CASE STUDY

DYNAMIC PASSENGER FLOW:

Düsseldorf Airport's Automated Queuing System

Highlights:

- **Düsseldorf Airport**, an innovative transportation hub at the edge of Germany's Rhine-Ruhr region, where Smart Space solutions have moved from idea to dynamic operations.
- Passengers per day: **~55,000**
- **Full ROI realized in under 12 months**, attributed to faster passenger throughput and improved staffing efficiency.

The Smart Guidance solution:

- Adaptive, data-driven system that responds to demand in real time
- Magnetic stanchions for precise, flexible queue layouts
- Automated Smart Gates to control passenger flow throughout space
- Stop/Go digital signage to automate occupancy requirements
- Digital displays to guide passengers to available service positions
- Design that boosts throughput

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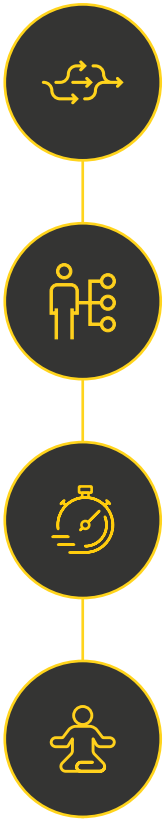
BACKGROUND

Germany's fourth-busiest airport, Düsseldorf Airport (DUS), serves more than 20 million passengers a year. Located seven kilometers from the city center, Düsseldorf Airport is North Rhine–Westphalia's busiest hub for European and international travel. To stay ahead of rising demand, the airport has invested heavily in modernization and passenger flow efficiency, particularly in its busy immigration hall.

Recognized as Best Regional Airport in Europe 2025 by the Skytrax World Airport Awards, Düsseldorf is setting a new benchmark for operational excellence and passenger experience, with Smart Guidance technology playing an integral role in this remarkable journey.

Smart Guidance is an adaptive, data-driven approach to managing passenger flow. It combines magnetic stanchions, automated gates, and digital signage to keep travelers moving by guiding them along the most efficient paths as traffic ebbs and flows. Based on an immediately successful pilot program, the smart guidance system was rolled out to additional checkpoints across the airport.



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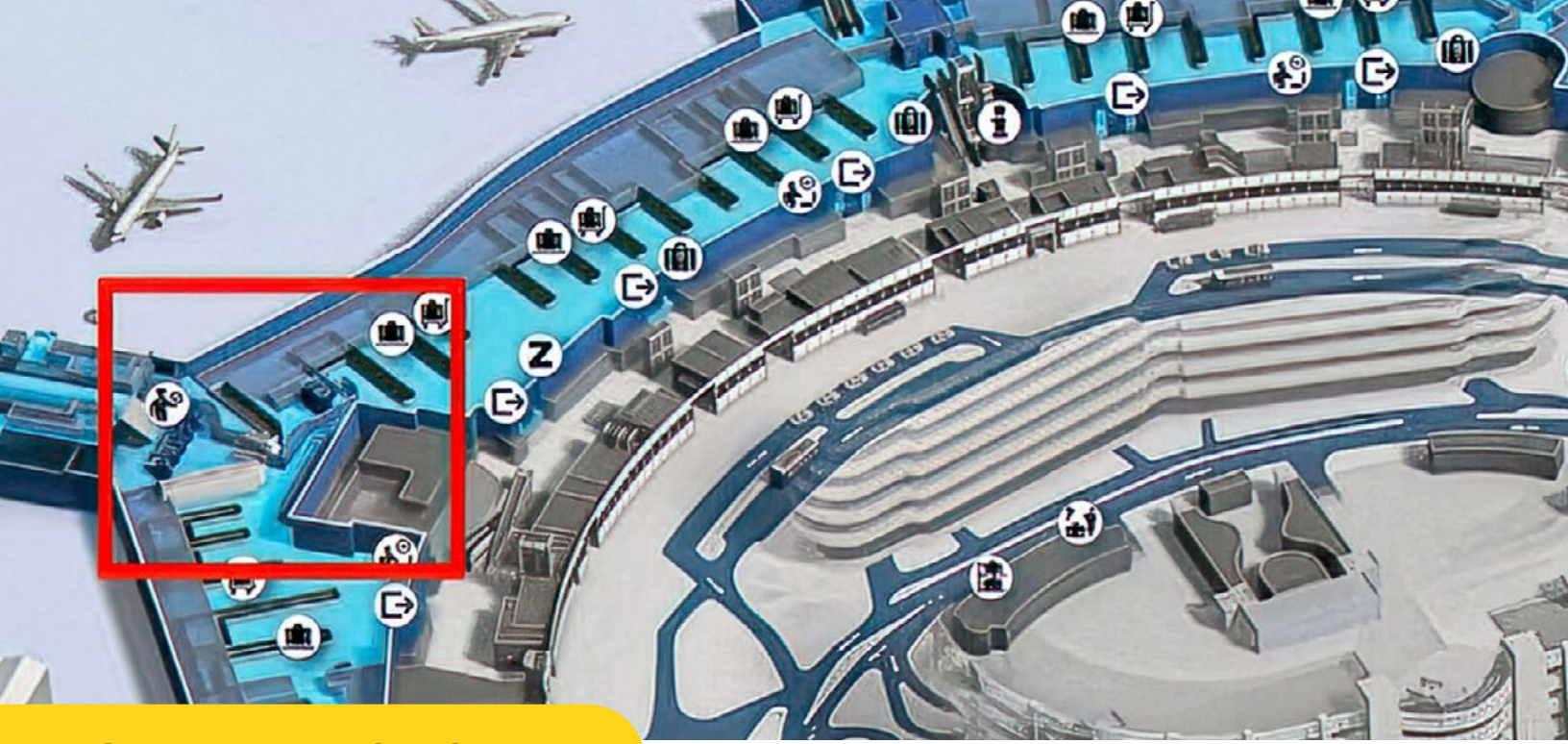

