SOFTWARE OPERATION MANUAL

Conveyor Layout & Throughput Simulator

Complete operating instructions, configuration reference, simulation workflow and troubleshooting guide.

DOCUMENT	DETAIL
Application version	V8.13 - connection distance/time and endpoint-gradient edition
Intended users	Conveyor layout designers, operators, engineers and simulation reviewers
Deployment	Standalone HTML; Chrome or Edge; offline or self-hosted
Manual file	Conveyor_Simulator_User_Manual.pdf (in the same folder as index.html)
Issued	19 November 2026

IMPORTANT SCOPE
This is a planning and throughput simulator, **not** a PLC controller, machinery safety system, or collision-certified digital twin. Validate assumptions against actual equipment before engineering or operational decisions.

Application branding: CentralYantra • Manual branding: Quinta

Contents & operating sequence

1. Installation and how to open the application
2. Interface overview and six-tab workflow
3. Layout: create, select, move and organize conveyors
4. Canvas toolbar and keyboard shortcuts
5. Right-click conveyor menu and conveyor naming
6. Connections: A/B endpoints, wire gradients and transfer units
7. Conveyor Settings: dimensions, motor delays and parcel capacity
8. Destinations & Routing: motor directions and exits
9. Parcels & Infeeds: queues, duplication and random generation
10. Simulation: run, pause, reset, progress and speed
11. Reports: completed PPH, transit, utilization and bottlenecks
12. Encrypted projects: export and import
13. Common errors and clickable validation
14. Example setup and acceptance checklist
15. Glossary, formulas and limitations

RECOMMENDED WORKFLOW
Create layout → connect endpoints → configure conveyor settings → create destinations and routes → set infeeds and parcels → validate → start simulation → review completed PPH → reset before editing.

1 | Installation and opening the simulator

1.1 Contents of the application package

Keep these two files together in the same directory. The manual download button uses a relative link and does not embed the PDF inside the HTML.

File	Purpose
index.html	The standalone simulator application.
Conveyor_Simulator_User_Manual.pdf	This operator manual; downloaded from the footer.

1.2 Run locally

- Extract the ZIP package to a folder on your computer.
- Open **index.html** in a current version of Chrome or Edge.
- Ensure the page has opened completely and that the six tabs appear.

- Click **Download User Manual (PDF)** at the right end of the bottom footer to download the manual.

1.3 On-premises or LAN deployment

Copy both files to the same directory on your web server. For example: **/var/www/conveyor-simulator/index.html** and **/var/www/conveyor-simulator/Conveyor_Simulator_User_Manual.pdf**. Publish that directory through Nginx or your chosen web server. The download link remains relative to the page location and works when both files are served from the same URL path.

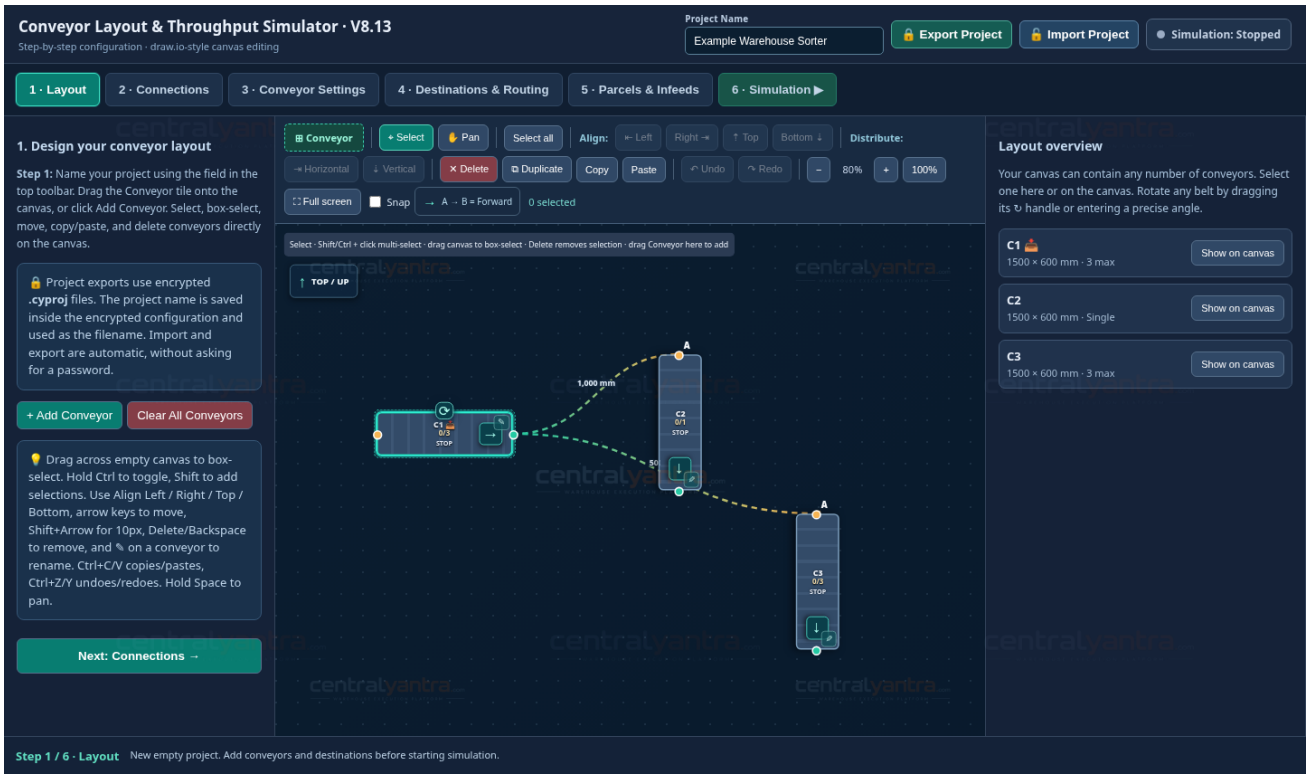
> **BROWSER REQUIREMENT**
> Project export/import uses the browser Web Crypto API. Use current Chrome or Edge, and HTTPS or localhost for a hosted deployment. A local file page (file:///) is supported by current Chromium browsers in testing.

