



COMPLEX PROJECTS GRADUATION STUDIO - P5.0

MULTI-MODAL TRANSFER STATION, BERLIN

Group 3 - Culture

Xiaotian Liu

31/10/2023

CONTENTS

1. INTRODUCTION

2. RESEARCH & DESIGN BRIEF

3. CONCEPT

4. DESIGN

5. CONCLUSION

BERLIN: CITY BUILT ON PUBLIC TRANSPORT



BERLIN'S CONTEXT

A developed and complex mobility network.



BERLIN'S CONTEXT

A developed and complex mobility network.

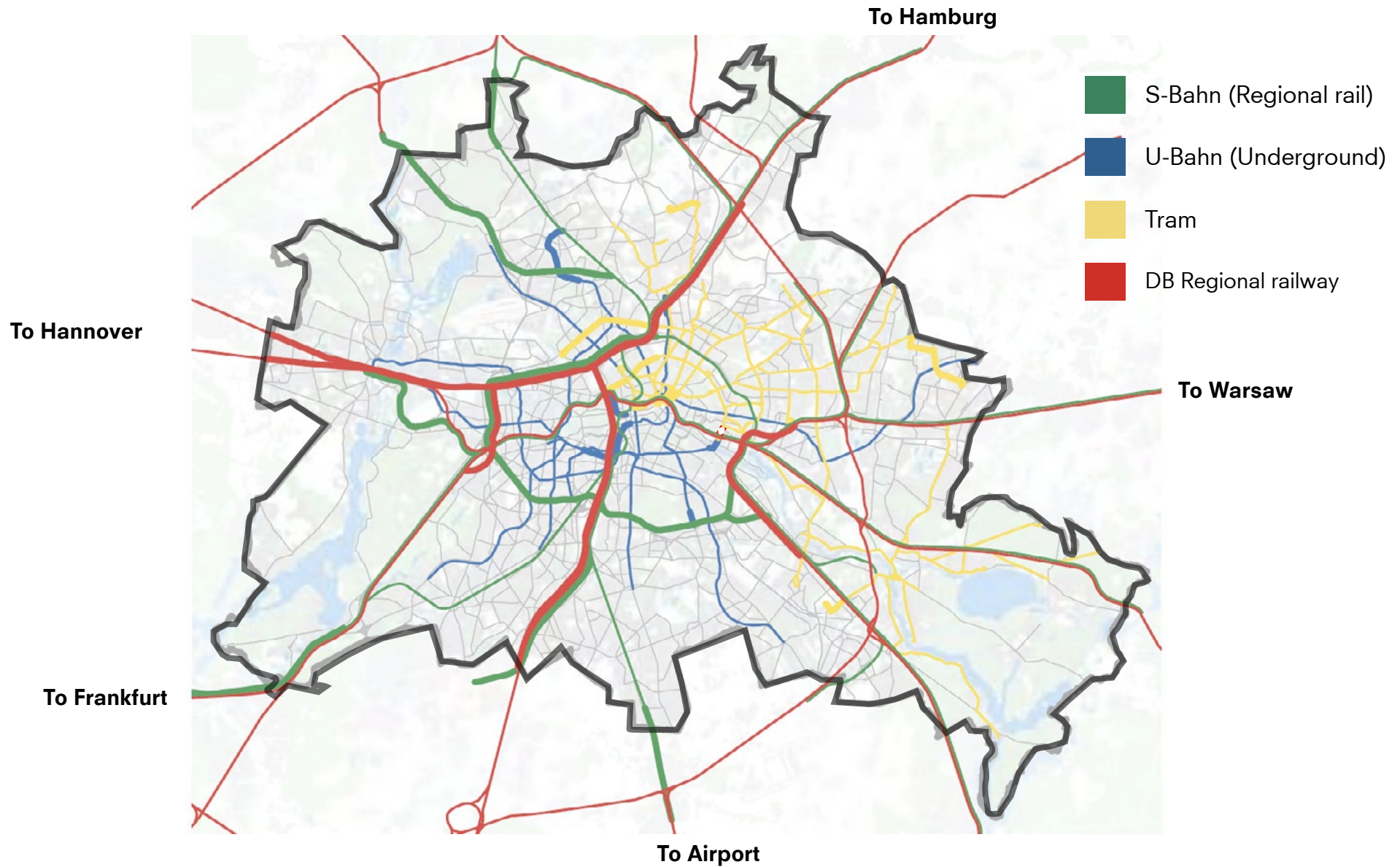


Berlin has **10** collective and shared mobility modes.

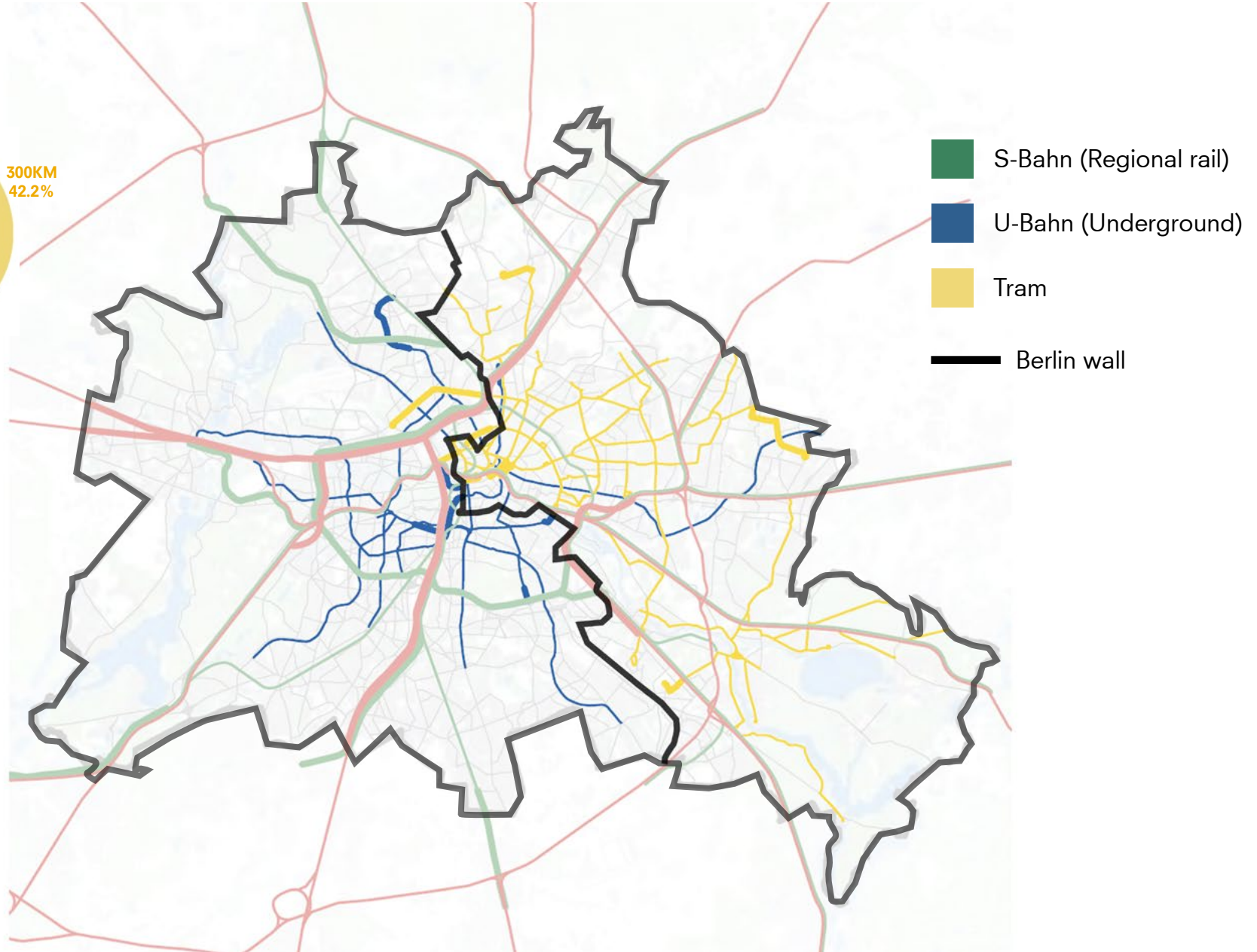
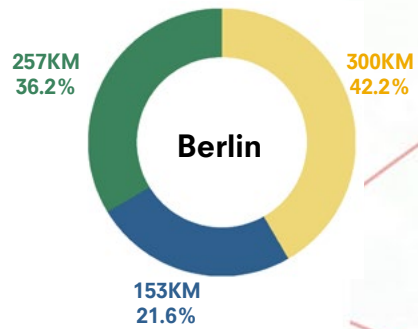
Highest numbers among major European cities.

✓ Bus ✓ Tram ✓ Metro ✓ Suburban rail ✓ Ferry ✓ Taxis ✓ Shared cars ✓ Shared bicycles ✓ Shared mopeds ✓ Shared e-scooters

PUBLIC TRANSPORT NETWORK

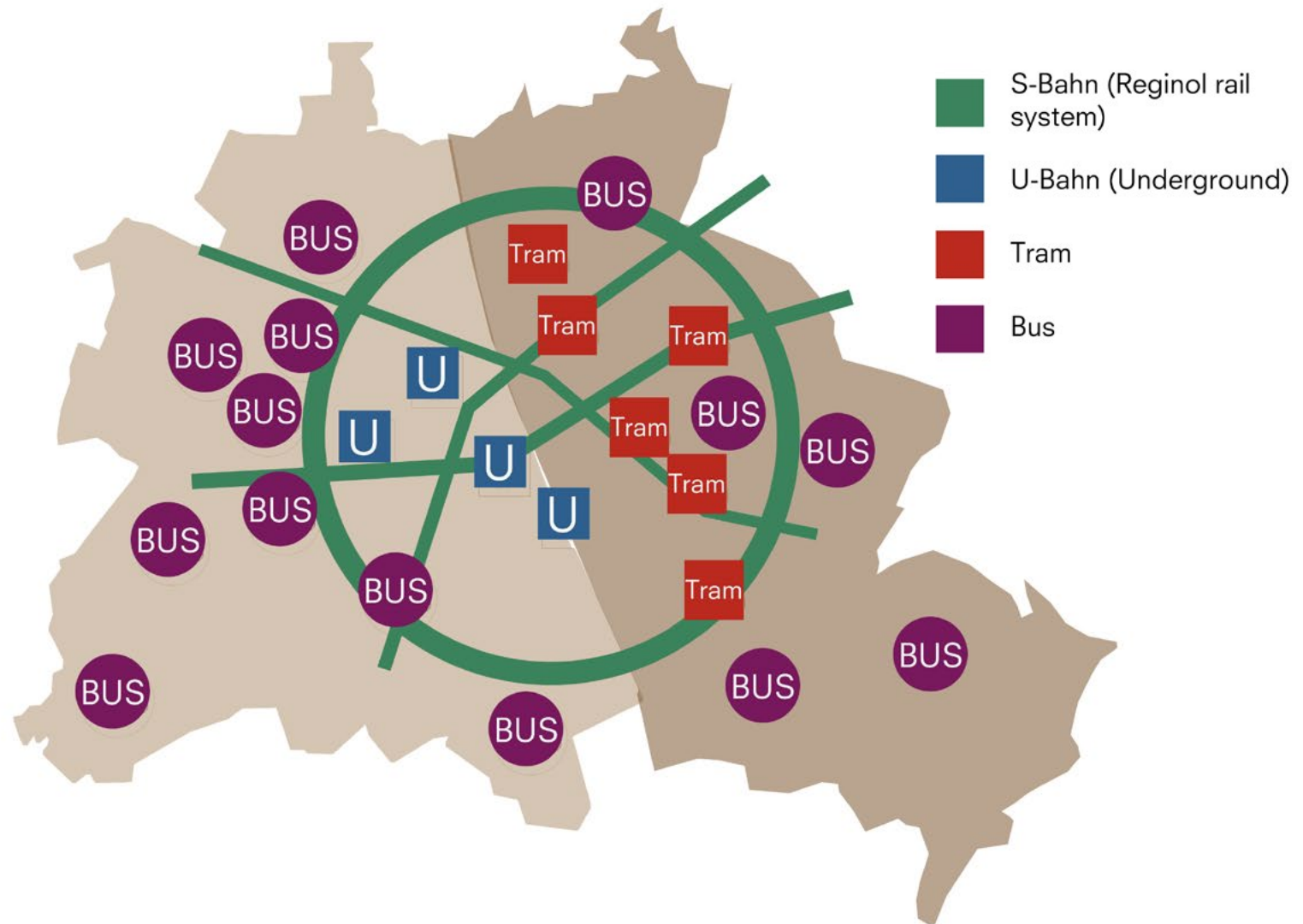


Introduction WITH BERLIN WALL



BERLIN'S CHALLENGES

Disconnected transportation routes



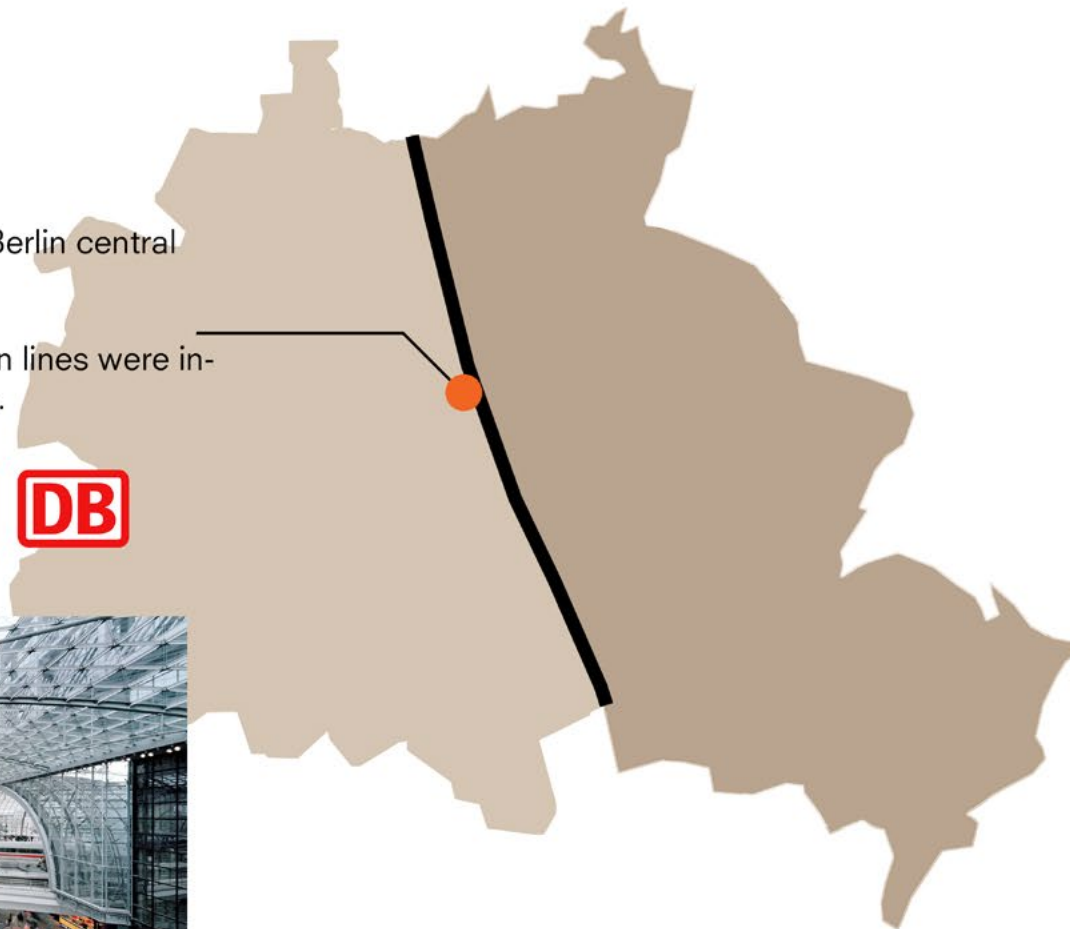
BERLIN'S CHALLENGES

Multi-modal train stations along Berlin wall

Hauptbahnhof (Berlin central station)

Renovated in **2006**

New tram, U-Bahn, S-Bahn lines were introduced after renovation.



BERLIN'S CHALLENGES

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PotsdamerPlatz Bahnhof

Renovated in **2006**

New traffic building was built while S-Bahn line was opened.



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Warschauer Straße Bahnhof

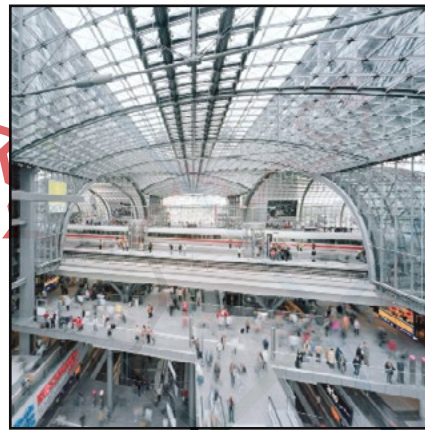
The transportation buildings of the U-Bahn, S-Bahn and trams were built separately at different times.



