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Logistics software: WMS, TMS and EDI

What warehouse, transport, forwarding and ERP systems do, how they talk to each other through EDIFACT, X12 and APIs, and why process comes before integration.

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Online interactive version: **https://ozgurkonakci.com/en/guide/logistics-software-wms-tms-edi/**

SHORT ANSWER

A WMS runs the inside of the warehouse (locations, receiving, picking, shipping, counts); a TMS runs the transport itself (planning, routing, carrier selection, freight bills). Forwarding software follows each shipment as a file, while the ERP holds the company's core records such as finance and stock. These systems talk to each other and to partners through EDI messages (UN/EDIFACT or ANSI X12) or, increasingly, through APIs. Whether integration succeeds depends on mapping the process correctly before choosing the software.

Which system does what?

On its way, a shipment passes through several pieces of software. The ERP opens the order, the WMS picks the goods in the warehouse, the TMS or the forwarder's operations system plans the transport, and status updates come back from the carrier as EDI messages or through an API. These systems do not replace one another; each looks after a different part of the job.

System	What does it manage?	Who runs it?
ERP (enterprise resource planning)	Brings processes such as finance, HR, distribution, manufacturing, customer service and logistics together in one suite with a common process and data model	Manufacturers, exporters, importers; a logistics company's own accounts
WMS (warehouse management system)	The inside of the warehouse: locations, receiving, put-away, picking, packing, shipping and counting	Warehouse operators, 3PLs
TMS (transportation management system)	The transport itself: shipment planning, freight rate comparison, routing, carrier selection, freight bills and payment	Shippers who manage their own transport, road carriers, 3PLs
Forwarding (operations) software	Follows each shipment as a file: booking, transport documents, costs and revenue, invoicing, messages to carriers and agents	Freight forwarders, NVOCCs

The definitions follow Gartner's glossary. Gartner describes a WMS as software that helps manage and execute the operations of a warehouse or distribution centre, a TMS as a system used to plan freight movements and compare freight rates across all modes, and ERP as an integrated suite of business applications sharing a common process and data model. We found no generally accepted standard definition of forwarding software; that row is a functional summary drawn from the document and message flows described below.

Storage types, FIFO/FEFO, ABC analysis and inventory indicators are covered in **Warehousing and inventory management**. This page focuses on what the software does and how the systems talk to each other.

What does a WMS manage?

Location management and put-away

In a WMS, every rack position and every block-stacking area is a **location** with its own address. When goods are received, the system proposes a location; the operator puts the goods there and scans the location. From then on, the answer to "where is this pallet?" lives in the system.

The rule that decides where goods go is called the **storage assignment policy**. Warehousing literature distinguishes three basic policies:

Policy	Rule	When does it fit?
Random	Each incoming load goes to one of the eligible empty locations	When space utilisation matters; location tracking relies entirely on the system
Dedicated	Each product has a fixed location, which stays reserved even when the product is out of stock	When the range is small and stable; pickers know where each item is
Class-based	Products are grouped into classes by how often they move; each class has its own area, and storage within the area is random	To keep fast movers close to the dispatch doors

Random storage only works with a system that keeps locations reliable: a single move without a location scan "loses" the goods inside the warehouse.

Receiving and shipping

Receiving covers unloading the goods from the vehicle, checking them and updating the stock records. The way to speed it up is to let the information arrive before the goods. When the supplier dispatches a shipment, it sends a **despatch advice** EDI message in which each pallet is identified by an **SSCC**, an 18-digit GS1 number. When the pallet arrives, the SSCC on its label is scanned and matched with the data received in advance, so a short or over delivery shows up at the door.

On the outbound side, the WMS releases the order for picking, prepares the packing and loading lists, deducts the goods from stock and passes the dispatch data to the customer or the TMS.

Picking: single-order, batch, zone and wave

Order picking is retrieving products from storage in response to a customer order. De Koster, Le-Duc and Roodbergen's 2007 literature review describes it as the most labour-intensive operation in manual warehouses and reports estimates that it can account for **up to 55%** of warehouse operating costs. This is where a WMS makes the biggest difference.

Method	How does it work?
Single-order picking	The picker collects one order per tour
Batch picking	Several orders are grouped and picked together in one tour, then split by order
Zone picking	The warehouse is divided into zones; each picker collects only the part of an order in their own zone
Wave picking	Orders for a common destination (for example, the same truck or the same dispatch time) are released together and picked at the same time across several areas. Usually combined with batch picking.