2 | Interface overview

The screen is divided into a top project toolbar, a six-tab navigation strip, a central canvas with editing toolbar, a left task panel, a right detail panel, and a bottom footer. Only the active configuration tab shows its related controls.

Area	What it does
Project Name	Names the design and the exported .cyproj file.
Export Project / Import Project	Encrypted local project backup and restore.
Simulation: Stopped / Starting / Started / Paused	Always-visible run-state indicator.
Six tabs	Layout, Connections, Conveyor Settings, Destinations & Routing, Parcels & Infeeds, Simulation.
Canvas	Create, move, rotate, select, align and connect conveyors.
Bottom footer	Current step, status messages and Download User Manual (PDF).

A new project begins **empty**: no conveyors, destinations or parcels. Simulation Start is disabled until the required configuration is valid.



SCREENSHOT | Tab 1 - Layout and conveyor selection (illustrative project configuration)

3 | Layout tab: create and manage conveyors

3.1 Add, position and select

- Click **+ Add Conveyor**, or drag the **Conveyor** palette tile onto the canvas.
- Click a conveyor to select it; the selected item is highlighted.
- Drag a conveyor to reposition it. Hold **Shift** or **Ctrl** while clicking to add/remove items from a selection.
- Drag across an empty area of the canvas to create a selection rectangle.
- Use **Show on canvas** in the right-side Layout overview to locate an off-screen conveyor.

3.2 Automatic conveyor numbering

New conveyor IDs are chosen from the maximum numeric conveyor ID currently present, not from an indefinitely increasing counter. Renaming allows custom IDs; conveyor names must remain unique. Deleting an item does not automatically renumber other conveyors.

3.3 Layout editing tools

Tool	Purpose
Select	Default pointer mode; click, drag, and box-select conveyors or wires.
Pan	Drag the background to move around the canvas without moving a conveyor.
Select all	Select every conveyor in the current project.
Align Left / Right / Top / Bottom	Align two or more selected conveyors to a common edge.
Distribute Horizontal / Vertical	Space at least three selected conveyors evenly, preserving the outside positions.
Delete	Delete the selected conveyor(s) or selected connection wire.
Duplicate, Copy, Paste	Clone selected items; new conveyor IDs are unique.
Undo / Redo	Revert or reapply supported canvas edits.
Zoom -, +, 100%	Change canvas magnification; this does not change conveyor lengths in mm.
Snap	Align positions to an invisible placement grid.
Full screen	Expand the canvas for more working space.

4 | Canvas shortcuts and selection rules

Keyboard or gesture	Action
Click	Select a single conveyor or connection line.
Ctrl + Click / Shift + Click	Toggle or extend selection of multiple conveyors.
Drag empty canvas	Draw a box selection rectangle.
Arrow keys	Move selected conveyors by one step.
Shift + Arrow	Move selected conveyors by 10 pixels.
Delete / Backspace	Remove selected conveyor(s) or connection wire.
Ctrl + A	Select all conveyors.
Ctrl + C / Ctrl + V	Copy / paste conveyors and supported internal links.
Ctrl + D	Duplicate the selection.
Ctrl + Z / Ctrl + Y	Undo / redo.
Hold Space and drag	Pan the canvas.
Zoom buttons	Magnify or shrink the visual canvas.

KEYBOARD FOCUS
Click the canvas before using canvas shortcuts. If the cursor is inside an input field, Arrow, Delete and other keys may edit the input instead of affecting conveyors.

4.1 Alignment vs distribution

Align places selected conveyors on a common left/right/top/bottom edge. **Distribute** leaves the first and last selected conveyor positions intact and equalizes clear gaps between them. Three or more conveyors are required for distribution. Overlap remains possible when outer conveyors are too close.

4.2 Zoom, pan and logo watermark

The current zoom percentage changes only the viewport scale. Conveyor size, travel distances, and timing parameters are still based on the configured physical values. The CentralYantra watermark is permanent and does not scale up when the canvas is zoomed.