TRAIN STATION UPGRADE



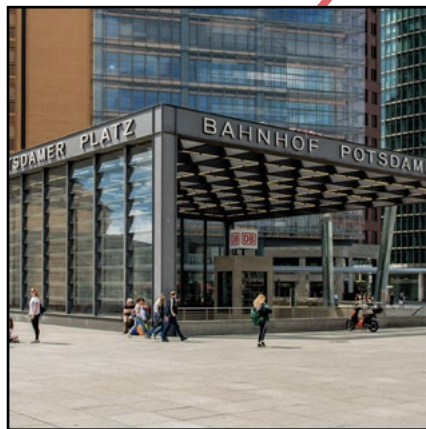
Bahnhof Berlin-Spandau



Hauptbahnhof



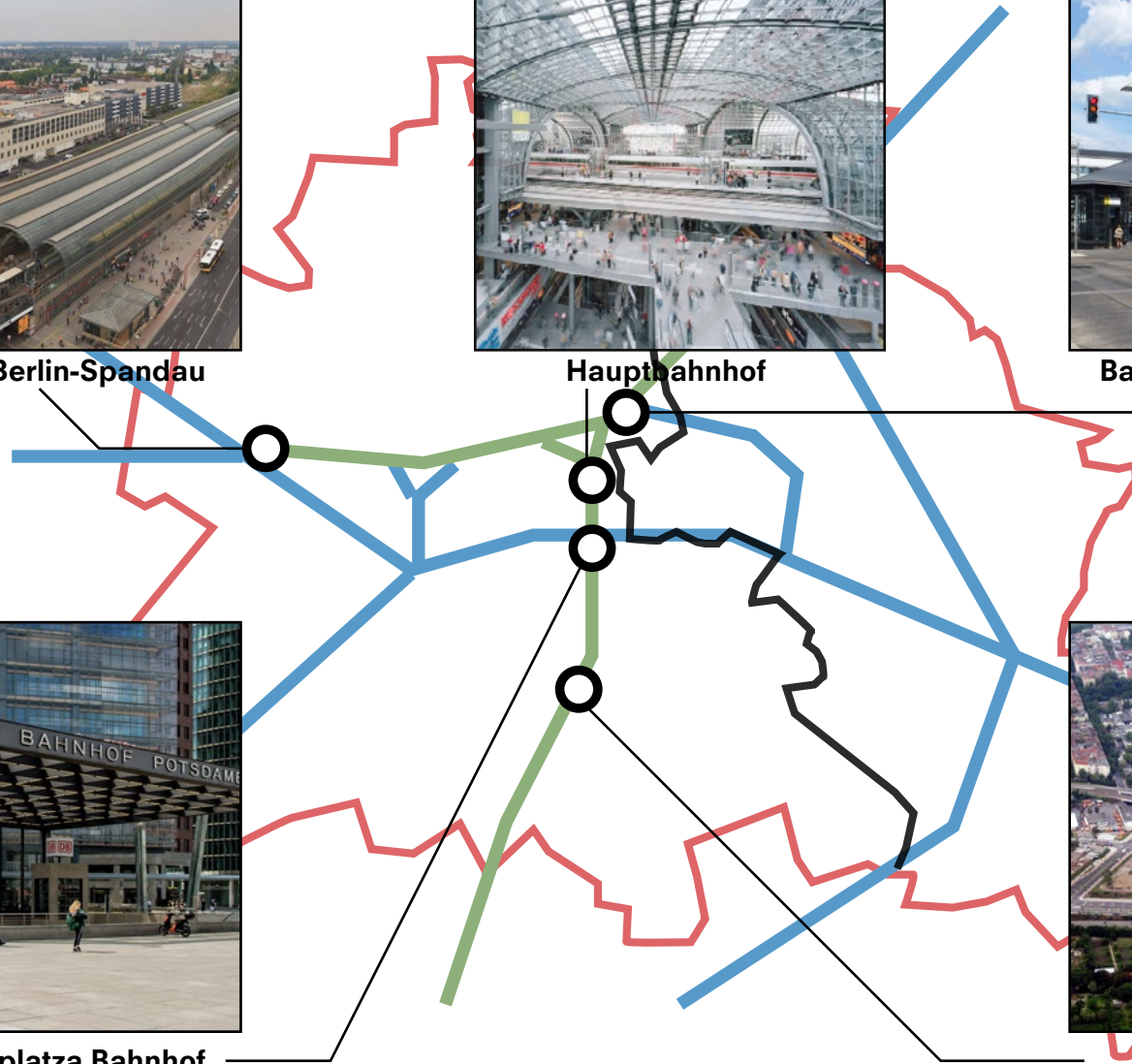
Bahnhof Gesundbrunnen



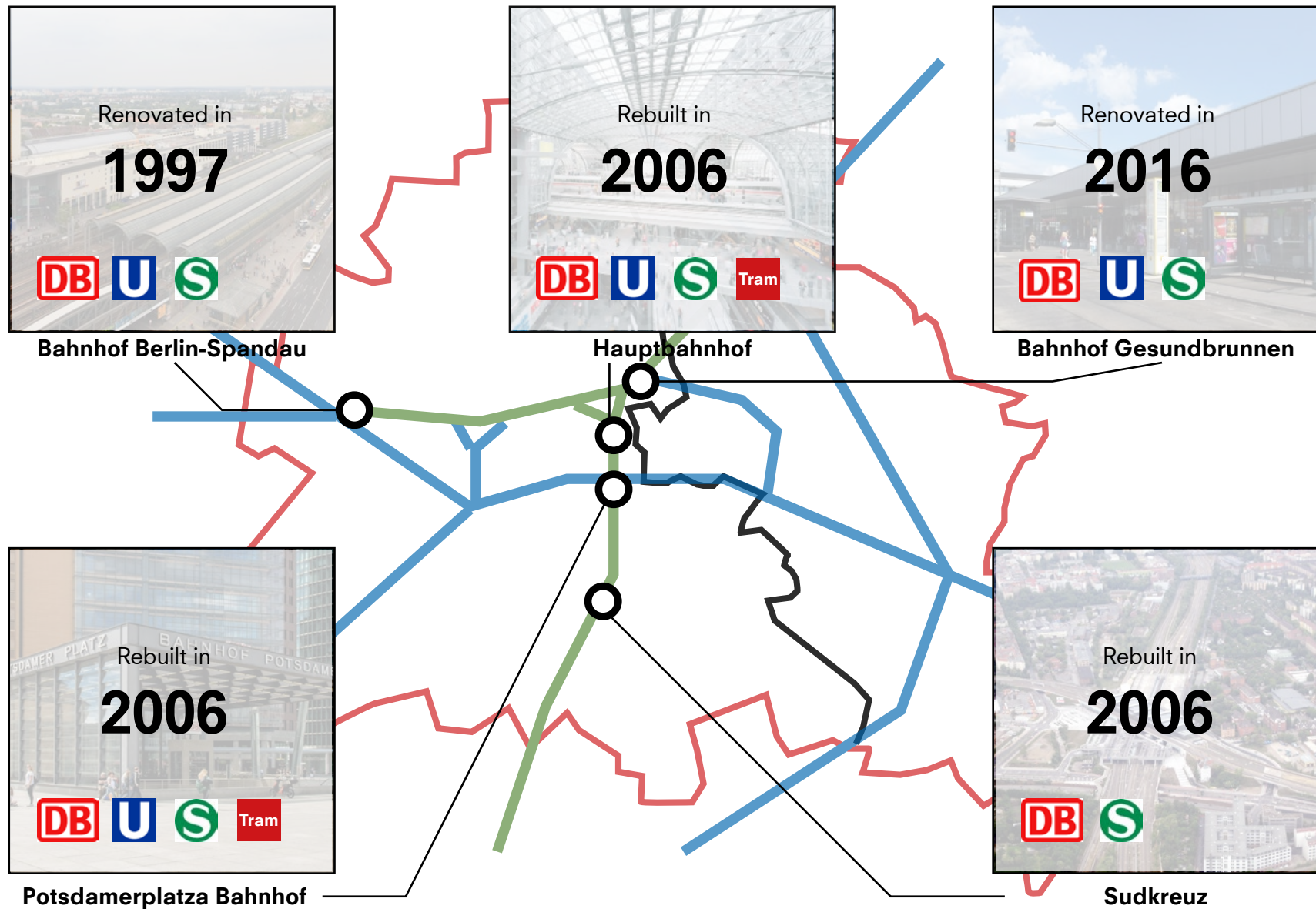
Potsdamerplatz Bahnhof



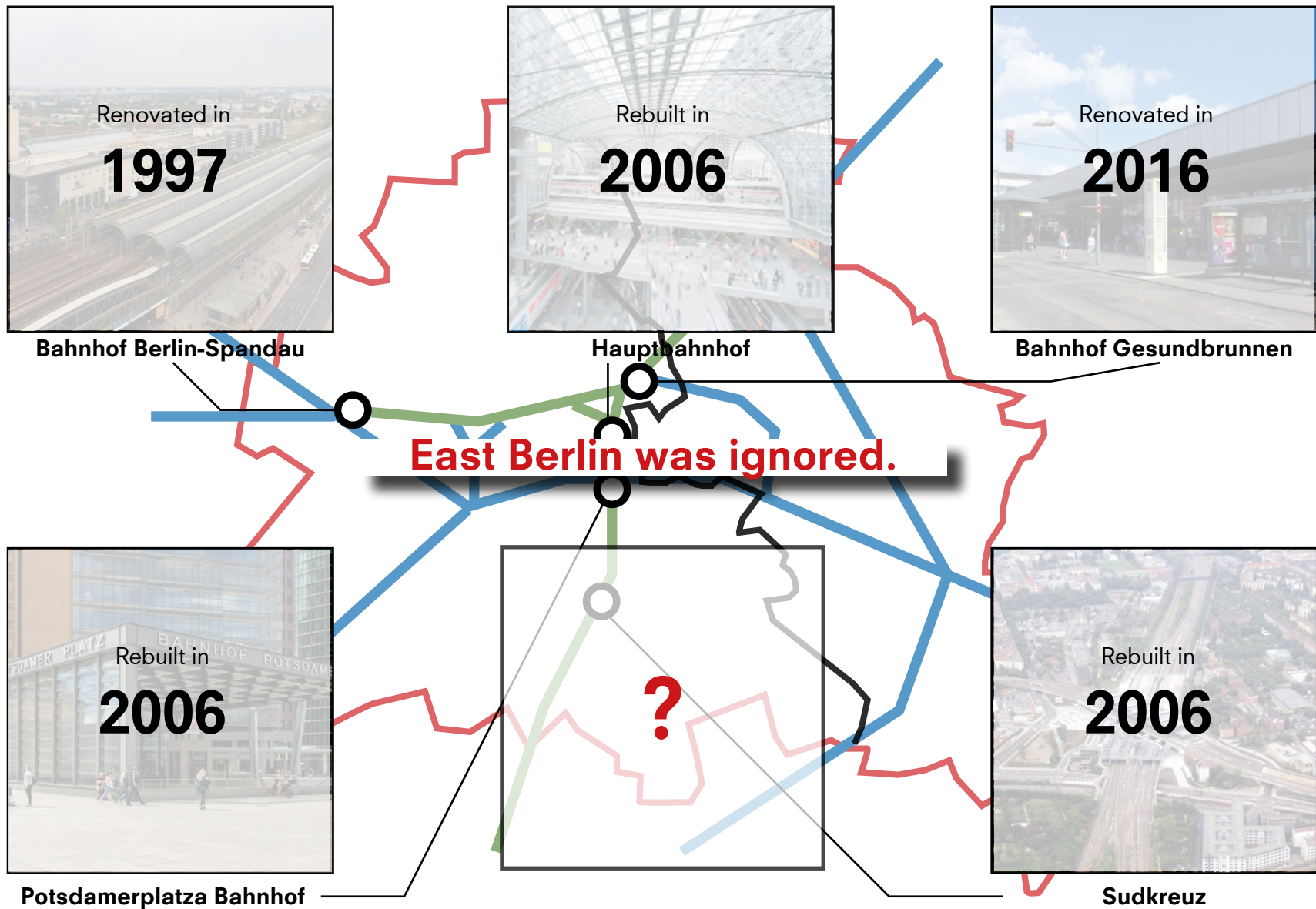
Sudkreuz



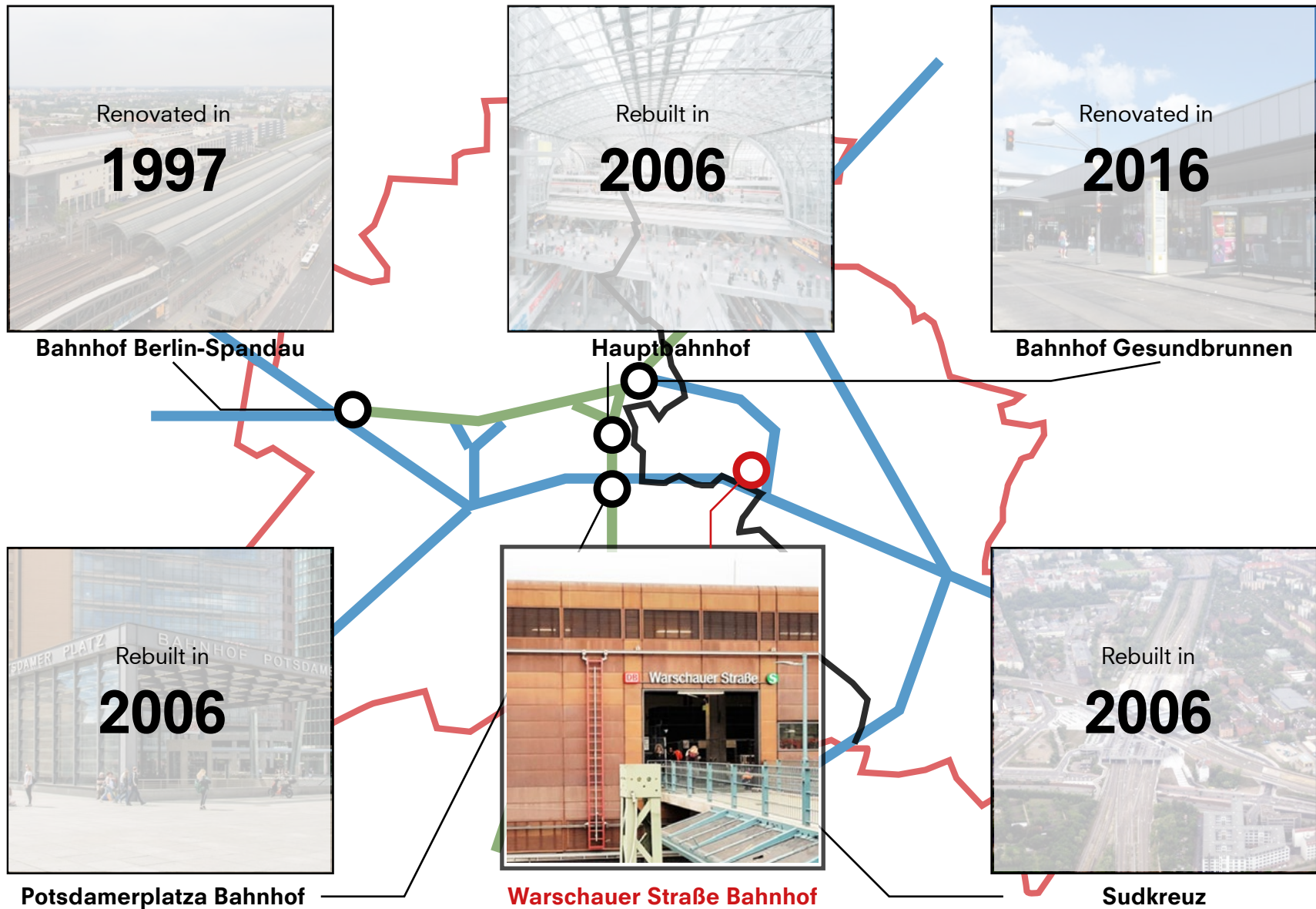
TRAIN STATION UPGRADE



TRAIN STATION UPGRADE



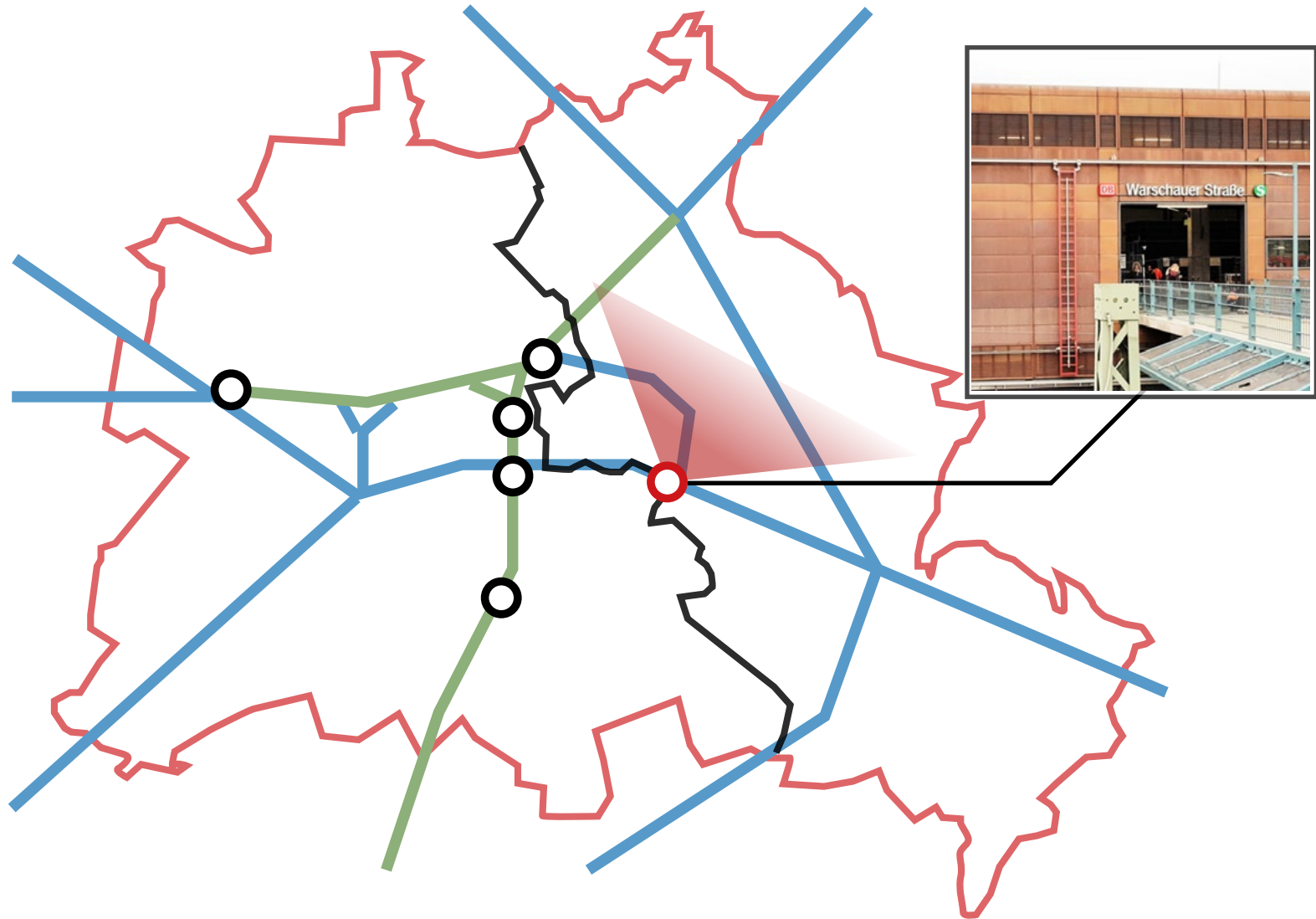
TRAIN STATION UPGRADE



Introduction

SYNTHESIS

A new Warschauer Straße Bahnhof to fill the gap in the east Berlin.



