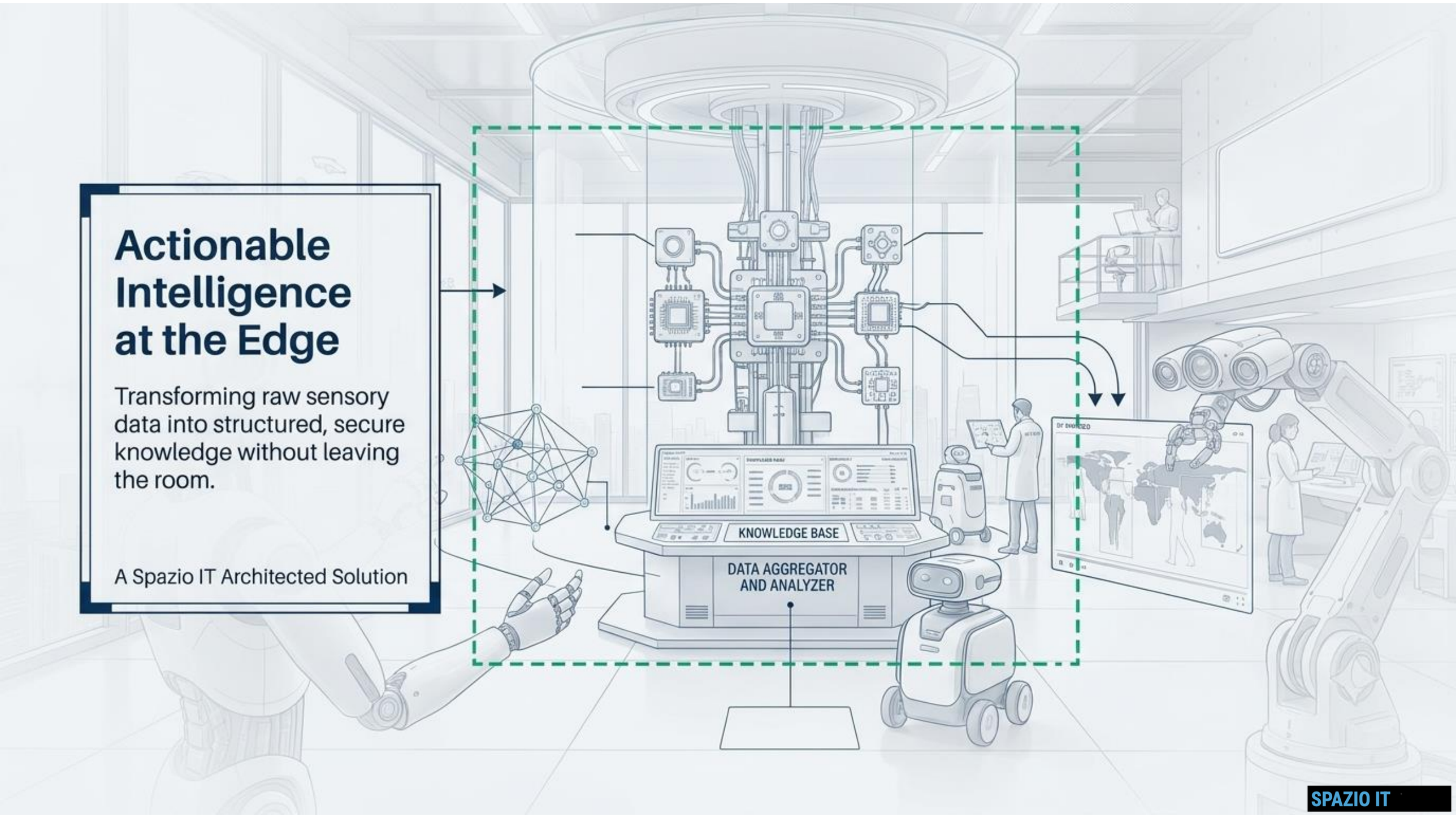
Actionable Intelligence at the Edge

Transforming raw sensory data into structured, secure knowledge without leaving the room.