In practice, wave picking means the WMS releases orders in "waves" timed to truck departures, so everything for the 2 pm truck is ready at the same time and nobody waits at the loading dock.

Stock counts: wall-to-wall and cycle counting

The US Government Accountability Office's (GAO) best-practice guide on physical inventory counts distinguishes two approaches:

- **Wall-to-wall count:** the entire inventory is counted at one point in time, usually for financial reporting.
- **Cycle counting:** a portion of the inventory is counted daily, weekly or monthly, spreading the count over time. This requires a perpetual inventory system that records every receipt and shipment as it happens.

The same guide highlights two practices: **blind counts**, where the counter does not see the quantity on record, and **counting higher-value items more often**. The second resembles applying ABC analysis to counting. A WMS plans which location is counted when, sends the task to a handheld terminal and routes discrepancies for approval.

For a short definition of a WMS and the questions to ask when working with a 3PL, see WMS: warehouse management system.

TMS: planning, executing and auditing transport

A TMS decides which vehicle, which carrier, which route and which price the goods leaving the warehouse will go with, and then checks whether that is what actually happened. Gartner's definition lists planning, freight rating and shopping across all modes, route and carrier selection, and the management of freight bills and payments. In practice, a TMS also receives status updates from carriers. These functions fall under five headings:

Function	What does it do?	What to watch
Planning	Turns orders into shipments, consolidates those going the same way, chooses the vehicle type	Vehicle capacity should be defined by weight and by volume or loading metres
Routing	Works out the stop sequence and the allocation to vehicles in multi-drop distribution	Delivery time windows and driving hours must be entered as constraints

Function	What does it do?	What to watch
Carrier selection	Compares contracted rates, tenders the load to a carrier and receives acceptance or rejection	The cheapest offer becomes expensive if on-time performance is poor
Execution and tracking	Receives events such as loading, departure and delivery from the carrier	Agree up front on the channel and frequency of status updates
Freight audit and payment	Checks the incoming freight invoice against the contracted rate and the actual shipment, then passes approved invoices to payment and accounting	If surcharges are not clearly defined in the rate agreement, the audit stays on paper

Routing is not a new problem. In their 1959 *Management Science* paper "The Truck Dispatching Problem", Dantzig and Ramser proposed a method based on linear programming to minimise the total mileage of a fleet delivering petrol from a bulk terminal to many service stations. Routing modules in today's TMS answer the same question with many more constraints, such as delivery windows, vehicle capacity and driving hours.

Why does freight audit matter? A freight invoice is rarely a single line: fuel surcharges, waiting time, extra stops, port and terminal charges come on separate lines. How to read these lines is explained in **Freight quotations and surcharges**; the profitability of a single quote in **Pricing and decision models**.

Forwarding software and ERP

For a forwarder, the basic unit is the shipment file. The file is opened at booking; carrier confirmation, loading, documents, customs, arrival, costs and revenue are all linked to it. When the file is closed, the sales invoice is issued, purchase invoices are matched to the file and its profit becomes visible.

The most visible task of forwarding software is to produce the data of the transport document and send it electronically to the carrier. Air cargo is a good example. According to IATA's e-AWB standard operating procedure:

- The master air waybill data (the FWB message, or its XML equivalent XFWB) is created **in the forwarder's own system** or on a web portal.
- In a consolidation, the data for each HAWB is sent in a separate message (FHL or XFZB).
- The forwarder does not tender the shipment until the carrier's acknowledgement arrives; after that, the goods are tendered without a paper AWB copy.
- Cargo-XML is the preferred format; the older Cargo-IMP format is accepted from specified versions onwards.

In ocean freight, the IFTMBF, IFTMBC and IFTMIN messages in the table below are used for booking and transport instructions. The legal side of the e-AWB and the electronic bill of lading is a separate topic: **Digital logistics and the electronic bill of lading (eBL)**.

The link to ERP: which record lives where?

Forwarding software, the WMS and the TMS run operations; the company's official books usually sit in the ERP. Integration problems rarely come from technology. A more common problem is the same record being kept

separately in two systems. If customer accounts, addresses, tax numbers, exchange rates and service codes are created on both sides, sooner or later they drift apart.

So before integrating, decide on a single **master source** for each type of data. For example, customer accounts are opened in the ERP and passed to the operations software; shipment and cost data are created in the operations software and go to the ERP with the invoice.