Warschauer Straße Bahnhof

Pedestrian bridge as transfer passage



Introduction

Warschauer Straße Bahnhof

Inside the building



Concourse



Exit



Platform



Exit



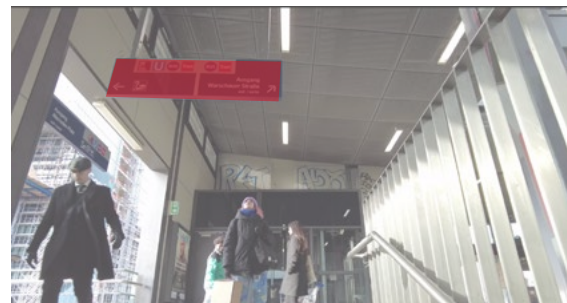
Concourse



Entrance



Pedestrian walkway



Concourse



Concourse

Introduction

Warschauer Straße Bahnhof

Inside the building



Concourse



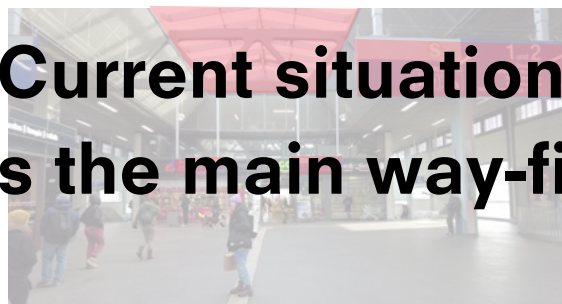
Exit



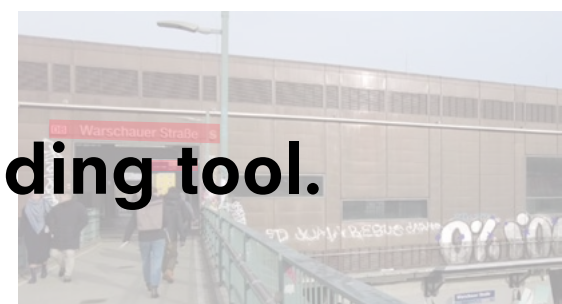
Platform



Exit



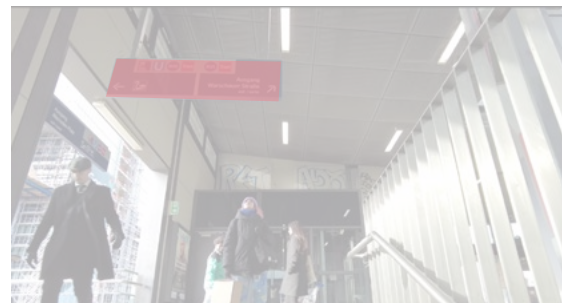
Concourse



Entrance



Pedestrian walkway



Concourse



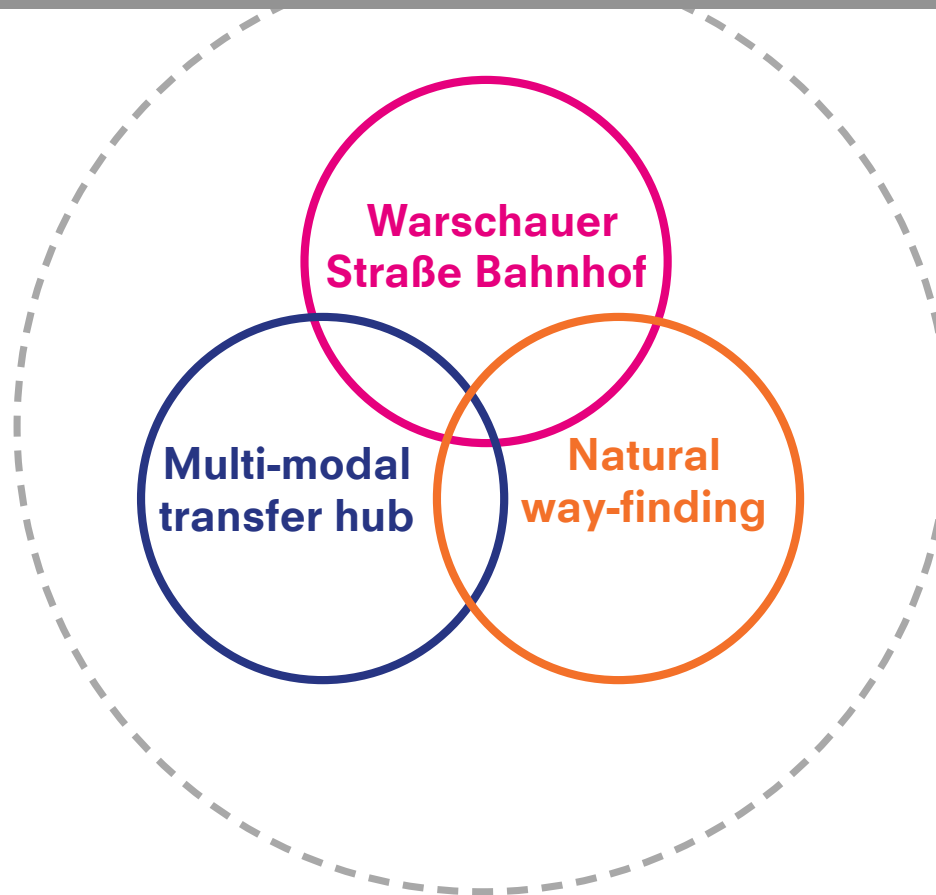
Concourse

Current situation:
Signage as the main way-finding tool.

RESEARCH QUESTION

Synthesis

How can architectural spaces guide people to **find routes** at **multi-modal transfer hubs** in **Berlin**?



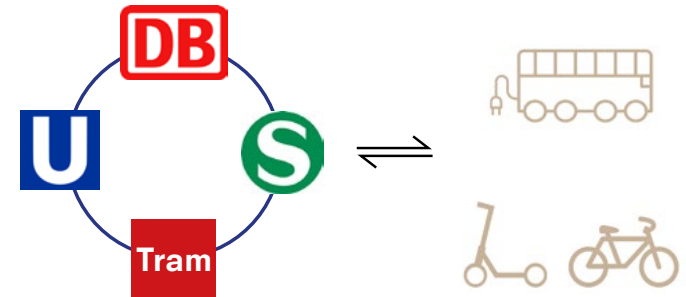
PROJECT STATEMENT

Berlin

Building

Body

A new **multi-modal transfer station** at Warschauer Straße aims to represent an inspiring example that can provide a solution for research question.



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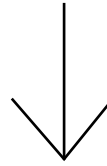
5. CONCLUSION

TRAIN STATION PROGRAM

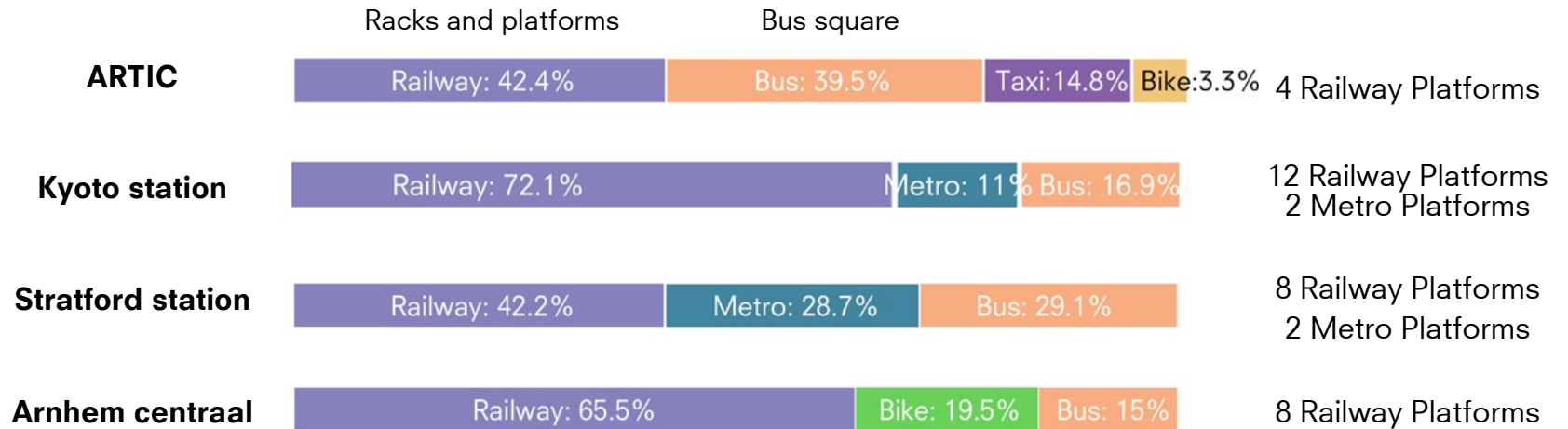
Book: *Edwards, B. (1997). The Modern Station: New Approaches to Railway Architecture (1st ed.). Taylor & Francis.*

Six main elements of designing

- Railway track and signaling
- The platforms
- Circulation areas
- Tickets sales and retail
- Post and parcel areas
- Station concourse

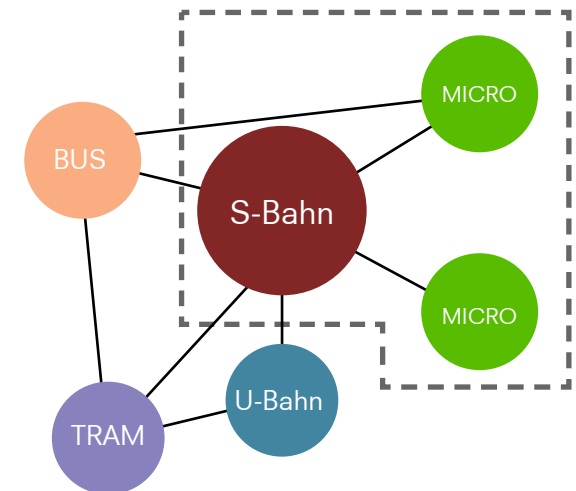


COMPARISON-SITE AND BUILDING



Warschauer Straße Bahnhof:

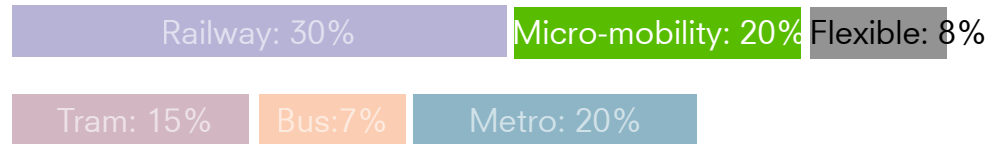
(4 S-Bahn platforms, 2 U-Bahn platforms, 2 tram platforms, 1 bus stop)



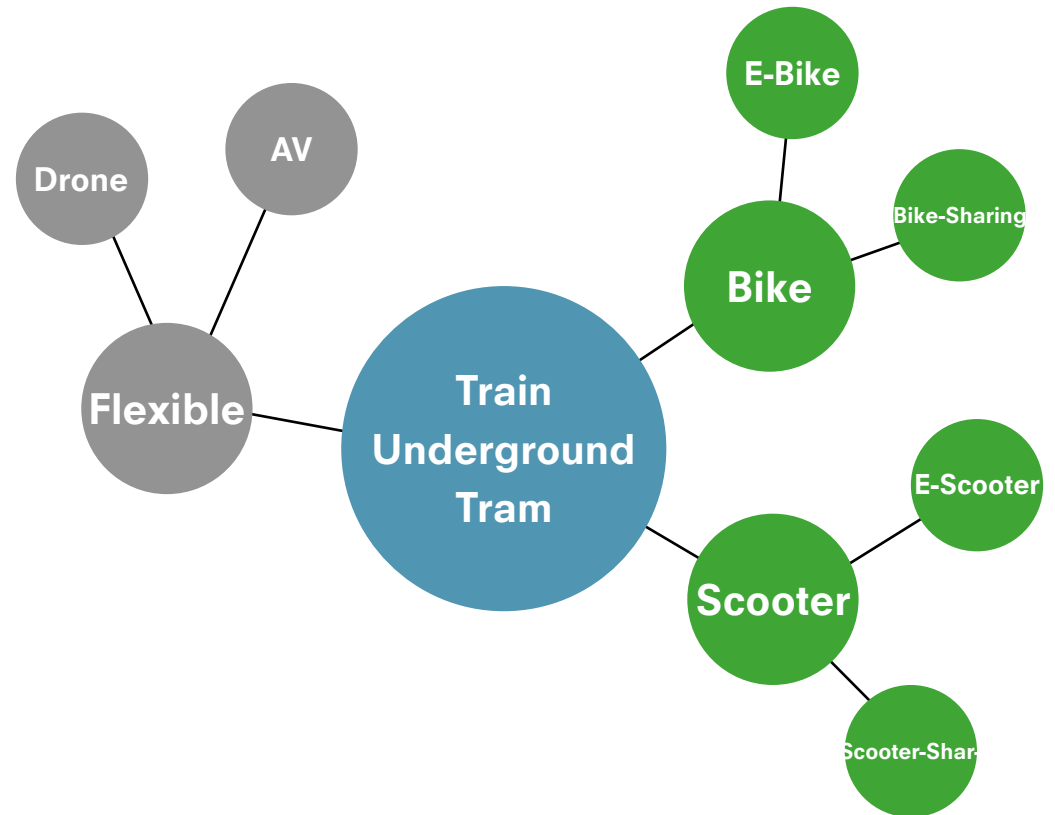
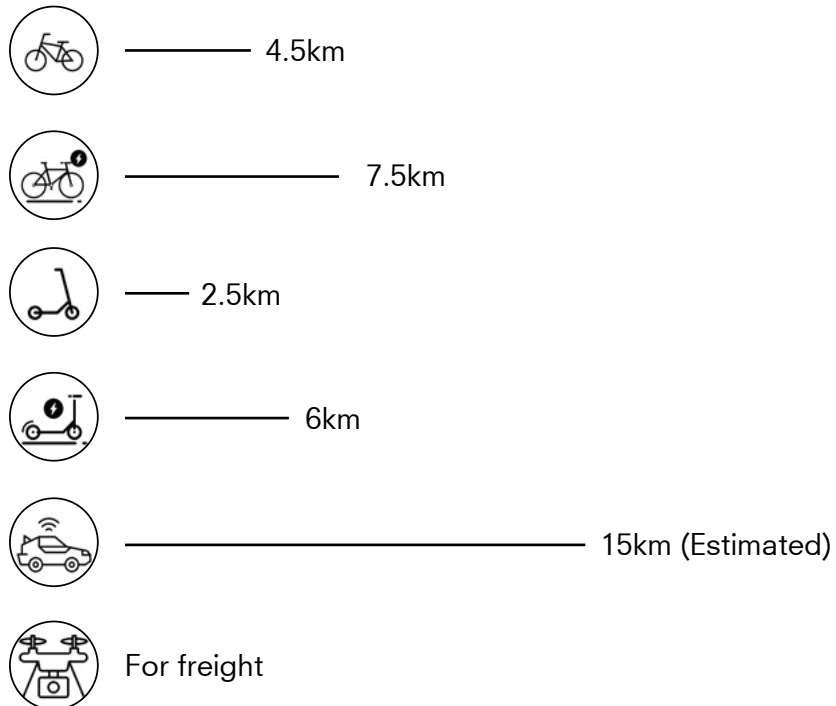
ADDED MICRO-MOBILITY HUB

Warschauer Straße Bahnhof:

(4 S-Bahn platforms, 2 U-Bahn platforms, 2 tram platforms, 1 bus stop)

