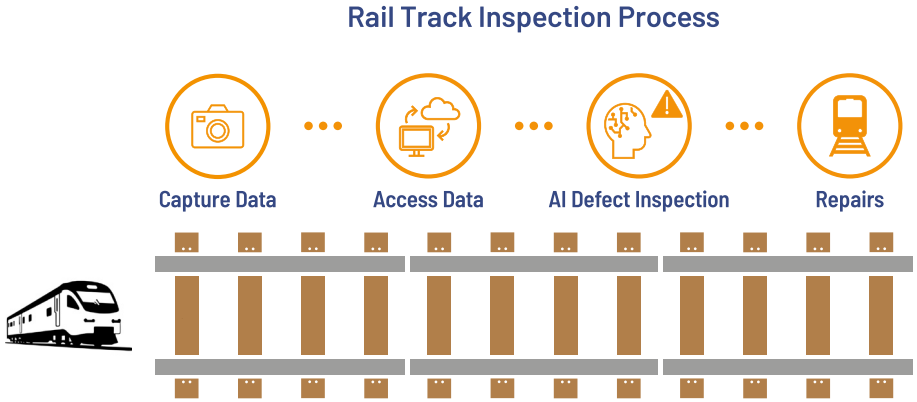
Edge AI for Intelligent Rail Track Inspection:

Relevant Insights, Real Business Benefits

Rail Track Monitoring for Maintenance

Modern railway infrastructure requires highly accurate, continuous, and resource-efficient inspection processes. Conventional track monitoring systems produce vast volumes of data, resulting in significant challenges for transmission and analysis due to time and bandwidth constraints.

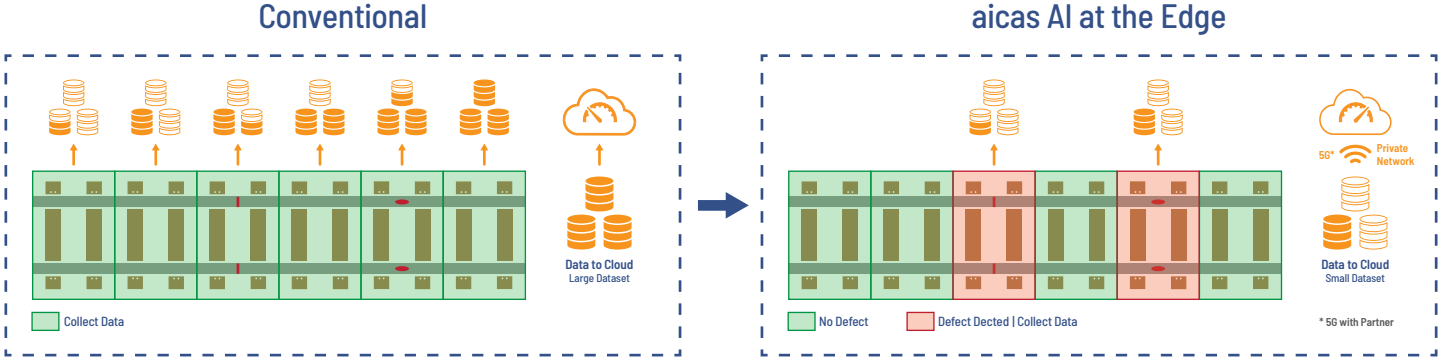


/ Solution

Selective Edge Data Collection using Edge AI

aicas revolutionizes data acquisition through **Selective Edge Data Management** powered by **Edge AI**. Sensor data is processed directly on the inspection vehicle, enabling real time detection of cracks, cavities, and rail deformations. Non-essential inputs, such as blurred or redundant data, are filtered locally, ensuring that only critical, geolocated findings are transmitted to the cloud.

This approach can reduce data volume by up to 90 percent, optimize 4G and 5G bandwidth usage, and deliver timely, actionable insights for maintenance teams.



/ Benefits

Turn Rail Data into Measurable Benefits

Selective Edge Data Management powered by Edge AI enables accelerated fault detection, reduced operational costs, optimized bandwidth utilization, and enhanced reliability of rail operations—even in remote or low-connectivity environments. Its effectiveness is demonstrated through measurable outcomes, such as up to 90% reduction in transmitted data volume and significantly faster maintenance response times.

General performance benefits of edge AI over cloud AI to share operational improvements:

Benefit	Cloud AI (conventional)	Edge AI (typical)	Quantifiable Gain
Latency (Response Time)	100–300 ms (depends on network)	<10 ms (local inference)	**10–30× faster** [1]
Bandwidth Usage	~6 Mbps (1080p video stream)	~0.1 Mbps (metadata only)	**Up to 98% reduction** [2]
Operational Cost	High cloud compute & storage fees	30–70% lower due to local processing	**30–70% lower due to local processing** [3]
Reliability / Uptime (outside of main Corridors)	<50% (network dependency)	>99.9% (local processing continues)	**>2x uptime improvement** [4]

/ Conclusion

aicas' Valuable Approach Empowers to Act Immediately

Selecting data at the edge with Edge AI, as described above, measurably increases efficiency. The greatest advantage of aicas' valuable approach lies in making relevant data instantly available, enabling itstransformation into actionable insights.

This empowers decision-makers to act immediately on accurate information, creating operational benefits and better business results.

1 ResearchGate – Latency Comparison Between Edge-AI and Cloud-AI
2 World Economic Forum – Weighing the Risks – and Rewards – of Edge AI Technology
3 arXiv – Quantifying Energy and Cost Benefit of Hybrid Edge Cloud
4 IBM – Edge vs. Cloud AI, Edge's ability to work offline / with intermittent connectivity

Get in touch with us to learn more about our solutions!

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