

MES · WMS · RFID AND RTLS EVENTS

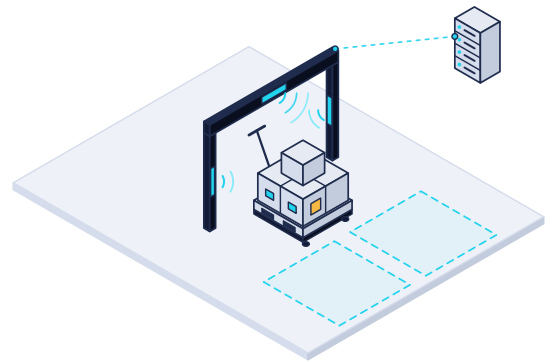
Replace manual scans with automatic bookings in your MES or WMS

An independent guide for operations managers, engineering, IT/OT, procurement and executives. It covers why manual scans fall short, the design choices that decide success, and how to prove it in one flow before you scale.

Why manual scans fall short

The pain points behind many projects

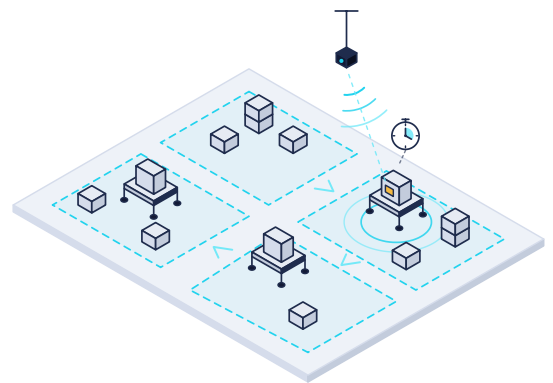
- **Scans that never happen:** a busy operator skips the scan, so the system shows stock or work where it is not.
- **Bookings that come late:** scans are caught up at the end of the shift, so planners work from old data.
- **Walking to the terminal:** people leave the line or the truck to find a scanner or a screen.
- **Searches and recounts:** when the system and the floor disagree, someone has to go and look.



What an automatic booking is

A physical event, a rule, then a business transaction

- **A physical event:** a pallet passes a gate, a trolley enters a zone or a container stays in a buffer.
- **A rule:** software turns raw reads into one clear event, such as "this order has arrived at line side". It filters noise and duplicates first.
- **A booking:** a validated event triggers a transaction your MES or WMS already knows, such as a goods receipt, a stock transfer or an operation start. Keep a confirmation step where detection alone cannot prove quantity or quality.
- **People where they add value:** staff confirm the steps that need it and handle the cases the rules cannot decide, instead of scanning every move.



WHO SHOULD READ WHAT

Operations managers

Pages 2, 4 and 5: process map, exceptions and the pilot.

Engineering

Pages 2 and 3: event types and integration options.

IT/OT

Pages 3 and 4: integration patterns and change control.

Procurement

Pages 3 and 5: scope to require and KPIs to contract on.

Executives

This page and page 5: roll-out method and payback.

Still scanning by hand? Book a [free 30-minute call](#) to talk through your process, and bring any integration proposal for a second opinion.

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Map every scan you do today

Each scan is a candidate, not every one should become automatic

CHECKLIST

Process mapping

- ☐ **List each scan:** where it happens, who does it, what is scanned and why.
- ☐ **Note the cost of a miss:** what goes wrong when the scan is skipped or late.
- ☐ **Decide the target:** fully automatic, automatic with confirmation, or stays manual.

CHECKLIST

Ground rules

- ☐ **Book business events, not raw reads.** Raw reads never become MES or WMS bookings directly.
- ☐ **Keep a manual path** for every automatic booking, for when hardware or network fails.

We map the rest with your team in Discovery.

DISCOVERY

What we map with you

- **Every scan**, and the booking it creates.
- **The carrier** that moves, and how it links to the order.
- **The owner** of each process, its data and its exceptions.

SURVEY

What we set per site

- **Read points** for your doors, lanes and lines.
- **Zone edges** drawn on your real floor.
- **Timings** agreed with the people who run each area.

Event design: gates, zones and dwell

Pick the event type that matches the physical step

Event type	Use it when	Design rules	Watch for
Gate (chokepoint)	Items pass a fixed point: dock door, line entry, store exit.	Set per site in the survey.	Stray reads from items parked near the gate, and items that pass too close together.
Zone entry and exit	Items move between areas: buffer, line side, quarantine, dispatch.	Set per site in the survey.	Zone edges that cut through a working area, and location error near walls and racks.
Dwell	Time in a place means something: arrived, waiting or forgotten. Never treat time alone as proof a process step, such as curing, is complete.	Set per site in the survey.	Thresholds that are too short or too long. Agree them with the people who run the area.
Association	An item must be linked to an order, carrier or person.	Set per site in the survey.	Old links not cleared when a carrier is emptied and reused.
Sequence	Steps must happen in order.	Set per site in the survey.	Real exceptions, such as rework loops, that the rule must allow.