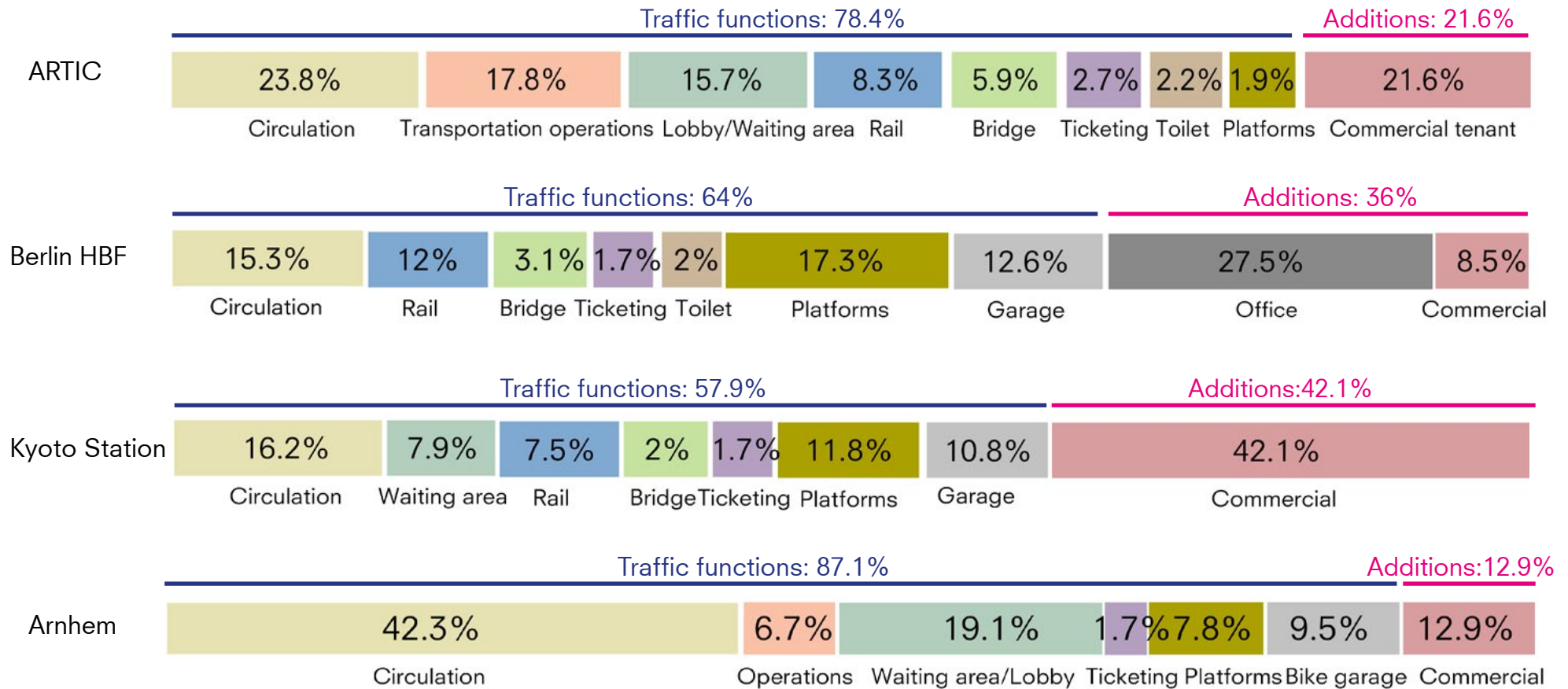


Average traveling distance:

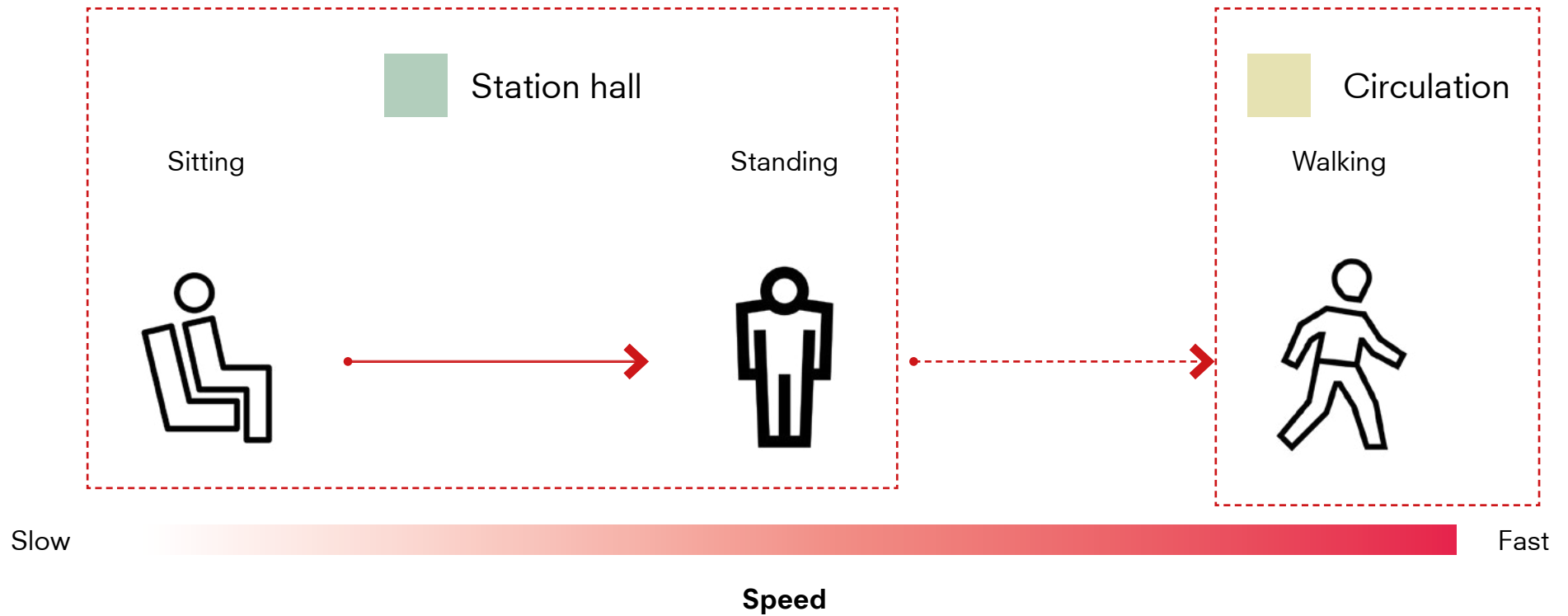


Source: Schaap, Nina & Harms, Lucas & Kansen, Maarten & wust, hans. (2016). Cycling and walking: the grease in our mobility chain.

PROGRAM BAR BENCHMARKING

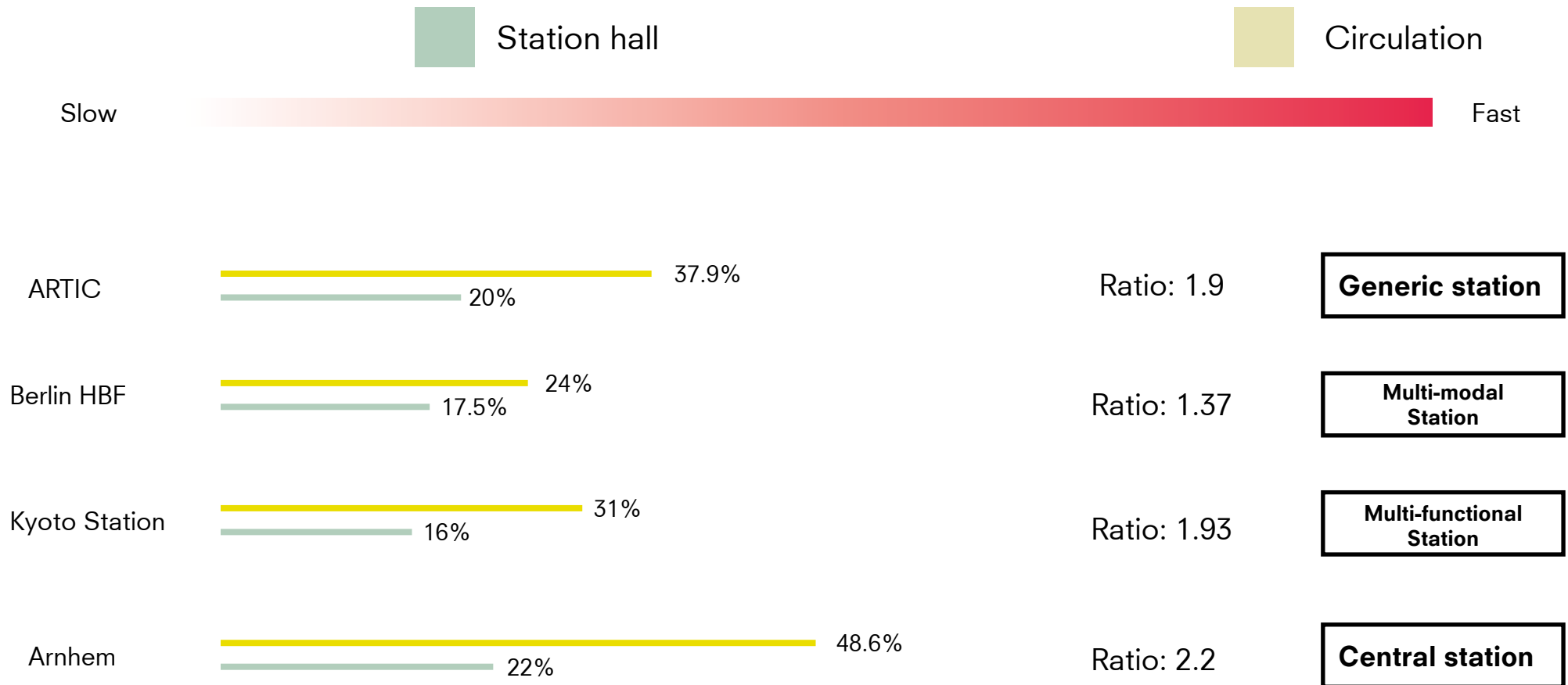


STATION HALL & CIRCULATION

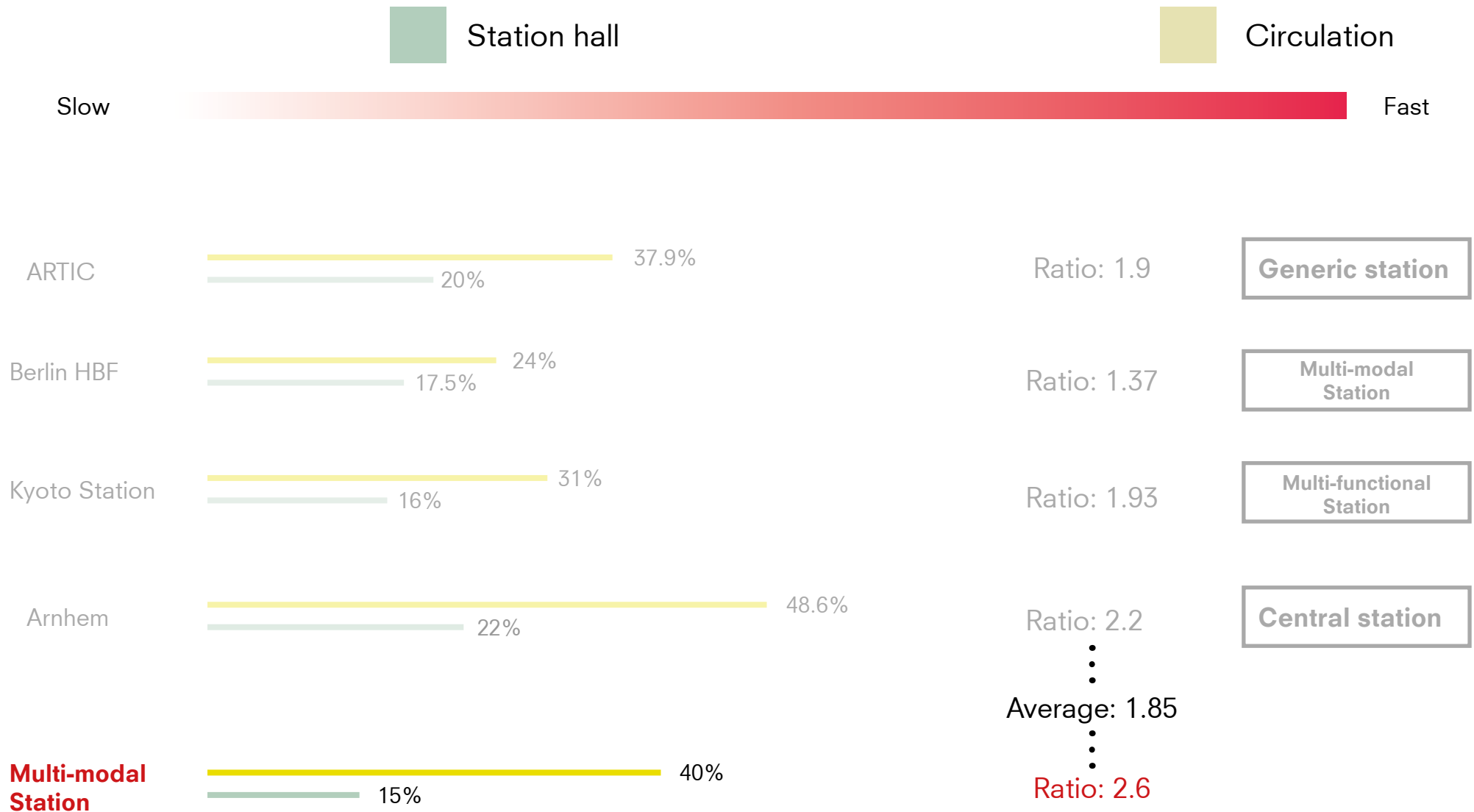


Nourian, Pirouz & Bai, Nan. (2021). Reuse: On Evaluating the Fitness of Spatial Configurations Before & After Retrofitting for Reuse of Architectural Heritage.

