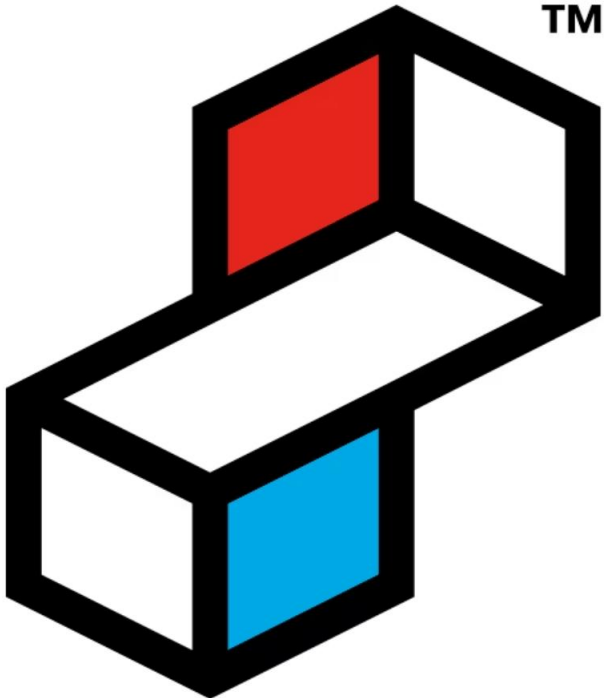


End-to-End Supply Chain Transportation Process

Maximum-granularity, enterprise-grade, multimodal framework – from strategic network design through continuous improvement – engineered for senior supply chain leaders managing complex, high-stakes transport operations.

- ENTERPRISE EDITION
- MULTIMODAL
- MAXIMUM GRANULARITY



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0. Strategic Foundation

Before Any Transport Moves

0.1 Network Design

Define your global supply chain footprint: regional hubs, cross-dock locations, distribution centres, consolidation points, and last-mile depots. Model transport lanes, transit times, cost-to-serve, CO₂ footprint, and modal mix across road, air, sea, rail, and barge.

Optimisation Levers

- Hub-and-spoke vs. point-to-point trade-offs
- Intermodal opportunity identification
- Backhaul matching to reduce empty miles
- Load consolidation for cost efficiency
- CO₂ footprint modelling per lane



0.2 Transportation Strategy



A robust transportation strategy sets the boundaries within which all operational decisions are made. Define service levels, carrier portfolio scope, and make-or-buy boundaries before execution begins.



Service Levels

SLA definitions, lead times, and delivery window commitments aligned to customer tiers.



Make or Buy

Own fleet versus subcontractor strategy, including capacity thresholds and asset intensity.



Sustainability Roadmap

Lean & Green targets, CO₂ reduction milestones, and modal shift commitments.



Security & Risk

TAPA, C-TPAT, and AEO compliance; redundancy planning and dual-sourcing strategy.

0.3 Governance & Policies

Enterprise-grade transport operations require a clear policy architecture governing every shipment type and compliance domain. These documents form the legal and operational backbone of your transport programme.

Core Policies

- Transportation policy
- Carrier management policy
- Safety & compliance policy
- Quality policy (ISO 9001)

Specialised Policies

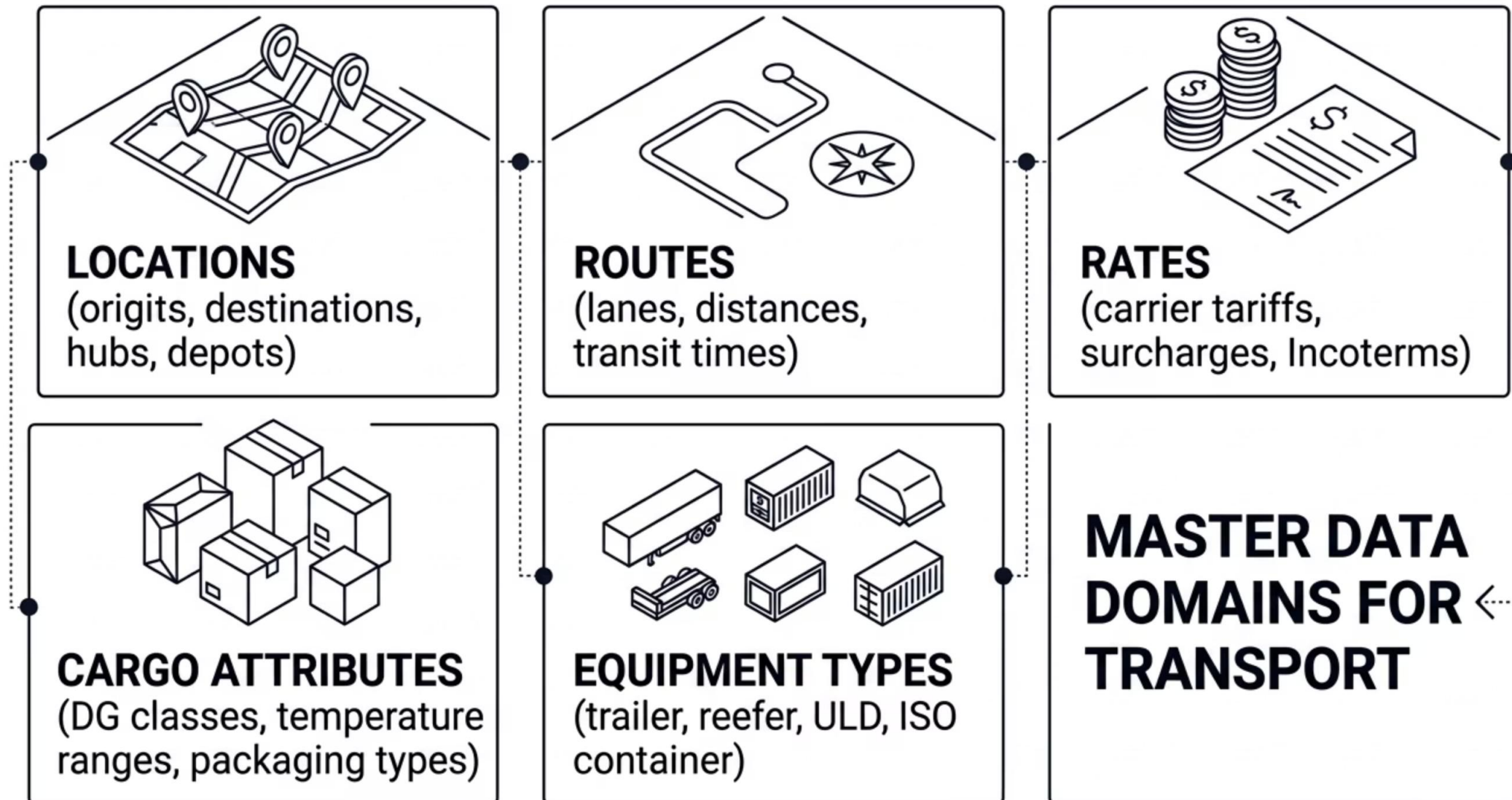
- Dangerous goods (DG) policy
- Temperature-controlled policy
- High-value cargo policy
- Sustainability policy

📄 Policies must be reviewed annually, aligned to regulatory updates, and cascaded to all carriers and third-party logistics providers in your network.

0.4 Master Data Setup

Accurate, complete master data is the single most critical enabler of transport automation and visibility.

Poor master data is the root cause of the majority of shipment exceptions and billing disputes.