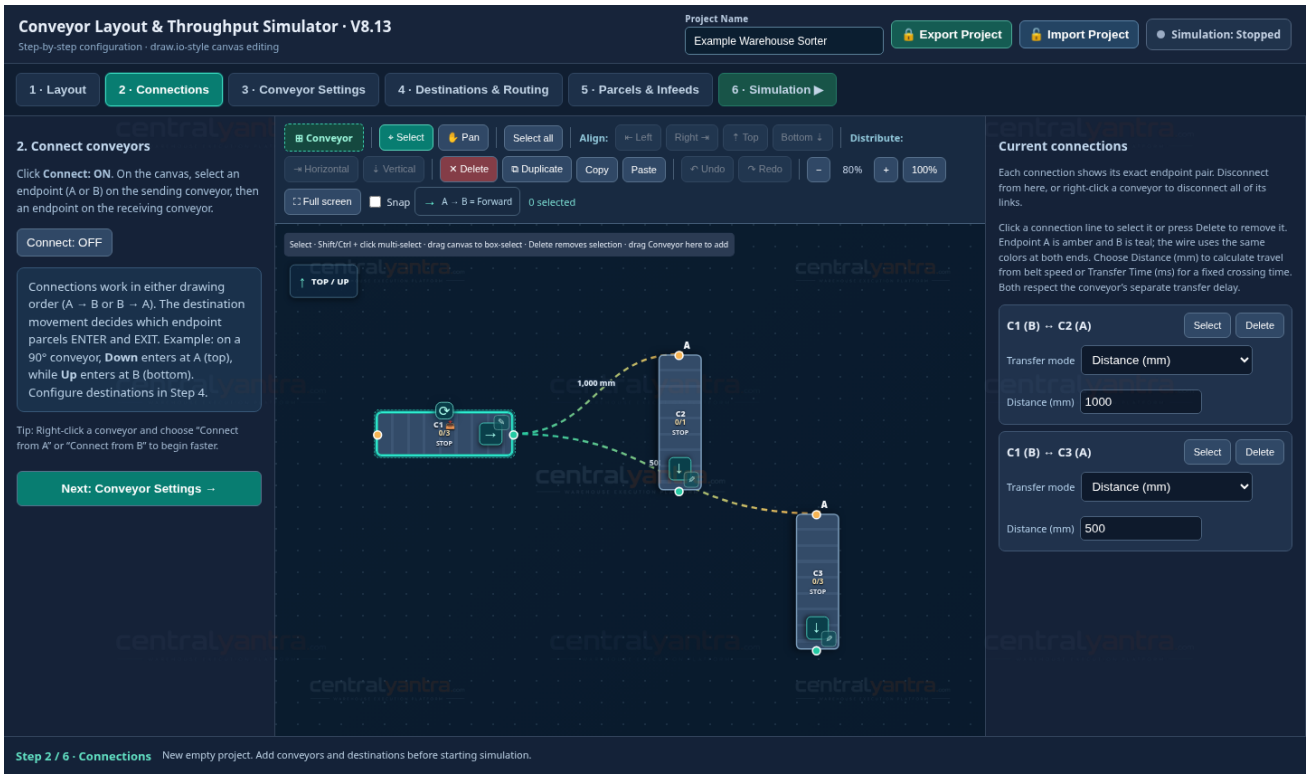
5 | Conveyor right-click menu

Right-click a conveyor to open the context menu. The same conveyor can also be renamed using its small pencil (✎) button directly on the conveyor.

Menu action	Meaning
Rename conveyor	Change its unique displayed ID/name; linked references and parcel assignments are updated.
Edit conveyor settings	Open the Conveyor Settings tab for that conveyor.
Edit destination routing	Open the destination command table for that conveyor.
View live occupancy	Inspect current parcel occupancy when available.
Rotate 90° / Set rotation angle	Rotate clockwise or specify an exact angle.
Duplicate conveyor	Create a new conveyor with copied settings and a unique ID.
Align / Distribute selection	Apply diagram arrangement commands to the selected group.
Single / Multiple parcel capacity	Set allowed parcels per conveyor.
Enable / Disable as infeed	Permit or disallow injecting parcels on the selected conveyor.
Connect from A / Connect from B	Begin connecting from the chosen endpoint.
Disconnect all links	Remove every wire attached to that conveyor.
Delete conveyor	Remove the conveyor after confirmation.

EDITING LOCK
After the simulation starts, configuration changes are locked until **Reset run**, even when the simulation is paused or completed. The menu disables write actions while locked.

6 | Connections tab: wires and endpoint logic



SCREENSHOT | Tab 2 - Endpoint wires, transfer modes and connection list (illustrative project configuration)

6.1 Connect two conveyors

- Open **Connections** and click **Connect: ON**.
- Click endpoint **A** or **B** on the sending conveyor.
- Click endpoint **A** or **B** on the receiving conveyor.
- Verify the new wire in **Current connections**; select it to adjust its transfer mode and value.
- Turn connection mode off when finished.

Connections can be drawn A→A, A→B, B→A or B→B. The draw order does not by itself define the actual route: the configured motor direction and parcel entry/exit sides must match the connected endpoints.

6.2 A/B color meaning

Endpoint	Displayed color	Meaning
A	Amber (#F7B453)	First end in the conveyor's A→B forward orientation.
B	Teal (#24C9A3)	Other end in the conveyor's A→B forward orientation.

The wire gradient follows the colors of its actual connected endpoints. For example, A→B fades amber to teal; B→A fades teal to amber. A→A and B→B are single-color wires. A wire is selectable directly on the canvas and can be deleted with Delete/Backspace.