STATION HALL & CIRCULATION

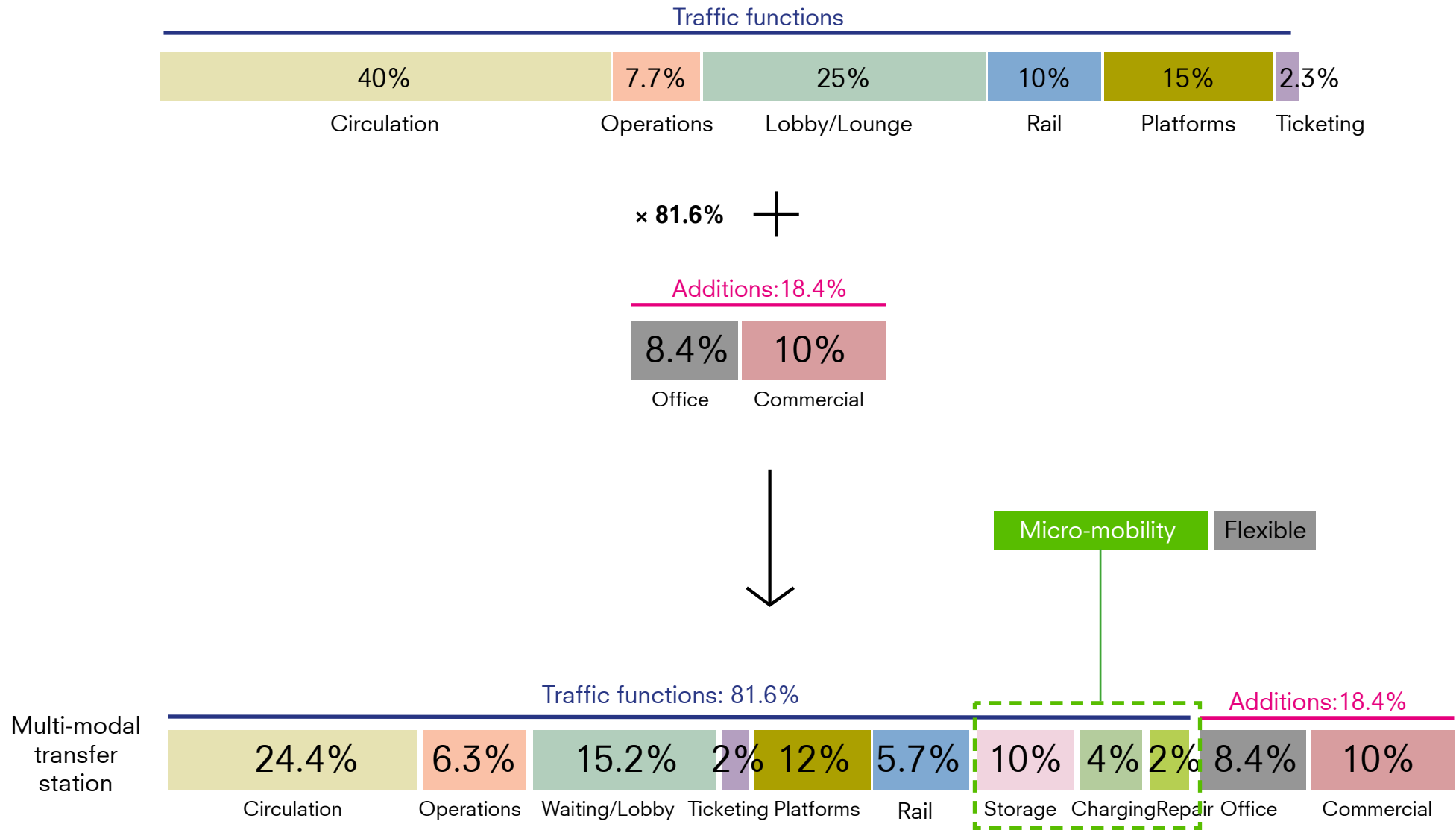


STATION HALL & CIRCULATION

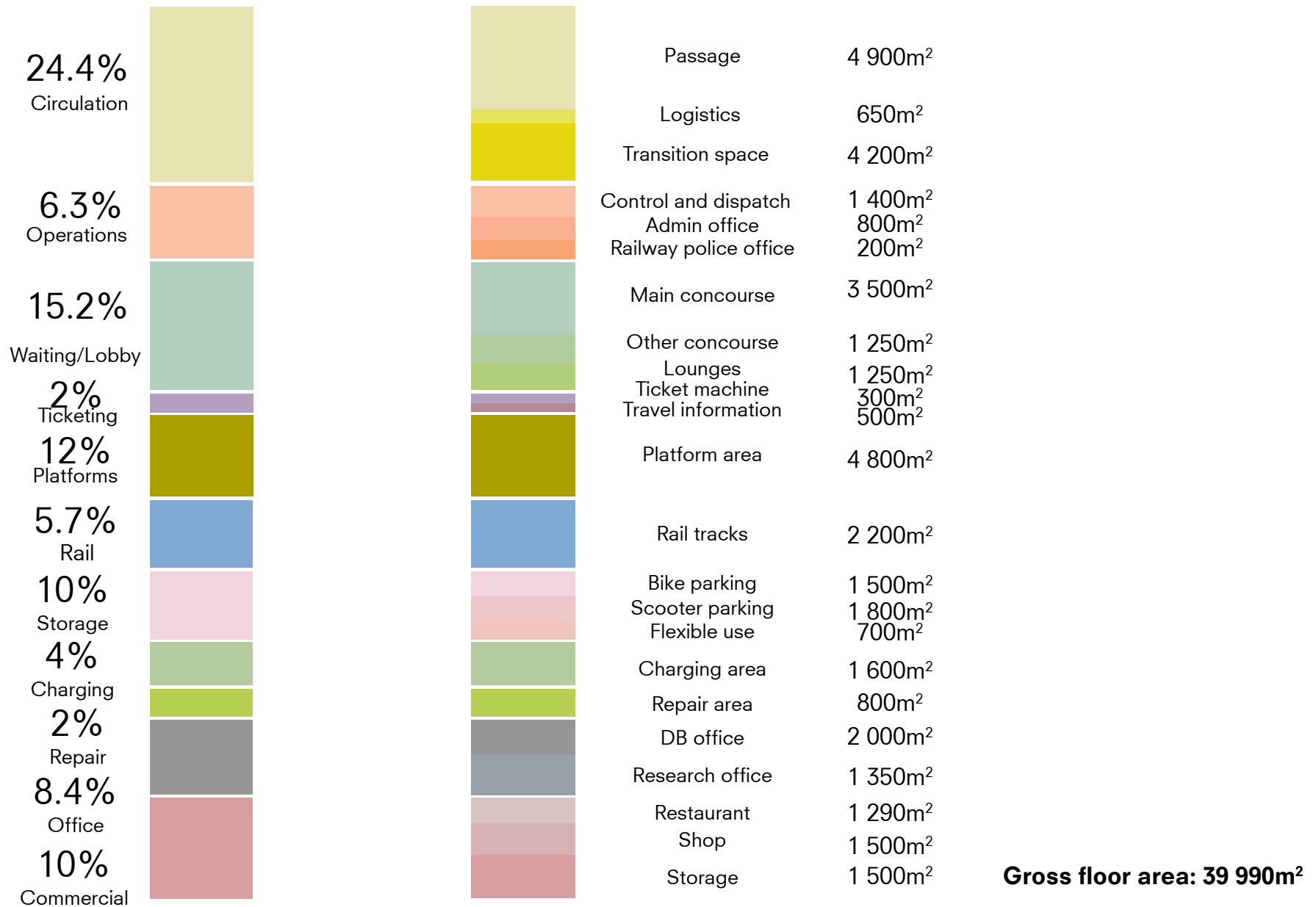


Research and design brief

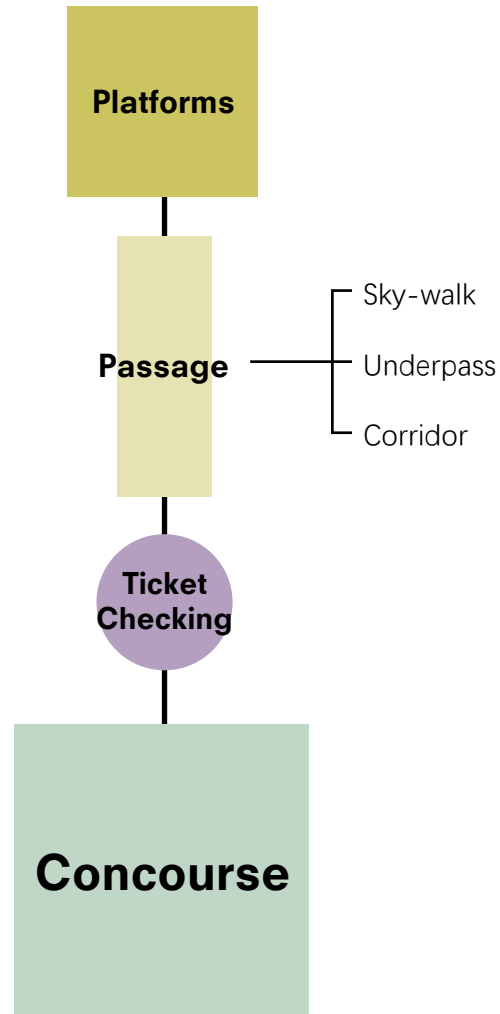
PROGRAM BAR SYNTHESIS



PROGRAM BAR SYNTHESIS

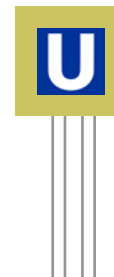
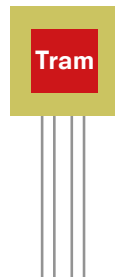


MAIN PATH FOR PASSENGERS



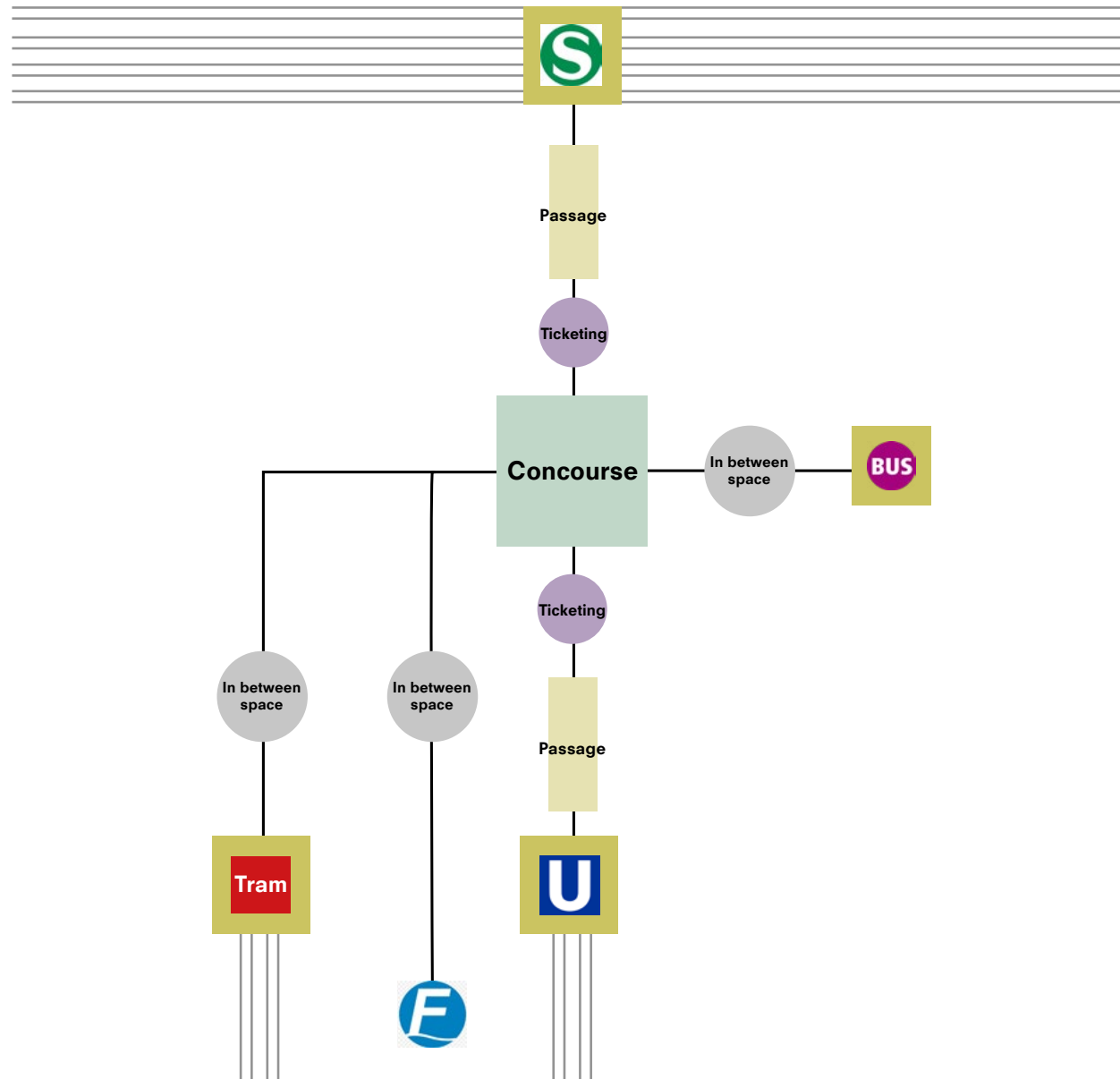
Research and design brief

APPLY TO SITE



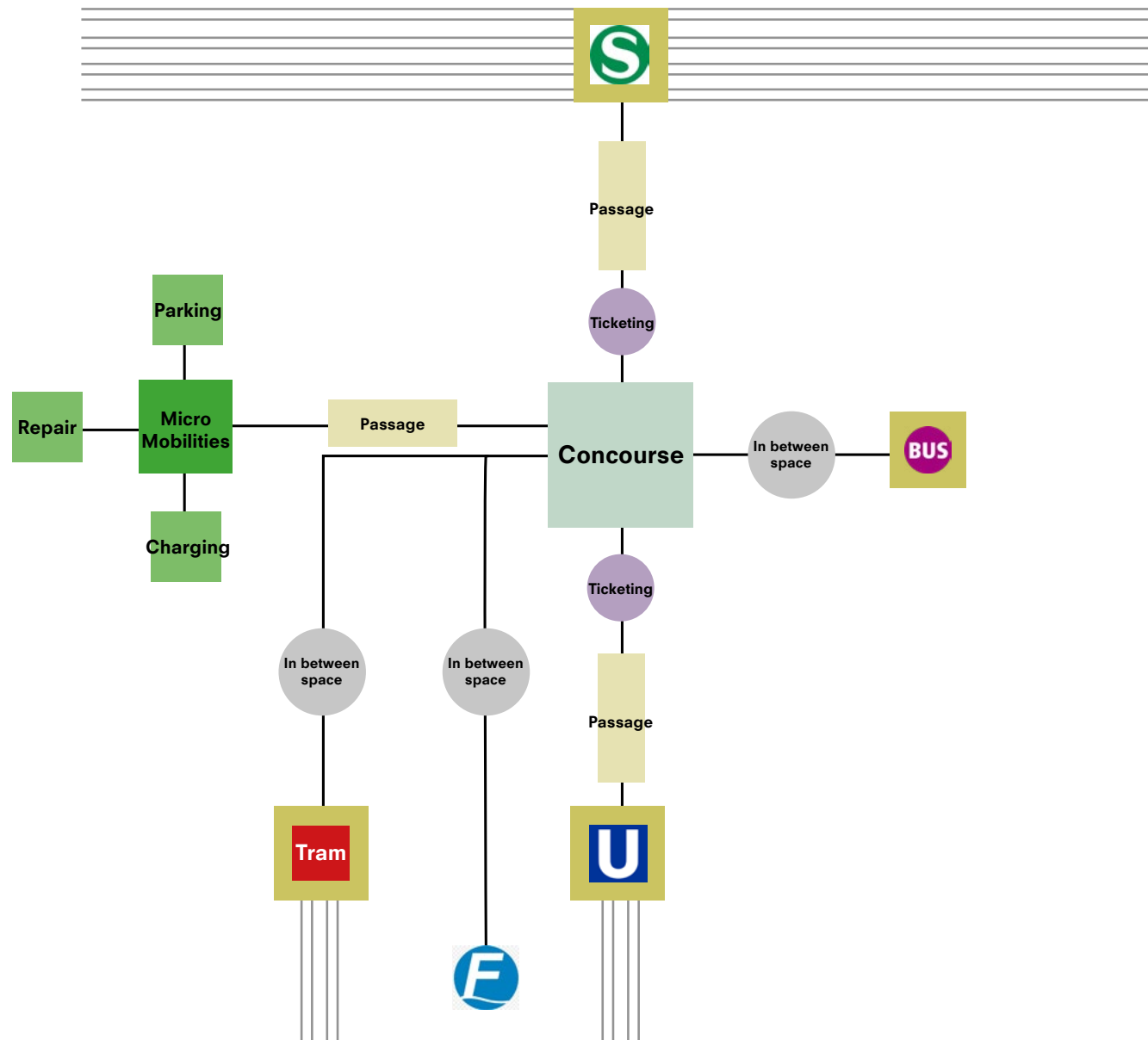
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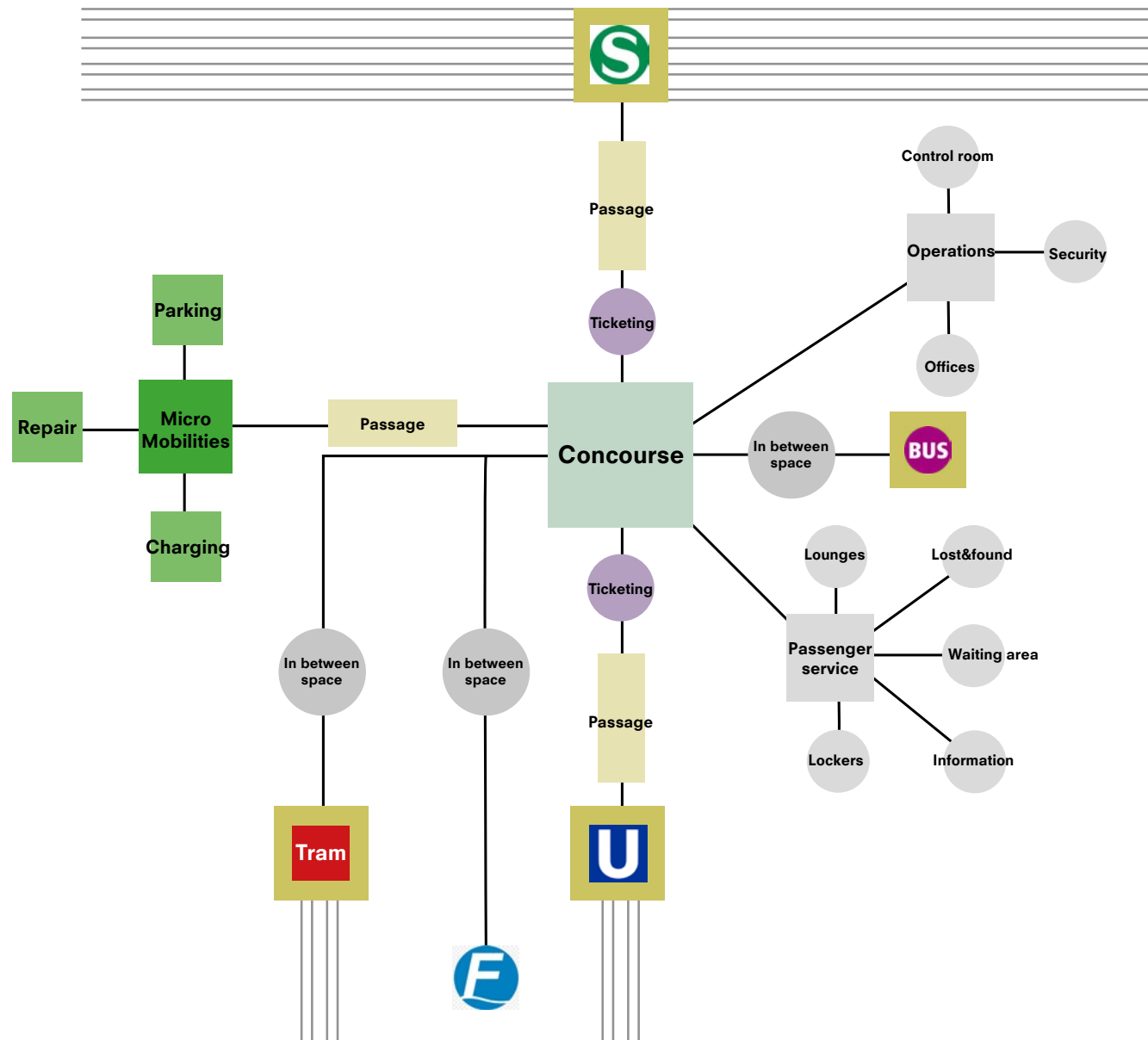
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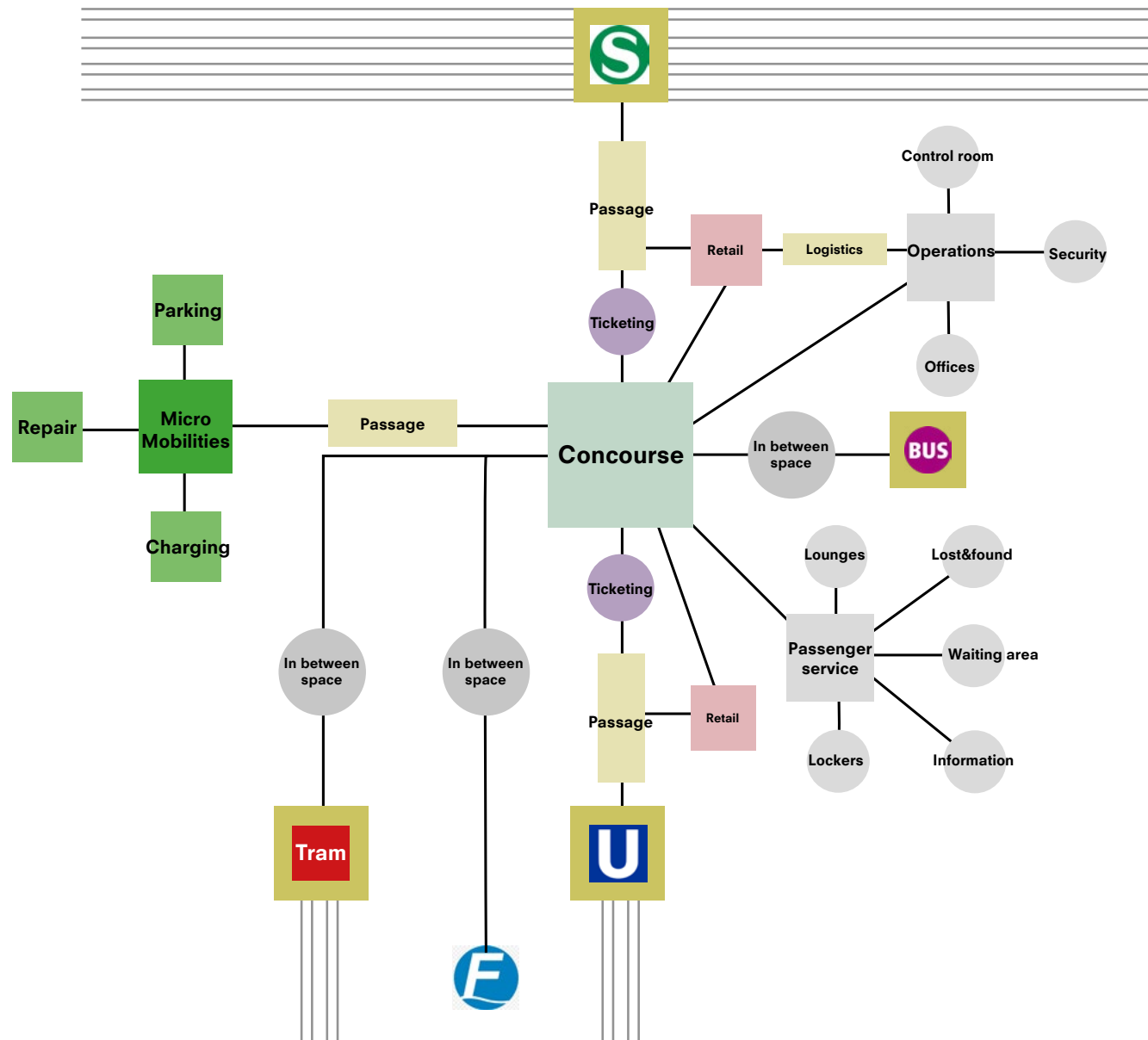
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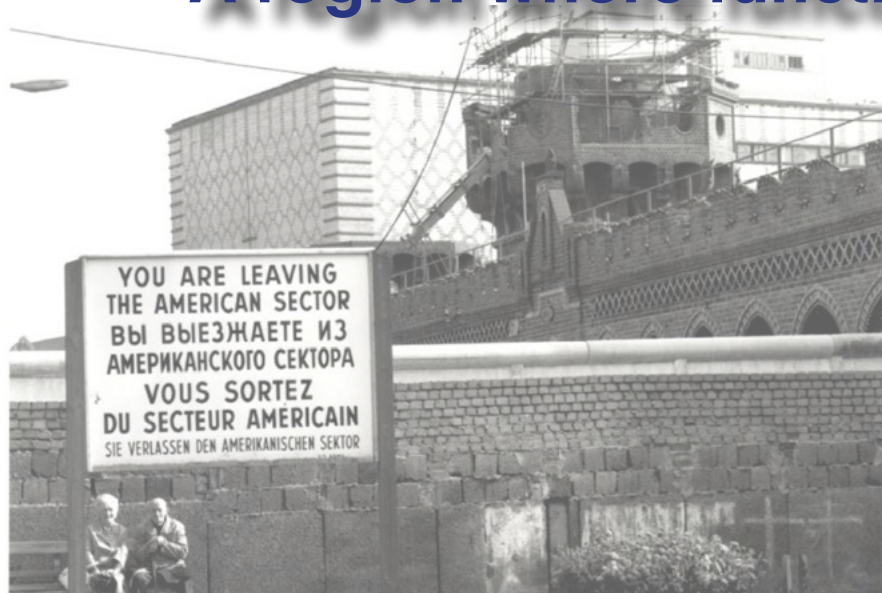