1. Demand & Transport Planning

Chapter 1 of 11

Translating demand signals into actionable transport requirements is the bridge between commercial commitments and physical logistics. Accuracy here directly determines carrier utilisation, cost, and service performance.

PLANNING



1.1 Demand Capture

Transport planning begins with a comprehensive, clean demand signal. Multiple order types must be ingested, normalised, and time-phased to enable accurate load-building and capacity reservation.



Commercial Demand

Customer orders, confirmed purchase orders, and contractual replenishment schedules form the primary demand signal driving transport requirements.



Operational Demand

Production orders and internal replenishment orders between facilities create secondary transport requirements that must be planned alongside commercial flows.



Forecast & Peaks

Forecasted demand, seasonal peaks, and promotional spikes require advance capacity reservation – often 4–8 weeks ahead for ocean and 2–4 weeks for road.

1.2 Transport Requirement Planning (TRP)

TRP converts raw demand into optimised shipment plans, applying consolidation logic, mode selection rules, and special cargo handling requirements before a single booking is made.

Optimisation Decisions

- Consolidation opportunities by lane & window
- Mode selection (road, air, sea, rail, barge)
- Carrier selection per lane & service level
- Routing and load building
- Delivery window alignment

Special Requirements Screening

- Temperature requirements (ambient, chilled, frozen)
- Dangerous goods (DG) classification & segregation
- High-value cargo protocols
- Oversized or out-of-gauge loads
- Dual driver or escort requirements

1.3 Capacity Planning

Securing adequate transport capacity – across all modes and asset types – must occur well ahead of execution, particularly during peak seasons or in constrained markets.

1

Fleet & Drivers

Own fleet availability, driver hours compliance (tachograph), and subcontractor capacity confirmation.

2

Carrier Capacity

Contracted capacity with primary and backup carriers, including spot market fallback thresholds.

3

Infrastructure

Warehouse dock availability, yard capacity, and booking slot management to prevent gate congestion.

4

Equipment

Trailers, reefer units, ISO containers, and ULDs – confirmed type, quantity, and positioning.

1.4 Booking & Scheduling

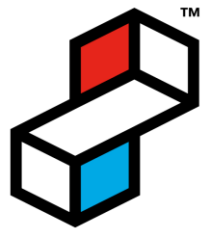
Formalising capacity reservations transforms a plan into a binding operational commitment. Every booking must include confirmed special requirements to prevent costly exceptions at execution.

What to Book

- Trucks (FTL / LTL / groupage)
- Ocean containers (FCL / LCL)
- Airfreight space and ULDs
- Rail slots and wagon allocation
- Barge capacity and terminal slots

What to Confirm

- Pickup time and loading window
- Delivery window at destination
- Equipment type and configuration
- DG, temperature, and high-value requirements
- Driver and vehicle documentation



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2. Pre-Transport Preparation

Chapter 2 of 11

The quality of pre-transport preparation determines whether a shipment moves smoothly from origin to destination – or generates exceptions, delays, and compliance failures en route.

PREPARATION



2.1 Order Consolidation

Effective consolidation is one of the highest-value activities in transport management – directly reducing cost per unit shipped while improving load factors and carbon efficiency.

By Destination

Group shipments heading to the same delivery postcode, city, or region to maximise full-truck or full-container utilisation.

By Cargo Type

Segregate by temperature regime, DG class, and pallet height to ensure compatibility and compliance within a single load.

By Time Window

Align shipments with compatible delivery windows and weight classes to optimise routing and meet customer appointment requirements.

2.2 Packaging & Labelling

Correct packaging and labelling are non-negotiable for DG compliance, cold chain integrity, and supply chain traceability. Errors here can result in shipment holds, regulatory fines, or cargo damage.

Apply

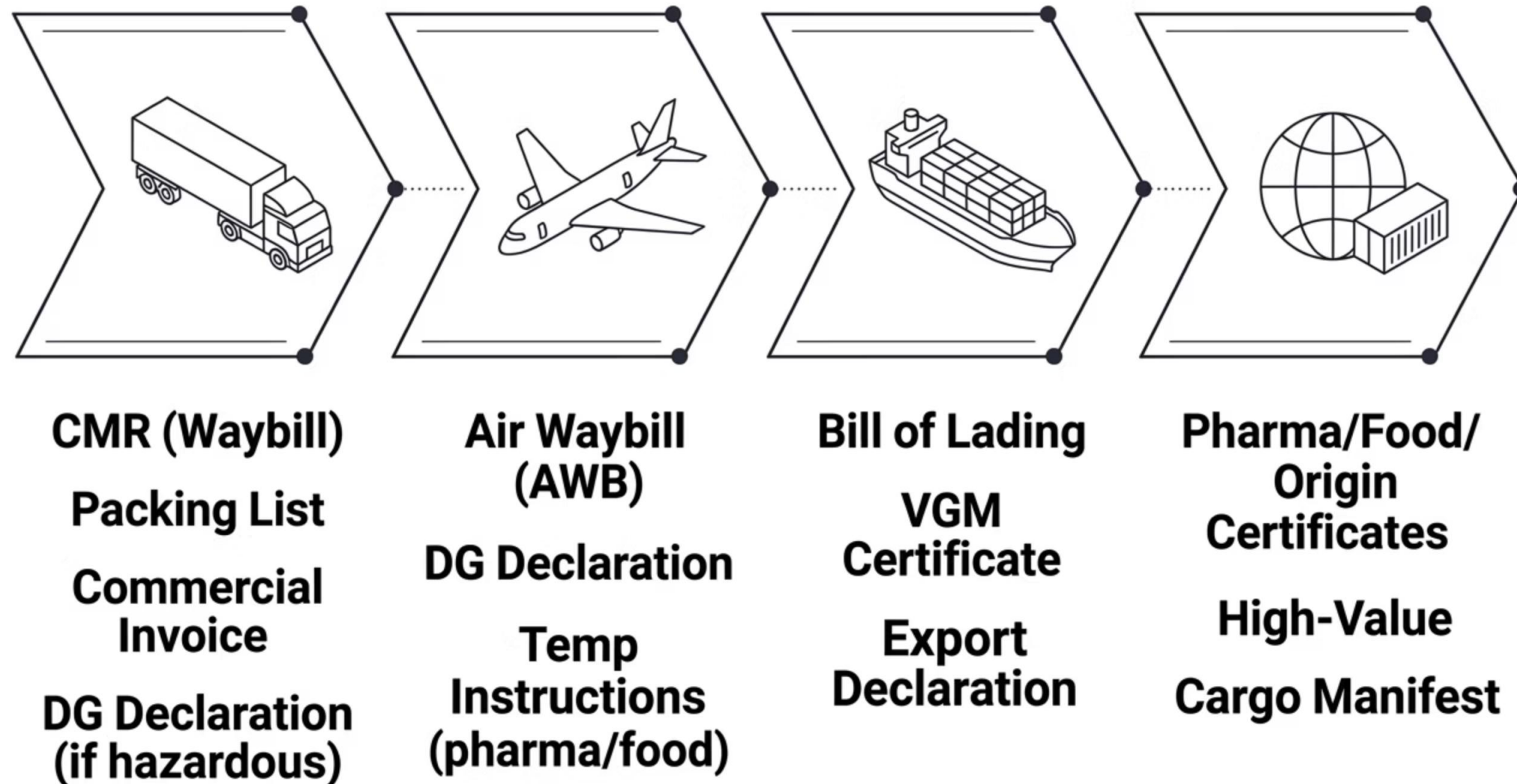
- Barcodes and SSCC labels
- DG labels (UN number, hazard class)
- Temperature and orientation labels
- High-value security seals

Validate

- Packaging integrity and closure
- Pallet stability and stretch-wrap quality
- Weight limits per unit and layer
- Moisture and shock protection measures

2.3 Documentation Preparation

Complete, accurate transport documentation is the legal and operational foundation for every cross-border and regulated shipment. Missing or incorrect documents are the leading cause of customs holds and carrier refusals.