An extra link in Türkiye: e-documents. Certain taxpayers in Türkiye must issue their dispatch notes (irsaliye) electronically as e-İrsaliye. The scope is set by Tax Procedure Law General Communiqué No. 509 and its amendments; for example, Communiqué No. 535, published in 2022, changed the turnover threshold. Thresholds have changed over time, so check the current position with the Turkish Revenue Administration (GİB). In practice, the dispatch note for goods leaving the warehouse must be matched correctly between the WMS shipping record and the ERP's e-document module. Electronic customs systems (BİLGE, NCTS, Single Window) are covered in **Türkiye's trade and customs systems: BİLGE, NCTS, Single Window and more**.

EDI and message standards

EDI (electronic data interchange) is the exchange of structured business data, in a format agreed in advance, between independent computer systems. A PDF attached to an e-mail is not EDI: the receiver needs a person to read it. An EDI message is processed directly by the receiver's system.

UN/EDIFACT

UN/EDIFACT is the United Nations set of standards, directories and guidelines for electronic data interchange in administration, commerce and transport; its rules are approved and published by UN/CEFACT. The messages are defined in the United Nations Trade Data Interchange Directory (UNTDID). The structure is layered:

- Data elements are grouped into **segments**, segments into **messages**, and messages into an **interchange**.
- An interchange opens with a UNB segment and closes with UNZ. Each message starts with UNH and ends with UNT. The closing segments are used to check that the interchange and the message arrived complete.

These are the messages you will meet most often in logistics. The names are the official names in UN/CEFACT's D.01A directory document:

Message	Official name	What does it carry, from whom to whom?
IFTMBF / **IFTMBC**	Firm booking message / Booking confirmation message	A firm booking request and the carrier's confirmation
IFTMIN	Instruction message	A transport instruction from the party issuing instructions for forwarding or transport services to the party arranging them
IFTSTA	International multimodal status report message	The status of a transport, or a change in that status (an event), between agreed parties
COPRAR	Container discharge/loading order message	An order to the container terminal to discharge the listed containers from a vessel or load them onto it

Message	Official name	What does it carry, from whom to whom?
COARRI	Container discharge/loading report message	A report that containers have been discharged from or loaded onto the vessel
CODECO	Container gate-in/gate-out report message	Notification that a container has entered or left the terminal or depot gate
BAPLIE	Bayplan/stowage plan occupied and empty locations message	All occupied positions on board: which bay, row and tier each container is in. It is sent to the terminal at the next port of call, which updates the plan and sends it back when the vessel sails.
CUSCAR	Customs cargo report message	Cargo report to customs
DESADV	Despatch advice message	Despatch advice: from supplier to buyer, what was shipped, pallet by pallet (with SSCCs)
INVOIC	Invoice message	Invoice

How to read the position data in a BAPLIE is explained in **How to read a container's position on board: bay, row and tier**; the terminal steps reported by COPRAR, COARRI and CODECO in The container's path through the terminal.

Same message, different use. UN/EDIFACT messages are broad; each sector and each party uses only part of them. In practice, therefore, a **message implementation guide** (MIG) is needed. SMDG, the user group of shipping lines and container terminals, publishes common guides for messages such as BAPLIE and COPRAR. On the retail and supply side, GS1's EANCOM guides are based on the D.01B directory. Even when two parties say "we send IFTMIN", they still need to agree which directory version and which guide they use.

ANSI X12

X12 is the EDI standard developed by Accredited Standards Committee X12, chartered in the United States by ANSI in 1979. Messages are known as transaction sets with three-digit numbers. When integrating with a warehouse or carrier working with North America, these numbers come up often:

No.	Name	What is it for?
204	Motor Carrier Load Tender	Tendering a load to a road carrier
990	Response to a Load Tender	The carrier's acceptance or rejection
214	Transportation Carrier Shipment Status Message	Shipment status from the carrier to shippers, consignees and their agents
210	Motor Carrier Freight Details and Invoice	The road carrier's freight invoice
856	Ship Notice/Manifest	Ship notice: a list of the goods and packages shipped
940 / **945**	Warehouse Shipping Order / Warehouse Shipping Advice	A shipping order to the warehouse and the warehouse's shipping advice

Our observation from the field: EDIFACT is more common in Europe, Türkiye and ocean shipping, X12 in North America. This is a tendency, not a measured share; your trading partner's guide decides which standard you use.

