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From Bottleneck *to Breakthrough*

Improving Performance & Removing Bottlenecks in Port Operations through Technology, Automation and AI Risk Assessments — Sustainably

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WHO IS SPEAKING

Türkiye's pioneer in X-Ray inspection, now scaling across the EU

MS SPEKTRAL is Türkiye's only domestic manufacturer of X-Ray truck, container and vehicle inspection systems. Founded in 2014, today we are a 130+ person electro-optics company with two factories and four locations.

Our scanners are deployed across customs gates, border crossings and ports, and our entry into the EU market is anchored by deployments with the Czech Customs Administration and two semi-fixed installations in Lithuania (Klaipėda and Medininkai).

84% Of new X-ray system orders in Türkiye since market entry

23% Current share of Türkiye's installed X-ray scanner fleet

EU Active deployments: Czech Republic + Lithuania (x2)

12+ Completed TÜBİTAK R&D programs underpinning our products

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TODAY'S TALK

How X-Ray imaging, AI-assisted decision support and the UFF data standard together remove the real bottlenecks at ports, without compromising on sustainability or operator trust.

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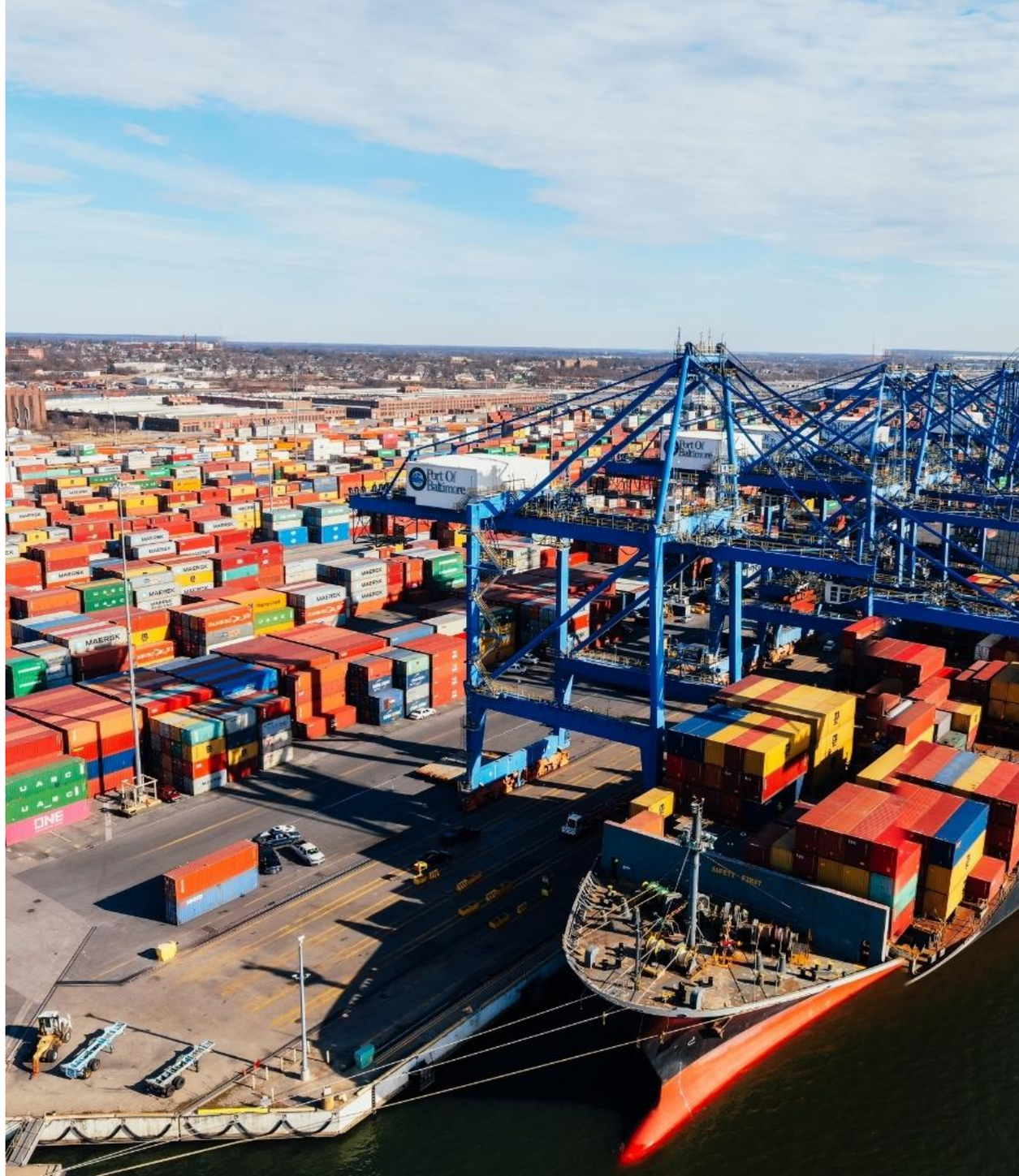
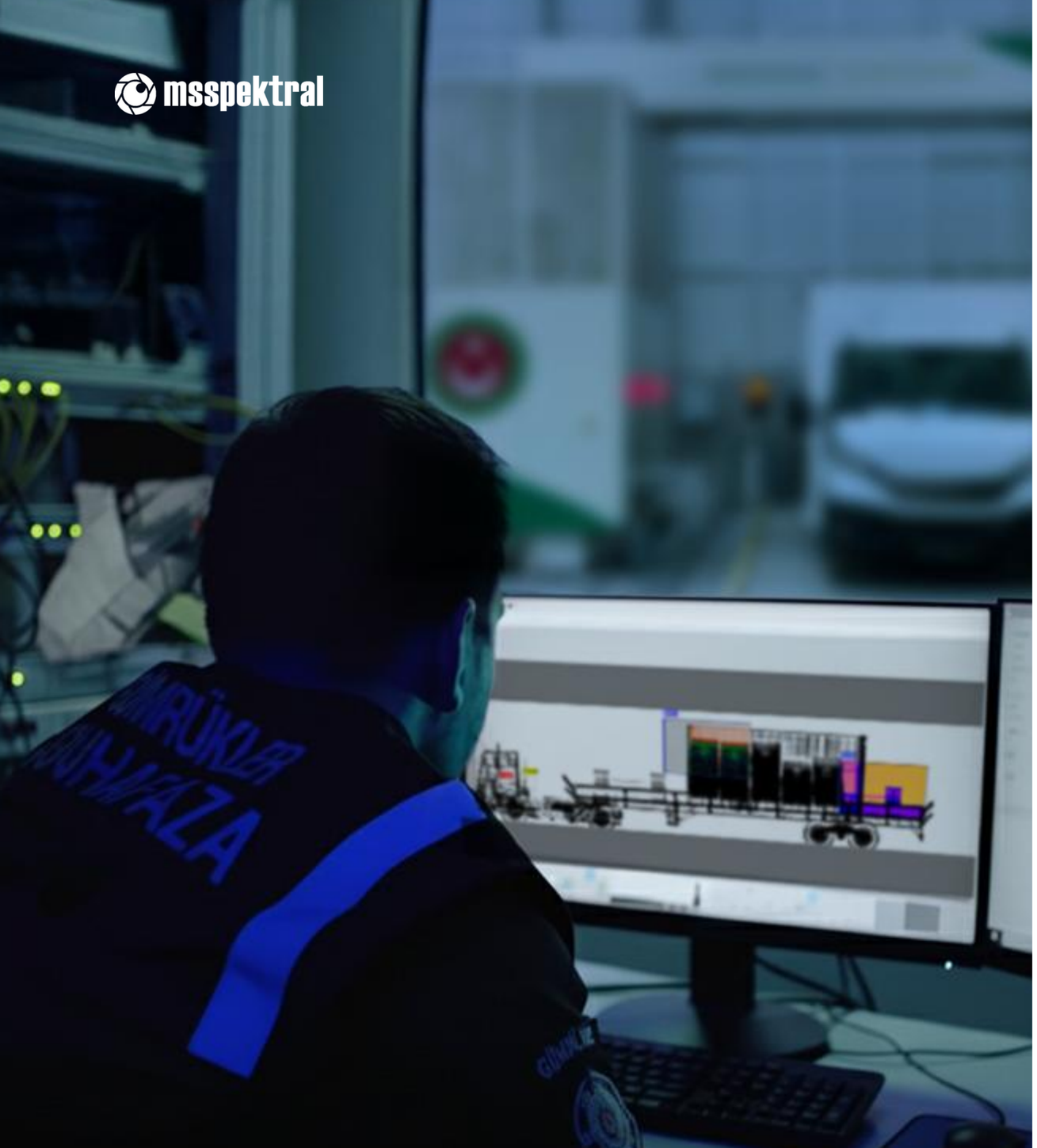
Ports are caught in an inspection paradox

Throughput is rising. Security and customs requirements are tightening. Inspection windows are shrinking. You cannot inspect your way to faster operations — not with people alone.

