

AccessRoute HK: Product Manual

A complete journey through the pages and GenAI services

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Abstract

AccessRoute HK connects journey planning, accessibility needs, indoor and outdoor maps, rail transfers, and step-by-step navigation. This manual follows a complete journey from PopCorn 2 to the public interchange near Corn-wall Street Park and the City University residences in Kowloon Tong. It then shows lift routing, obstacle reporting, landmark-photo localization, weather updates, and caregiver settings. Each walkthrough links a user action to a page result and its backend logic. Four generative artificial intelligence (GenAI) services support language preferences, visual observations, map evidence matching, and Cantonese guidance.

1 Follow one continuous journey

The main example uses ordinary walking in sunny weather. It includes origin walking, rail, and destination walking: 13 steps, approximately 1,010 metres of walking, and four floor transitions. The lift example uses an elderly-traveller profile, approximately 1,507 metres of walking, and three floor transitions. The photo example identifies the public passage near A-1 Bakery, shop LG1-51, in Festival Walk.

The screenshots retain the product's Traditional Chinese interface. English instructions below identify the same controls and explain the displayed result. Read the current action, check the next action, and complete a step after reaching its endpoint. The fixed bottom controls provide obstacle reporting, location assistance, and step completion.

2 Choose the places and needs

2.1 Set the departure and destination

On the home page, choose PopCorn 2 in **Departure**. Choose the Kowloon Tong park/residence

interchange in **Destination**. Figure 1 shows both fields and the planning action. Scroll through the central area to review travel needs and weather. Press **Plan route** after checking the selections.

The place selector offers 12 scenes. These include Hysan Place, PopCorn 2, Kowloon Tong, Shek Kip Mei Estate's service facilities building, government offices, and municipal-services buildings. Both place fields use the same scene catalogue. The backend saves scene identifiers and loads their public entrances, destinations, and rail connection points.



Figure 1: Home page: select PopCorn 2 and the Kowloon Tong interchange, then press Plan route.

2.2 Reverse the journey

Press **Swap departure and destination**. Kowloon Tong becomes the departure and PopCorn 2 becomes the destination (Figure 2). Press the same control again to return to the main example. Plan

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after choosing the direction.

The backend searches the directed walking network in the selected direction and rebuilds the rail connection. Place order determines the departure entrance, destination exit, and instruction sequence.



Figure 2: Return journey: the swap control places Kowloon Tong first and PopCorn 2 second.

2.3 Reuse a caregiver profile

Open **Caregiver settings**. Select the elderly profile and require lifts for floor changes. Press **Save caregiver default**. The home page displays the saved needs, as in Figure 3.

Apply to this journey changes the active journey. Saving a caregiver default also stores the reusable profile. **Restore original defaults** restores ordinary walking. The session keeps the reusable profile and active journey preferences as separate records.

3 Configure access and reading

3.1 Select a travel profile

Caregiver settings offer ordinary walking, wheelchair, elderly traveller, stroller, and heavy luggage. Lift choices cover required lifts, profile-dependent use, preferred avoidance, and avoidance. Stairs and escalators have separate



Figure 3: Saved needs appear on the home page alongside weather and the route-planning action.

switches. The elderly example selects required lifts and excludes stairs (Figure 4).

Route objectives include balanced, shortest, sheltered, indoor, lower effort, and faster. The backend first checks each passage against the selected access conditions. It then ranks eligible paths using the route objective. Wheelchair settings include a default maximum slope of 8.33%; required-lift settings select lift-based floor changes.

3.2 Enter measurable passage conditions

Enter 5 in maximum acceptable slope and 1 in minimum passage width. Select the verified-accessibility-attributes option and press Apply to this journey. Figure 5 shows these values together with lift and route choices.

The backend stores 5% as a slope ratio of 0.05 and width as 1 metre. Passage checks compare slope and width with these thresholds. The verified-attributes option adds a check on the recorded access information. The same conditions apply during initial planning and remaining-route updates.

3.3 Set text, directions, and voice

Scroll to navigation preferences. Select detailed text, direction hints, and Cantonese narration, then

Figure 4: Caregiver settings: choose the elderly profile and require lifts for floor changes.

Figure 5: Concrete access settings: maximum slope 5%, minimum width 1 metre, and verified passage attributes.

choose standard, larger, or extra-large text. Press Apply to this journey. Figure 6 shows the reading and narration switches.

Extra-large text uses a 200% scale. The central content scrolls while the primary actions stay at the bottom. Equivalent text steps provide a list view of the journey. The browser selects a Hong Kong Cantonese voice and reads the current instruction; step completion changes the instruction for the next action.

Figure 6: Navigation preferences: detailed text, direction hints, Cantonese narration, and text size.

4 Describe the journey in words

4.1 Submit one complete request

Keep the elderly and required-lift settings from the previous example. Open **Choose places by voice/text**. Enter the request shown in Figure 7. Its English translation is “From PopCorn 2 to Kowloon Tong, with Mum, avoid stairs, and prefer covered passages.” Press **Submit and analyse**.

The voice-description control converts spoken Cantonese into editable text. Review the transcript, make any changes, and submit. Typed and spoken requests enter the same preference-confirmation workflow.



Figure 7: Language input: submit places and travel needs in one request.



Figure 8: Review the interpreted needs, then confirm the selection for this journey.

4.2 Check and apply the result

The page lists the recognized needs before applying them (Figure 8). Check the departure, destination, elderly profile, lift use, stair avoidance, and sheltered objective. Press **Confirm and apply**. Figure 9 shows the resulting labels on the home page.