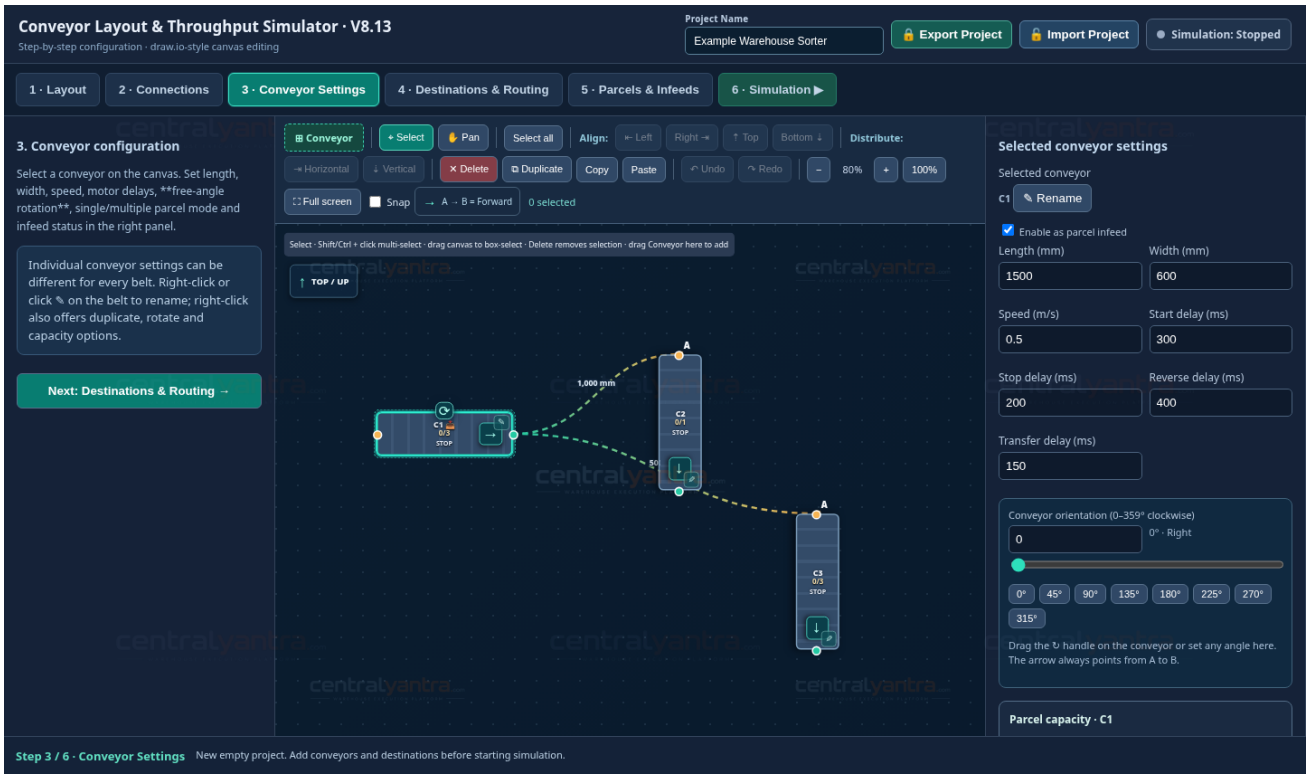
6.3 Distance vs fixed transfer time

Mode	Operator input	Simulated crossing
Distance (mm)	Nonnegative millimeters, e.g. 1,000	Distance ÷ outgoing conveyor speed (converted to mm/s).
Transfer Time (ms)	Nonnegative milliseconds, e.g. 1,500	Uses the specified 1.5-second crossing directly.

Select the mode on the connection row, then edit its value. The selected wire can also be edited through its detail panel. Switching modes preserves the last entered values for both modes; only the active mode affects simulation travel. A conveyor's own **Transfer delay (ms)** is a separate delay added before the wire crossing.

EXAMPLE
1,000 mm at 1 m/s corresponds to 1.0 second across the connection, plus the source conveyor's configured transfer delay. In Transfer Time mode, 1,500 ms is 1.5 seconds regardless of belt speed.

7 | Conveyor Settings tab



SCREENSHOT | Tab 3 - Individual conveyor motor and capacity settings (illustrative project configuration)

Setting	Units and explanation
Length	Millimeters. Used for parcel travel and fit checks.