- **Rising throughput**
- **Tighter requirements**
- **Shrinking windows**





Supporting operators where it matters most

X-ray scanners produce more images than any operator can review at peak concentration. AI doesn't replace the operator — it handles the repetitive screening, so the human focus stays on the decisions that matter.

- **Consistent attention**
- **Fewer false positives**
- **Faster onboarding**
- **Adapting to new patterns**

"The goal is not to replace operator judgement — it is to give every operator the support they need to make better decisions, faster."

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AI DECISION SUPPORT

Attention Assist — not autopilot

AI does not replace the inspector. It pre-reads, prioritises and contextualises each image — so that human attention lands where it matters.

Three layers of value

DETECT

Flag anomalies, contraband and mis-declared cargo before the operator opens the image.

DECIDE

Confidence score + suggested action route the container green / amber / red.

DOCUMENT

Every flag, every score, every override — captured as an audit trail.

Decision support — not automated enforcement. The human remains the decision-maker.

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HOW THE ALGORITHM WORKS

01 **Pre-processing & normalisation**
Noise reduction, density calibration across scanner types.

02 **Feature extraction**
Texture, density distribution, packing patterns.

03 **AI inference + confidence**
Model returns probability + flag — tuned for high recall.

04 **Decision support**
Routing + highlighted region. Operator confirms.

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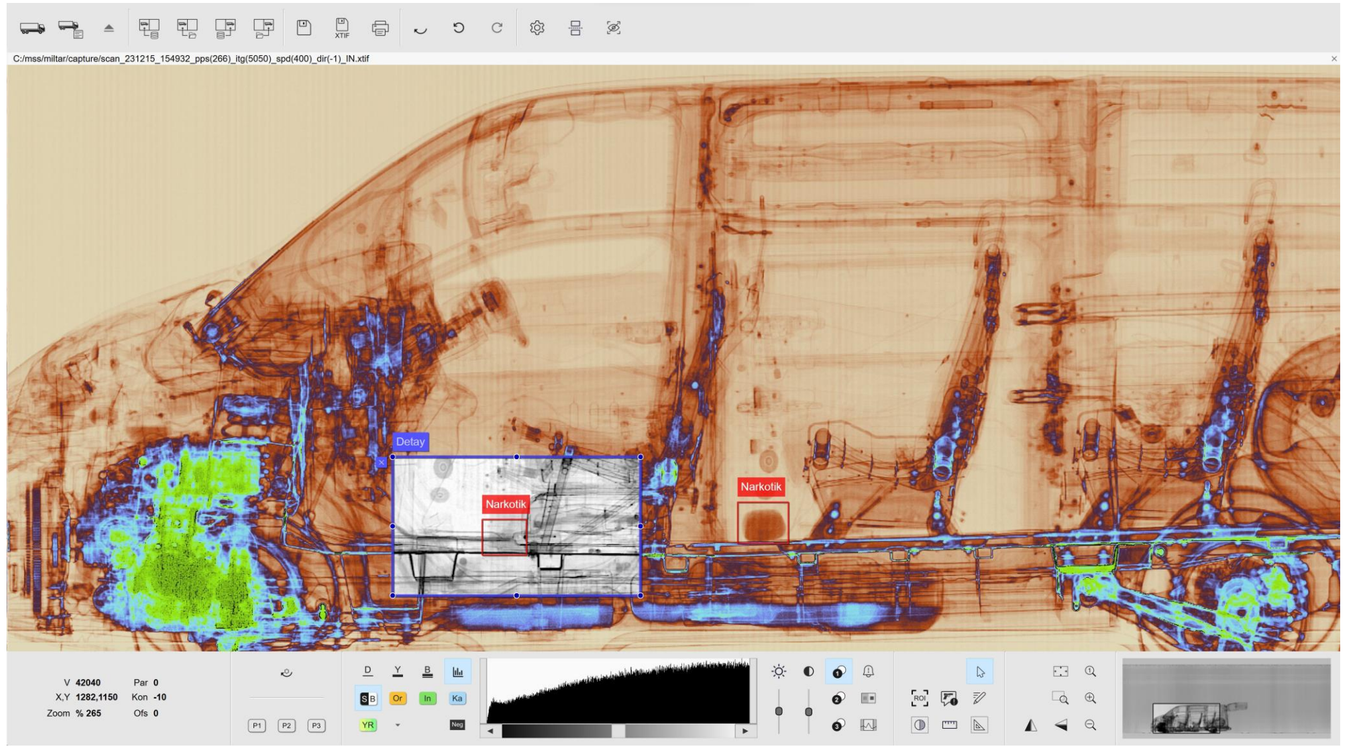
USE CASE · ATTENTION ASSIST IN THE FIELD