This example combines the new stair and shelter request with the existing elderly and lift settings. The preference service reads both the request and active profile. Its structured fields become visible labels; confirmation saves them as the active travel needs. During navigation, the same operation updates the remaining route from the current position.

5 Read the route before starting

5.1 Return to the ordinary-walking example

Open caregiver settings and restore the original defaults. Use ordinary walking, allow stairs and escalators, select the balanced objective, and use sunny weather. Keep PopCorn 2 as the departure and Kowloon Tong as the destination. Press Plan route.

The overview reports approximately 1,010 metres of walking and four floor transitions (Figure 10). These values summarize the walking stages. Rail instructions appear in their own stage.



Figure 9: Confirmed needs appear as the active journey preferences.

The page offers route overview, segmented steps, return to editing, and start navigation.



Figure 10: Ordinary-walking overview: approximately 1,010 metres, four floor transitions, and 13 steps.

5.2 Inspect each scene

Select PopCorn 2 in the overview-map scene selector. Figure 11 shows the origin and its first floor-change point. Select Kowloon Tong to inspect the destination approach. Zoom and change map views while retaining the journey summary.

The backend calculates origin walking to the rail connection and destination walking from the arrival station. It inserts the rail connection between these paths and converts the combined journey into continuous step numbers.

5.3 Read the three stage lists

Open **Segmented steps**. Select origin walking to read steps 1–4 (Figure 12). Select rail to read steps 5–7 (Figure 13). Select destination walking to read steps 8–13 (Figure 14). Scroll each list to read its remaining entries.

The main rail connection starts at Tseung Kwan O Station, changes from the Tseung Kwan O Line to the Kwun Tong Line at Tiu Keng Leng, and ends at Kowloon Tong. The station stage directs the traveller towards the Festival Walk/F-exit connection. Press **Start navigation** to begin step 1.



Figure 11: Overview map: switch to PopCorn 2 to inspect the departure corridor and floor-change point.



Figure 12: Origin list: four walking steps connect PopCorn 2 to Tseung Kwan O Station.



Figure 13: Rail list: board, change at Tiu Keng Leng, and leave the train at Kowloon Tong.



Figure 14: Destination list: steps 8–13 continue from the station to the public interchange.

6 Complete all 13 steps

Each navigation page shows the stage, current step, map or rail card, current action, and next action. After completing a step, press **Completed this step, continue**. The backend moves the current position to that step's endpoint and returns the next step. The following figures show every step in order.

6.1 Step 1: walk the 1/F corridor

Walk along the public corridor for 173 metres towards the floor-change facility. Figure 15 displays the 1/F location and previews the escalator. Complete the corridor before advancing. The corridor edges form one walking segment with a common floor and endpoint.



Figure 15: Step 1: walk 173 metres along the 1/F public corridor. The next action uses an escalator.

6.2 Step 2: descend to G/F

Use the indicated escalator from 1/F to G/F. The page records a 17-metre transition and previews the G/F corridor (Figure 16). On reaching G/F, press Continue. The backend changes the current node and floor to the escalator's destination.

6.3 Step 3: follow the ground-floor corridor

Walk 165 metres along the G/F public corridor (Figure 17). Check the map endpoint and station-link preview. Advance after reaching the corridor



Figure 16: Step 2: use the escalator from 1/F to G/F, then continue.

end. The remaining path retains the same destination while the current position progresses along the origin stage.



Figure 17: Step 3: follow the G/F corridor for 165 metres towards the station connection.

6.4 Step 4: reach the station connection

Follow the 166-metre connection to Tseung Kwan O Station (Figure 18). The next-action preview switches to boarding the Tseung Kwan O Line. Complete the connection to enter the rail stage. The journey keeps the origin endpoint and rail boarding point linked through the scene's station connection.



Figure 18: Step 4: walk 166 metres to the Tseung Kwan O Station connection.

6.5 Step 5: board towards North Point

Board the Tseung Kwan O Line towards North Point and alight at Tiu Keng Leng. Figure 19 shows the rail action and next transfer. Follow the station's train-direction signs and displays. Mark the step complete at the interchange station. Rail steps carry station and direction instructions within the continuous journey sequence.

6.6 Step 6: change to the Kwun Tong Line

At Tiu Keng Leng, change to the Kwun Tong Line towards Whampoa (Figure 20). Use the station's platform signs to find the connection. Complete the transfer after boarding the indicated direction. The backend advances to the arrival instruction while retaining the destination walking stage.



Figure 19: Step 5: take the Tseung Kwan O Line towards North Point and alight at Tiu Keng Leng.



Figure 20: Step 6: change at Tiu Keng Leng to the Kwun Tong Line towards Whampoa.

6.7 Step 7: leave at Kowloon Tong

Alight at Kowloon Tong and follow signs towards the Festival Walk connection and F exit (Figure 21). Check signs for the public passage, station lifts, and nearby exit. Continue after reaching the connection. The next step begins the destination walking stage at the station lift.



Figure 21: Step 7: alight at Kowloon Tong and follow the Festival Walk/F-exit connection.

6.8 Step 8: reach the covered bridge

Use the F-exit accessible lift from the station concourse to the covered bridge (Figure 22). The page records a 4-metre transition. After arriving on the bridge, complete the step. The lift's destination node provides the starting position for the bridge segment.