2.4 Carrier Pre-Check

Verifying carrier and vehicle readiness before loading prevents costly failures during transit. This gate should be treated as a quality checkpoint – not a formality.

→ Vehicle & Equipment

Confirm vehicle compliance (roadworthiness certificate, ADR approval), correct equipment type, and cleanliness standards for food or pharma loads.

→ Temperature Readiness

Validate pre-cooling of reefer units to the required set-point temperature before loading begins. Document pre-load temperature with timestamp.

→ Driver & Safety

Check driver ID, ADR certificate (if applicable), availability of seals, fire extinguisher, PPE, and DG safety equipment before granting loading access.

3. Pickup & Loading

Chapter 3 of 11

The loading phase is the critical handover point between warehousing and transport. Every step – from gate control to final seal – must be executed with precision and fully documented.

EXECUTION



3.1 Gate Control

Gate control is the first physical security and compliance checkpoint of the transport process. No vehicle should access the loading dock without completing all gate checks.

01

Identity Verification

Check driver ID against booking confirmation and carrier roster. Verify vehicle registration plate matches the booking.

02

Vehicle Inspection

Inspect trailer for cleanliness, structural integrity, seal availability, and compliance with equipment specification in the booking.

03

Documentation & Safety

Verify DG documentation, confirm booking reference, conduct safety briefing, and issue site access pass before dock assignment.

3.2 Loading Operations

Systematic loading sequence planning is essential to protect cargo integrity, ensure DG compliance, and maximise vehicle utilisation. Deviations from the approved load plan must be documented and authorised.

Load Sequence

- Heavy items loaded first (front and floor)
- Temperature-sensitive cargo loaded last
- DG segregation per IMDG / ADR rules
- Fragile items on top, clearly marked

Securing & Sealing

- Straps, nets, load bars, and dunnage bags
- Sequential seal applied and number recorded
- Load manifest signed by loader and driver
- Temperature probe inserted (if required)

3.3 Pre-Departure Checks

Before any vehicle departs, a structured pre-departure verification ensures the shipment is compliant, complete, and trackable from the moment it leaves the facility.

Weight & Stability

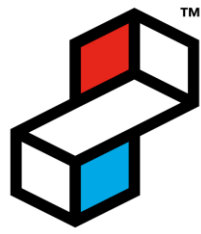
Axle weight check, total gross weight confirmation, and load stability sign-off per site procedure.

Compliance

DG segregation final check, temperature validation at departure, and seal number recorded in TMS.

Handover

Documentation handover to driver, driver signature on CMR/load manifest, and control tower departure notification.



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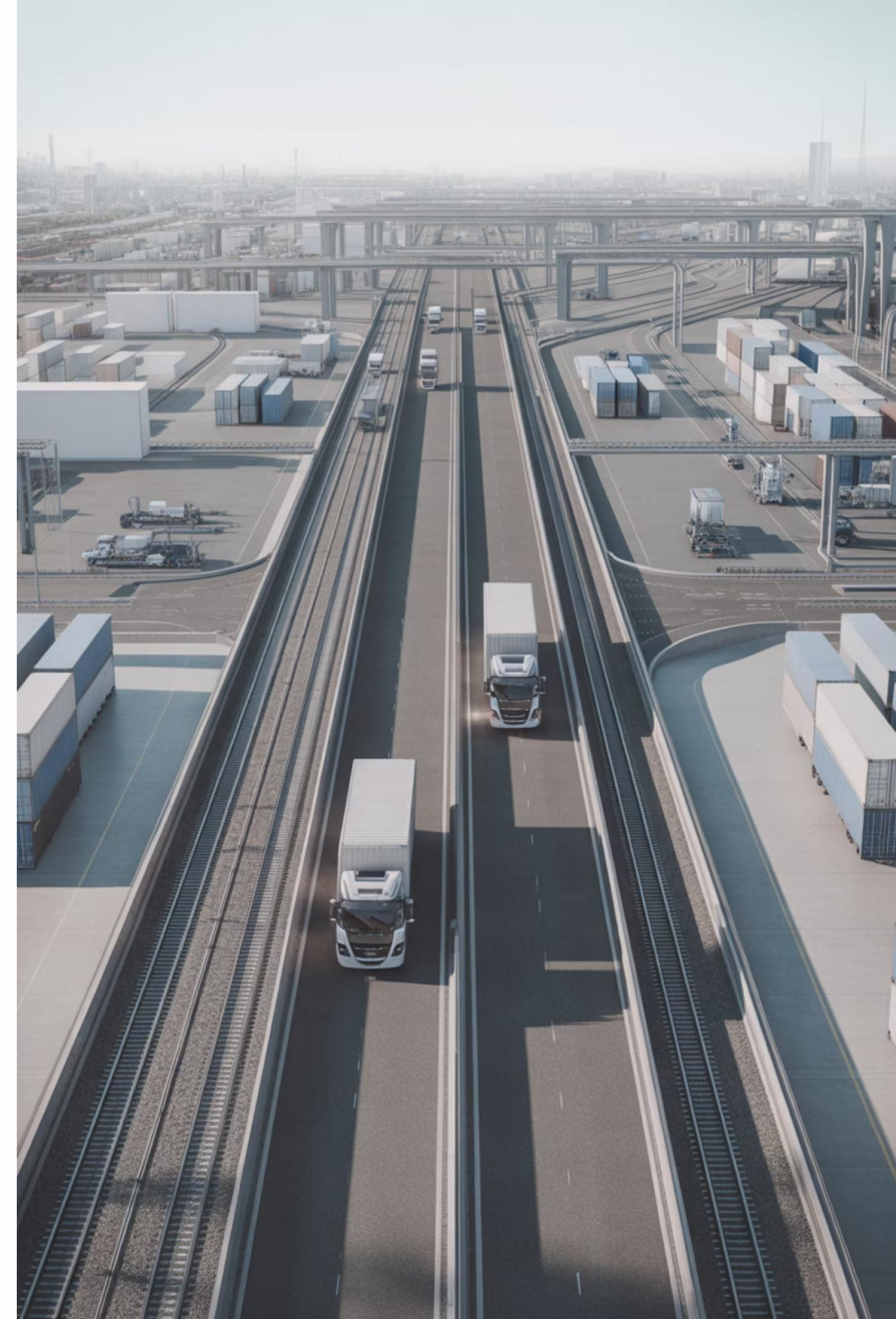
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4. Transport Execution — Multimodal

Chapter 4 of 11

Execution across five transport modes — road, air, sea, rail, and barge — requires mode-specific operational protocols, real-time monitoring capabilities, and integrated handover processes at every intermodal transfer point.

EXECUTION



4.1 Road Transport

Road remains the dominant last-mile and primary distribution mode for most enterprise supply chains. Real-time visibility and driver behaviour monitoring are critical to delivering on SLA commitments and security standards.



Visibility

Continuous GPS tracking with geofencing alerts for route deviations, unauthorised stops, and no-stop zone violations (TAPA requirement).



