliance

4. Verified Hardware Benchmarks (Orange Pi 5 Max — Rockchip RK3588, 16GB LPDDR5)

Performance Category	Target Specification	Verified On-Hardware Performance
NPU AI Inference Time	Real-time object detection	12.4 ms per frame

Video Ingestion Rate	Full-motion camera stream	30.0 FPS (Zero dropped frames)
Plate Recognition (ANPR)	MoRTH & BH syntax validation	< 1.2 ms per plate string
Relay Pulse Accuracy	3000 ms non-blocking activation	3002 ms (Safety interlock active)
Cloud MQTT Round-Trip	Uplink event dispatch & ACK	104.7 ms (TLS 1.3 encrypted)
System Memory Footprint	Low idle operating overhead	427 MB (< 3% of available 16GB RAM)
SoC Operating Thermals	Continuous multi-worker load	37.0 °C (Ambient indoor operation)
Power Cut Crash Recovery	Power loss during write queue	100% queue recovered on subsequent boot

5. System Subsystems, Management & Target Deployments

- **Physical Barrier I/O:** Non-blocking background relay pulses with optical safety beam interlock. Character device GPIO with sysfs fallback.
- **Vision & NPU Pipeline:** 6.0 TOPS Tri-Core NPU load balancing, multi-line plate classification, HSRP artifact stripping, character disambiguation.
- **Embedded Audio Worker:** Local synchronized speech-to-text transcription without external cloud APIs.
- **WAL Storage:** SQLite3 Write-Ahead Logging with power-fail transactional upload queue and encrypted credential whitelist.
- **Management & CLI:** Local Web Console (:8000), REST Integration API, and onboard senzr-ctl utility for hardware diagnostics.
- **Target Markets:** Smart Commercial Campuses, Gated Residential Townships, Freight & Logistics Hubs, and Off-Grid Security Posts.

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