6.9 Step 9: reach the bridge fork

Walk 79 metres along the covered bridge. At the fork, follow the ordinary-walking route towards the right-hand stairs (Figure 23). Read the next-action preview before advancing. The selected route determines the action at this shared fork; the mall branch later uses the entrance ahead.

6.10 Step 10: descend beside the entrance

Use the Festival Walk bridge stairs shown in Figure 24. The current segment covers 14 metres



Figure 22: Step 8: take the F-exit lift from the station concourse to the covered bridge.



Figure 23: Step 9: walk 79 metres to the bridge fork; the next action uses the right-hand stairs.

from the LG1 bridge-entrance area towards elevation 19.1 metres. Expand the full instruction to read the floor and facility description. Complete the step after descending to the outdoor connection.



Figure 24: Step 10: descend using the bridge stairs beside the Festival Walk entrance.

6.11 Step 11: follow the outdoor link

Walk 34 metres along the outdoor station-link passage (Figure 25). The next action points towards the park-side stairs. Continue after reaching the passage end. The map switches to geographic route geometry for the outdoor connection.

6.12 Step 12: follow the park-side stairs

Follow the grouped park-side stairs and connecting paths for 342 metres (Figure 26). The instruction covers the linked stair segments from elevation 19.0 to 43.7 metres. Expand the full instruction for the longer description. Complete the grouped segment at its endpoint. The backend retains the underlying path edges within this single user action.

6.13 Step 13: confirm arrival

Walk the final 16 metres towards the public interchange near Cornwall Street Park and the CityU residences (Figure 27). Press **Confirm arrival at**



Figure 25: Step 11: follow the outdoor connection for 34 metres.



Figure 26: Step 12: follow 342 metres of park-side stairs and connecting paths.

destination on reaching the public endpoint. Figure 28 shows the completed journey and the action for another plan.

Arrival moves the session to the final node and completed state. The paired page receives the same completed journey. Planning again returns to place and preference selection with the saved caregiver profile available.



Figure 27: Step 13: walk the final 16 metres and confirm arrival at the public interchange.



Figure 28: Arrival confirmation completes the journey and provides a new-planning action.

7 Inspect the navigation space

7.1 Use maps and full instructions

Open **Map tools**. Auto view selects a floor plan for indoor segments and a geographic plan for bridge or outdoor segments. The full-route plan displays the scene. The floor-plan control selects a floor and provides zoom and reset actions. The 3D view displays buildings and route geometry (Figure 29).

Use zoom or rotation to inspect the 3D view. Reset north or follow the current step to orient the map. Expand the current full instruction or the next-step description for more text. Open current position and travel needs to check the active context; open equivalent text steps to read the route as a list.

The maps share the session's current node and route segment. Floor geometry draws indoor passages, geographic coordinates draw outdoor lines, and building outlines support 3D context. Map-view state stays separate from journey progress, so changing views retains the current step.

7.2 Compare the nearby Street View

Choose **Nearby Street View**. Figure 30 shows the panorama near the Festival Walk LG1 entrance, approximately 5 metres from the step origin. Drag the panorama to inspect the surroundings or use



Figure 29: 3D navigation view at the bridge entrance: buildings, route geometry, and the current instruction.

its zoom, full-screen, and external-map controls. Read the location and capture month alongside the image.

The Street View service selects a viewpoint using the current segment's geographic position, floor, and direction. Step changes update this context. The panorama helps compare the entrance and surrounding structures with the current action.

8 Plan with required lifts

8.1 Build the elderly-traveller branch

Choose elderly traveller and require lifts in care-giver settings, then apply the choices to this journey. Plan from PopCorn 2 to Kowloon Tong. The overview reports approximately 1,507 metres and three floor transitions (Figure 31). Start navigation; the first corridor action previews Lift A from 1/F to G/F (Figure 32).

Access checks select lift-based floor changes. At Kowloon Tong, this profile follows Festival Walk route A: enter LG1, use the public lift to G, and leave through the north exit. The route service evaluates the active profile's slope, width, facility, and passage conditions together.



Figure 30: Nearby Street View: the LG1 entrance panorama, its distance, and capture date.



Figure 32: Lift branch, step 1: the next action identifies Lift A from 1/F to G/F.



Figure 31: Required-lift overview: approximately 1,507 metres and three floor transitions.

9 Report a closed lift and continue

9.1 Describe the obstacle

Press **Report obstacle** during the PopCorn corridor step. Enter the closure report shown in Figure 33. Its English translation is “Lift A is out of service; use another lift.” Submit the observation (Figure 33). The page also accepts a photograph or selected image with optional text. Supported formats are JPEG, PNG, and WebP, with a 6 MB size ceiling.

The result card identifies PopCorn 2 Lift A, its floor, and supporting evidence (Figure 34). Check the facility and use the map-preview control if needed. Press **Confirm this obstacle**, then return to navigation.

The GenAI obstacle backend reads visible facility names and notices from an image. Map evidence matching connects these observations to a facility or passage in the current scene. The candidate record names the object that confirmation will close for this journey.

9.2 Read and follow the alternative

The corridor becomes 175 metres and the next action changes to Lift B. Expand **Route updated**. The explanation identifies Lift B and an increase of approximately 4 metres and under one minute



Figure 33: Obstacle report: describe the Lift A closure and submit the observation.



Figure 34: Obstacle candidate: verify PopCorn 2 Lift A and confirm the facility.

(Figure 35). Complete the corridor, then use Lift B for the 9-metre transition from 1/F to G/F (Figure 36).

