



3D SPATIAL INTELLIGENCE FOR

HIGH-SECURITY ENTRANCE SYSTEMS

**Beyond Presence Detection: Understanding People, Movement and
Passage Events in 3D**

TECHNICAL WHITE PAPER

PASINS 3D Series | 3D ToF + Edge AI for secure passage understanding

Prepared for entrance equipment manufacturers, solution providers and system integrators

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1. From Presence Detection to Spatial Intelligence

Why high-security entrance systems need to understand more than zone occupancy

Traditional entrance sensors are effective at answering basic questions: Is the zone occupied? Is it clear? Has something entered the detection area? For many high-security entrances, however, presence alone is not enough. Security revolving doors, interlocking doors, security portals and other controlled pedestrian entrances also need to understand how people and objects are moving through the passage.

For reliable passage control, the system may need to know:

- How many people are in the controlled passage
- Where each person or object is located and which direction it is moving
- Whether more than one person is passing, following closely, moving side-by-side, or entering from the opposite direction
- Whether a person or object remains in a safety-critical closing or interlock zone
- Whether the passage is proceeding normally or an abnormal event is occurring

Traditional sensing tells the controller that something is present. PASINS 3D adds the spatial context needed to understand who or what is in the passage, where it is moving, and what passage event is taking place.

TRADITIONAL DETECTION	PASINS 3D SPATIAL INTELLIGENCE
Human presence	What exists
Object detection	Where it is
Event trigger	What it is doing

FROM PRESENCE → TO SPATIAL STATE UNDERSTANDING

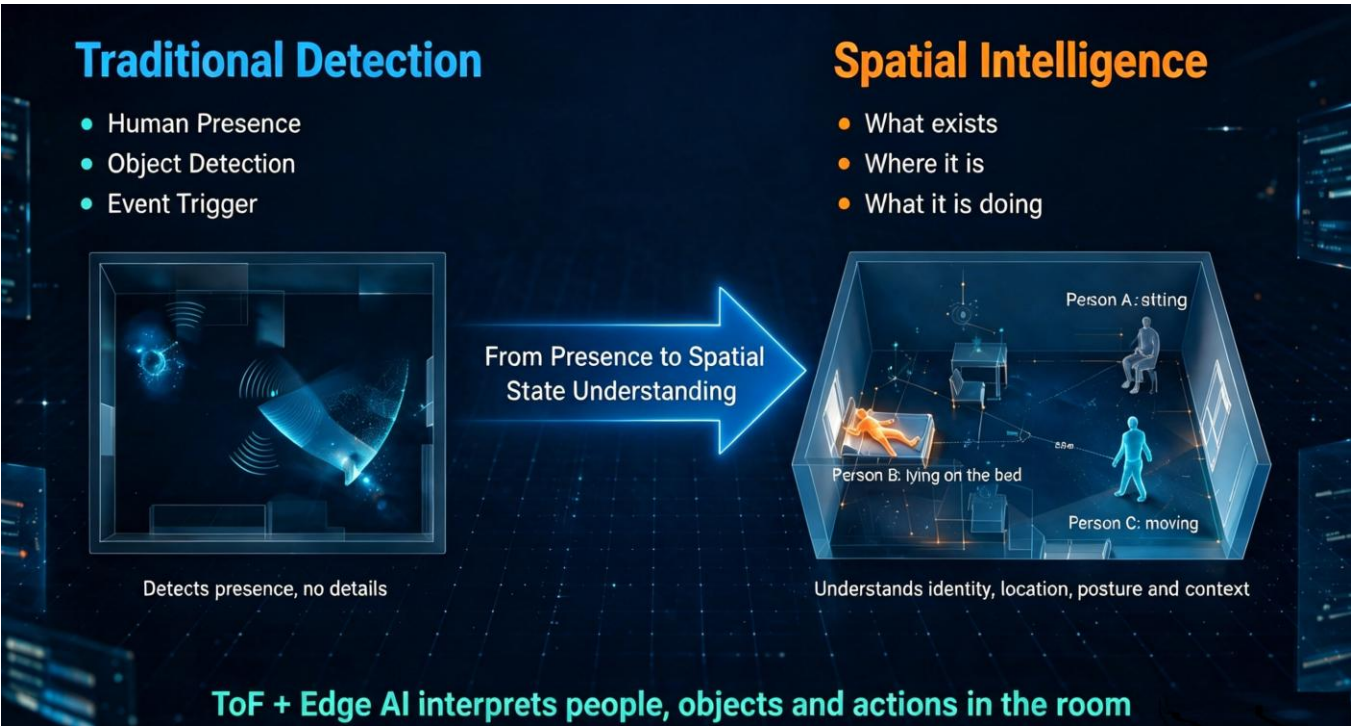


Figure 1. Traditional detection answers “is something there?”; spatial intelligence understands the complete passage state.