Cargo Monitoring

Real-time temperature monitoring with automated alerts for excursions. Reefer set-point verification at each planned stop.

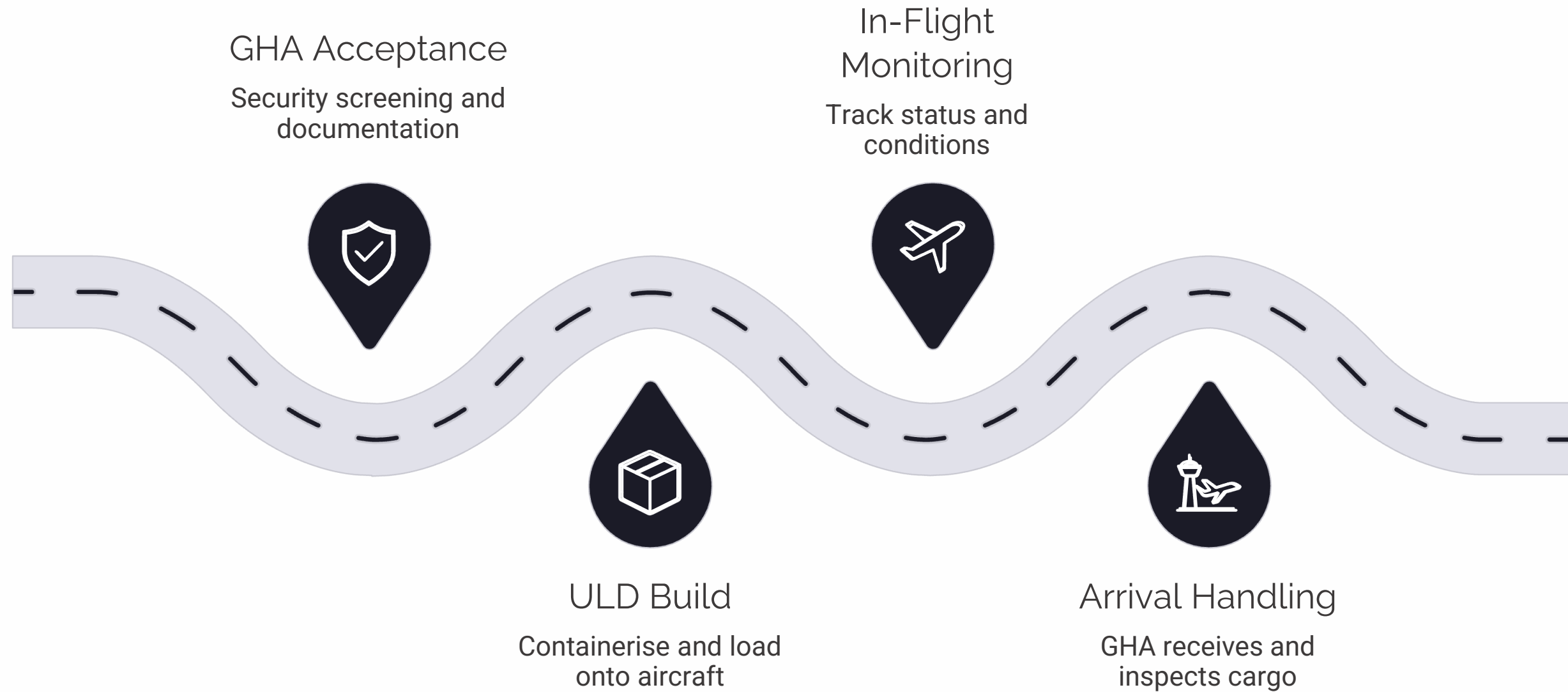


Compliance & Safety

Driving behaviour monitoring, secure parking enforcement, ETA updates to control tower, and structured incident reporting protocol.

4.2 Air Transport

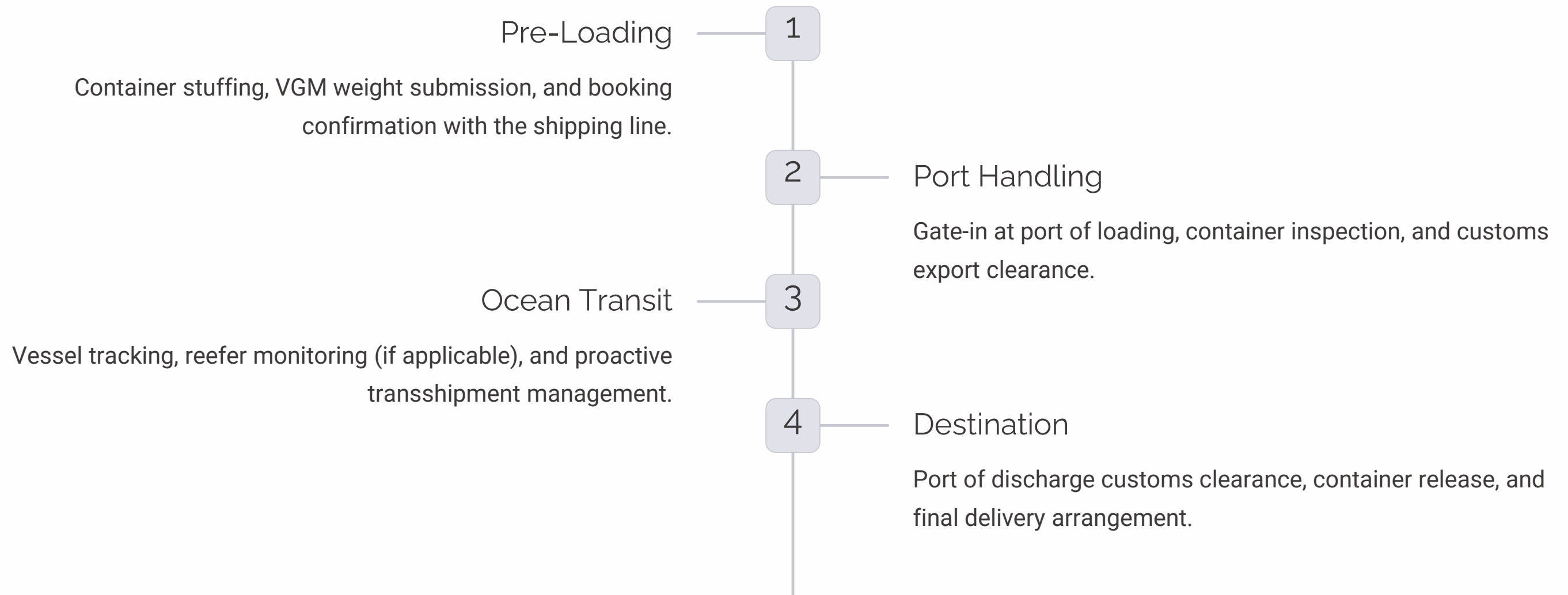
Air freight offers unrivalled speed for time-critical, high-value, or perishable cargo – but demands the most rigorous security, documentation, and handling standards of all transport modes.



Temperature-sensitive air shipments require both active (dry ice, cool containers) and passive (validated insulated packaging) solutions – selected based on lane duration and regulatory requirements (IATA CEIV Pharma, etc.).

4.3 Sea Transport

Ocean freight is the backbone of global supply chains, offering the highest capacity at the lowest cost per tonne – but requiring the longest lead times and the most complex documentation and port management processes.



4.4 Rail Transport

Rail is increasingly strategic for long-haul, high-volume continental flows – offering a compelling cost and CO₂ advantage over road, particularly for pan-European and China-Europe corridors.