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How events reach your MES or WMS

Choose the pattern your IT/OT team can support for years

Pattern	Fits best	Strengths	Watch for
OPC UA	Shop-floor and OT systems, machines and MES that already use it.	Standard information models, subscriptions and built-in security options. A companion specification for automatic identification (AutoID) devices exists.	Check which information model the proposed device actually implements. The business booking still needs its own interface. Certificates and OT security need planning.
APIs of the business system	Bookings into the MES, WMS or ERP through their supported interfaces.	Uses the system's own checks. Check the manufacturer's support and upgrade policy for the interface.	Rate limits, interface licences and the effort to test each transaction.
Middleware or edge event engine	Many readers or anchors, several target systems, or messy raw data.	Can filter and combine reads into events, buffer events during outages, if it is set up and tested for this, and keep the rules in one place.	Another system to run and secure. Make sure you own the rules and can export them.
Message broker (for example an MQTT broker)	Events shared by several receiving systems, or edge to cloud.	Loose coupling; more systems can subscribe to the same events.	Event formats, access, delivery settings, ordering and retention must be designed and owned. Some delivery settings can deliver an event twice, so receivers must handle duplicates.
File or batch export	As a stop-gap, or for data that is not time-critical.	Simple to start.	Not real time; failures can go unnoticed.

Integration design rules

What keeps automatic bookings trustworthy

- **Five design rules:** book once, time at source, store and forward, supported interfaces only, close the loop.
- **Our check:** we check every integration proposal against them.



INTEGRATION REVIEW

What we check in an integration proposal

- **The pattern** your IT/OT team can support for years.
- **The interfaces**, and whether their supplier supports them.
- **Outages and retries**, and how they are tested.
- **The event rules:** who owns them, and whether you can export them.

Bring any integration proposal to a free 30-minute call for a second opinion.

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Exception handling

Design for the cases the rules cannot decide

Exception	Typical cause
Missed read	Tag damaged, covered by metal or liquid, or passed too fast.
Stray or cross read	Items near a gate, or a neighbouring door.
Unknown tag	New, foreign or unenrolled tag.
Booking rejected	Order closed, stock blocked, quantity mismatch, master data wrong.
Duplicate or out of order	Network retry, buffer replay, item passing twice.
System or network down	Planned maintenance or outage.
Wrong booking made	False read or wrong association.

Handling designed with you, per exception type.

CHECKLIST

Exception queue

- ☐ **One queue**, visible to the people who can fix the cause.
- ☐ **A named owner per exception type** and a target time to clear it.

CHECKLIST

Change control with IT/OT

- ☐ **Change request** under your normal IT/OT process for every system touched.
- ☐ **Test system first**: test cases for every booking type and every exception.
- ☐ **Cutover and rollback plan**, with a date, owners and a way back.
- ☐ **People data**: if events link to named staff, agree purpose, retention and access. Check local privacy and employee-consultation rules, such as works councils or unions, before tracking people or tools linked to people.

We plan cutover with your IT/OT team.

Plain-language glossary

Systems

- **MES**: manufacturing execution system, runs and records production.
- **WMS**: warehouse management system, runs and records stock and moves.
- **Event engine**: software that turns raw reads into business events.

Events

- **Gate**: a fixed read point that items pass.
- **Zone**: an area on the floor that items enter and leave.
- **Dwell**: how long an item stays in a zone.

Integration

- **OPC UA**: an open standard for industrial data exchange.
- **Store and forward**: holding events during an outage and sending them later.
- **Idempotent**: safe to receive twice without booking twice.
- **Loose coupling**: systems can change without breaking each other.

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Pilot and roll-out method

One flow, one or two booking types, real production

1 Baseline

2 Pick one flow

3 Agree criteria

4 Survey and pilot

5 Controlled comparison

6 Roll out in waves

How we work, in five stages: Discovery, Assess and shortlist, Pilot with KPI baseline, Integrate, Multi-site roll-out. We baseline your KPIs before the pilot and work out payback from your own numbers.

KPIS TO TRACK

A KPI is a number you track, before and during the pilot.