What the operator actually sees?



Live MİLTAR inspection — AI-highlighted narcotics regions on a transmission scan.

Low-Contrast, High-Risk

Cigarettes and narcotics don't shine like weapons — they are organic, low-contrast, often hidden in legitimate cargo.

Operating Point

98%
Recall

76%
Precision

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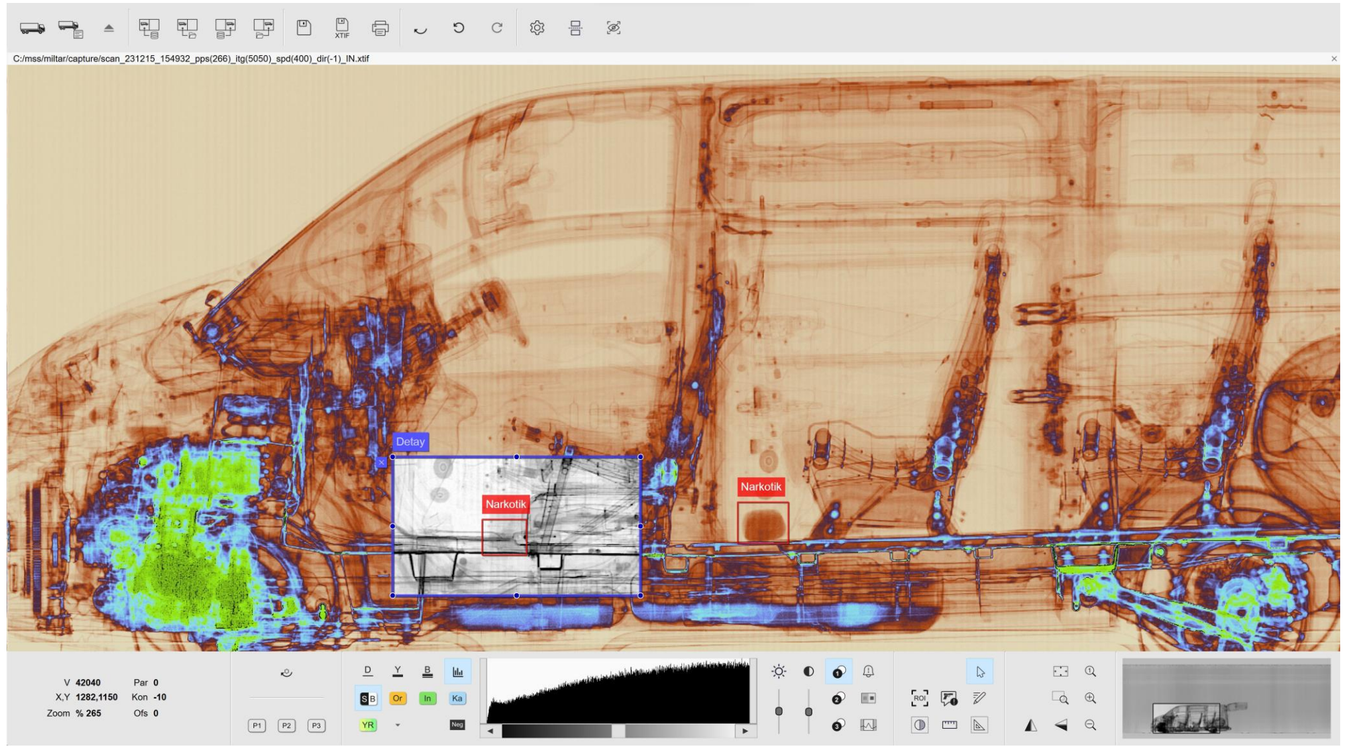

Live MİLTAR inspection — AI-highlighted narcotics regions on a transmission scan.