Confirmation updates the dynamic facility state. The route service searches from the current public node and creates new remaining steps. The distance comparison uses the same starting position before and after the update. Completed stages remain part of the journey; both pages receive the revised instructions and statistics.



Figure 35: Reroute explanation: Lift B replaces Lift A, adding approximately 4 metres and under one minute.

10 Wait for facilities and resume

Close both Lift A and Lift B through the paired facility controls while the journey requires lifts. The phone retains its position, needs, and destination in a waiting state (Figure 37). Use **Recheck route** after checking facility status. The access-settings control opens the active conditions.

Restore Lift B in the paired facility controls. Figure 38 shows navigation resuming from the saved corridor position with Lift B next. Facility restoration changes the same dynamic state that obstacle confirmation uses. The backend reruns remaining-route search and returns the session to navigation when the active conditions admit a path.



Figure 36: Alternative step: take Lift B from 1/F to G/F, a 9-metre transition.



Figure 38: Resume after Lift B restoration: continue from the saved corridor position.



Figure 37: Waiting state: the journey retains its position and lift requirement while both facilities remain closed.

11 Confirm a location from a photo

11.1 Submit the nearby landmark

In the Kowloon Tong walking stage, press **I am lost**. Select or photograph the A-1 Bakery frontage and shop marker. Add the landmark clue shown in Figure 39. Its English translation is “I am near A-1 Bakery, shop LG1-51.” Submit the photo and clue (Figure 39).

The candidate card displays the shop name, LG1-51, floor, public-passage position, and evidence (Figure 40). Compare the candidate with the photo and surroundings. Select another candidate or provide new clues when appropriate; cancellation returns to the journey.

The GenAI localization backend extracts the shop name, visible text, objects, and floor clues. Nearby map retrieval gathers landmarks. Evidence matching links the observations to a landmark and its public-passage anchor, which supplies the position for route continuation.

11.2 Preview, confirm, and return

Press **View candidate on map**. The map labels the candidate as awaiting confirmation (Figure 41). Check its relationship to the nearby entrance and route. Press **View recognition result** to return to the candidate, then **Confirm this location**.



Figure 39: Localization input: select the A-1 Bakery photo and add the LG1-51 shop clue.

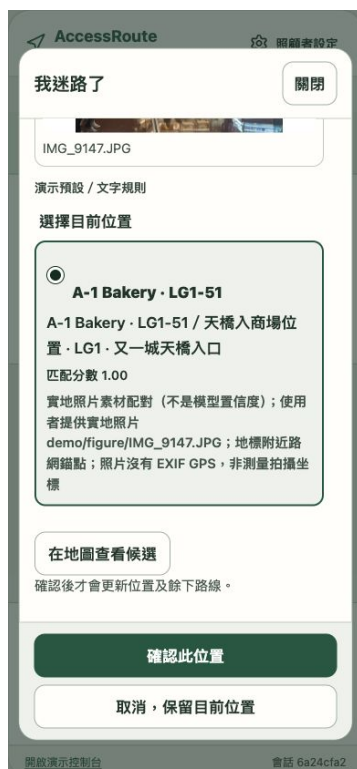


Figure 40: Location candidate: check A-1 Bakery, shop LG1-51, floor, and matching evidence.

The result confirms synchronization with navigation (Figure 42). Press **Return to navigation**. The next action starts from the public passage near A-1 Bakery. Confirmation saves the candidate's scene, node, and floor, then recomputes the remaining route from that anchor. New passage segments update the displayed step count and current number together.



Figure 41: Candidate map: the marker and awaiting-confirmation label identify the A-1 Bakery public-passage position.

12 Update the journey for rain

12.1 Follow the sheltered route

After location confirmation, the current instruction leads into Festival Walk beside A-1 Bakery. Select rainy weather in the paired controls. With the balanced objective, the journey prioritizes sheltered passages and changes to the mall lift route. Expand the explanation: the example adds approximately 483 metres and three minutes (Figure 43).

The weather service reads Hong Kong Observatory temperatures, rainfall, and warnings for the departure and destination areas. It retains observation and retrieval times with a five-minute cache. Rain or high temperature changes the balanced objective's shelter preference. Recalculation starts from the confirmed current position and applies access conditions alongside weather.



Figure 42: Confirmed location: the result acknowledges the position update and returns to navigation.



Figure 43: Rain update: the explanation identifies the sheltered mall route and the remaining-distance change.

12.2 Read the three destination choices

Expand the Kowloon Tong route-choice panel (Figure 44). The outdoor route covers approximately 489 metres and uses bridge and park-side stairs. Mall route A covers approximately 994 metres via LG1, the public lift, and the G-floor north exit. Mall route B covers approximately 808 metres via the LG1 CityU tunnel direction and includes exit stairs.

The cards identify the active route, each route's passages, and the selection reason. Ordinary walking in sunshine uses the outdoor route in the main example. The elderly and sheltered examples use mall route A. The backend checks candidate routes against travel needs, weather, and facility status before selecting the active path.



Figure 44: Destination alternatives: outdoor route, mall route A, and mall route B with selection reasons.

13 Walk every step of mall route A

13.1 Step 9: enter Festival Walk

After the F-exit lift, walk approximately 80 metres along the covered bridge. At the fork, continue into Festival Walk towards A-1 Bakery (Figure 45). Complete the bridge segment. The next action follows the LG1 public passage. The selected mall branch determines the entrance action at the fork.



Figure 45: Mall step 9: walk approximately 80 metres along the bridge and enter Festival Walk.