2. What Spatial Intelligence Means for Entrance Systems

From 3D sensing to real-time passage understanding

PASINS 3D combines 3D Time-of-Flight (ToF) sensing with edge AI. It measures depth in real time, reconstructs the entrance space as 3D data, tracks people and objects through the passage, and converts their positions, directions and relationships into structured events that an entrance controller or higher-level system can use.

3D ToF SENSING	3D POINT CLOUD	EDGE AI ANALYSIS	STRUCTURED EVENTS
940 nm ToF 30 FPS acquisition	Spatial reconstruction Depth fusion Target geometry	Multi-target tracking Behavior understanding Event classification	Passage event type Position & direction System control signals

Figure 2. PASINS 3D technology architecture - from 3D sensing to structured event output.

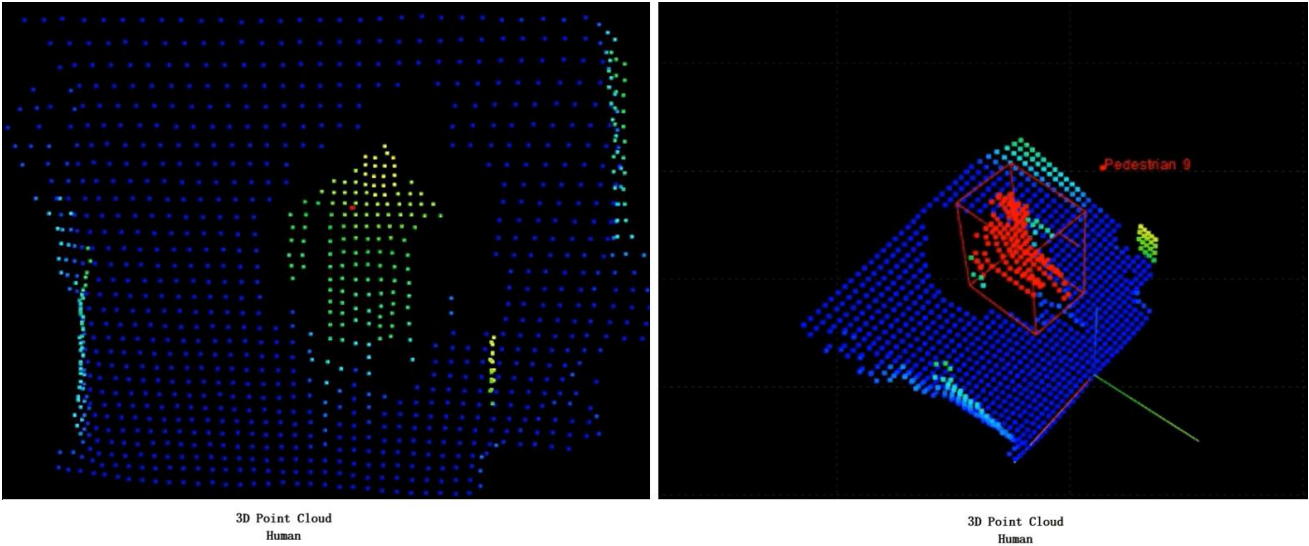


Figure 3. PASINS 3D ToF point-cloud visualization - real-time spatial position, target geometry and motion trajectory.

PASINS 3D can track up to 8 people or objects simultaneously within the detection area, preserving their individual positions and motion states as they move through the passage.

3D Spatial Data	Target Understanding	Spatial Relationships
3D coordinates	Person / object	Front / rear relationship
Depth information	Target ID	Side-by-side movement
Target height & geometry	Target count	Following distance
Spatial position	Direction & motion state	Multi-target tracking

Passage Event Types

Turning 3D passage understanding into usable entrance events

PASINS 3D recognizes representative passage and safety events and outputs them as structured information for entrance controllers, access-control systems or higher-level software. The examples below show how raw 3D sensing becomes information that can be used directly in system logic.

NORMAL PASSAGE Single- or multi-person continuous passage	TAILGATING Unauthorized person follows an authorized passage	REVERSE ENTRY Entry from the exit direction	MULTI-TARGET TRACKING Simultaneous tracking of multiple targets
HEIGHT DETECTION Human height measurement	RUSHING / FORCED ENTRY Rapid entry into the closing zone	SAFETY-ZONE OCCUPANCY Person or object remains in a hazardous zone	LEFT-OBJECT DETECTION Object remains in the detection area

Figure 4. Eight passage event types recognized by PASINS 3D.

Why this matters for entrance equipment manufacturers

Instead of providing only an occupied / clear signal, PASINS 3D can output the passage context behind that signal: target count, direction, spatial relationship and event type. Equipment manufacturers can map this information into door-control logic, access-control workflows, alarms and event records.