CHALLENGES

Like many airports, Düsseldorf faced the dilemma of rising passenger volumes while space, staffing, and regulations remained fixed.

Then came a new challenge: the EU's new Entry/Exit System (EES) introduced biometric checks for non-EU travelers, and replaced manual passport stamping with fingerprint and facial capture—adding time and pressure to EES checkpoints.

To make the situation even more complex, the airport had only one spot readily available for the new EES hall: a former baggage area split by a fire-regulated ramp that had to stay clear at all times. If passengers backed up there, processing would shut down until the ramp was cleared.

To meet the challenge, Düsseldorf set out to:

- Maximize passenger throughput within a confined, irregular footprint.
- Establish clear wayfinding for three queue types: General, Crew, and Reduced-Mobility (PRM).
- Maintain fire-code compliance by keeping the ramp clear and preventing congestion.
- Deliver a positive passenger experience despite longer biometric processing time.

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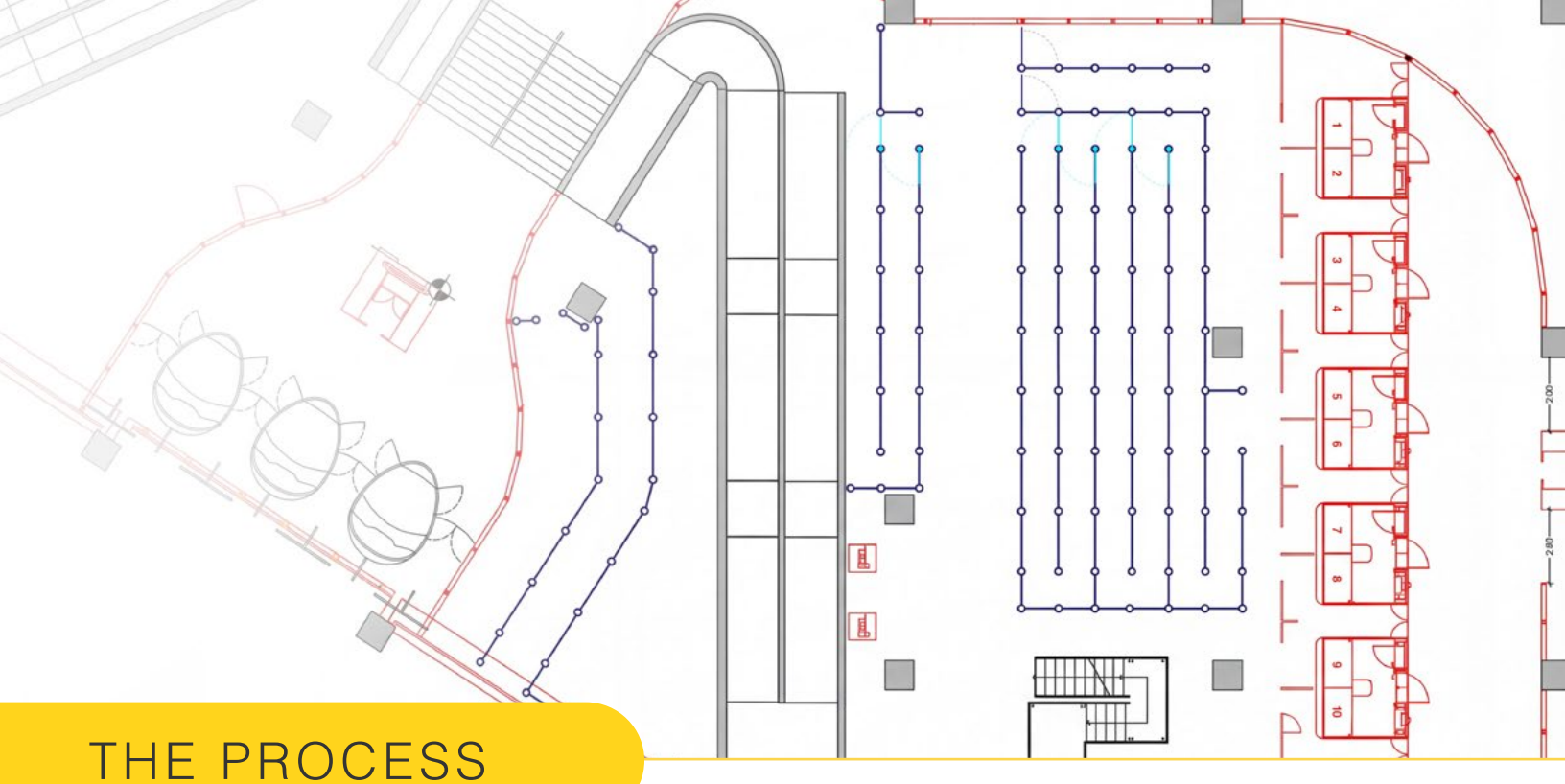


THE PROCESS

Through deep expertise, meticulous planning, and hands-on project management, the rollout unfolded smoothly and collaboratively from first design to final deployment.

Step 1: Plan the flow.

We used purpose-built modeling to develop a clear plan for how passengers, staff, and data would move through the space at different times of day.

Step 2: Map the environment.