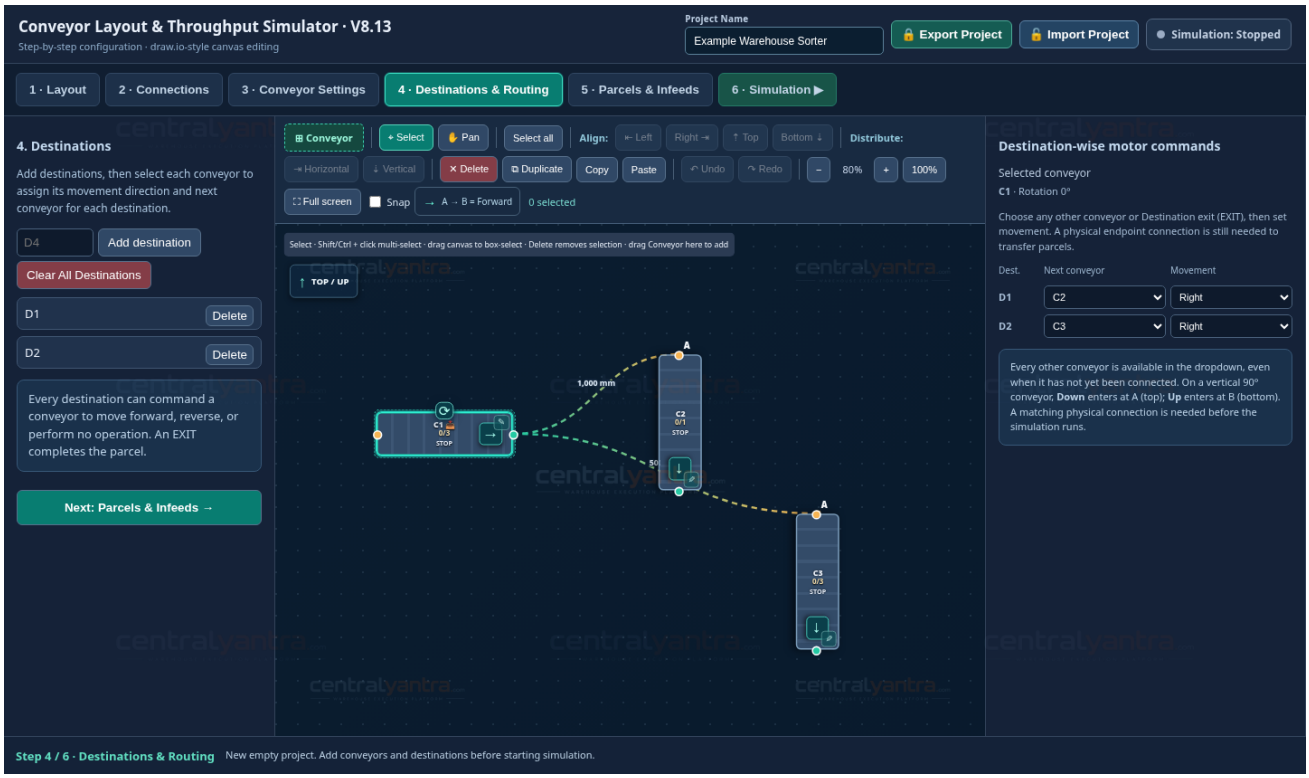
Setting	Units and explanation
Width	Millimeters. A parcel must fit within the belt width.
Speed	Meters per second. Used for belt movement and distance-mode wire travel.
Start delay	Milliseconds before a stopped motor starts running.
Stop delay	Milliseconds associated with stopping.
Reverse delay	Milliseconds associated with switching motor direction.
Transfer delay	Milliseconds of additional source-belt delay before a wire transfer.
Rotation	Any integer angle 0–359°, clockwise on screen. 0° is right, 90° down, 180° left, 270° up.
Allow occupied reversal	Permits the belt motor to reverse after the configured delay while parcels are present.
Single parcel	Capacity is exactly one parcel at a time.
Multiple parcels	Operator-set maximum parcel count, additionally limited by dimensions and spacing.
Enable as parcel infeed	Makes this conveyor available in parcel infeed selection.

Select a conveyor before editing. Different conveyors can have different dimensions, speeds and motor delays. The arrow on each conveyor shows its configured A→B forward orientation; the live motor indicator shows actual motor movement during simulation.

7.1 Capacity and occupancy

In Single mode, incoming parcels wait until the belt becomes available. In Multiple mode, the limit is the maximum allowed occupancy, not a guarantee that that many parcels will fit. Parcel lengths, belt dimensions and minimum gaps also constrain capacity.

8 | Destinations & Routing tab



SCREENSHOT | Tab 4 - Destination definitions and conveyor command matrix (illustrative project configuration)

The application permits any number of destination identifiers. Add destinations on the left, select each conveyor, then configure **Next conveyor** and **Movement** for each destination on the right. The Next conveyor dropdown lists every other conveyor, regardless of whether a wire has been created.

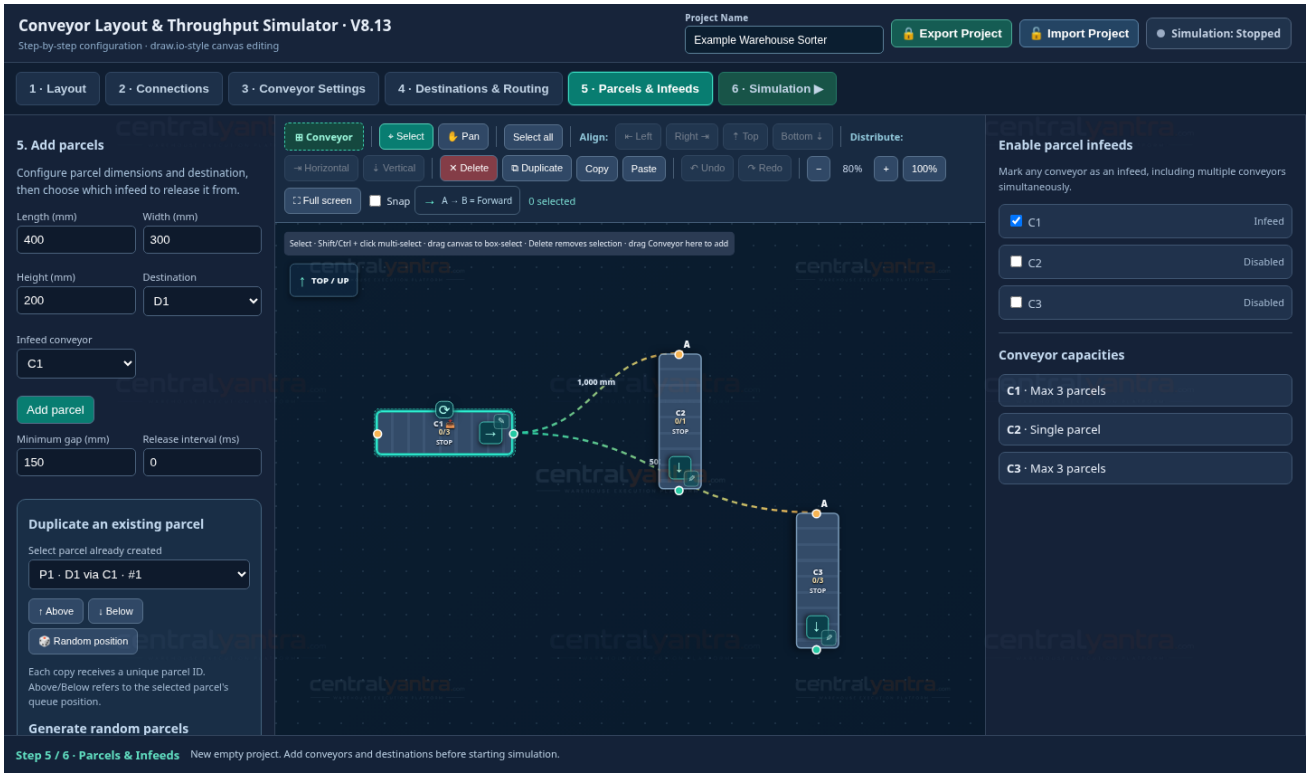
Control	Description
Add destination	Creates a destination such as D1, D2 or D5.
Delete (one destination)	Removes an unused destination; assigned parcel references may need to be cleared first.
Clear All Destinations	Removes all destinations and routes and clears dependent queued parcels; conveyors remain.
Next conveyor	Choose any other conveyor, EXIT, or None.
Movement	Physical movement direction for this destination (forward, reverse, or No Operation, displayed by angle).
Destination exit (EXIT)	Marks the parcel complete when it leaves the selected conveyor.