Wagon Allocation

Reserve wagons by cargo type (flatbed, box, reefer) aligned to load specifications and intermodal gauge requirements.

Terminal Handling

Coordinate loading/unloading at intermodal terminals, including crane operations and ground transport interfaces.

In-Transit Tracking

Rail tracking via carrier API or wagon-level IoT, with proactive management of intermodal transfer delays.

Temperature (if reefer)

Validate reefer wagon set-point and monitoring data continuity across all border crossings and terminal stops.

4.5 Barge Transport

Inland waterway transport offers a low-cost, low-emission alternative for bulk and container flows in regions with navigable river networks – Rhine, Danube, Mississippi, and Yangtze corridors being most significant globally.

→ Terminal Booking & Loading

Reserve berth and crane slots at inland terminals. Coordinate container or bulk cargo loading against confirmed barge departure schedule.

→ River Transit

Monitor barge position and estimated arrival, accounting for seasonal water level restrictions that may affect maximum draught.

→ Port Interface & Transfer

Manage handover at sea-port interfaces, coordinating with feeder vessel or deep-sea vessel schedules to avoid missed connections.



5. Control Tower Operations

Chapter 5 of 11

The control tower is the nervous system of the enterprise transport network – aggregating real-time signals across all modes, carriers, and geographies to enable proactive decision-making and exception resolution.

VISIBILITY

5.1 Real-Time Visibility

End-to-end shipment visibility requires a multi-layer sensor and data architecture spanning GPS, IoT cargo monitors, and predictive analytics. Visibility without actionability is merely monitoring – the goal is proactive intervention.



Location & ETA

GPS tracking across all modes, machine-learning ETA prediction, and geofence alerts for route deviations and no-stop zone compliance.



Cargo Condition

IoT sensors monitoring temperature, humidity, shock/vibration, and door openings – with real-time alerts for any excursion beyond defined thresholds.



External Signals

Live weather alerts, traffic disruption feeds, port congestion data, and airline delay notifications integrated into the control tower dashboard.

5.2 Exception Management

Exceptions are inevitable in complex multimodal networks. What differentiates leading logistics organisations is not the absence of exceptions, but the speed and quality of their response.

Exception Types

- Transit delay vs. committed ETA
- Temperature excursion (cold chain breach)
- DG incident or near-miss
- Customs hold or regulatory stop
- Vehicle breakdown or driver incident
- Port congestion or flight cancellation

Response Actions

- Customer notification with revised ETA
- Re-route to alternative carrier or lane
- Emergency vehicle replacement
- Regulatory escalation and documentation
- CAPA (Corrective and Preventive Action) trigger

5.3 Performance Monitoring

Control tower KPIs must bridge operational execution and strategic performance. Real-time dashboards should surface both leading indicators (ETA risk) and lagging indicators (OTIF actuals) to support daily decision-making.

OTIF

On-Time In-Full

Primary customer-facing KPI combining on-time pickup and on-time delivery compliance rates.

CO₂

Emissions per Shipment

Tracked per lane and mode against Lean & Green reduction targets and Scope 3 reporting obligations.

T°C

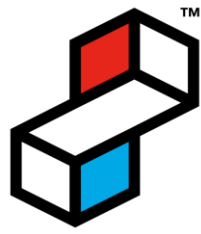
Temperature Compliance

Percentage of cold chain shipments with zero excursions, tracked per carrier, lane, and product category.

DG

DG Compliance Rate

Zero-tolerance metric for dangerous goods documentation, segregation, and incident reporting compliance.



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6. Arrival & Unloading

Chapter 6 of 11

The inbound receiving process is the mirror image of outbound loading – and equally critical. Discrepancies not caught at arrival become inventory errors, financial disputes, and compliance exposures downstream.

INBOUND



6.1 Gate Control — Inbound

Inbound gate control replicates the rigour of outbound procedures, with additional focus on seal verification and cargo condition assessment before any unloading begins.

01

Driver Identity Check

Verify driver identity against the inbound shipment booking and carrier manifest before granting site access.

02

Seal Verification

Inspect seal number against CMR or AWB documentation. Any broken or mismatched seal must trigger an immediate security investigation.

03

Vehicle Inspection

External vehicle condition check, DG placard verification, and reefer temperature download before dock assignment.

6.2 Unloading

Structured unloading operations protect both cargo and personnel. Every anomaly detected during unloading must be documented immediately – it is the sole opportunity to raise a formal carrier claim before custody transfer is complete.

Unloading Sequence

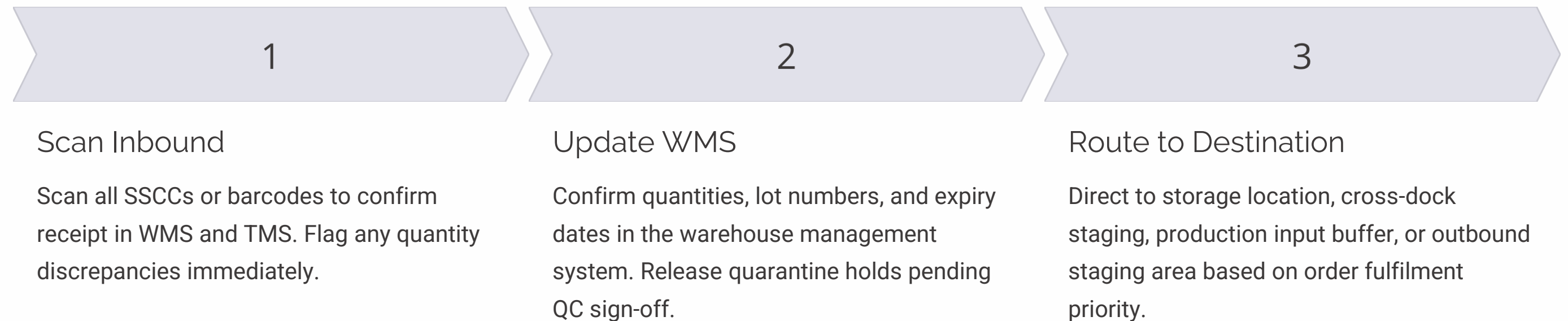
- Assign dock and confirm equipment availability
- Unload in reverse sequence of load plan
- Segregate high-value cargo immediately
- Place DG cargo in designated safe area

Quality Checks

- Damage check – photograph all discrepancies
- Temperature download and excursion review
- DG packaging integrity confirmation
- High-value cargo count and seal verification

6.3 Receiving & Put-Away

The final step of inbound operations updates all system records and routes cargo to its next operational stage. Accuracy at this step is foundational to inventory integrity and production scheduling.



7. Customs & Compliance

Chapter 7 of 11

Customs and trade compliance is one of the highest-risk domains in international supply chains. Errors result in shipment holds, duty penalties, loss of trusted trader status, and reputational damage with customs authorities.

COMPLIANCE



7.1 Export Compliance

Export compliance requires a combination of accurate classification, sanctions screening, and dual-use goods assessment for every international shipment. Automated screening integrated into the TMS is best practice for high-volume operations.

Export Declaration

File correct customs export declaration (EX-1 / EEI) with accurate commodity codes, values, and consignee details. Retain copies per local retention requirements.

DG & Trade Controls

Validate DG compliance with ADR/IATA/IMDG. Screen all parties against sanctions lists (OFAC, EU, UN). Classify dual-use goods and obtain export licences where required.