We designed every detail — queue layouts, ramp intersections, and service counter placement — to visualize how three distinct passenger groups would merge and separate throughout the hall.

Step 3: Lay the mechanicals.

New electrical lines were installed beneath the floor to power six automated Smart Gates, digital displays, and an electronic queuing system.

Step 4: Select the data engine.

Because Smart Guidance is data-agnostic, Düsseldorf could choose whatever sensors they wanted to supply the real-time occupancy, density, and flow data driving the automation.

Step 5: Deploy the sensors.

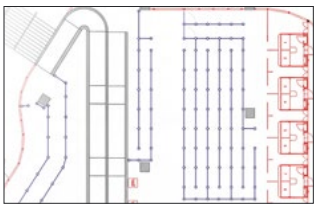
Xovis sensors were positioned at key points — entrances, the ramp, switchbacks, and service counters — providing a 360-degree, real-time view into how passengers move and where service points open up.

Step 6: Install the queue.

Six automated Smart Gates, installed along the main queue to regulate flow, were anchored by a magnetic stanchion grid. Digital Signage and Electronic Queuing rounded out the install.

THE SOLUTION

Smart Guidance turns static queues into dynamic infrastructure, managing passenger flow and boosting throughput without adding staff.



Modular grid layout:

A modular grid provides precise, fixed positioning, a critical element for accurate, consistent sensor data. It also offers built-in flexibility; belts, panels, and gates can be repositioned anywhere on the grid.

Magnetic stanchions:

Magnetic stanchions attach to thin steel plates glued (not drilled) into the floor. Their slim, low-profile design fits up to 15% more lanes within the same footprint.