Research and design brief

Warschauer Straße Bahnhof



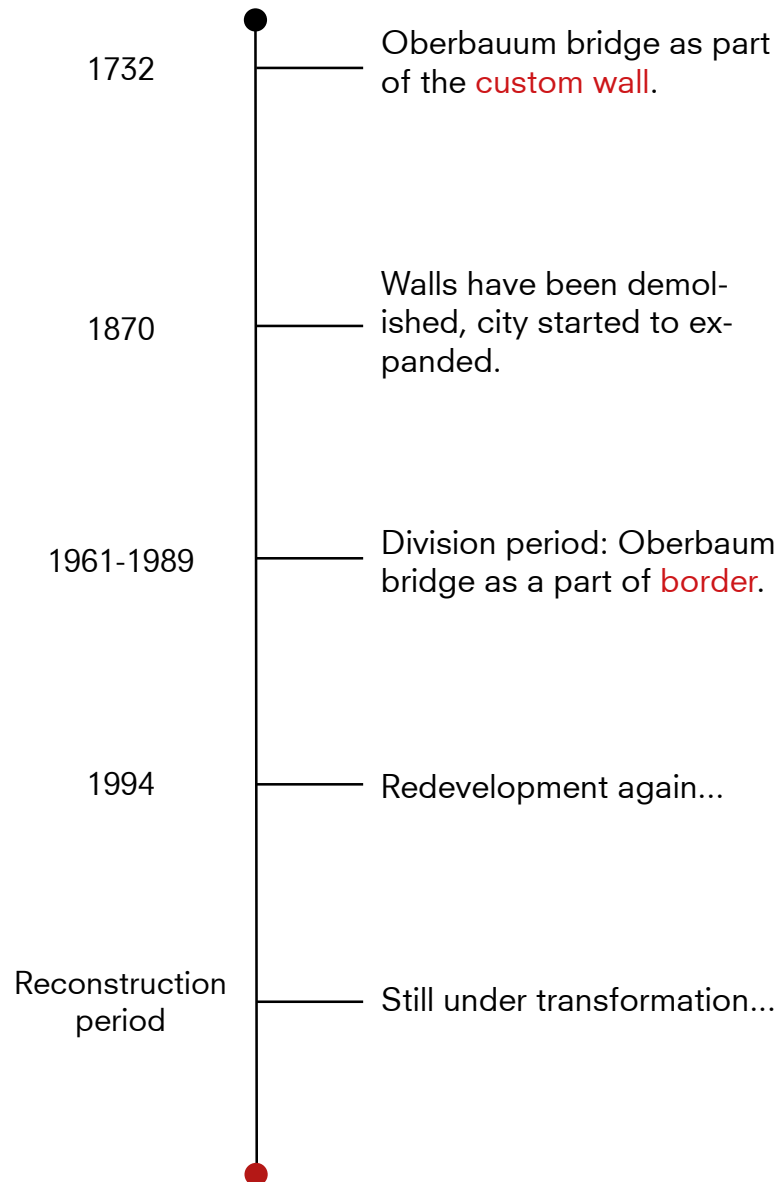
A region where functions are ever-changing.



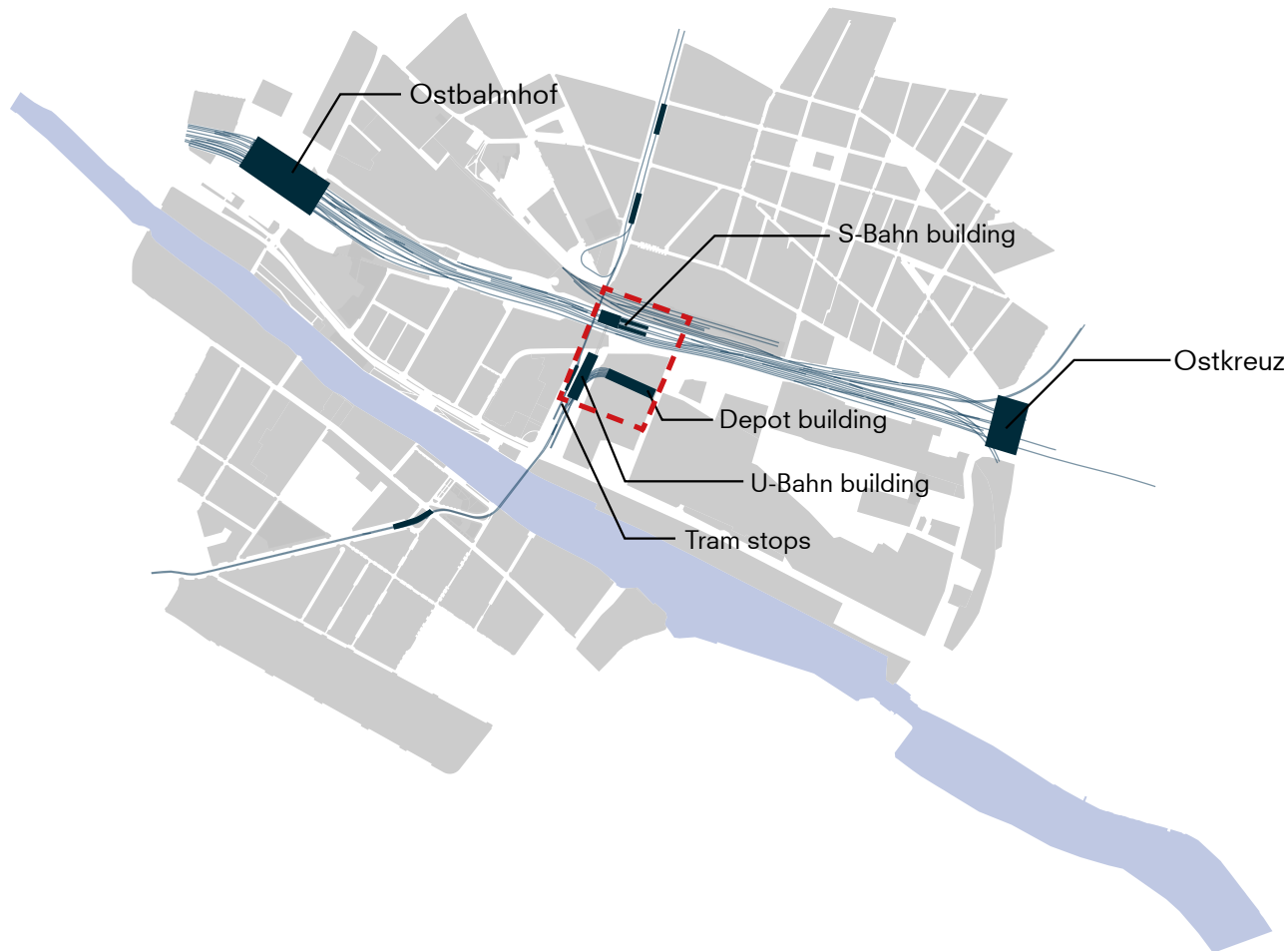
Research and design brief

HISTORY DEVELOPMENT

Area of Warschauer Straße and Oberbaum bridge



CURRENT TRANSPORT LINES



Within the site:



1 traffic building
4 platforms
5 S-Bahn lines:



1 traffic building
1 carriage depot building
2 platforms
2 U-Bahn lines:



1 tram stops
2 tram lines: M10 M13



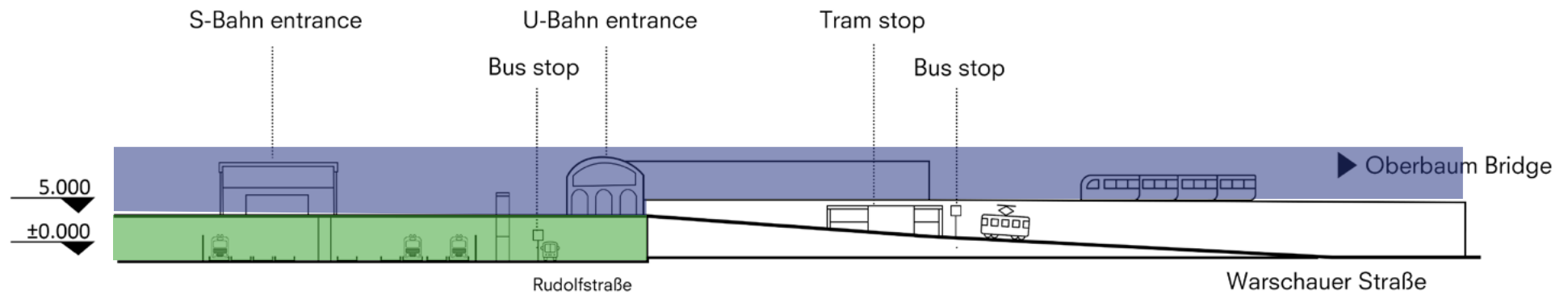
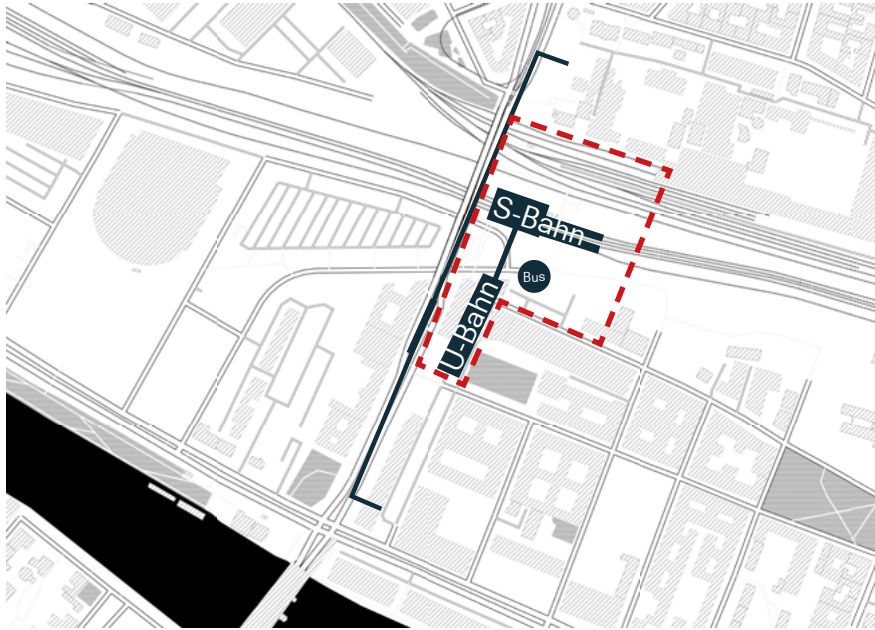
2 bus stops
3 bus lines: 300, 347, N1