From EDI to APIs

In classic EDI, parties send messages as files. The receiver processes the file when it arrives and, if needed, replies with another message. An **API** (application programming interface) lets one system ask another "what is the latest status of this shipment?" and get the answer immediately. The shift is from sending messages to sharing data:

- **Air cargo: ONE Record.** IATA's standard aims to create a single record view of the shipment. The data structure is JSON-LD, systems talk through a web API, and authentication relies on an industry-wide trust network. According to IATA, ONE Record has been the preferred standard since 1 January 2026. IATA also says the transition will be "evolutionary rather than revolutionary" and that legacy messaging will coexist with it for some time.
- **Containers: DCSA Track & Trace.** DCSA, the association of container lines, publishes a standard that describes visibility data across the container journey in one common language, together with an API. Events fall into five groups: shipment, transport, equipment, IoT and reefer.

Is EDI going away? Not in the short term. The API's advantages are on-demand queries and a more flexible data structure. EDI's advantages are long-established guides and the fact that it already works with most trading partners. Many companies use both. The right question for you is not "EDI or API?" but "which does my partner support, and which data do I need how often?"

Visibility and tracking

Visibility means knowing reliably where a shipment is and when it will arrive. That knowledge does not come from a single system; it is assembled from events reported by each link in the chain:

Event	Who reports it?	Which message?
Container gated in / out of the terminal	—	CODECO; an equipment event in DCSA
Container loaded onto / discharged from the vessel	—	COARRI; an equipment event in DCSA
Vessel departed / arrived	Shipping line	IFTSTA; a transport event in DCSA
Road carrier picked up / delivered	Road carrier	IFTSTA or X12 214
Reefer temperature, location	Device on the container	IoT and reefer events in DCSA; usually via API

The practical takeaway: your visibility screen is only as good as the slowest or least complete link. If a carrier sends its events in a batch at the end of the day, you will not see "real-time" data.

Visibility matters for more than a tracking number. The bullwhip effect is an information distortion: a link further up the chain sees the orders of the link below it, not real demand (see The bullwhip effect). For where the estimated time of arrival (ETA) sits in the shipment timeline, see **The container shipment timeline**.

Process first, then integration

The business process analysis guide prepared by the UN Economic and Social Commission for Asia and the Pacific (ESCAP) with UNECE and UNNExT puts the systematic mapping and documentation of existing processes as the first step, before any measures to simplify and automate trade procedures. The guide was written for trade procedures, but the principle applies just as well to integration inside a company: automate a bad process and you make the same mistake faster.

In an integration project, process analysis means writing down the answers to these questions:

1. **How does the work run today?** Which information goes from whom to whom, with which document, in which order? Who re-keys what by hand?
2. **Which system is the master source for which data?** Customer accounts, product master, addresses, rates, exchange rates.
3. **How do codes map?** Your product code and the customer's; your service code and the carrier's charge code.
4. **What happens with exceptions?** Short deliveries, cancelled bookings, split shipments, corrected invoices. Most integrations work in the "normal" flow and get stuck on exceptions.
5. **Who will notice when something fails?** There should be a screen and a named person monitoring messages that were rejected or never reached the other side.

When these steps are skipped, a common result is that the software goes live but staff keep their old spreadsheets as well, because the system reflects the process on paper, not the real one.

What to look for when choosing software

The table below summarises the questions to ask in a selection process. Set the weights to suit your own business; how weighted scoring works is explained in Supplier selection: criteria and weighted scoring.

Criterion	Question to ask
Process fit	Can it show your three hardest scenarios (exceptions included) live in the demo?
Integration	Which EDIFACT and X12 messages does it support, and in which directory versions? Is its API documented? Has it worked with your partners' guides before?
Local requirements	How are e-İrsaliye and e-Fatura handled? Are a Turkish interface, TRY and foreign currency, and local tax rules supported?
Data ownership	Can you export your data at any time in a readable format? What happens when the contract ends?
Scalability	How does it perform when order or shipment volumes multiply in peak season?
Total cost	Beyond the licence, what do implementation, integration, training, maintenance and each new partner connection cost?
References	Can you speak to a user of your size who does the same kind of work?

This table is an experience-based checklist; it is not taken from a standard.

Where to go next in the guide

- Electronic bills of lading, e-CMR and eFTI: **Digital logistics and the electronic bill of lading (eBL)**
- Electronic customs systems: **Türkiye's trade and customs systems: BİLGE, NCTS, Single Window and more**
- Storage types, stock methods and dwell time: **Warehousing and inventory management**
- What a forwarder does and its documents: **What does a freight forwarder do?**
- The e-AWB and air cargo documents: **Air cargo: the AWB and chargeable weight**
- The steps at the terminal: **How cargo moves through a port: terminals, parties and charges**

Which courses cover this topic?