A Spazio IT Architected Solution



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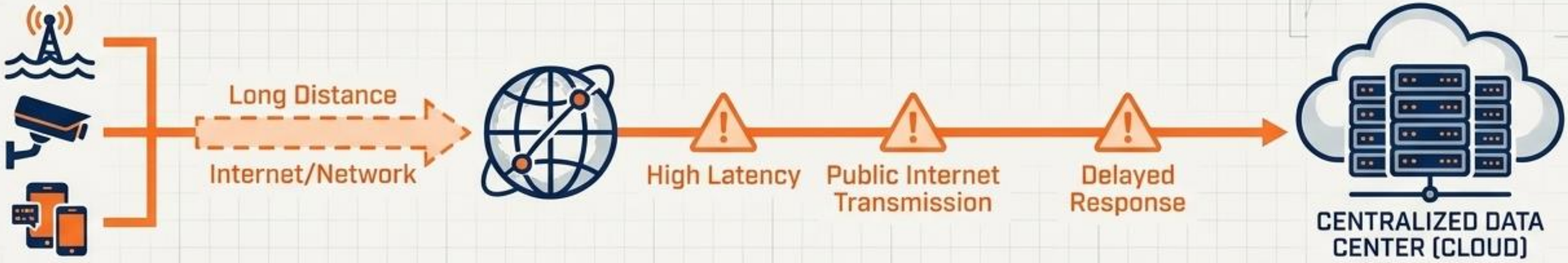
The Latency and Risk of the Cloud

CENTRALIZED CLOUD COMPUTING



EDGE COMPUTING

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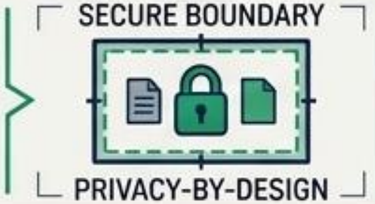
Cloud vs. Edge Diagnostic Matrix

	Traditional Cloud	Spazio IT Edge Architecture
Latency & Speed	Unpredictable (100ms+); bottlenecked by network traffic. 	Deterministic (< 15ms); capable of real-time critical interventions. 
Bandwidth Costs	Continuous high-volume data streaming; expensive overhead. 	Highly efficient; raw data stays local, only structured insights or summaries are transmitted. 
Data Privacy (GDPR)	Data leaves the sovereign boundary; high compliance risk. 	Privacy-by-design; zero cloud egress natively reinforces data protection. 
Processing Location	Centralized servers vulnerable to widespread outages. 	Decentralized AI PCs and industrial nodes acting autonomously on-site. 

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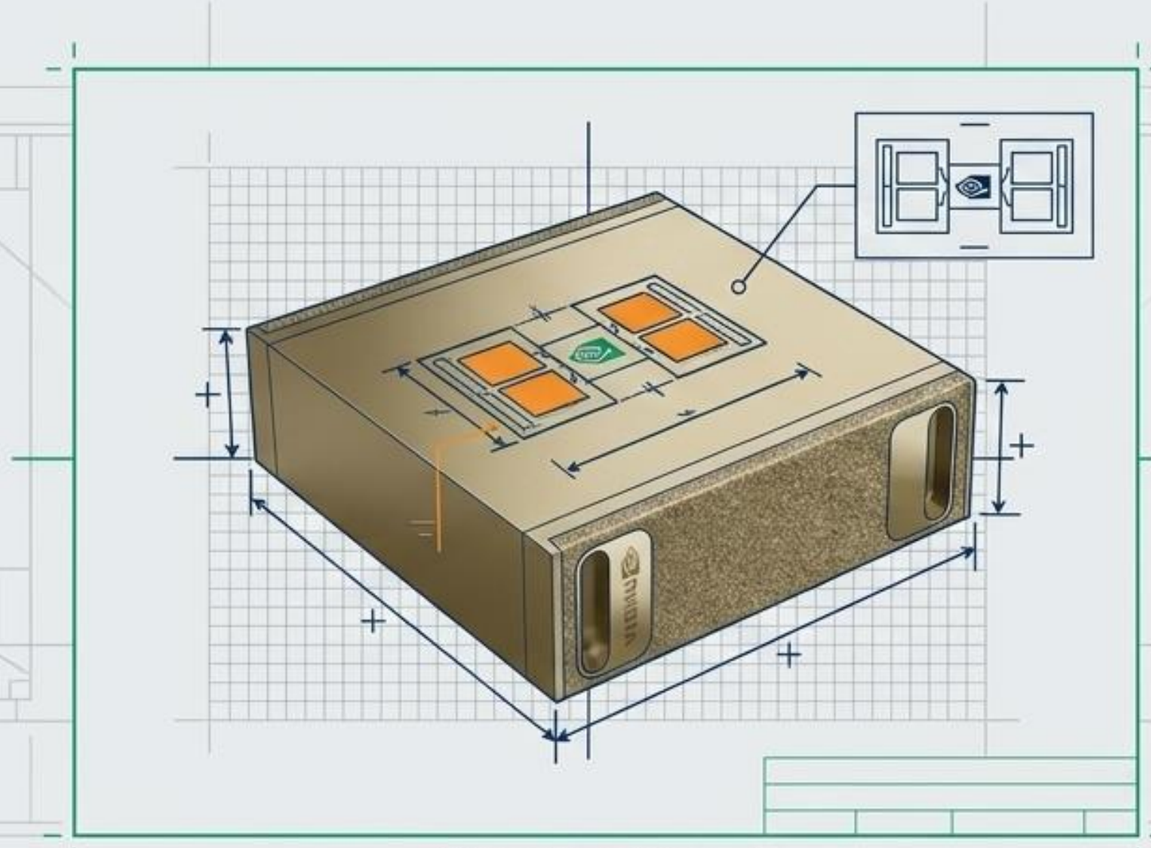
The Hardware Foundation