Why detection sensitivity matters

Missing a real threat costs customs revenue and public safety. A false alarm only costs a few seconds of operator time. Asymmetric cost — asymmetric tuning.

- *Operator confirms — never auto-rejects*
- *Adjustable sensitivity for each port or lane*

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THE FOUNDATION

Five X-Ray platforms — one inspection backbone

Different ports, gates and lanes need different inspection geometries. We engineer them all in-house — same software stack, same AI layer underneath.

PHANTOM-X

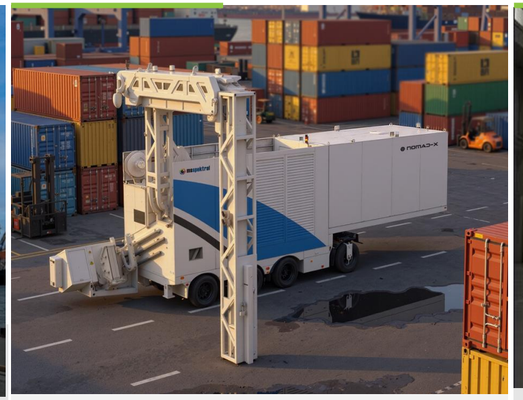
Mobile Scanning System with Backscatter Technology

NOMAD-X TH

Truck-integrated Mobile X-Ray Vehicle & Container Scanning System

TITAN-X

Transmission Technology-Based Gantry Type Scanning System



NOMAD-X

Mobile Scanning System with Transmission Technology

HYBRID-X

Vehicle Scanning System with Hybrid (Transmission and Backscatter) Technology

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WHERE TRANSMISSION ENDS · BACKSCATTER BEGINS

Two physics — one operator workflow

Stowaways & migrant detection

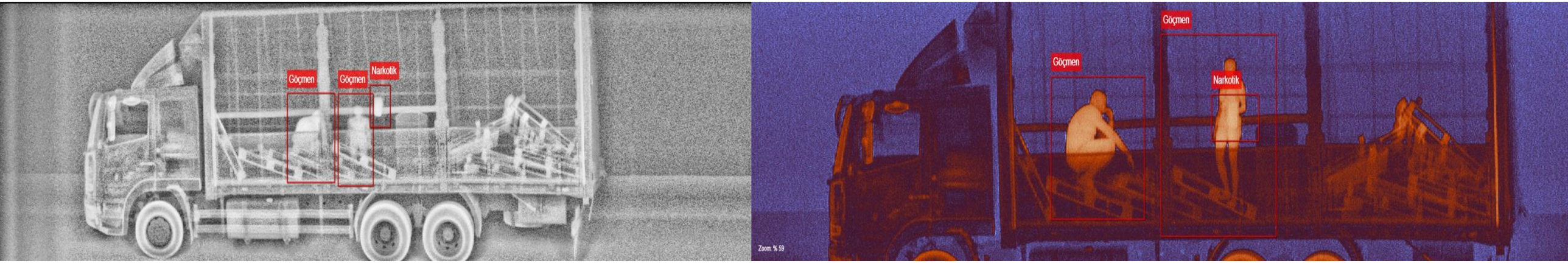
Backscatter surfaces organic material against the cargo background — where transmission imaging is blind.

Mobile & non-intrusive

Van-mounted PHANTOM-X scans from outside the vehicle. No gantry needed, no opening containers.

Narcotics in organic cargo

Painted-straw concealment is the use case backscatter was designed for.



PHANTOM-X backscatter scan — AI-flagged stowaway and narcotics regions.

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EU FOOTPRINT

Already operating across EU customs and borders

Two EU member states. Three active deployments. Fixed, semi-fixed and mobile geometries — the same platform family adapted to local mission profiles.

CZECH REPUBLIC

Czech Customs Administration

Mobile inspection — NOMAD-X TH

First Türkiye-origin X-ray inspection supplier accepted into EU customs operations. Mobile transmission scanning for cross-border cargo.