13.2 Step 10: reach the public lift

Follow the 118-metre LG1 passage beside A-1 Bakery towards the public lift (Figure 46). Check the current floor and next lift action, then continue at the lift. The route joins public-passage nodes to the lift's boarding node.

13.3 Step 11: go from LG1 to G

Take the Festival Walk public lift from LG1 to G. Figure 47 shows the 7-metre transition and the target floor. Complete the step after reaching G. The backend updates the current node to the lift's upper endpoint and checks its service state whenever the route changes.

13.4 Step 12: leave by the north exit

Follow 265 metres of G-floor public passage to the north exit towards Tat Chee Avenue (Figure 48). Read the next action before leaving the mall. Complete the passage at the exit. The journey connects indoor floor geometry to the outdoor geographic passage through the exit node.

13.5 Step 13: reach the interchange

Follow the final 520-metre pedestrian connection towards the Cornwall Street Park/CityU residence public interchange (Figure 49). Confirm arrival at the public endpoint. The destination stage keeps its



Figure 46: Mall step 10: follow 118 metres of LG1 public passage towards the lift.



Figure 47: Mall step 11: take the public lift from LG1 to G, a 7-metre transition.



Figure 48: Mall step 12: follow the G-floor passage for 265 metres to the north exit.

lift, indoor passages, north exit, and outdoor connection in one continuous route.



Figure 49: Mall step 13: follow the final 520-metre pedestrian connection and confirm arrival.

14 Use paired controls and exit

The paired-control link in the phone footer opens the same journey session. Planning, starting, moving to the previous or next step, and jumping between journey stages all update that session. Weather controls select sunshine, rain, heat, or Observatory data. Facility controls close or restore a named facility in a selected scene.

The paired page also provides lift-closure and A-1 Bakery localization workflows, journey reset, and independent-session creation. Reset presents a confirmation action and retains the caregiver profile. An independent session keeps its own places, needs, position, and progress.

On the phone, press **Exit navigation**. Choose **Continue this journey** to return to the current step or **Confirm exit** to end navigation. The saved caregiver profile remains available for the next plan. Both pages submit session commands and receive the resulting position, step, route, and status together.

15 Connect pages to backend services

The product backend centres on a journey session. The phone sends place, preference, planning, step-completion, observation, confirmation, and exit commands. The paired page sends commands to the same session. The backend processes each session's commands in order and returns a complete state for rendering.

The state includes departure and destination scenes, caregiver defaults, active travel needs, weather, current public node, stages, route segments, steps, facility events, and pending submissions. A position links a scene, node, floor, and geographic coordinates. A step links its endpoints to a route segment. These identities keep map, text, and statistics aligned.

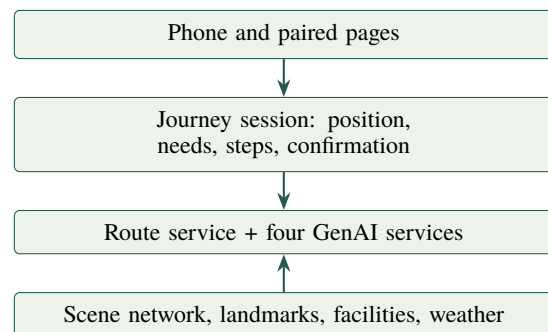


Figure 50: Service organization: the journey session connects page actions to routes, GenAI, and scene context.

Planning loads both scene packages, calculates

the origin and destination walking paths, and inserts rail steps. Segment construction groups the path into user actions and computes distance, floor transitions, and time estimates. Weather changes, confirmed locations, and facility changes all call the same remaining-route calculation from the current public node.

The model adapter manages text and visual model requests, configuration, and credentials. Qwen models receive task instructions and structured context. The backend validates JavaScript Object Notation (JSON), a text format for named fields, before passing results between services. The browser handles image selection, speech recognition, and narration playback.

16 Turn the scene graph into actions

16.1 Connect places with passage data

A scene graph is a network of public positions and passages. Nodes represent entrances, corridor junctions, facility endpoints, and interchange points. Edges connect nodes and carry length, movement mode, shelter, indoor status, slope, width, and facility references. Floors store display names, elevations, and geometry. Facilities store identities and service states. Landmarks store names, shop numbers, descriptions, and nearby public-passage anchors.

Map rendering uses floor geometry, building outlines, and geographic centre lines. Route search uses stable node, edge, and facility identifiers. A1 Bakery’s landmark record provides a readable identity and a nearby public node for photo-based position confirmation.

16.2 Check access, then choose a path

Each passage check reads stair and escalator permissions, lift requirements, slope, width, verified attributes, and dynamic facility status. Eligible passages enter route search. The shortest objective uses distance; faster routing uses estimated duration; lower-effort routing includes slope and floor-change costs.

Sheltered and indoor objectives compare outdoor exposure before path cost. The balanced objective selects the ordering from active preferences and weather. Dijkstra’s shortest-path search compares cumulative passage costs; policy additions remain nonnegative. The base graph retains spatial structure while session events update passage availability.

For the Lift A closure, the remaining route starts at the saved corridor node. Access checks close the Lift A edges. Search follows the alternative corridor to Lift B, changes to G/F, and continues towards the station. Restoring Lift B runs the same search with its updated service state.

16.3 Build readable navigation segments

Segment construction combines consecutive same-floor corridor edges into walking actions. Lifts, stairs, escalators, and ramps create floor-change actions. Each segment keeps distance, endpoints, floors, facility, and its original edges. A long stair action can therefore represent several connected edges while retaining its full explanation.