Modern edge infrastructure is powered by specialized AI PCs equipped with advanced GPUs and NPUs, bringing supercomputing capabilities directly to the facility floor.



NVIDIA DGX Spark
(NVIDIA GB10 Grace-Blackwell architecture)

Lenovo ThinkStation
(same NVIDIA GB10 Grace-Blackwell reference design)

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The Silent, Unobtrusive Assistant

Vision (SI-Watcher)

Understands spatial environments and dynamically tracks objects and actions.

Hearing (SI-Listener)

Captures, transcribes, and semantically enriches audio in real-time.

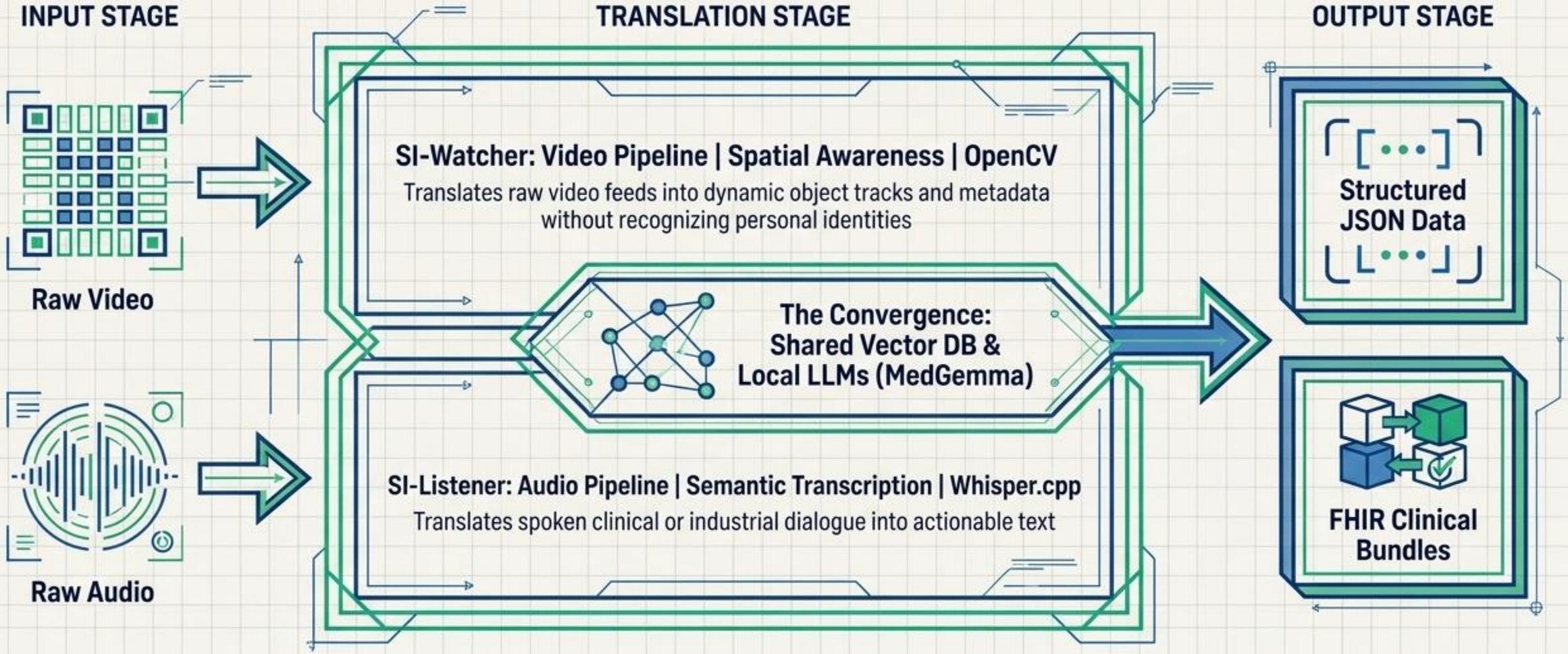
Knowledge Base

Maintains context through localized Vector Databases, ensuring the system remembers and learns.