LITHUANIA

Klaipėda

Semi-fixed — TITAN-X

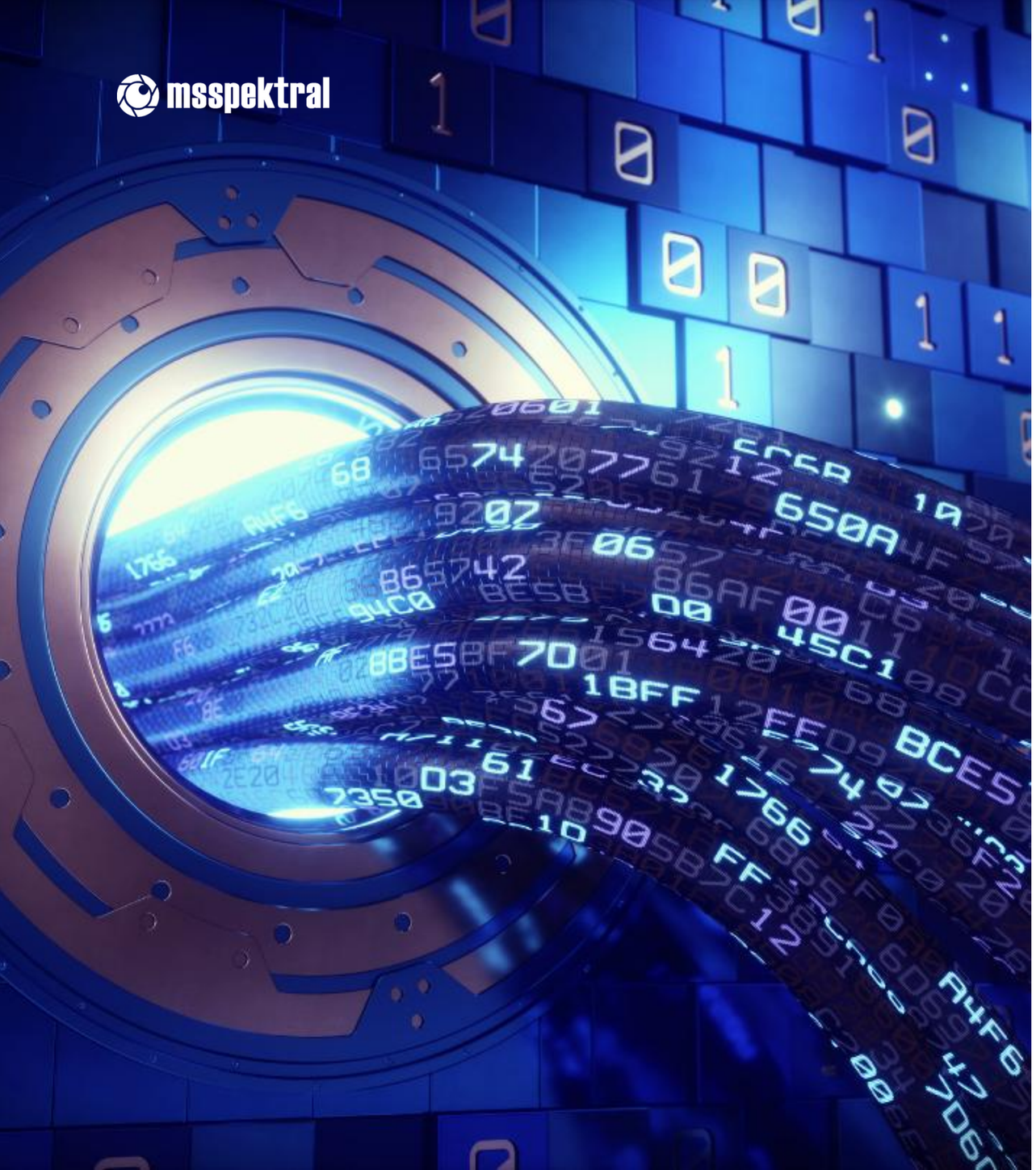
Fixed-site TITAN-X gantry installed at the port.

LITHUANIA

Medininkai

Semi-fixed — TITAN-X

TITAN-X installation at the EU's eastern external land border. High-volume truck inspection with AI decision support.