Completing a segment moves the session to its endpoint. Location confirmation moves it to the chosen public-passage anchor. Route updates retain completed stages and rebuild remaining segments. The page reads these fields to show current action, next action, floor, map geometry, and journey totals.

17 GenAI parses travel preferences

17.1 Combine the request with the profile

The preference service receives the submitted text, active travel profile, and existing preferences. Its system instructions define allowed profile values, field meanings, and output types. Place resolution uses the scene catalogue and aliases to produce official departure and destination identifiers.

The language example starts with an elderly, required-lift profile. The request adds stair avoidance and covered-passage preference. The backend combines these fields and returns a confirmation card. A numeric request such as “slope at most 5% and passages at least 1 metre wide” produces slope ratio 0.05 and width 1 metre.

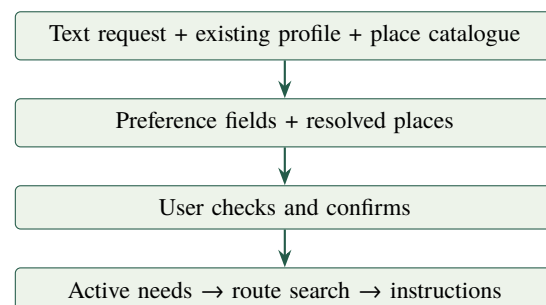


Figure 51: Preference-service design: language becomes explicit travel conditions before route calculation.

17.2 Return fields the route can use

The preference interface’s output example contains:

```
mobility_type: elderly
avoid_stairs: true
prefer_covered_shelter: true
route_objective: sheltered
tts_selection: text_only
```

The interface also handles steep-slope avoidance, lift avoidance, escalator permission, maximum slope, and minimum width. Field validation checks types, ranges, and allowed values. The route adapter converts the accepted result into passage conditions.

“Avoid stairs” changes stair eligibility. “Keep out of the rain” selects shelter. “Lower effort” selects that route objective. “Stairs are acceptable” changes stair permission. The page presents these concrete choices for confirmation, then saves the active needs and plans or updates the remaining route.

18 GenAI reads scene observations

18.1 Extract landmark evidence

The visual-observation service receives an image, task, scene, and optional user description. Optical character recognition (OCR) means reading visible text from the image. The visual-language model returns name clues, OCR text, objects, visible floor information, orientation clues, and observation scores in JSON.

For the A-1 Bakery design example, observations include name “A-1 Bakery”, shop text “LG1-51”, object “bakery frontage”, and floor clue “LG1”. These fields enter landmark retrieval and map evidence matching. The result retains the submitted photo so the traveller can compare it with the candidate.

18.2 Extract facility status

For a Lift A notice, the design example includes name “Lift A”, notice text “out of service”, and objects “lift and notice”. The obstacle fields indicate a present obstacle, type `broken_lift`, and evidence from the closure notice. Other supported types cover facility closure, stairs, flooding, and construction.

Task and obstacle type select the map-object category: lifts, facilities, or passages. Output validation checks field types and item counts. The observation service supplies visual evidence; map evi-

dence matching resolves the observations to an object in the scene.

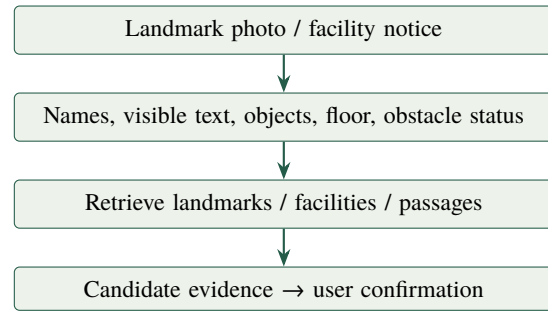


Figure 52: Visual-service design: image observations feed localization and obstacle workflows.

19 GenAI matches evidence to the map

19.1 Retrieve nearby candidates

Retrieval reads the scene index, floor, and current public node. A current-node search uses a nearby range of 120 metres. When a request supplies Global Positioning System (GPS) coordinates and accuracy, the query radius uses that accuracy. Floor clues resolve to the scene’s floor identifiers.

Localization searches nearby shops, entrances, and public-facility landmarks. Lift obstacles search lifts; passage obstacles search path objects. Candidates carry an identifier, name, description, floor, node, and distance. Text similarity retains a shortlist of up to 20 objects for matching.

19.2 Link observed text to object fields

Text normalization and two-character fragments support partial names, Chinese labels, and shop numbers. Specific facility numbers and shop identifiers supply identity evidence. Generic words such as “lift” or “entrance” carry lower identity weight.

The matching model receives observations and candidate fields. It returns a candidate identifier with paired evidence: observed “A-1 Bakery” corresponds to the landmark name; “LG1-51” corresponds to the shop description. The backend checks that each observation exists in the input and each map field exists in the candidate before retaining the evidence.

19.3 Rank and confirm the public anchor

The candidate score combines 70% name/text identity, 15% checked evidence, 10% spatial proximity, and 5% route proximity. Observation scores and anchor type constrain the final score. The can-

didate page presents the object, location, and evidence for review.

Location candidates keep scene, public node, and floor. Obstacle candidates also keep facility identifiers or edge lists. Confirmation uses these identities to update position or dynamic availability. Candidate scores support ranking; the user checks the displayed evidence and map position before applying a result.