Reasoning

Utilizes specialized LLMs to combine multiple sensory sources, compare them against the knowledge base, and intervene only when specifically requested.

The Modality Matrix: From Senses to Structured Knowledge



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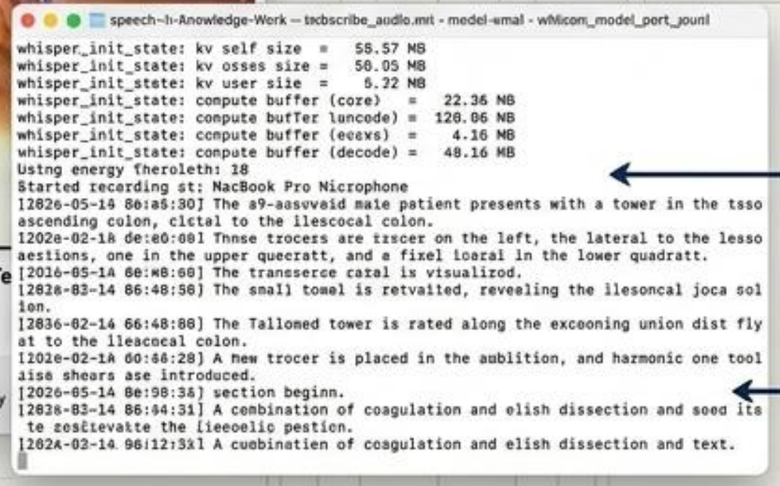
The Operating Room (OR-Edge)



Environment

Live Surgical Theater.

Sensory Input

Video feed from laparoscopes (e.g., Laparoscopic Right Hemicolectomy).

The Edge Process

SI-Watcher continuously monitors the surgical field, recognizing instruments (like HARMONIC ACE+ Shears) and tracking the surgical phase in real-time.

Actionable Knowledge

Generates instantaneous text metadata outlining the progress of the procedure (e.g., "surgeon is using a laparoscope... manipulating tissues"), assisting with automated surgical logging and safety monitoring without cloud latency.

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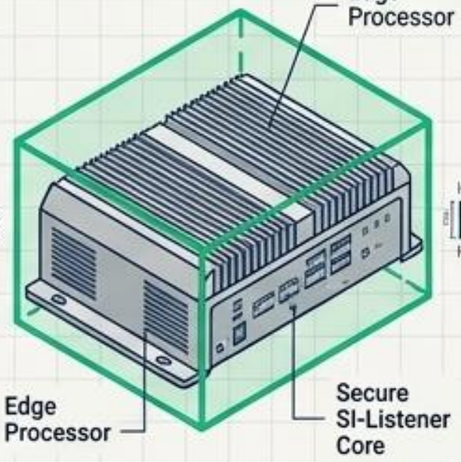
Clinical Governance (M&M Conferences)

Step 1: Input

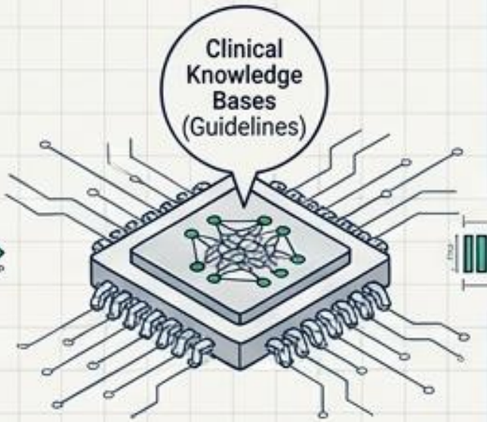
High-stakes Morbidity and Mortality (M&M) conference audio.

Step 2: Processing
(The Cognitive Facilitator)



SI-Listener acts as a GDPR-compliant, privacy-first processor with no persistent audio recording.

Step 3: AI Translation



Generative AI processes clinical language against clinical guidelines.