Research and design brief

SURROUNDED BY HOT-SPOTS

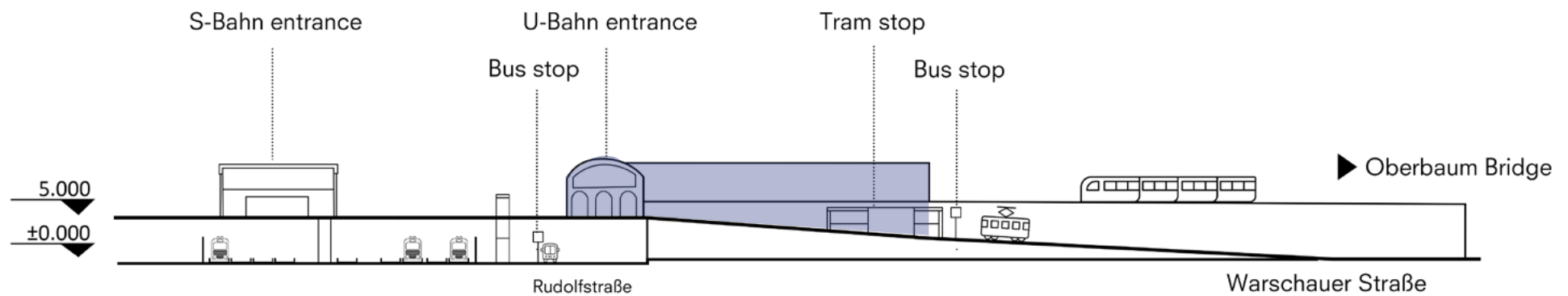


TWO LEVELS

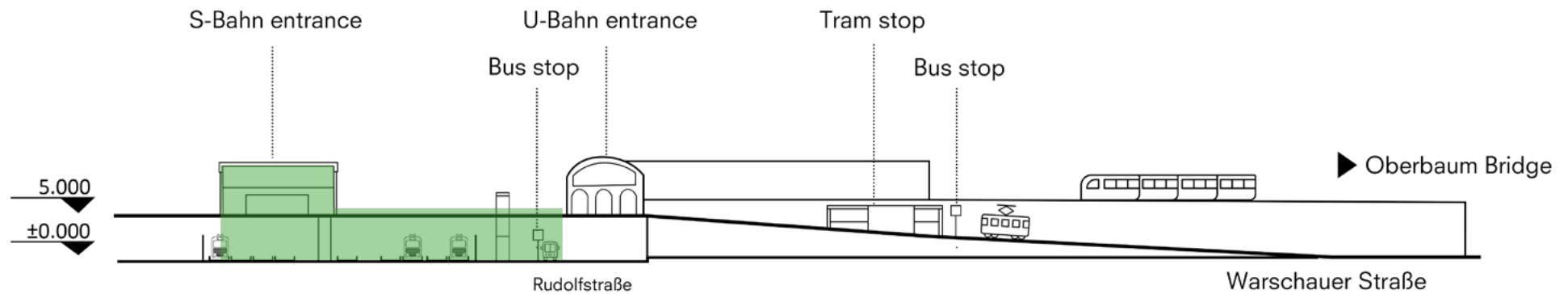


Research and design brief

U-BAHN ON BRIDGE LEVEL

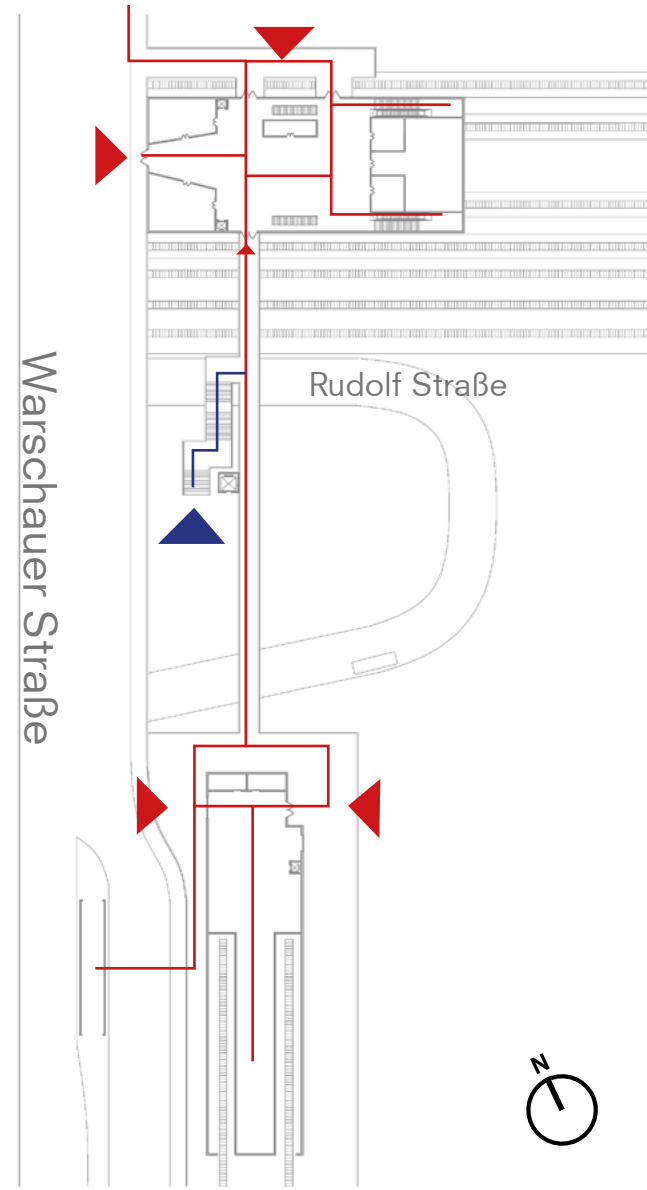
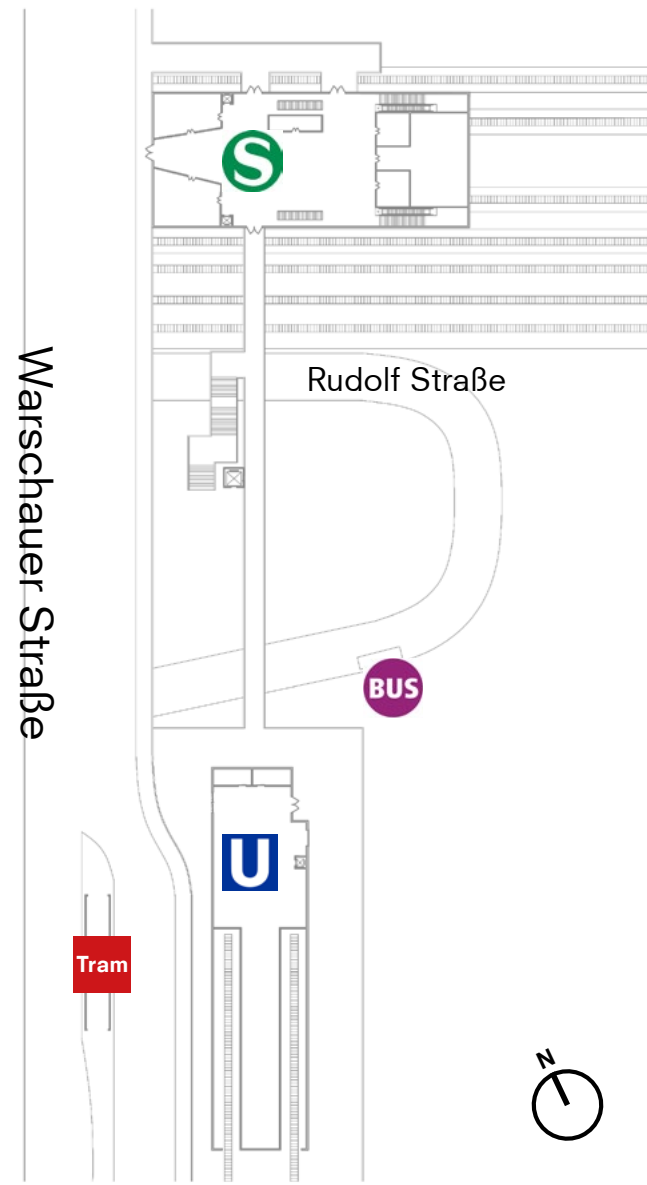


S-BAHN ON GROUND LEVEL



Research and design brief

ENTRANCES ON 2 LEVELS



Research and design brief

PASSENGER FLOW

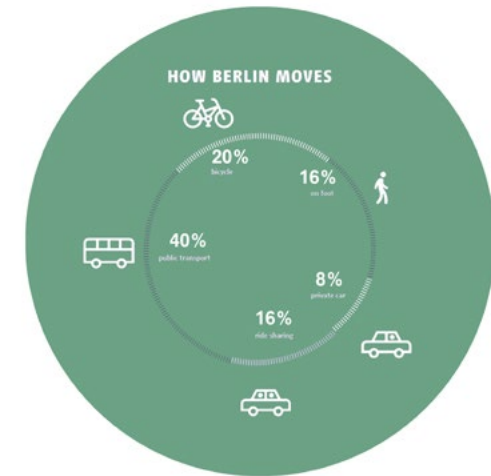
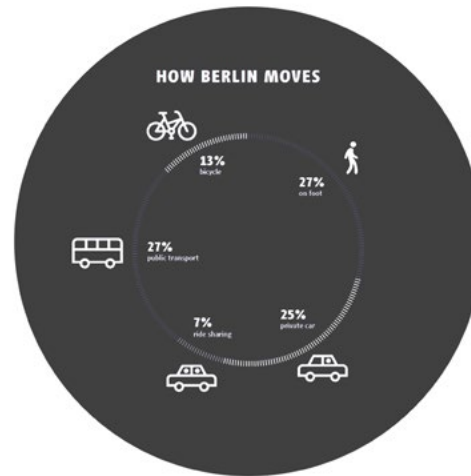


Warschauer Street Bahnhof

Current Passenger Volume:

31 000 000 per year

85 000 per day



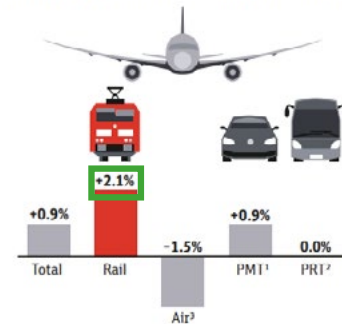
increased by **29%** in 10 years

40 300 000 per year

Research and design brief

PASSENGER FLOW

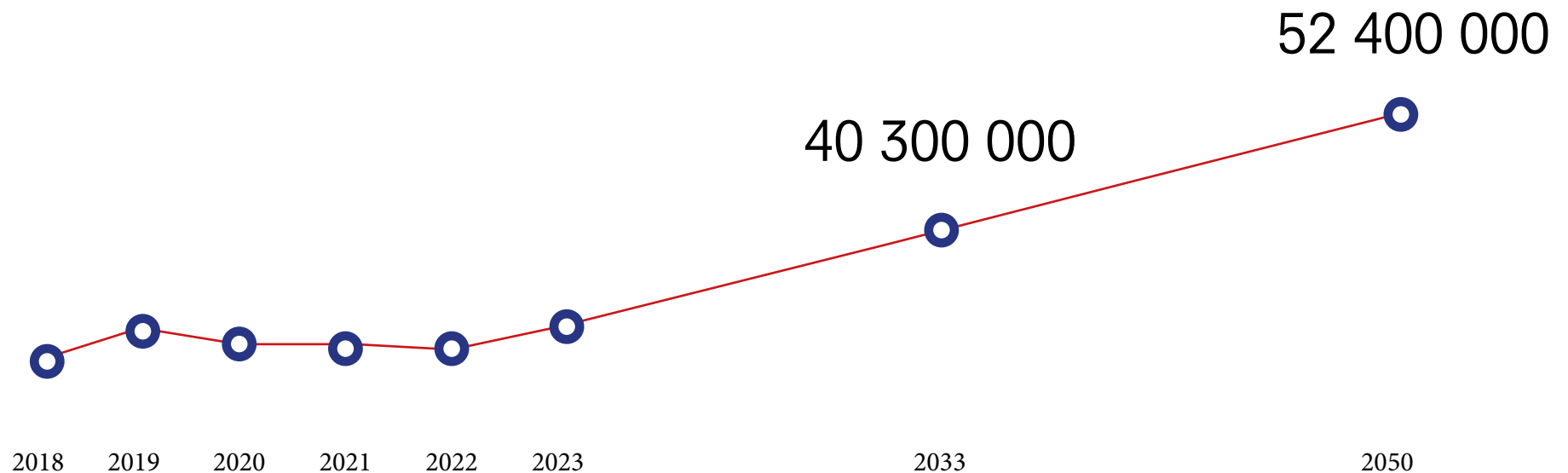
Market performance in 2019 compared with previous year (measured in transport volume)



Market performance in 2021* compared with previous year (measured in transport volume)



	Jan-Jun 2022		
Passengers (million)	1,809	1,229	+ 580
<i>RAIL PASSENGER TRANSPORT</i>			
Punctuality of DB passenger transport (rail) in Germany (%)	92.5	94.9	- 2.4
Punctuality of DB Long-Distance (%)	69.6	79.5	- 9.9
Passengers (million)	917.5	559.6	+ 357.9
thereof in Germany	783.9	479.9	+ 304.0



Research and design brief

PASSENGER FLOW

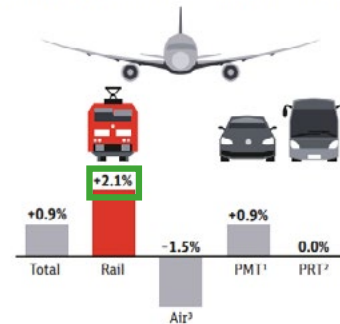
52 400 000 per year
140 000 per day

Peak hour(7:00-9:00; 17:00-21:00) :11 000 per hour

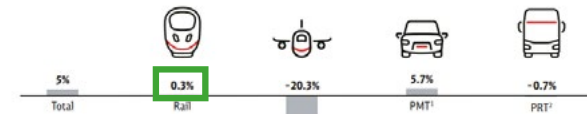
Off-peak hour(5:00-7:00, 9:00-17:00, 21:00-00:16):8000 per hour

3:56-00:56 (21hours)

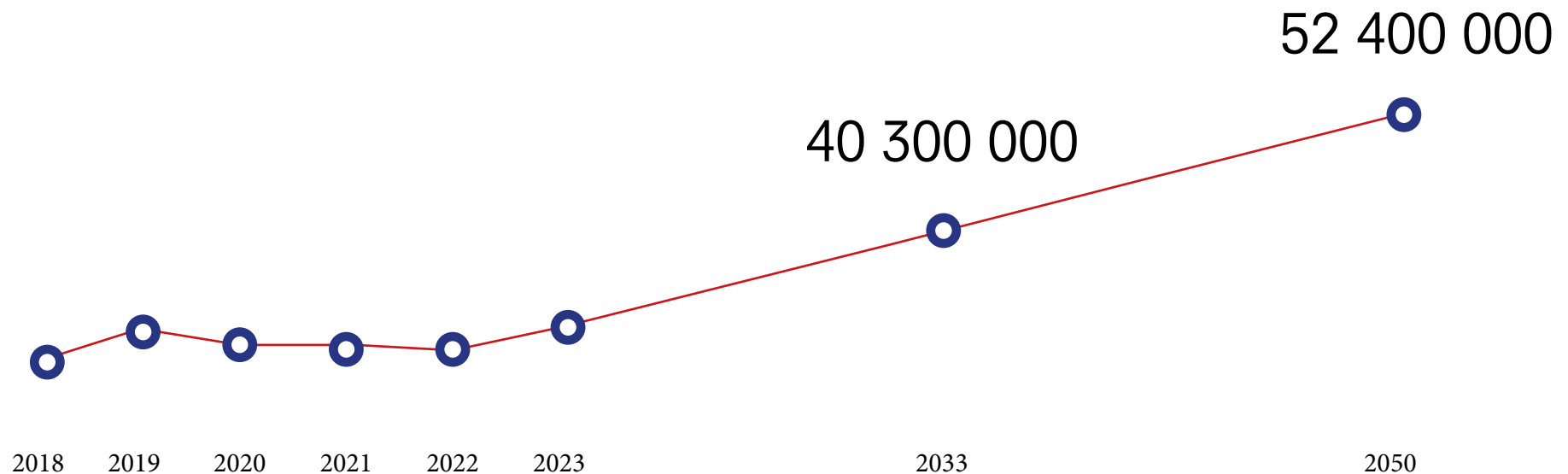
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CAPACITIES



$350 \text{ pp/carriage} * 8 = 2800$

>



$330 \text{ pp/carriage} * 6 = 1980$

>



ca.200



PASSENGER FLOW DISTRIBUTION



>



>



350 pp/carriage * 8 = 2800

330 pp/carriage * 6 = 1980

ca.200

Total passenger: 140 000 per day					Transfer: 70 000		
					Origin-destination: 70 000		
From	S-Bahn	U-Bahn	Tram	Bus	Micro-mobility	Walk	Car
S-Bahn	\	10000	7000	1000	8000	8000	0
U-Bahn	10000	\	6000	1000	6000	6000	0
Tram	7000	7000	\	1000	6000	6000	0
Bus	1000	1000	1000	\	2000	2000	\
Micro-mobility	8000	6000	6000	2000	\	\	\
Walk	8000	6000	6000	2000	\	\	\
Car	0	0	0	0	\	\	\

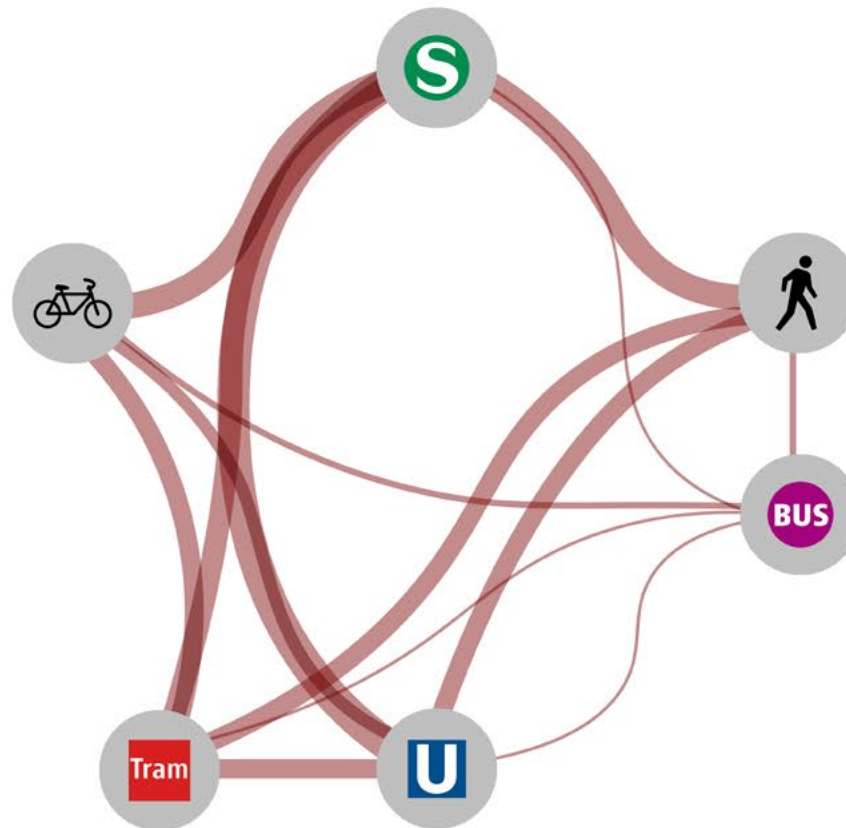
PASSENGER FLOW DISTRIBUTION



Total passenger: 140 000 per day					Transfer: 70 000		
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From	S-Bahn	U-Bahn	Tram	Bus	Micro-mobility	Walk	Car
S-Bahn	\	10000	7000	1000	8000	8000	0
U-Bahn	10000	\	6000	1000	6000	6000	0
Tram	7000	7000	\	1000	6000	6000	0
Bus	1000	1000	1000	\	2000	2000	\
Micro-mobility	8000	6000	6000	2000	\	\	\
Walk	8000	6000	6000	2000	\	\	\
Car	0	0	0	0	\	\	\

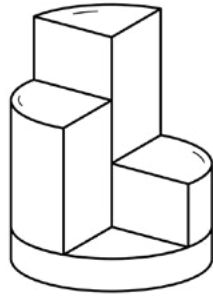
Research and design brief

PASSENGER FLOW

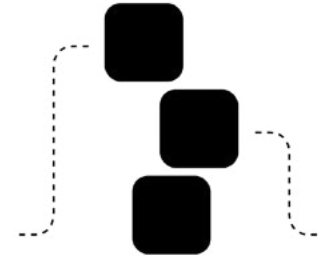


Research and design brief

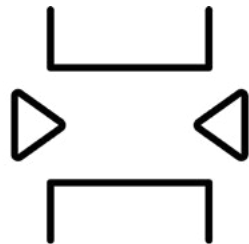
DESIGN BRIEF SUMMARY



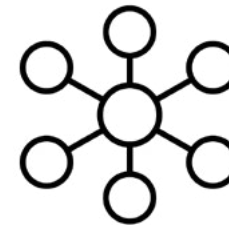
Potential to organize all transport modes in an **overarching building**.