Logistics information systems is taught as a dedicated course in logistics and international trade programmes in Türkiye and abroad. In our course map, it appears as a dedicated course in 26 programmes and as part of a course in 51. Some courses overlap closely with this page: the Anadolu University Open Education course includes weeks on barcodes and RFID, vehicle tracking systems and ERP, and the MITx course includes weeks on EDI and XML, ERP, TMS, WMS and supply chain visibility. Examples:

Institution	Programme	Course
Anadolu University	International Trade and Logistics (English), bachelor's	Logistics Information Systems (UTL303)
Anadolu University, Open Education Faculty	Logistics, associate degree	Use of Technology in Logistics (LOJ202U, in Turkish)
İzmir University of Economics	Logistics Management (English), bachelor's	Supply Chain and Logistics Information Systems (LOG 364)
Atatürk University	International Trade and Logistics, bachelor's	Logistics Information Systems (IUT311, in Turkish)
Cranfield University	MSc Logistics and Supply Chain Management, master's	Information Systems and Digital Supply Chains
MIT CTL / MITx	MicroMasters in Supply Chain Management, open online course	Supply Chain Technology and Systems (CTL.SC4x)
Irish International Freight Association (IIFA)	FIATA Diploma in Freight Forwarding, certificate	Digital Operations

Test yourself

1. In a warehouse, orders are grouped by the 2 pm and 5 pm trucks and picked at the same time in several zones. What is this picking method called? *(Answer: Wave picking. Orders for a common destination are released together and picked simultaneously across several areas.)*

2. What does cycle counting require that a wall-to-wall count does not? *(Answer: A perpetual inventory system that records every receipt and shipment as it happens. Only such a system holds the current balance against which the counted quantity is compared.)*
3. A shipping line reports all occupied positions on board to the terminal at the next port of call. Which EDIFACT message is used? *(Answer: BAPLIE, the Bayplan/stowage plan occupied and empty locations message.)*
4. A road carrier will report shipment status to your US customer in X12 and to your partner in Türkiye in EDIFACT. Which two messages do the same job? *(Answer: X12 214 and EDIFACT IFTSTA. Both report the status of a transport and changes to it.)*
5. A new WMS has gone live, but the team still tracks stock in a separate spreadsheet. Where should you look first? *(Answer: Process analysis. If the system does not cover the real process, especially exceptions, staff keep parallel records. The missing steps need to be identified and reflected in the system or the process.)*

Frequently asked questions

What is the difference between a WMS and an ERP?

An ERP holds the company's core records, such as finance, purchasing, sales and stock, in a common data model. A WMS manages the work inside the warehouse at location level: receiving, put-away, picking, shipping and counting. The ERP knows how many units of a product there are; the WMS knows which rack and which pallet they are on.

What is the difference between EDI and an API?

With EDI, parties send messages built to an agreed standard (UN/EDIFACT or ANSI X12) as files, and the receiver processes each file when it arrives. With an API, one system asks another a question and gets the answer immediately. IATA's ONE Record in air cargo and DCSA's Track & Trace API in container shipping are examples of this shift. The two approaches will be used side by side for some time.

What do IFTMIN, IFTSTA, COPRAR and BAPLIE mean?

They are all UN/EDIFACT messages. IFTMIN is a transport instruction (Instruction message), IFTSTA a transport status report (International multimodal status report message), COPRAR an order to a container terminal to discharge or load containers (Container discharge/loading order message), and BAPLIE a report of occupied positions on board a vessel (Bayplan/stowage plan occupied and empty locations message).

What is cycle counting?

Instead of counting the whole inventory at once, a portion is counted daily, weekly or monthly, spreading the count over time. It requires a perpetual inventory system that records every receipt and shipment as it happens. The US GAO's guide highlights blind counts, where the counter does not see the recorded quantity, and counting higher-value items more often as good practice.

What should come first when choosing logistics software?

Map the current process before looking at software: which information goes from whom to whom and in what order, which system is the master source for which data, and how exceptions are handled. Then ask candidates to demonstrate your hardest scenarios, and to show the EDI messages and API they support, their e-invoice and e-dispatch note integration (in Türkiye), and the total cost.

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