Step 4: Output

- Structured M&M Documentation
- Audit & Quality Reports
- Educational Value metrics for patient safety.

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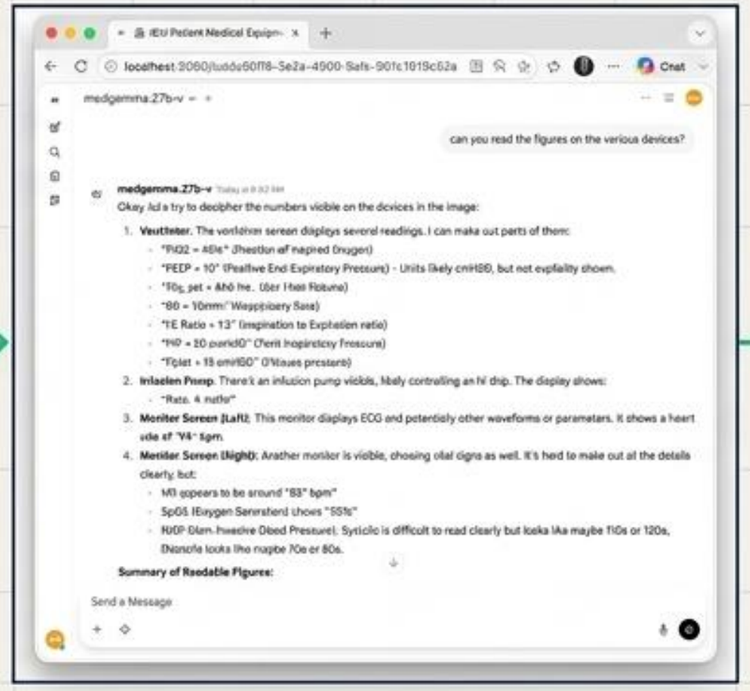
ICU Ambient Intelligence

The Environment & Input

Environment: Intensive Care Unit.

Sensory Input: Smart cameras observing bedside medical equipment.

The Edge Process



The Edge Process: MedGemma-27b-v visually parses complex monitor screens, reading figures across disparate, unconnected devices.

Actionable Knowledge

Actionable Knowledge: The localized LLM accurately reads and correlates specific vital signs:

- Ventilator settings: FiO2 = 45%, PEEP = 10, RR = 15/min
- Infusion Pump rates: 4 mL/hr
- Patient Monitors: HR = 94 bpm, SpO2 = 95%

A unified, instantaneous patient status is generated without risking cloud exposure of patient imagery.

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Industrial Operations (The Hidden Factory)

Environment

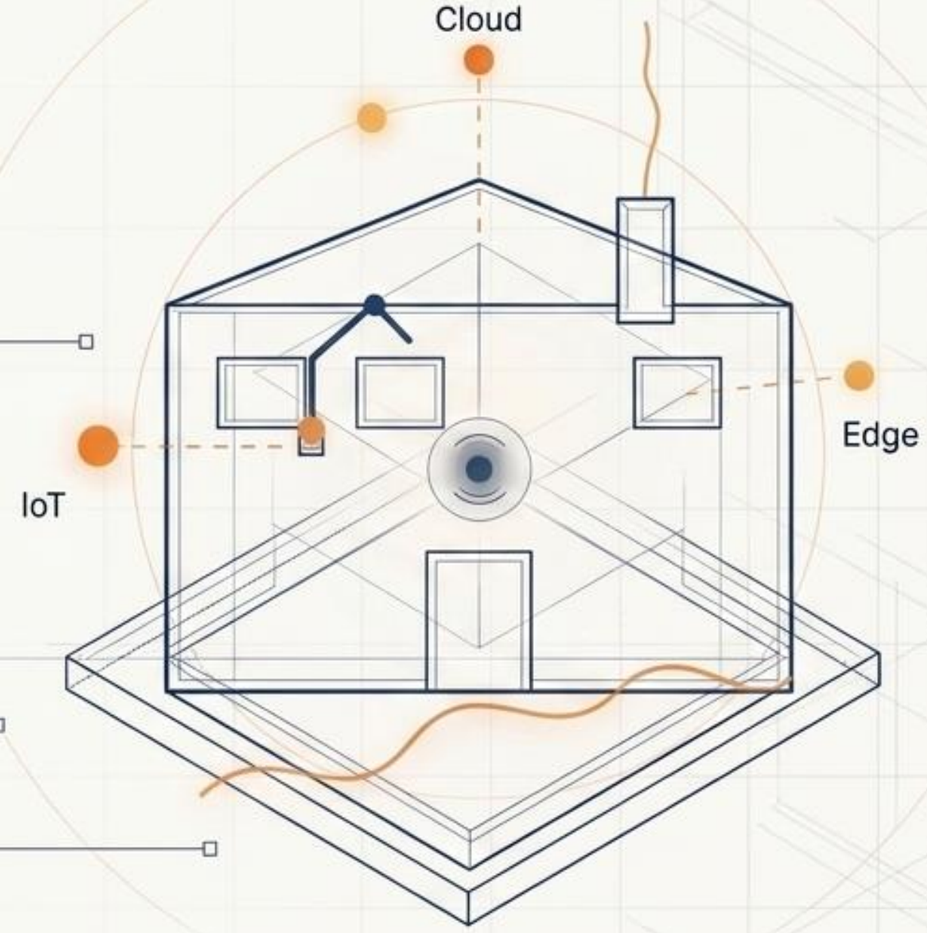
Manufacturing and Industrial Plants.