8.1 How A/B endpoints and motor directions interact

A conveyor moving in its forward direction (A→B) **enters at A** and **exits at B**. A conveyor moving in reverse (B→A) **enters at B** and **exits at A**. For a 90° conveyor, Down is forward and Up is reverse. The route must correspond to a wire connecting the appropriate source exit endpoint to the destination entry endpoint.

FIVE-WAY EXAMPLE
If the infeed routes D5 to B5 and a wire connects **Infeed (B) to B5 (A)**, B5 must be configured to receive at A (for a 90° belt, usually **Down**). Selecting Up would require entry at B and produce an endpoint mismatch warning.

9 | Parcels & Infeeds tab



SCREENSHOT | Tab 5 - Parcel fields, queue and random parcel generator (illustrative project configuration)

9.1 Manual parcel creation

Enter Length, Width, Height (mm), choose an existing destination and an enabled infeed conveyor, then click **Add parcel**. Parcels appear in the queue with a unique ID such as P1. Each queued parcel may be edited or deleted before the run. Parcel height is stored but is not currently used for overhead clearance validation.

Control	Meaning
Length / Width / Height (mm)	Dimensions of the parcel.
Destination	End destination for routing.
Infeed conveyor	Conveyor from which the parcel enters the simulation.
Minimum gap (mm)	Default required spacing between parcels; individual generated parcels may override it.

Control	Meaning
Release interval (ms)	Default spacing in time between parcel releases; generated parcels may override it.
Edit	Load the chosen parcel into the form and save changes.
Duplicate / Above / Below / Random	Create a copy with a new ID at a selected queue position.
Queue Up / Down	Reorder a parcel one position at a time.
Clear All Parcels	Clear all queued parcels without deleting conveyors/destinations.

9.2 Duplication

Choose an existing entry from **Select parcel already created**. Click **Above** to insert the copy immediately above it, **Below** to insert immediately below it, or **Random position** to insert into a random queue position. The source parcel remains unchanged.

10 | Generate Random Parcels

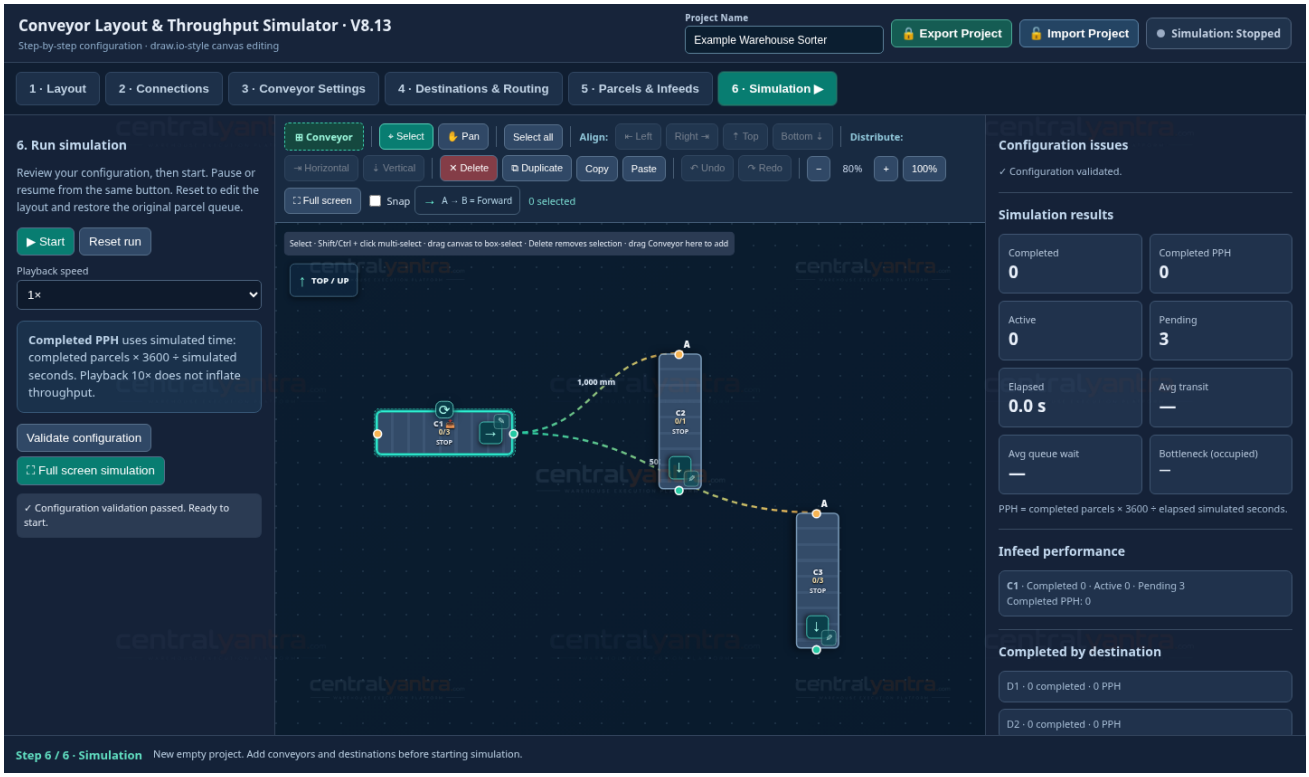
The random generator can create 1–2,000 parcels at once. Enter the **Number of parcels** and choose **Append to bottom**, **Add to top**, or **Random positions**. Each of seven attributes has its own Random/Fixed mode. Fixed shows an editable number or a selected destination/infeed.