Origin Documentation

Issue certificates of origin, EUR.1 movement certificates, or REX statements to enable preferential duty treatment at destination.

7.2 Import Compliance

Import compliance determines whether goods clear customs promptly or face costly delays. A proactive approach – pre-filing declarations and engaging customs authorities before arrival – is standard in Authorised Economic Operator (AEO) programmes.

Customs Clearance

File import declaration with correct HS codes, declared value, and Incoterms. Pay applicable duties and taxes or utilise bonded warehouse / customs procedure relief.

Regulatory Checks

Coordinate veterinary, phytosanitary, CITES, FDA, EMA, and food safety inspections. Pre-notify competent authorities where required by regulation.

Inspection & Release

Respond to customs examination requests. Provide supporting documentation promptly to minimise dwell time and demurrage charges.

7.3 Security Compliance

Security compliance programmes provide enterprise supply chains with trusted trader benefits – faster customs clearance, fewer inspections, and recognised partner status in major trading blocs and with key customers.



TAPA & C-TPAT

TAPA FSR/TSR certification for cargo security standards; C-TPAT membership for US import supply chain security partnerships with CBP.



AEO

Authorised Economic Operator status (EU/UK/global equivalents) delivers simplified procedures, expedited customs processing, and mutual recognition benefits.



Aviation Security

Known Consignor (KC), Regulated Agent (RA), and ACC3 certifications required for air cargo security compliance under EU and ICAO frameworks.



8. Delivery & Last-Mile

Chapter 8 of 11

Last-mile delivery is the most cost-intensive and customer-visible segment of the supply chain. It accounts for up to 53% of total shipping cost – making optimisation at this stage disproportionately impactful on both cost and satisfaction.

LAST MILE

8.1 Delivery Scheduling

Effective delivery scheduling balances customer preferences with route efficiency and operational constraints. Proactive appointment booking reduces failed delivery attempts – the single largest driver of last-mile cost inflation.



Time Windows

Negotiate and confirm customer-specific delivery windows. Prioritise narrow windows for just-in-time production supply and retail replenishment.



Access Restrictions

Screen delivery addresses for vehicle size restrictions, low emission zones (LEZ/ULEZ), and night delivery prohibitions before route assignment.



Appointment Booking

Use carrier or TMS booking portal to confirm dock appointments, reducing congestion at customer receiving locations and improving driver wait time KPIs.

8.2 Last-Mile Execution

Last-mile execution quality is the moment of truth for the customer relationship. Digital proof-of-delivery tools and real-time ETA sharing are now table stakes for enterprise-grade last-mile performance.

Route & Sequence

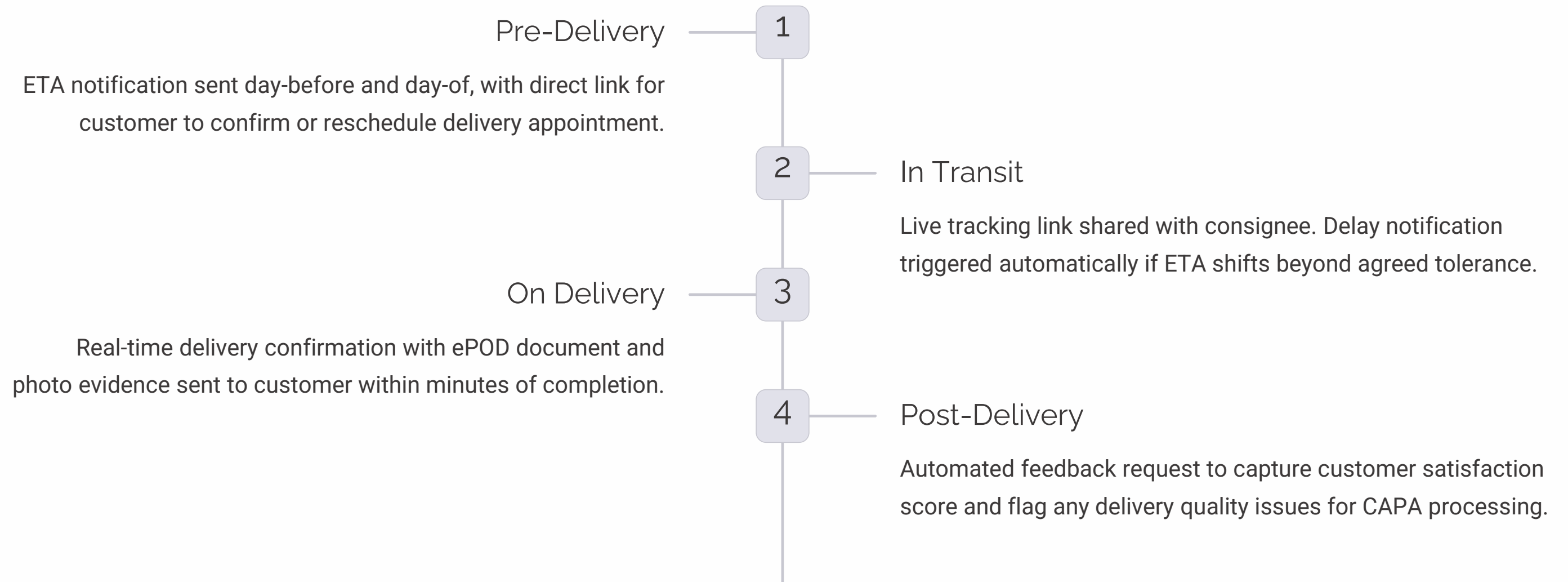
- Dynamic route optimisation accounting for live traffic
- Delivery sequence aligned to time window priority
- Multi-drop load sequence reverse-mapped to route

Proof of Delivery

- Electronic POD (ePOD) with customer signature
- Photo evidence of delivered goods and condition
- Temperature proof for cold chain deliveries
- GPS timestamp and geolocation of delivery event

8.3 Customer Communication

Proactive, multi-channel customer communication at last-mile stage significantly reduces inbound service calls, increases first-attempt delivery success, and is a key driver of net promoter score in B2B and B2C alike.





9. Reverse Logistics

Chapter 9 of 11

Reverse logistics is increasingly a strategic differentiator – driven by circular economy regulation, sustainability commitments, and customer expectations for seamless returns experiences. Poorly managed returns destroy margin and customer trust simultaneously.

REVERSE LOGISTICS

9.1 Returns Management

A structured returns process protects asset value, ensures regulatory compliance, and provides clean data for root cause analysis. Returns must be treated as a distinct inbound flow – not an exception to outbound processes.

01

Return Authorisation

Issue RMA (Return Merchandise Authorisation) with defined reason code, return routing instructions, and packaging requirements before any pickup is scheduled.

03

Condition Assessment

Inspect returned goods against original specification. Categorise as: restock, refurbish, recycle, or dispose. Document all findings with photographic evidence.

02

Pickup & Transport

Schedule dedicated reverse collection, applying same carrier pre-check, documentation, and tracking standards as outbound shipments.

04

Repackaging

Repackage goods to original or secondary standard before re-entering the forward supply chain or dispatching to refurbishment partner.

9.2 Recycling & Disposal

End-of-life processing of returned goods and packaging is both a regulatory obligation and a circular economy opportunity. Leading organisations close the loop – converting waste streams into value streams.



Packaging Recycling

Recover and recycle pallets, cardboard, shrink-wrap, and reusable packaging assets through certified recycling partners.



Product Refurbishment

Assess, repair, and remarket returned products to secondary markets – recovering value and reducing waste-to-landfill volumes.