The Problem

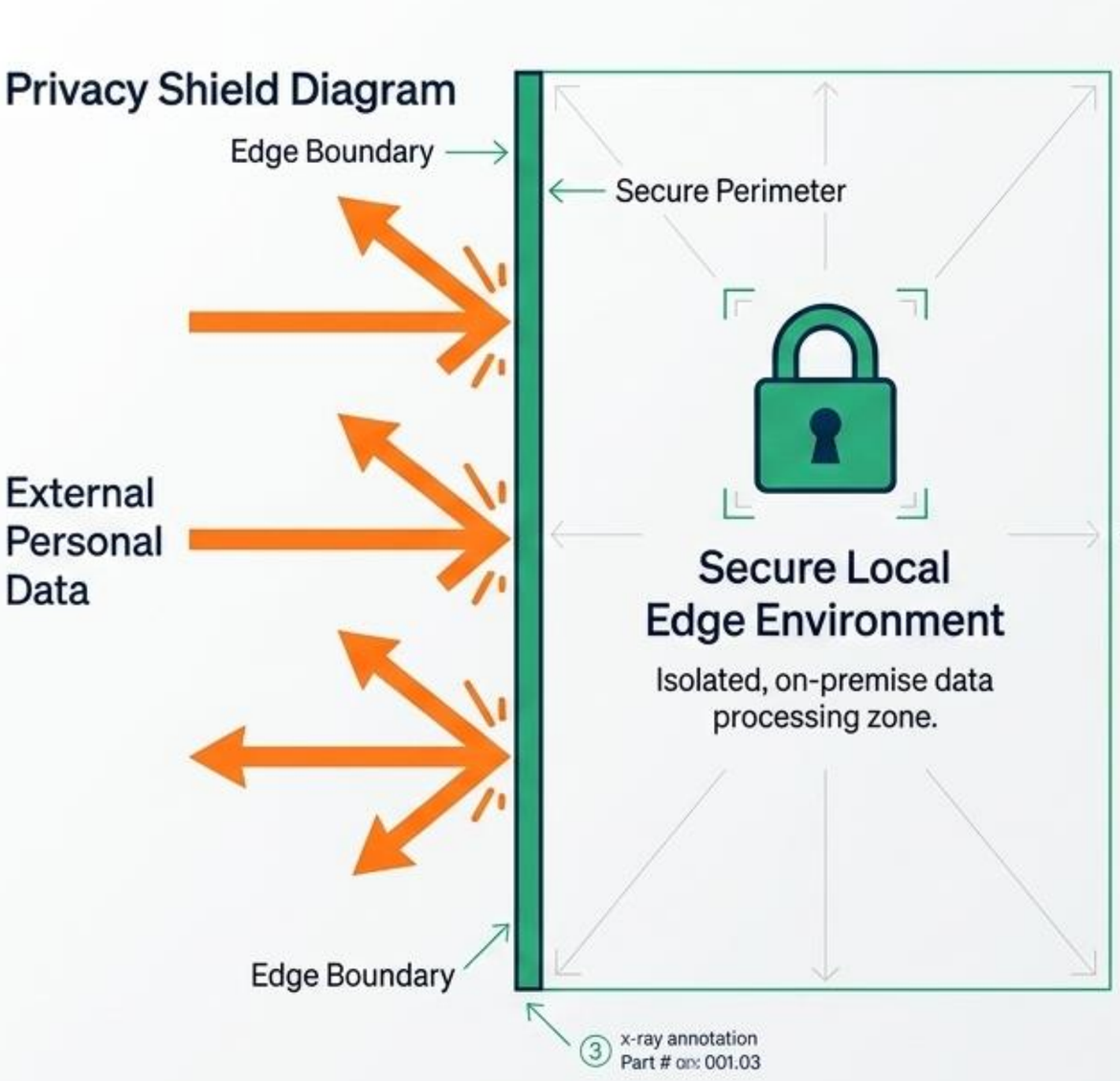
Intelligence is not the limitation in industrial operations; visibility is.