THE INVISIBLE WAR

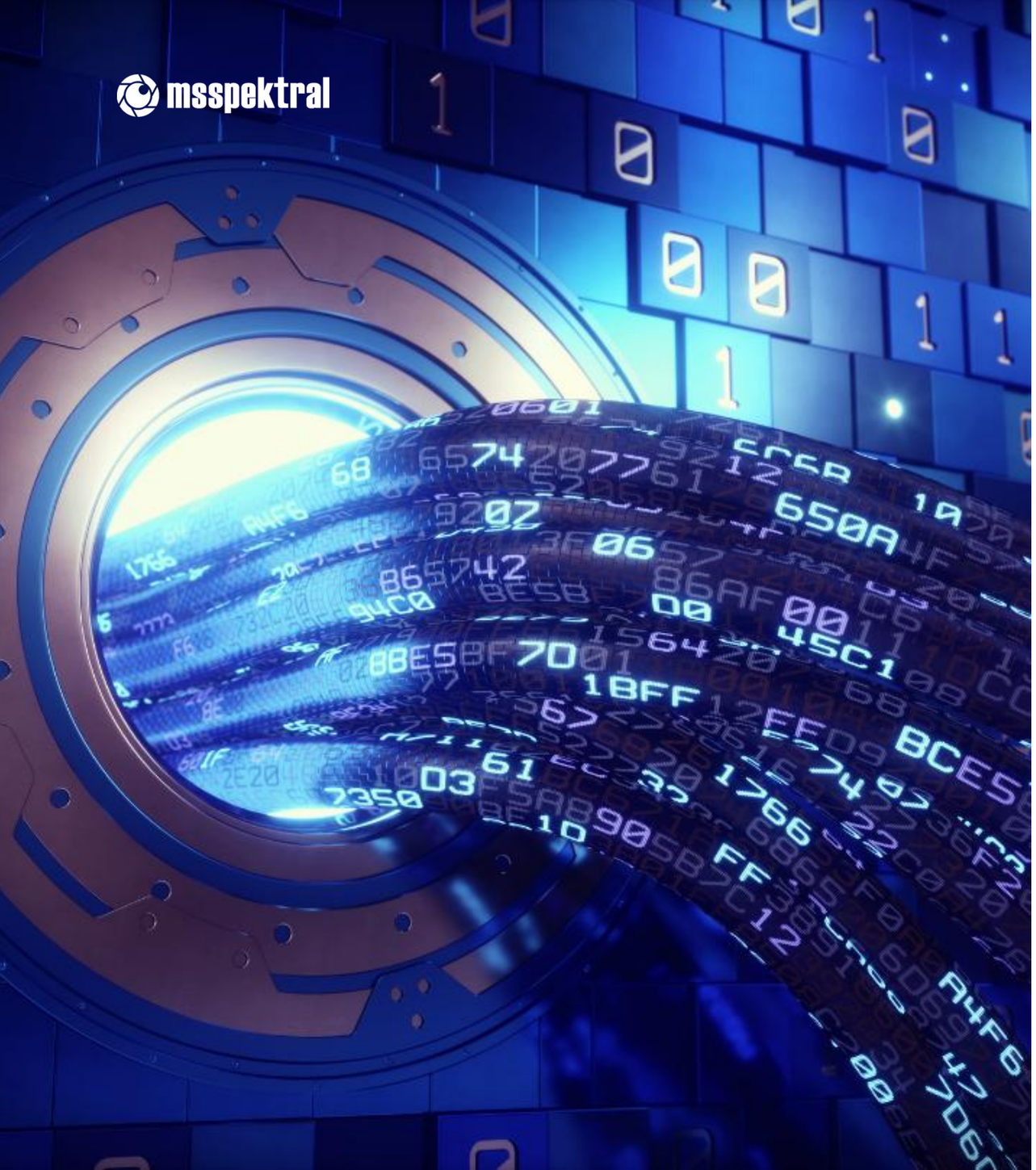
Modern trade corridors are not only physical

they are digital and data-driven.

"In today's trade corridors, the real battlefield is not the scanner itself — it is the inspection data."

1- Fragmented data

Inspection records live in vendor silos. Different formats. Different metadata. Impossible to compare across borders.