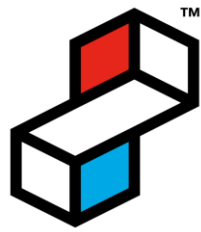
Hazardous Waste

Route DG or hazardous materials through certified waste carriers, ensuring full ADR/Basel Convention compliance and chain-of-custody documentation.



Circular Economy

Integrate reverse flows into circular economy programme – feeding material recovery data into product design and procurement decisions.



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10. Post-Transport Operations

Chapter 10 of 11

Post-transport operations close the financial and performance loop on every shipment. Rigorous billing audit, claims management, and carrier review processes are essential to cost control and continuous network improvement.

POST-TRANSPORT



10.1 Billing & Freight Audit

Freight invoice errors are endemic – industry estimates suggest 3–8% of carrier invoices contain overcharges. A disciplined freight audit and payment process is one of the highest-ROI investments in transport management.

Audit Process

- Match invoice to shipment record in TMS
- Validate rate against contracted tariff
- Check accessorial charges (fuel surcharge, waiting time, tolls)
- Flag discrepancies for dispute before payment

Dispute Resolution

- Raise formal dispute with carrier within SLA timeframe
- Provide supporting documentation (CMR, ePOD, TMS data)
- Track dispute to resolution with clear escalation path
- Update contract if systematic billing errors identified

10.2 Claims Management

A structured claims process ensures the organisation recovers its financial exposure from transport failures – while generating the data needed to prevent recurrence through carrier management and network design decisions.

Damage Claims

Photograph evidence at delivery, raise formal claim within carrier liability window (CMR: 7 days for visible damage, 21 days for concealed).

Loss Claims

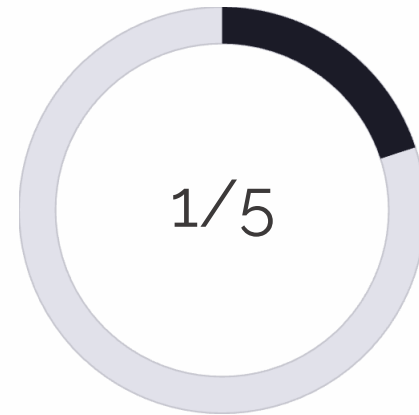
Document shortage against CMR/AWB/B/L, escalate to carrier and insurer simultaneously for shortfall recovery and insurance claim initiation.

Temperature & DG Incidents

Cold chain excursions and DG incidents require immediate notification to QA and regulatory affairs, with parallel financial recovery process initiated.

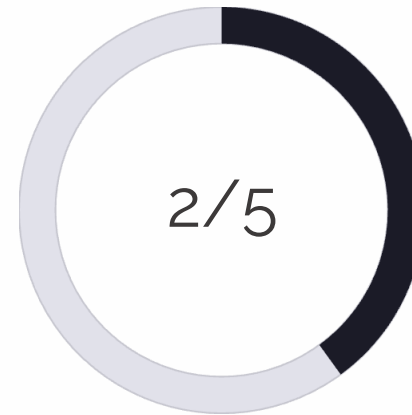
10.3 Carrier Performance Review

Regular, data-driven carrier performance reviews are the primary mechanism for managing carrier relationships, enforcing SLAs, and making informed contract renewal decisions. Scoring should be transparent and shared with carriers in advance of review meetings.



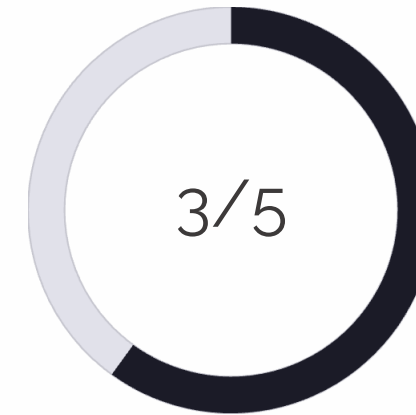
SLA Compliance

On-time pickup and delivery performance against contracted KPIs, segmented by lane and cargo type.



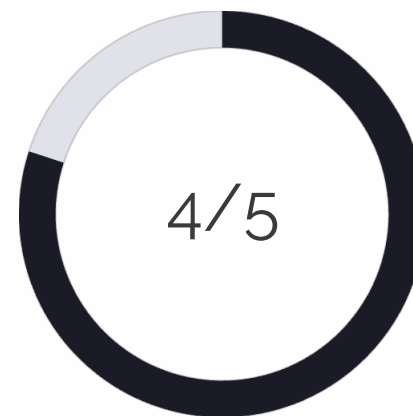
Cost Performance

Actual cost vs. contracted rate, including accessorial charge frequency and billing accuracy rate.



Sustainability

CO₂ emissions per tonne-km, alternative fuel adoption progress, and Lean & Green programme participation.



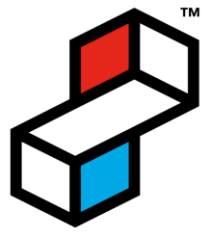
Safety Record

Incident frequency rate, near-miss reporting culture, TAPA audit score, and driver compliance metrics.



Contract Renewal

Composite scorecard determines contract continuation, volume adjustment, or tender re-opening decision.



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11. Continuous Improvement

Chapter 11 of 11

Sustainable competitive advantage in supply chain transportation is not achieved through a single transformation – it is earned through relentless, disciplined, data-driven continuous improvement across people, process, technology, and sustainability dimensions.

CONTINUOUS IMPROVEMENT



11.1 Lean & Green

Lean & Green is the operating philosophy that unifies cost efficiency with environmental responsibility – demonstrating that reducing waste in transport operations and reducing carbon emissions are fundamentally the same objective.



CO₂ Reduction

Set science-based targets per lane and mode. Track Scope 3 emissions monthly against reduction roadmap. Report under CDP and GHG Protocol frameworks.



Modal Shift

Systematically migrate volume from road to lower-emission modes – rail, barge, and sea – where transit time requirements permit. Track shift progress quarterly.



Fleet & Fuel Optimisation

Optimise load factors, reduce empty kilometres, accelerate EV and hydrogen fleet adoption, and track fuel efficiency per carrier and lane.

11.2 ESG Integration

ESG performance in transport is no longer a voluntary commitment – it is a customer requirement, investor expectation, and regulatory obligation. Supply chain leaders must embed ESG KPIs into operational scorecards, not treat them as a separate reporting exercise.