Smart gates:

Motor-driven Smart Gates transform fixed queue lanes into adaptive infrastructure. Gates automatically open or close to match passenger traffic in real time, providing the shortest path to service.

Electronic queuing system:

The electronic queuing system automates call-to-service: sensors detect open positions, screens direct passengers, and workloads stay balanced, without manual intervention.

Digital signage & static wayfinding:

Digital signage manages mid-queue flow, signaling “Wait” when the main hall is full and “Go” when it’s time to move down the ramp. Static wayfinding then takes over, with clear cues for each lane.

Manual swing gate:

A small swing gate at the metering point provides a simple physical reminder to wait before proceeding down the ramp. This simple barrier makes the flow instantly intuitive, reducing passenger confusion.

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BENEFITS

With the latest advances in smart guidance, Düsseldorf gained:

- ✔ Faster lanes without requiring more staff
- ✔ Efficient checkpoint routing and load balancing
- ✔ Maximum use of every square foot
- ✔ Safe and fire code-compliant ramps
- ✔ Clearly marked lanes for crew and assistive travelers
- ✔ Greater visibility into potential bottlenecks
- ✔ Smooth, stress-free experience
- ✔ Clear wayfinding that reduces passenger hesitation
- ✔ Reduced strain on staff and higher performance
- ✔ Inviting, modern design with simple upkeep and easy cleaning
- ✔ A system ready to scale with airport demand

> “(Smart Guidance) allows us to optimally manage our passenger flows while remaining cost-effective.”
>
> *Simone Simons*
> *DUS Airport Terminal Management Advisor*

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THE RESULTS

Düsseldorf shows what happens when queues incorporate intelligence. For decades, airports have collected data on queue lengths, dwell times, and passenger counts — but that data stayed trapped on dashboards. Even when alerts were triggered, they depended on people to act; by the time help arrived, tension was already building.

Integrating automation with data unlocks capacity when expansion isn't possible. It creates real-time flexibility, making airports more efficient, satisfying, and profitable. Düsseldorf immediately achieved what every airport aims for: more capacity, better service, and lower operational overhead.

- **Greater speed and capacity:**
  Even during peak traffic periods, Düsseldorf Airport reports a 50% gain in throughput.
- **Self-managing operations:**
  The queue runs itself — no attendants, no manual adjustments. With automated flow, gates, and guidance, staff is freed to focus on service.
- **Efficiency and ROI:**
  Automation reduced staff dependency and manual interventions so effectively that the system paid for itself in under 12 months.
- **Passenger experience:**
  Continuous flow, intuitive signage, and balanced queues create a visibly calmer experience — helping Düsseldorf earn recognition as Best Regional Airport in Europe 2025 by Skytrax.
- **Scalability:**
  After the success of the 2023/2024 installation at Checkpoint C, Düsseldorf expanded Smart Guidance to Security Checkpoints A and B, applying the same real-time intelligence that made the immigration hall so successful.

SMART GUIDANCE INSTALLATIONS

Frankfurt Airport NXT
Installed: 2016
Solution: Automated call forward system for security checkpoints.

Copenhagen Airport
Installed: 2018/2019
Solution: Automated call forward system for central security checks plus Smart Gates for shortcuts and load balancing security checks.

Isavia Iceland Airport
Installed: 2022
Solution: Automated call forward system for central immigration plus Smart Gates.

Düsseldorf Airport
Installed: 2022
Solution: Automated call forward system for central immigration (EES) plus Smart Gates for shortcuts. Occupancy sensors on ramp per fire department restrictions.

Keflavik Airport
Installed: 2022
Solution: Automated call forward system and Smart Gates for central immigration (EES).

Munich Airport
Installed: 2023/2024
Solution: Automated call forward system and Smart Gates for centralized security area for load balancing and pre-loading service lanes.

Hamburg Airport
Installed: 2023
Solution: Smart Gates for centralized security area for load balancing.

Cologne-Bonn Airport
Installed: 2024
Solution: Automated call forward system and Smart Gates within centralized security area for load balancing and pre-loading. service lanes.

Ready to optimize your operations and improve your passenger experience?

Let' Get Started! CONTACT US 1.888.285.8605 | www.lavi.com | sales@lavi.com

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