The Solution

Spazio IT provides the missing Sensory Layer. By deploying SI-Watcher and SI-Listener on the factory floor, operations achieve a compounding advantage. The system tracks dynamic object movements, equipment acoustics, and operational flow, creating a live, actionable digital twin of the factory's hidden processes.



The Privacy Shield: AI Act & GDPR Compliance



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High-Risk Status Managed

Pipelines assisting clinical triage fall under High-Risk (Annex III). Spazio IT's architecture enables mandatory pre-market conformity (Art. 43) and automatic operational logging (Art. 12).

2 x-ray annotation
Part num#: 0-12Y80

Privacy-by-Design (GDPR Art 10)

Focuses on "Understanding the situation, not the identity." Operates with Zero Biometrics—no facial recognition, no biometric categorization, and no biometric databases.

2 x-ray annotation
Part # tx: 000.02

Zero Cloud Egress

Local edge deployment natively minimizes the cybersecurity attack surface (Art. 15) by entirely removing external data exposure.

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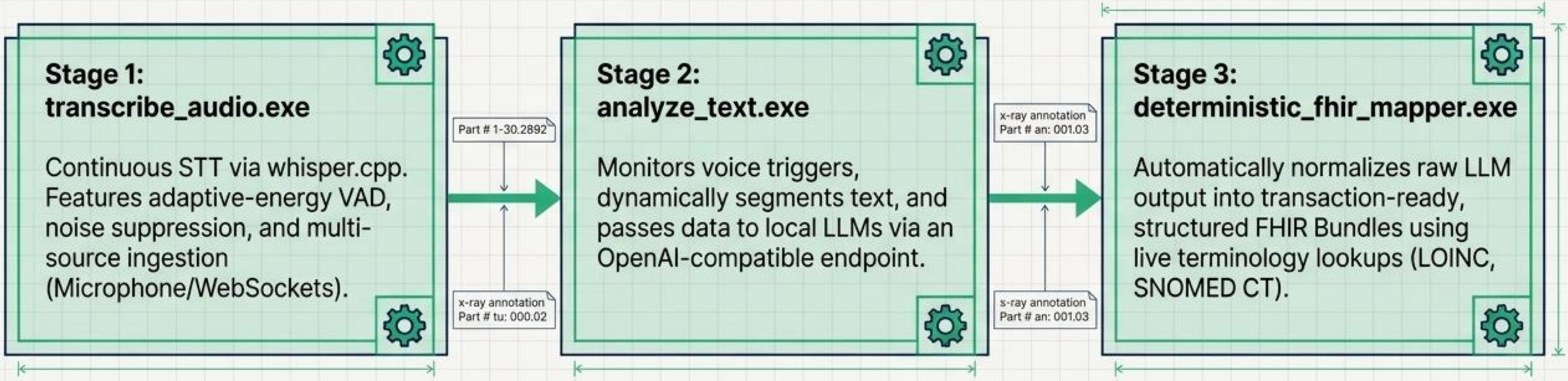
SI-Listener Pipeline: The Speed of Native Architecture

Performance Baseline: Built entirely in C++ for native hardware access. Achieves 3.2x faster audio processing, 40% lower memory usage, and a blistering 15ms median latency compared to Python alternatives.