Environmental KPIs

- CO₂ per tonne-km (Scope 3)
- Waste generated and diverted from landfill
- Share of renewable energy in warehouse & fleet
- Packaging material reduction rate

Social KPIs

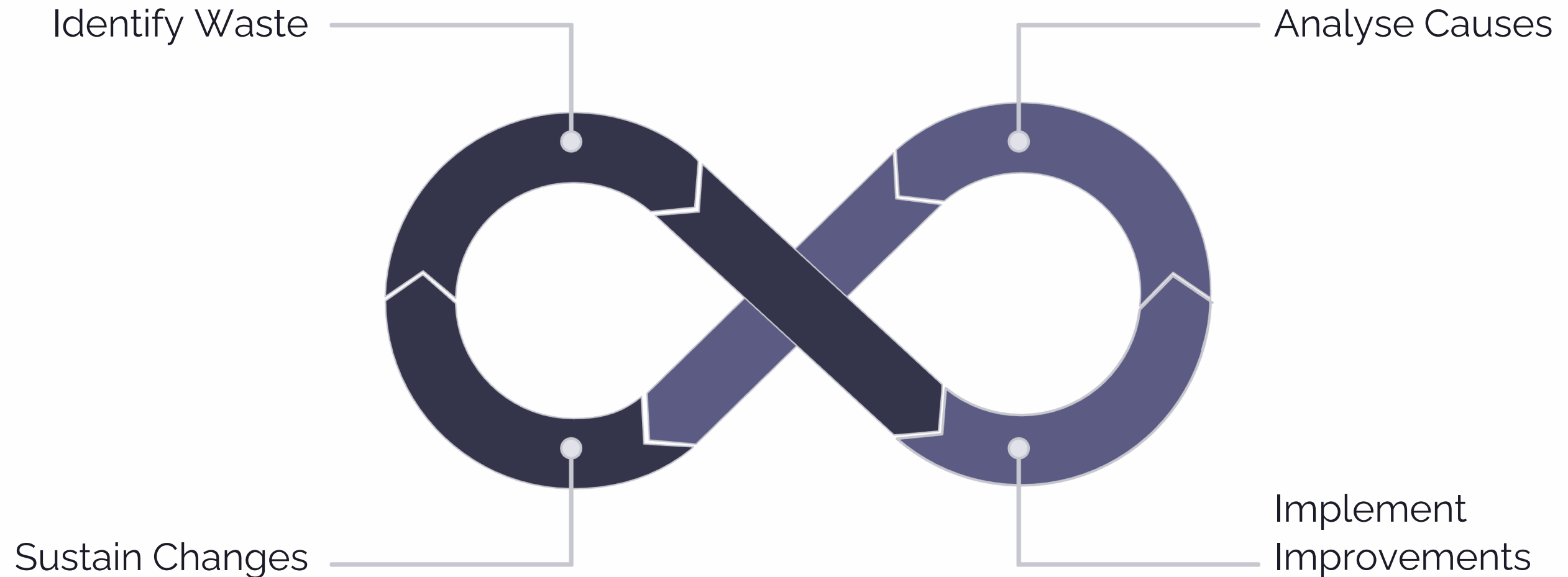
- Driver safety incident rate
- Working hours and fatigue compliance
- Supplier code of conduct adherence
- Diversity in carrier and supplier base

Governance KPIs

- Policy compliance audit scores
- Anti-corruption and ethics training completion
- Data privacy and GDPR compliance rate
- AEO and trusted trader status maintenance

11.3 Kaizen & Lean Process Improvement

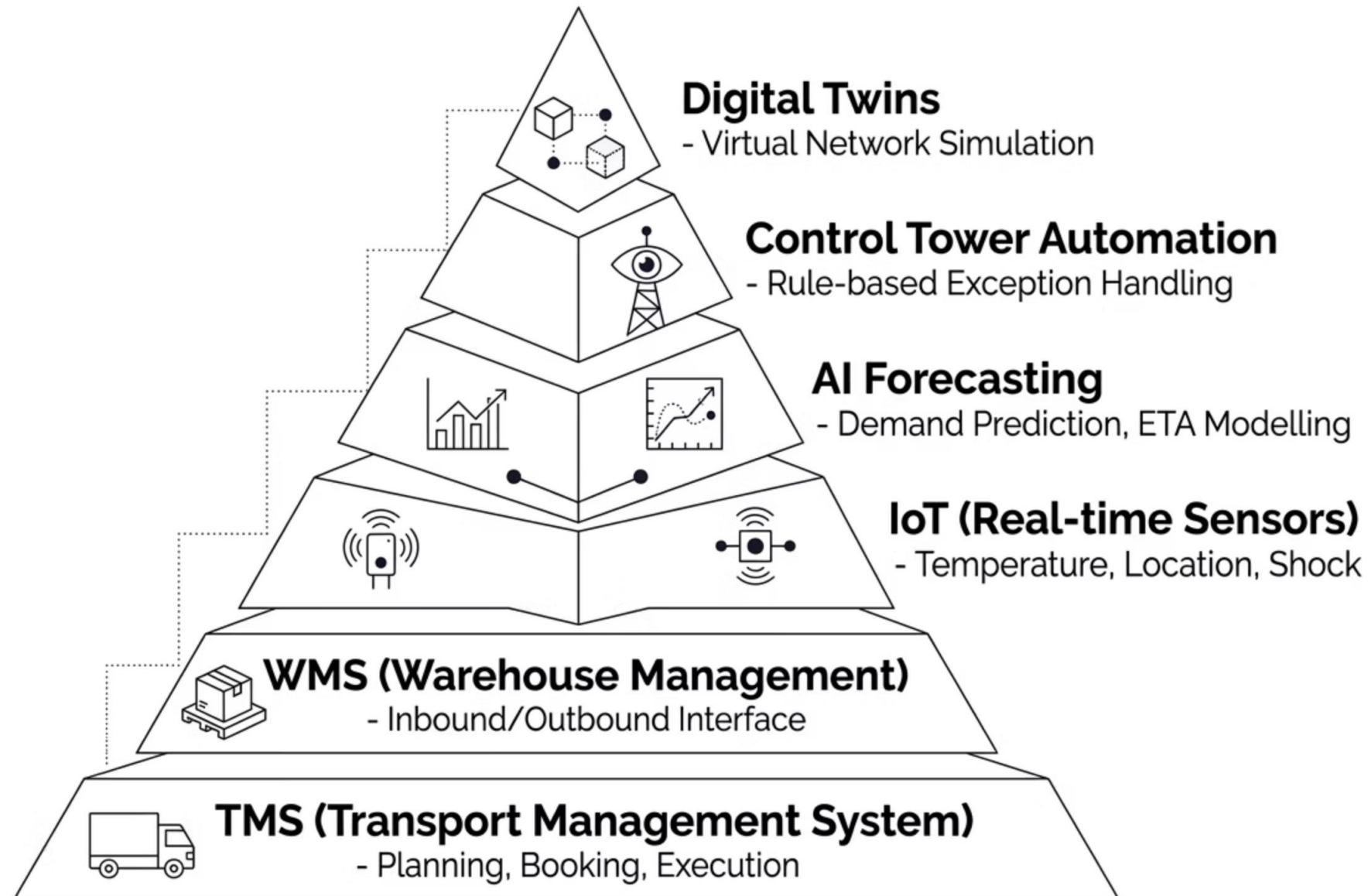
Kaizen – continuous, incremental improvement through the collective intelligence of the people closest to the process – is the engine of operational excellence. In transport, it translates directly into faster lead times, fewer errors, and lower cost per shipment.



Structured problem-solving tools – A3 analysis, 5-Why, value stream mapping – should be deployed on every significant recurring exception to prevent recurrence and build institutional knowledge.

11.4 Digitalization

Technology is the force multiplier of every process improvement initiative. The digital transport stack – from TMS to AI-powered control towers – enables a level of speed, accuracy, and insight that manual processes cannot match at enterprise scale.



End-to-End: The Complete Picture



From strategic network design through real-time execution, customs compliance, last-mile delivery, and continuous improvement – this framework defines what enterprise-grade, maximum-granularity multimodal transport management looks like in practice.

- 1** Strategic Foundation
Network design, strategy, governance, master data
- 2** Planning & Booking
Demand capture, TRP, capacity, scheduling
- 3** Execution
Preparation, loading, multimodal transport, control tower
- 4** Compliance & Delivery
Customs, last-mile, returns, post-transport
- 5** Improvement
Lean & Green, ESG, Kaizen, digitalisation