20 GenAI writes Cantonese guidance

The guidance interface receives the current segment identifier, movement type, facility, distance, floor or endpoint floors, and nearby landmarks. For Lift B, the facts are a lift transition from 1/F to G/F with a distance of 9 metres. The lift action and target floor come from the route segment.

The model produces a Hong Kong spoken-Cantonese instruction of 1–60 characters. The English translation of one design example is “Take Lift B down to G/F, then follow the route.” The JSON response contains a `text` field and retains the segment identity in the result package.

The speech-preparation service reads the instruction and narration preference to prepare browser playback. Current action, next action, and full explanation use the route facts; the GenAI interface expresses these facts in a short spoken sentence. Voice input produces editable text, and voice output reads an instruction.

Guidance requests retain scene, position, segment, and route context. A reroute from Lift A to Lift B supplies the new facility and floor-change facts. Advancing a step supplies the next segment. The session’s step table remains the source for stage labels and continuous numbering.

21 Confirm changes and synchronize pages

21.1 Apply the chosen business object

Preference confirmation updates active travel needs and selected places. Location confirmation updates a public node and floor. Obstacle confirmation updates facility or passage availability. Each action calls remaining-route calculation and produces a complete session state.

Submission retains the journey context, current segment, input, candidate set, and confirmation identifier. Confirmations use a five-minute validity period and check the current journey context. Cancellation ends the submission and returns to nav-

igation. New clues create a new submission and candidate set.

21.2 Keep position and route context aligned

The session processes commands in sequence. Request identifiers give repeated clicks the same operation result. State sequence and route identifiers associate commands with the active journey. Asynchronous analysis retains its submission context, which the backend checks before presenting confirmable results.

The phone and paired page share a session identifier. Hypertext Transfer Protocol (HTTP) requests submit commands. Server-Sent Events (SSE), a server-to-page update stream, deliver complete states to both pages. Reconnection reads the latest state and aligns maps, steps, weather, and facilities.

22 Backend interfaces and data

Session interfaces connect page actions to the journey state. Workflow interfaces handle preference parsing, localization, obstacles, and guidance. Scene interfaces supply geometry and graph objects. Table 1 lists the corresponding service routes.

The model adapter holds model configuration and service credentials. Workflow services build task instructions, input context, and JSON requirements. Validation checks fields; retrieval reads scene indexes; routing reads node, passage, and facility structures. Weather and Street View adapters supply their respective context, while the browser handles speech services.

Commands explicitly name the user action: select places, apply needs, save defaults, plan, start, complete a step, confirm a candidate, update weather, or update a facility. The read interface returns a complete state. The client selects the page and available actions from journey stage and pending confirmation.

Interface	Product role
GET /api/sessions/catalog	Scene catalogue and supporting assets
POST /api/sessions	Create an independent journey
GET /api/sessions/:id	Read the complete session state
POST /api/sessions/:id/commands	Places, needs, planning, progress, confirmation, and facilities
GET /api/sessions/:id/stream	Push session states to connected pages
GET /api/sessions/:id/streetview	Nearby panorama position, direction, and entry point
GET /api/scenes/:id	Scene geometry, nodes, passages, and facilities
POST /api/route	Calculate routes and alternatives from context
POST /api/genai/workflows/preferences	Parse language travel preferences
POST /api/genai/workflows/localization	Observe a photo and match its location
POST /api/genai/workflows/obstacle	Observe an obstacle and match its facility or passages
POST /api/genai/workflows/guidance	Express segment facts as Cantonese guidance
POST /api/genai/confirm	Confirm workflow candidates

Table 1: Service interfaces connect pages, journey state, scene data, and GenAI workflows.

23 Accuracy criteria and service cost

23.1 Check each GenAI output

Table 2 defines acceptance targets for the four GenAI services. Each percentage specifies the minimum fraction of cases that must satisfy the stated criterion. Check preference fields against the traveller’s request and existing profile; check visual observations against annotated photographs; check map identities against scene records; and check guidance against the current route facts.

For a field metric, divide correct field values by all checked field values. For a request or image metric, divide correct cases by all cases. Top-3 accuracy counts a case once when any of its first three candidates matches the reference anchor. Obstacle-presence checks include both obstacle and clear-path images. An image with no visible floor has a reference value of null. Guidance fact accuracy requires every supplied navigation fact to remain correct; the expression check assesses the same sentence’s Cantonese grammar and clarity.

23.2 Check complete user workflows

Table 3 sets acceptance targets for the complete interaction. Each case includes input, analysis, candidate review where applicable, confirmation, and the resulting journey state. A successful case must satisfy every condition in its row.

Use scene and object identifiers to judge position and obstacle correctness. For required-lift and sheltered routes, compare passage eligibility and route objective values with the scene graph. For guidance, compare each sentence with the active segment after every step completion or route up-

date. These checks connect the page result to the same backend fields that drive navigation.

23.3 Convert tokens into model charges

The configured model names are `qwen3.8-max` for text and `qwen3-vl-plus` for images. Table 4 records their published QwenCloud pay-as-you-go rates, checked on 11 October 2026. The vision rate applies to requests with at most 32,000 input tokens. The calculation uses ordinary input and output list prices.

Price sources: [Qwen3.8-Max](#) and [Qwen3-VL-Plus](#). For one model call, let I and O denote billed input and output tokens, and let p_I and p_O denote the corresponding prices per million tokens. Its model charge is

$$C = \frac{Ip_I + Op_O}{1,000,000}. \quad (1)$$

Input accounting includes system instructions, request context, and image tokens for visual calls. Output accounting includes all billable generated tokens, including reasoning tokens when the selected mode produces them. Table 5 assigns an input and output token budget to each GenAI call and converts that budget into a USD charge.