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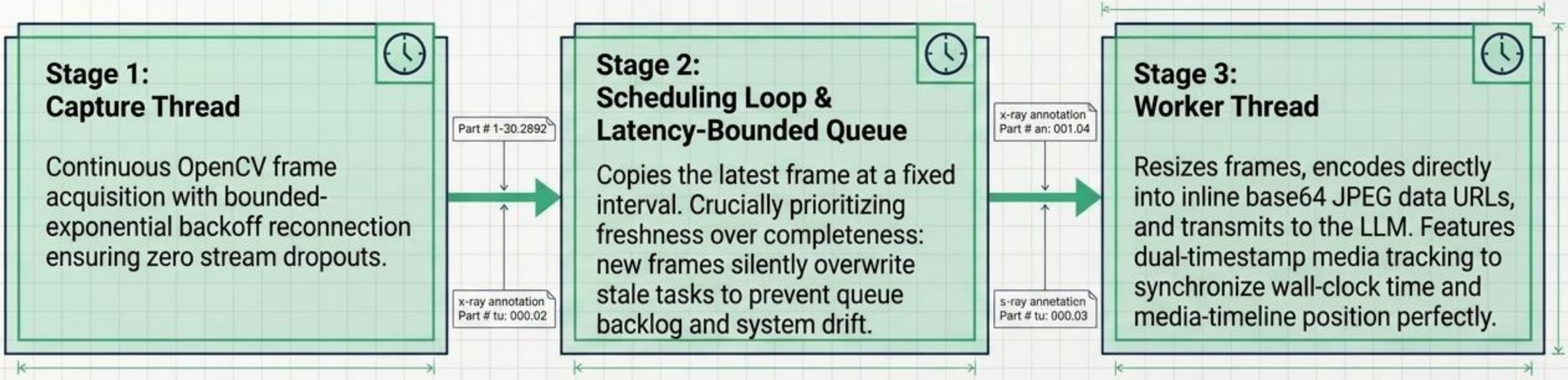
SI-Watcher Pipeline: Highly Efficient Threaded Vision

Performance Baseline: Edge-first multimodal AI performing real-time video-to-knowledge inference locally on a single PC utilizing models like MedGemma-1.5:4b.



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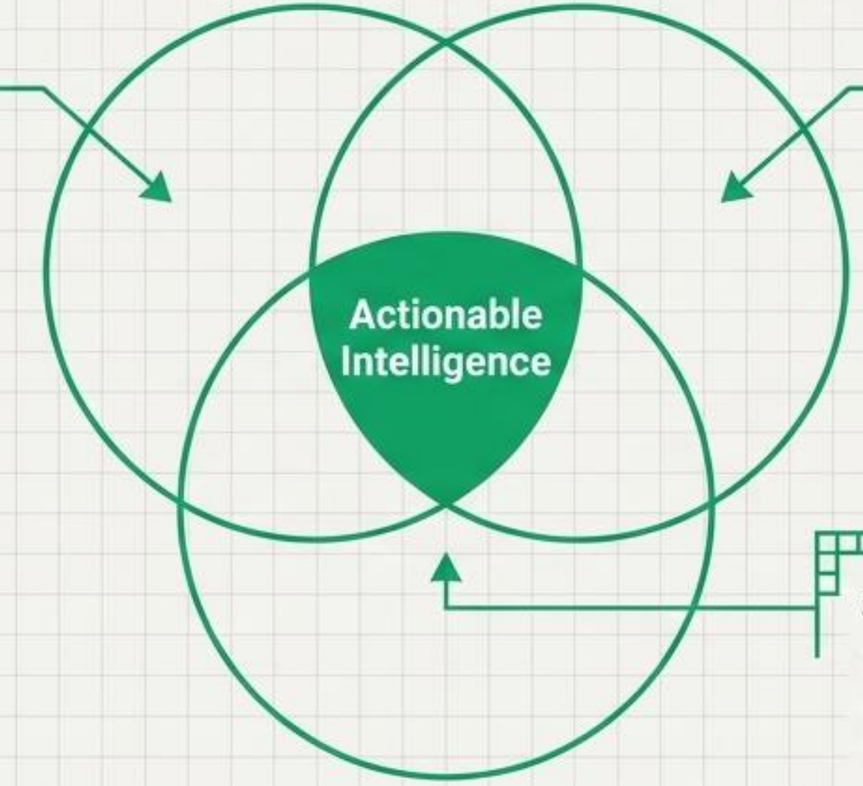
The Edge Advantage: Intelligence Without Compromise

1. Maximum Operational Speed

C++ pipelines, 15ms latency, and latency-bounded queues deliver deterministic, real-time insights for critical environments.



2. Total Contextual Awareness

Multimodal vision (SI-Watcher) and audio (SI-Listener) perfectly synthesized through local Vector DBs and LLMs to understand complex industrial and clinical operations.

3. Absolute Regulatory Safety

Zero cloud egress, zero biometrics, and privacy-by-design natively fulfill GDPR and high-risk EU AI Act requirements.

The Bottom Line: In modern critical environments, you cannot have actionable intelligence without absolute data sovereignty. Spazio IT delivers exactly that.

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