PASSAGE Who and how many are moving through	DIRECTION Where they are moving
SAFETY Who or what is inside a critical zone	EVENT Whether passage is normal or abnormal

3. Turning Entrance-Site Pain Points into Intelligent Events

Connecting entrance pain points to actionable control information

The key advantage is not simply detecting a target more accurately. It is understanding the passage as it develops - who or what is present, how targets relate to one another, where they are moving, and whether the situation is normal, unsafe or unauthorized.

Scenario	Traditional Sensor	PASINS 3D Understanding	Result
Authorized single-person passage	Zone occupied / clear	One person moving forward	Normal passage
Tailgating	Zone occupied / multiple targets	Multiple people detected in a following relationship	Tailgating alarm
Reverse entry	Zone occupied	Reverse-direction entry detected	Reverse-entry alarm
Rushing / forced entry	Zone occupied	Target position & trajectory	Forced-entry alarm
Safety-zone dwell	Obstruction detected	Person / object localized in critical zone	Safety-zone occupied
Left object	Object remains after passage	Left-object event recognized	Left-object alarm

Figure 5. Six typical entrance scenarios - traditional sensing vs. PASINS 3D understanding.

For security revolving doors, curved sliding doors, interlocking doors and security portals, this scene context can be translated into practical control actions: allow passage, hold or prevent closing, keep the next door locked, deny passage, trigger an alarm, or create an event record. The exact response remains configurable by the equipment manufacturer or system integrator.

From detection signals to actionable entrance context

ALLOW PASSAGE Normal authorized movement	HOLD / PREVENT CLOSING Person or object remains in a safety zone
LOCK NEXT DOOR Interlock logic requires a controlled sequence	DENY / ALARM / RECORD Abnormal or unauthorized passage event

4. Integrating Spatial Intelligence into Door-Control Logic

Adding physical passage understanding after authorization

Access control determines whether a credential or identity is authorized. PASINS 3D addresses the next question: what physically happens in the passage after authorization? By tracking people, objects and movement in 3D, it can provide the entrance system with structured passage events for control, safety and security logic.

ACCESS / DOOR CONTROL	PASINS 3D	DOOR EXECUTION
Identity authorization Door / interlock control	3D ToF + Edge AI Target & trajectory understanding Structured event output	Allow / deny passage Hold open / lock Alarm / event record

Figure 6. PASINS 3D integration with access / door-control systems - from authorization to execution.

Designed to integrate with existing entrance-control architectures

- Structured passage results over Gigabit Ethernet / TCP/IP for system-level integration
- Optional communication interface converter with digital I/O and RS232 / RS485 serial interfaces
- Configurable event logic for different entrance mechanisms, safety zones and project requirements
- HYD technical support for initial integration, configuration, commissioning and evaluation

Authorization answers who may enter. PASINS 3D adds the real-time spatial context needed to understand how the authorized passage actually occurs.

STRUCTURED OUTPUT Passage event type, target count, position and direction	FLEXIBLE INTERFACES TCP/IP, optional digital I/O, RS232 and RS485
CONFIGURABLE LOGIC Adapt event logic to the entrance mechanism and project	OEM SUPPORT Integration, commissioning and evaluation support

5. PASINS 3D Platform, Models and Technical Information



Figures 7-8. PASINS 3D in a smart-gate deployment and the compact sensor module designed for overhead integration.

Model Comparison

Model	3D ToF	RGB Video Evidence	Field of View	Typical Application
PASINS 3D/M1	✓	-	H90° × V70°	Compact / standard passage
PASINS 3D/M2	✓	-	H120° × V70°	Wider entrance coverage
PASINS 3DV/M1	✓	✓	H90° × V70°	Compact passage + video evidence
PASINS 3DV/M2	✓	✓	H120° × V70°	Wider passage + video evidence

Choosing the appropriate PASINS 3D model

M1 variants are designed for compact or standard passages. M2 variants provide a wider horizontal field of view for broader entrance spaces. PASINS 3D models use 3D ToF sensing without RGB video evidence, while PASINS 3DV models add RGB video evidence when a project requires visual event records.

Core Technical Specifications

Optical sensing	940 nm 3D ToF optical sensing
Eye safety	IEC 60825-1:2014 Class 1
Frame rate	30 FPS data acquisition / 15 FPS detection
Communication	Gigabit Ethernet, RJ-45
Power	DC 24 V, 2 A
Operating temperature	-10°C to +50°C
AI processing	Edge AI processing and multi-target tracking
Installation	Overhead installation for entrance-space coverage

PASINS 3D turns 3D sensing into a practical spatial-intelligence layer for entrance systems - helping equipment manufacturers and solution providers move from simple presence signals to real-time understanding of people, objects and passage events.

FOR ENTRANCE EQUIPMENT MANUFACTURERS & SOLUTION PROVIDERS

PASINS 3D provides structured spatial intelligence that can be integrated into security revolving doors, interlocking doors, security portals, speed gates and other controlled pedestrian entrances.