Attribute	Random mode	Fixed mode
1. Length	Random fit-compatible length (mm)	Exact mm value
2. Width	Random fit-compatible width (mm)	Exact mm value
3. Height	Random 60–500 mm	Exact mm value
4. Destination	Random configured destination	Choose one destination
5. Infeed	Random enabled infeed	Choose one infeed
6. Min Gap	Random 0–300 mm	Exact gap in mm
7. Release interval	Random 0–1,000 ms	Exact ms value

Length randomization is bounded by the shortest configured conveyor and normally uses 100–750 mm; width uses the narrowest belt and normally 80–450 mm. When the belts are smaller, the limits shrink accordingly. **All Random** and **All Fixed** set every field at once, after which you can override individual fields.

GENERATION RULES
Configure at least one conveyor, an enabled infeed and a destination before generating parcels. A Fixed length/width must fit the configured belts. Generated gap and release interval settings travel with each generated parcel. Random output is not repeatable unless you record the generated project.

11 | Simulation tab: operating the run



SCREENSHOT | Tab 6 - Start, Reset, speed and results (illustrative project configuration)

11.1 Start, pause, resume and reset

- Finish the six-tab configuration and open **Simulation**.
- Click **Validate configuration**. If an issue appears, click the issue to jump to the appropriate tab and highlight the affected item.
- Click **Start** when enabled. The status changes from Stopped to Starting/Started.
- Click the same button to **Pause**; click again to Resume. Progress is maintained.
- Click **Reset run** to restore the original parcel queue and unlock all editing controls.

After Start, all configuration panels and edits are locked until Reset, even after Pause or completed runs. Zoom, viewing, simulation speed, progress and relevant control buttons remain usable.

11.2 Speed and progress

Option	Description
1× / 2× / 5× / 10×	Playback multiplier; 10× consumes simulated seconds faster but does not multiply throughput.
Progress bar	Percentage = completed parcels ÷ original run parcel count × 100.
Full screen simulation	Hides configuration panels and keeps Start/Pause, Reset, speed, PPH, elapsed time, zoom and Exit Full Screen available.
Stopped / Starting / Started / Paused	Top-right run state indicator.
Reset	Restores the original queued parcels and re-enables project editing.

12 | Simulation metrics and interpretation

Metric	Interpretation
Completed	Number of parcels that successfully reached EXIT.
Completed PPH	Finished parcels per simulated hour, based on elapsed simulated time.
Active	Parcels currently on conveyors or travelling on connections.
Pending	Parcels not yet released from their assigned infeed queue.
Elapsed	Total simulation time in seconds, independent of wall-clock playback speed.
Avg transit	Average finish time minus system entry time for completed parcels.
Avg queue wait	Average time before parcels enter the system (for completed parcels).
Bottleneck (occupied)	Simple occupancy-based bottleneck indicator, not full capacity optimization.
Infeed performance	Completed/active/pending and completed PPH by infeed.
Completed by destination	Completed parcels and completed PPH for each destination.
Conveyor utilization	Estimated conveyor busy-time share.
Live conveyor occupancy	Parcel IDs and counts currently on each conveyor.

12.1 Throughput formula

COMPLETED PPH
Completed PPH = completed parcels × 3,600 / elapsed simulated seconds.
Example: 100 parcels finish in 300 simulated seconds → 1,200 completed parcels per hour. Early-run PPH can fluctuate because the observation window is small.

Average waiting time in this version is the system-entry wait, not a complete queue delay decomposition at every connection. Treat estimates as planning inputs and compare the simulated behavior with measured machine data.

13 | Encrypted project files

Use the Project Name field in the top toolbar to name your design. **Export Project** downloads a project file using that name and extension **.cyproj**. **Import Project** opens a supported encrypted .cyproj file and restores the saved project name, conveyors, links, routes, parcel queue and relevant settings.

13.1 Export

- Enter a meaningful name, e.g. **Sorter_Line_A**.
- Click **Export Project**.
- Save the resulting **Sorter_Line_A.cyproj** to your chosen folder.
- Keep backups before important changes or software updates.

13.2 Import

- Open the application and click **Import Project**.
- Select a supported .cyproj project file.
- Wait for decryption and validation to complete.
- Review the imported conveyors, destinations, connection modes and parcels before starting.