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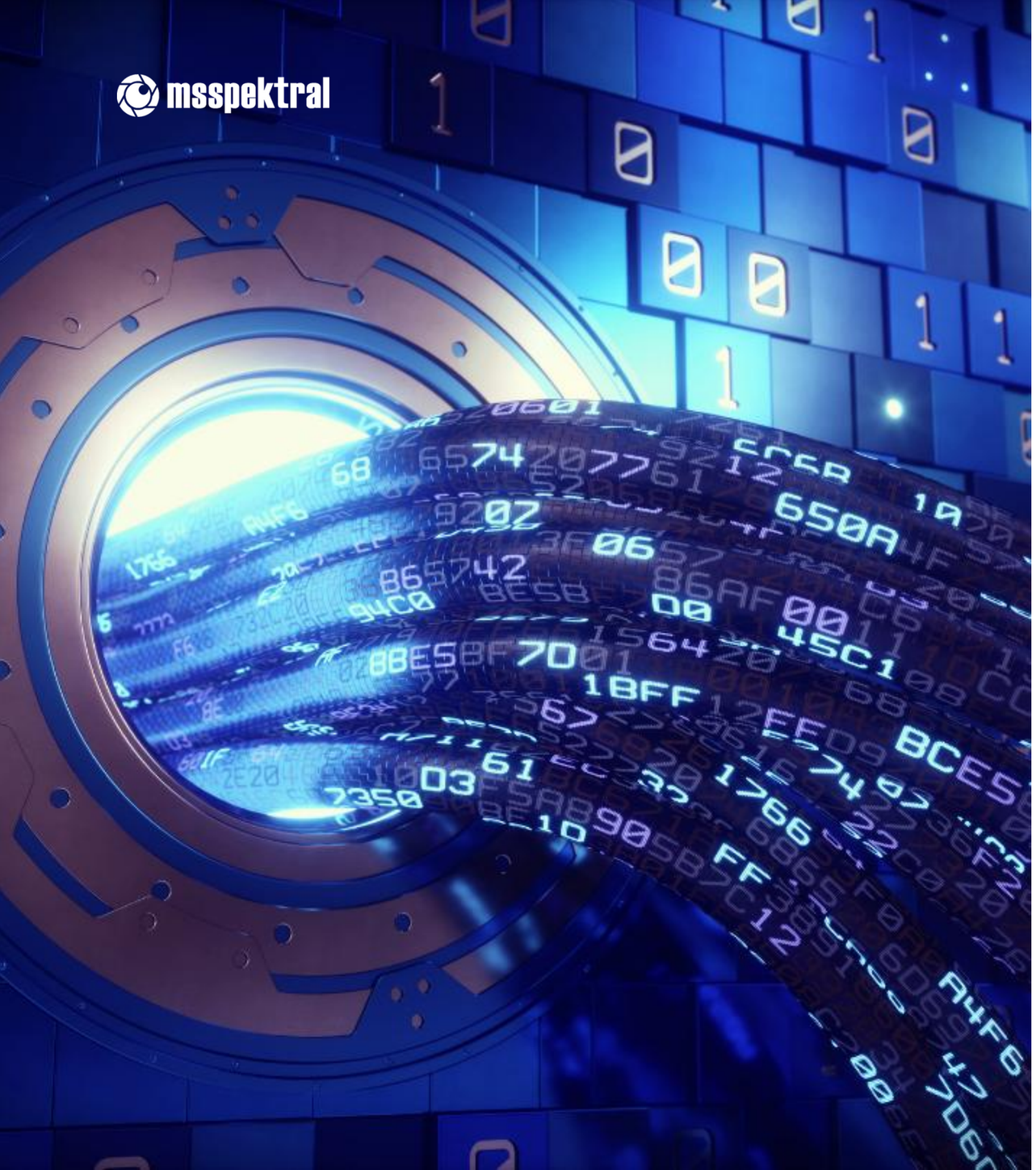
2- Server-first thinking

We end up prioritising the safety of the server over the security of the border.



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3- Lost evidence value

Without integrity and traceability, an X-ray image is hard to use as customs evidence — let alone in court.

THE STANDARD

UFF — a sustainable foundation for inspection data

If X-ray is the lens and AI is the brain, UFF is the common language. A vendor-neutral, standardised format for non-intrusive inspection data that travels with the image — across scanners, ports and authorities. Built once, reused for the life of the asset.

Data Integrity **Traceability** **Auditability** **Sustainability**

PUTTING IT TOGETHER

X-Ray + AI + UFF
one inspection workflow

1 · Arrive

Truck or container enters lane. Classic gate workflow.

2 · Scan

Transmission or backscatter scan in seconds. TITAN-X / NOMAD-X / PHANTOM-X.

3 · AI screen

Pre-read, anomaly scoring, risk-tier suggestion.

4 · Decide

Operator confirms or overrides. Human in the loop.

5 · Record

UFF-standard record persisted — traceable, auditable, interoperable.

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01 Treat AI as a decision-support layer — not an inspection replacement.

02 Design for data trust from day one — choose UFF-compatible systems.

03 Measure what actually matters — time-to-decision, not just accuracy.

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Thank You!

Feel free to contact us for your questions and requests!

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