- **Bookings made automatically** as a share of all bookings for the flow
- **Booking delay** from physical event to system
- **Missed and late scans** per shift
- **Exceptions** per day, by reason, and time to clear
- **Stock or WIP accuracy** at spot checks
- **Search time** for items the system cannot place
- **Time spent scanning** per shift

We agree how each KPI is measured, and the baseline, in the pilot plan.

TOTAL COST AND PAYBACK

ROI (return on investment) compares what you gain with what you spend. Payback is the time until the savings cover the cost.

What drives payback here

- Scanning time removed, net of any confirmation step
- Search and recount time removed
- Errors and stoppages avoided

If the benefit is not bigger than the running cost, there is no payback.

Bring to the call

- The scans you do today, and where
- Scanning and search time today, from your records
- Your MES or WMS, and the booking types you need

We work out total cost and payback with you from your own pilot data, not technology provider averages. **Bring rough figures to a free 30-minute call.**

What it means for each role

YOUR ROLE

WHAT IT MEANS FOR YOU

Operations

Fewer scans, fewer searches and a system that matches the floor.

Engineering

Event rules you can read, test and change.

IT/OT

Supported interfaces, no raw reads in your MES or WMS, and every change under your control.

Procurement

Integration scope, acceptance test and exit terms in writing.

Executives

One flow proved before money goes into the rest.

Other terms. **RFID:** radio-frequency identification, tags read by radio. **RTLS:** real-time location system; an **anchor** is a fixed unit that locates its tags. **ERP:** enterprise resource planning, the business system for orders and finance. **API:** a supported interface between systems. **MQTT:** a lightweight messaging standard. **WIP:** work in progress. **IT/OT:** office IT and the systems that run the site.

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CHECKLIST**Before a pilot: what to have ready**

- ☐ **A named process owner** for the flow you want to automate.
- ☐ **Master data you trust:** items, carriers, locations and orders.
- ☐ **A test system** for the MES or WMS, with the booking types you need.
- ☐ **IT/OT contacts** for network, accounts, certificates and change control.
- ☐ **A baseline** of today's KPIs, measured the way you will measure the pilot.

QUESTIONS**Questions to ask an integration partner**

- ☐ Where do the **event rules** live, who can change them, and can we export them?
- ☐ How are **duplicates, retries and outages** handled, and how is that tested?
- ☐ What does it cost to **add the next flow** after the pilot?

How a TRACIO project works: five stages**1 Discovery**

Your pain points, site, process and KPIs.

2 Assess and shortlist

Site survey, then the options that fit compared.

3 Pilot with KPI baseline

KPIs measured first. Pass marks agreed in writing before set-up.

4 Integrate

If useful, one agreed link into your MES or WMS, under your change control.

5 Multi-site roll-out

Only after a go decision, one area at a time.

How a pilot runs: set-up, then live weeks in normal use, then a short written report with a go or no-go.

Questions we hear**"We already have a system."**

We give a free second opinion and check how it performs against your KPIs, using your live data and a site visit.

"How do we know it will work here?"

Judge us on method: a pilot, KPIs measured before and during it, and a written go or no-go.

"Can you bid with us, or for us?"

Yes. We team with integrators, or act as the buyer's independent adviser, but never both on the same bid.

"Do you sell or resell hardware?"

No. We don't sell hardware, so our advice stays independent. We rent pilot equipment and offer survey and installation support.

Free second opinion

Send us your technology provider's quote or spec for a free second opinion. What to send: the quote or spec, a floor plan or site photos, item counts and your current process. Bring it to the call or send it via tracio.com/contact.

TRACIO consultancy fees

- **UK:** £3k to £30k per project, £1,200 a day
 - **Europe:** €3.5k to €35k per project, €1,400 a day
 - **US and Canada:** \$4k to \$40k per project, \$1,600 a day
 - **Middle East and Australia:** \$4k to \$40k per project, \$1,600 a day
 - **Rest of the world:** \$3.5k to \$35k per project, \$1,400 a day
- Scoped per project, no packages. Fees cover our work only; hardware, software licences and other supplier costs are separate. \$ = US dollars. Travel extra.

Why TRACIO: we work for you, not for the technology providers. We compare the options across the market that fit your site, provide site surveys and installation support, and work worldwide under your change control.

Also from TRACIO: buyer guides on judging an RFID or RTLS proposal, VDA 5050 for robot fleets and tool control and RTLS for aviation MRO; checklists for RF site surveys, UWB anchor placement, RTLS pilots and RFID feasibility studies. Ask for any of them on the call or at tracio.com/contact.

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