SECURITY NOTE
Exports use AES-256-GCM with PBKDF2-derived key material, but this passwordless standalone edition contains a compatibility key in the HTML source. The file is not plaintext and accidental editing is detected, but it is **not** strong protection against someone who can inspect the application code. Restrict access to the app and project files when confidentiality matters.

Do not manually edit .cyproj contents. The importer rejects corrupted, unsupported, malformed or non-encrypted files. Very old plain JSON exports are not imported by this version.

14 | Validation and troubleshooting

When validation fails on the Simulation tab, click the error message. The simulator attempts to open the related tab, select the relevant conveyor/parcel/connection, and highlight the item for correction.

What you see	Likely cause	What to do
Start disabled	Missing/invalid configuration.	Add a conveyor, destination, enabled infeed, parcel, and complete the required routes.
Missing route for Dn	No next conveyor/EXIT selected.	Select the conveyor; set Dn Next conveyor and Movement.
No Operation blocks Dn	One conveyor is disabled for this destination.	Set a movement direction for the destination on that conveyor.
Connect X (B) to Y (B)	A link endpoint does not match source exit / target entry.	Check both motors' directions and select/connect the required A or B endpoints.
Routing loop	Route returns to an already visited conveyor.	Check Next conveyor choices and break the cycle.
Parcel does not fit	Length or width exceeds a belt.	Adjust dimensions or select a compatible belt.
Invalid infeed	Parcel refers to a non-enabled/deleted infeed.	Enable the conveyor or reassign the parcel.
Simulation appears idle	Parcels blocked, conveyor stopped or route invalid.	Inspect commands, connection timing and occupancy; reset before editing.
Cannot edit	A run has already started.	Use Reset run, not Pause, to unlock edits.
Keys not moving selection	Focus is inside an input rather than canvas.	Click the canvas and select conveyors first.
Import fails	Unsupported/corrupted file or incompatible key.	Use a project exported from a compatible edition; check file integrity.
Manual button fails	PDF missing from page folder.	Put Conveyor_Simulator_User_Manual.pdf beside index.html.

15 | Example: build a two-destination sorter

- **Layout:** Add C1, C2, C3. Place C1 horizontally and C2/C3 vertically. Rotate vertical conveyors to 90°.
- **Settings:** Mark C1 as an infeed. Set lengths, widths, speeds and capacity. Use single parcel on C2 if required.
- **Connections:** Connect C1 (B) → C2 (A), and C1 (B) → C3 (A). Choose mm or ms for each connection.
- **Destinations:** Create D1 and D2. On C1 set D1 next=C2, D2 next=C3, movement=Right.
- **End conveyors:** On C2 set D1 next=EXIT and movement=Down. On C3 set D2 next=EXIT and movement=Down. Unused routes can be No Operation.
- **Parcels:** Add P1 for D1 and P2 for D2, both via C1, with dimensions that fit every relevant belt.
- **Validate and run:** Resolve any endpoint/routing warnings, then click Start and observe Completed PPH, progress, active counts and destination totals.

- **Reset and save:** Reset to unlock editing, then Export Project for later use.

ENDPOINT CHECK
For the setup above, C1 Right exits at B. A 90° receiving conveyor moving Down enters at A. If you change the receiver to Up, its entry side becomes B and the link must change accordingly.

16 | Final acceptance checklist

Check	Pass when…
Project name	Name is meaningful; exported filename matches it.
Canvas	All conveyors visible, positioned, renamed and oriented correctly.
Connections	Each physical wire uses intended A/B endpoints and has mm or ms configured.
Routing	Every required destination follows a valid route to EXIT.
Capacities	Single/multiple settings agree with intended conveyor occupancy.
Infeeds	All parcel entry conveyors are enabled.
Parcels	Dimensions, gap, release interval and destination assignments are correct.
Validation	No unresolved error remains before Start.
Simulation	Completed count and per-destination totals match expectations.
Performance	Throughput and queue behavior are compared with independent benchmarks.
Backup	Encrypted .cyproj export and import round-trip are confirmed.
Documentation	PDF is present alongside index.html and footer download works.

17 | Glossary and engineering assumptions

Term	Definition
A / B endpoint	The two ends of a conveyor used for physical connections and forward/reverse movement.
Infeed	A conveyor authorized to receive parcels from the queue.
Destination	A selected final sort exit identifier, e.g. D1, D2.
No Operation	Motor command that prevents movement on a particular conveyor for a destination.
EXIT	End of a destination route; parcels are considered completed.
Transfer delay	Source conveyor delay prior to a connection crossing.
Connection travel	Distance-derived or fixed time required to cross a wire.
PPH	Parcels per hour, extrapolated from completed count and simulated seconds.
Snap	Canvas-only position alignment, not a physical measurement.
Utilization	Estimated fraction of time a conveyor is busy.
Capacity	Maximum parcel occupancy allowed, subject also to spatial constraints.
Release interval	Waiting time parameter for admitting additional queued parcels at an infeed.

This is a simplified planning simulation. It does not model all PLC interlocks, sensor noise, conveyor acceleration profiles, parcel mechanics, slip, three-dimensional height collisions, equipment faults or certification standards. For factory deployment, verify with measured belt speeds, distances, real delays, physical dimensions and machine safety controls.

Support and version handling

When reporting a problem, include the application version, a sanitized encrypted project file if sharing is permitted, the error text, relevant conveyor/endpoint IDs, expected behavior, and a screenshot. This greatly improves reproducibility.

> **KEEP THESE FILES TOGETHER**
> **index.html**
> **Conveyor_Simulator_User_Manual.pdf**
> Place both at the same directory level for local and on-premises deployments.