For preference parsing, 1,200 input tokens at USD 2.00 per million and 180 output tokens at USD 6.00 per million give USD 0.003480. Landmark localization combines one visual observation and one landmark-matching call: 4,200 input tokens, 560 output tokens, and USD 0.006032. An obstacle-photo workflow combines its observation and matching calls: 4,800 input tokens, 640 output tokens, and USD 0.007088. Each guidance sentence uses one text call.

Accuracy metric	Correctness criterion	Target
Preference field accuracy	Each requested field matches its reference value.	97.5%
Complete-request accuracy	All requested fields and retained profile values match.	94.0%
Numeric-condition accuracy	Slope, width, units, and normalized values match.	99.0%
Landmark-name accuracy	The photo observation identifies the annotated name.	94.0%
Shop-identifier accuracy	The normalized shop identifier matches exactly.	95.0%
Visible-floor accuracy	The observation matches the annotated visible floor.	96.0%
Obstacle-presence accuracy	The predicted presence or absence matches the image label.	95.0%
Obstacle-type accuracy	The predicted category matches the reference category.	93.0%
Location top-1 accuracy	The first candidate matches the reference public anchor.	92.0%
Location top-3 accuracy	The first three candidates include the reference anchor.	98.0%
Obstacle-target accuracy	The first candidate identifies the correct facility or passage.	95.0%
Structured-output accuracy	The response satisfies the task schema on the first call.	99.5%
Guidance fact accuracy	Action, facility, distance, and floors match the route facts.	99.0%
Cantonese expression accuracy	A fluent speaker accepts grammar, wording, and action clarity.	96.0%

Table 2: GenAI accuracy acceptance targets and their correctness criteria.

Workflow	Success criterion	Target
Language-to-route accuracy	Confirmed fields match the reference and the route satisfies them.	92.0%
Photo-to-position accuracy	Confirmation selects the reference scene, floor, and public node.	90.0%
Obstacle-to-reroute accuracy	Confirmation closes the correct object and the route avoids it.	91.0%
Lift-required journey accuracy	Every floor change uses an eligible lift throughout the journey.	99.0%
Sheltered-route accuracy	The route meets the active shelter objective and access conditions.	98.0%
Guidance-to-step accuracy	Every instruction matches its active segment after progress or rerouting.	98.0%

Table 3: Complete-workflow accuracy acceptance targets.

Model	Input	Output
Qwen3.8-Max	2.00	6.00
Qwen3-VL-Plus	0.20	1.60

Table 4: Published model prices in USD per million tokens.

23.4 Budget a complete journey

Table 6 combines these calls into three interaction patterns. An ordinary journey uses one preference request and 13 guidance calls. A location-assistance journey adds one landmark-photo workflow. A journey with both assistance types adds one landmark-photo workflow, one obstacle-photo workflow, and two further guidance calls after route updates. These are explicit workload budgets: each row’s call count and charge follow from its listed interaction pattern.

Sum the call charges to obtain a workflow or journey charge, then multiply by the journey count for volume budgeting. Repeated page viewing, deterministic route search, user confirmation, and session synchronization add zero GenAI calls. The tables account for model inference; map services, hosting, storage, and browser speech belong to their own service-cost categories.

GenAI call	Model	Input	Output	Total	USD/call
Preference parsing	T	1,200	180	1,380	0.003480
Landmark observation	V	2,400	320	2,720	0.000992
Obstacle observation	V	2,600	380	2,980	0.001128
Landmark evidence matching	T	1,800	240	2,040	0.005040
Obstacle evidence matching	T	2,200	260	2,460	0.005960
Cantonese guidance	T	450	70	520	0.001320

Table 5: Per-call token budgets and model charges; T denotes Qwen3.8-Max and V denotes Qwen3-VL-Plus.

Journey workload	Calls	Input	Output	USD/journey	USD/1,000
Preferences + 13 guidance steps	14	7,050	1,090	0.020640	20.640
Above + one landmark photo	16	11,250	1,650	0.026672	26.672
Preferences + both photo workflows + 15 guidance calls	20	16,950	2,430	0.036400	36.400

Table 6: Journey token budgets and model charges for three interaction patterns.

24 Quick reference for a full showing

Start with ordinary walking and sunshine. Select the two places, inspect the overview and stage lists, and follow all 13 steps. Next choose elderly traveller and required lifts. Report Lift A, confirm its identity, read the alternative, and take Lift B. Close both lifts to show waiting, then restore Lift B to resume.

At Kowloon Tong, submit the A-1 Bakery photo and shop clue. Preview the candidate on the map, confirm the public-passage position, and return to navigation. Select rain and read the shelter explanation. Follow all five mall-route steps through LG1, the public lift, the G north exit, and the final pedestrian connection.

Use caregiver settings to show slope, width, verified attributes, text size, directions, and Cantonese narration. Use paired controls to show shared step progress, facility changes, weather, and independent journeys. End by confirming arrival or confirming exit.

Scene geometry and walking networks use Hong Kong spatial-data resources. Rail instructions refer to MTR lines and station information. Weather uses Hong Kong Observatory observations and warnings. Nearby panoramas use Google Street View. These data sources enter the scene, weather, and panorama services that supply the journey’s maps and route context.