A clear and adaptive **flow** to meet the needs of people with different purposes.



Eliminating the physical boundaries created by railway tracks.



Convenient **access** from any directions.

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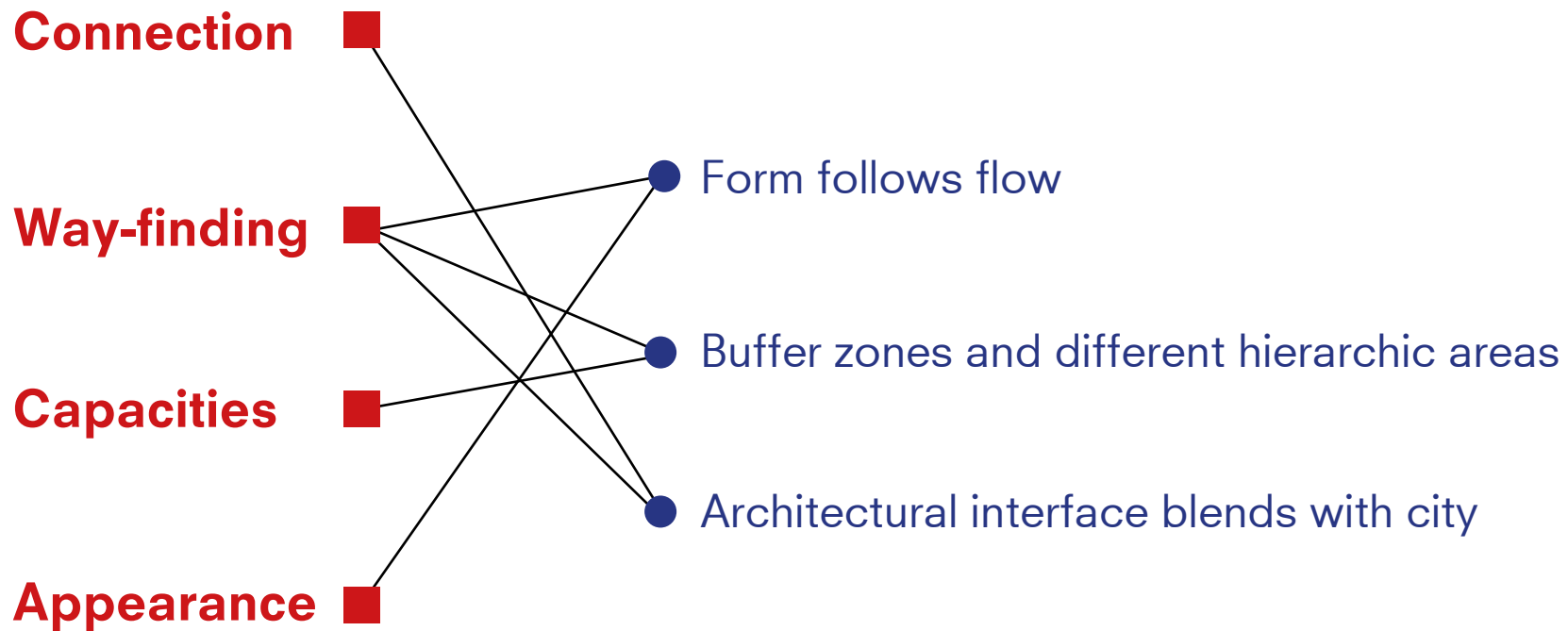
5. CONCLUSION

DESIGN POINTS & GOALS

- 1. Barrier-free and convenient **connection** to surroundings
View connection, people flow connection, easily access by foot and micro-mobilities
- 2. Fast and easy **navigation** and **way-finding** system
Reduced streamline crossings, continuous transfer flow, short transfer path
- 3. Meet the needs of different **capacities**
Able to meet heavy passenger flows in a short period
- 4. **Appearance** that can be recognized
People can quickly recognize it as a train station from a distance

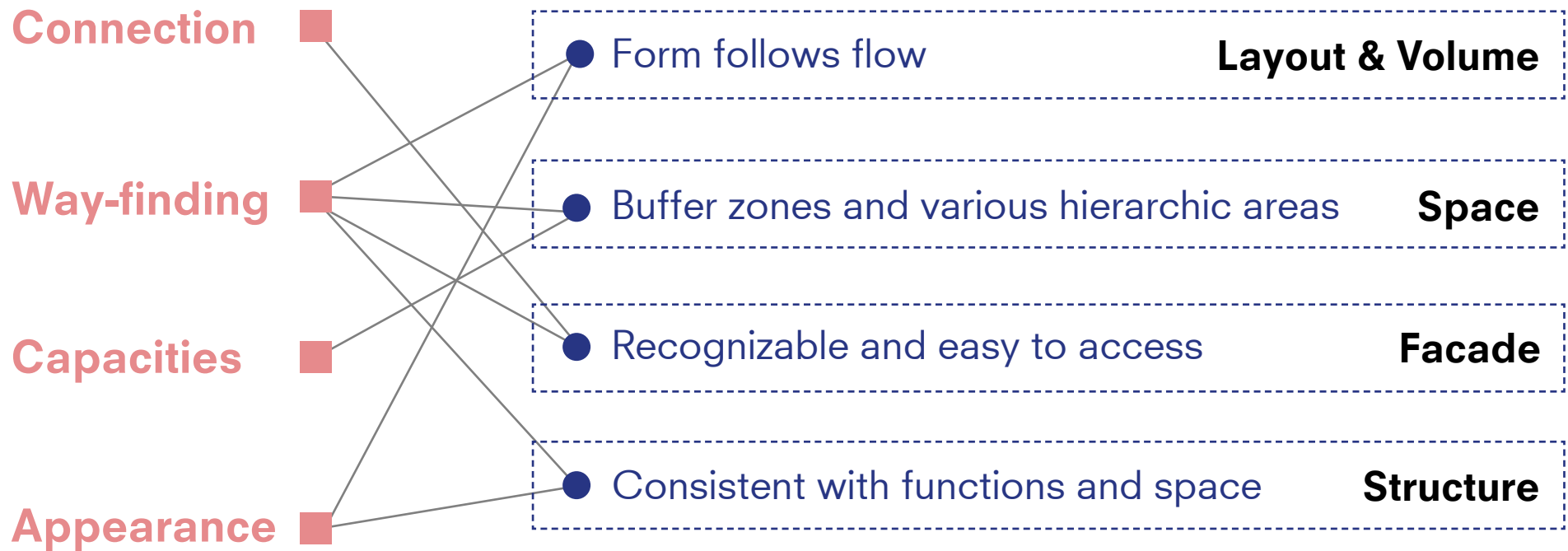
Concept

CONCEPT



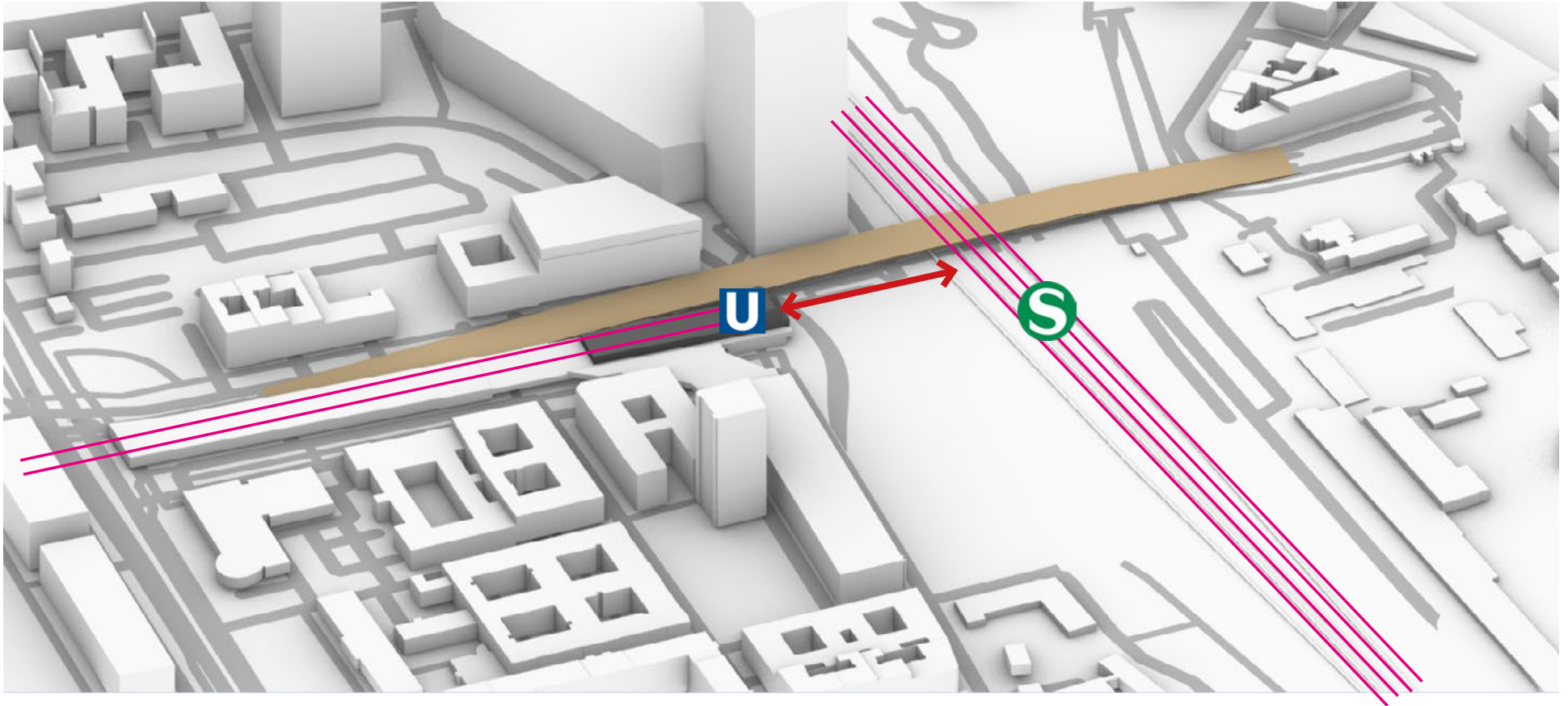
Concept

CONCEPT



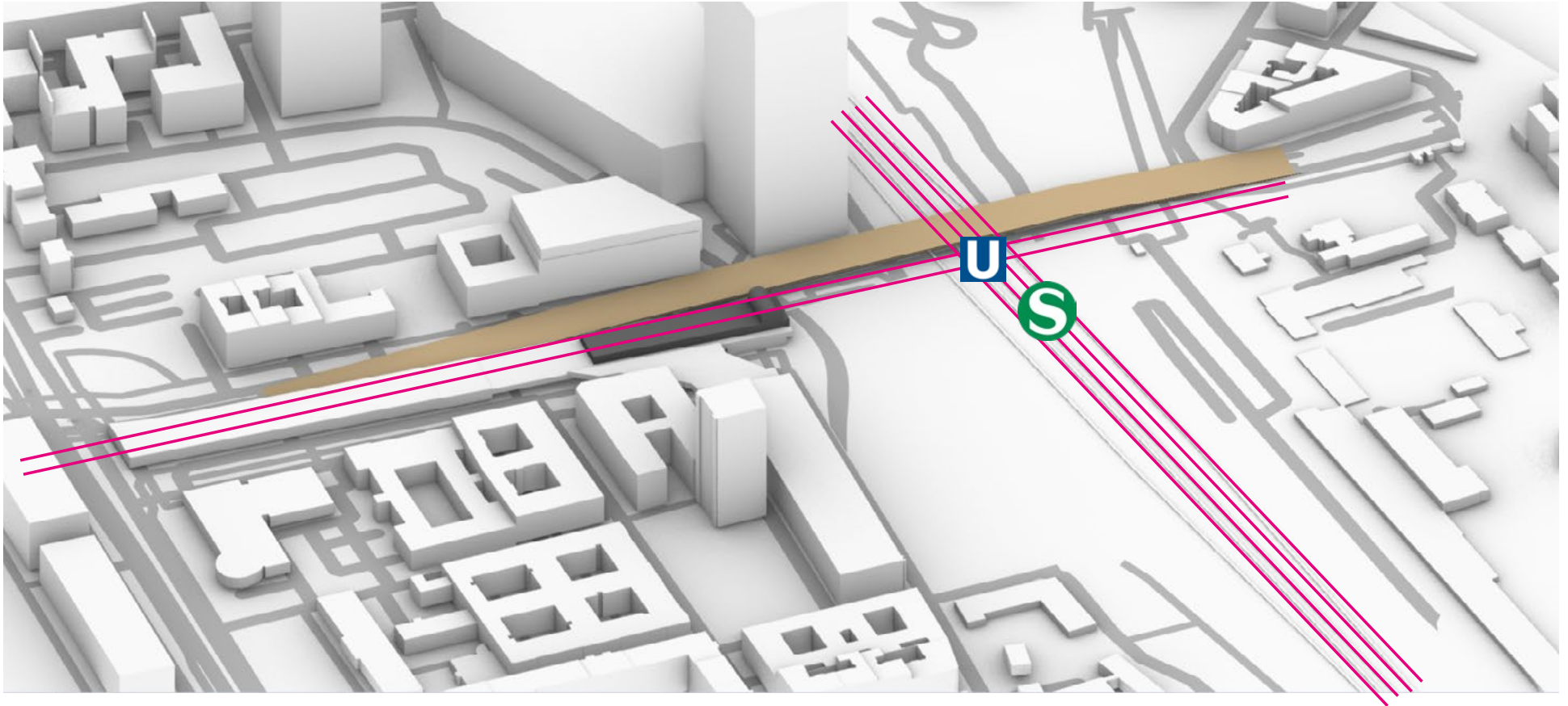
Concept

EXTENDED RAILWAY



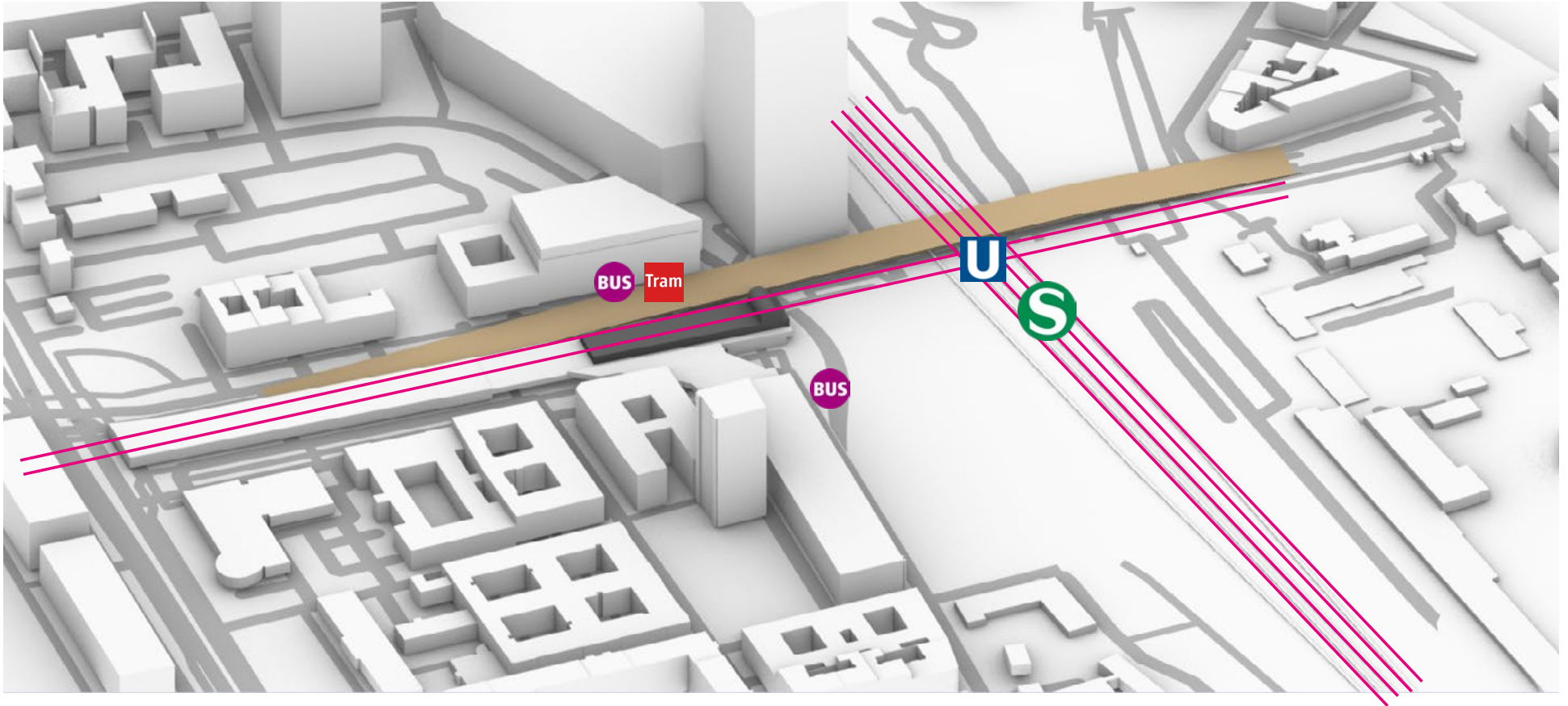
Concept

CLOSER TO S-BAHN



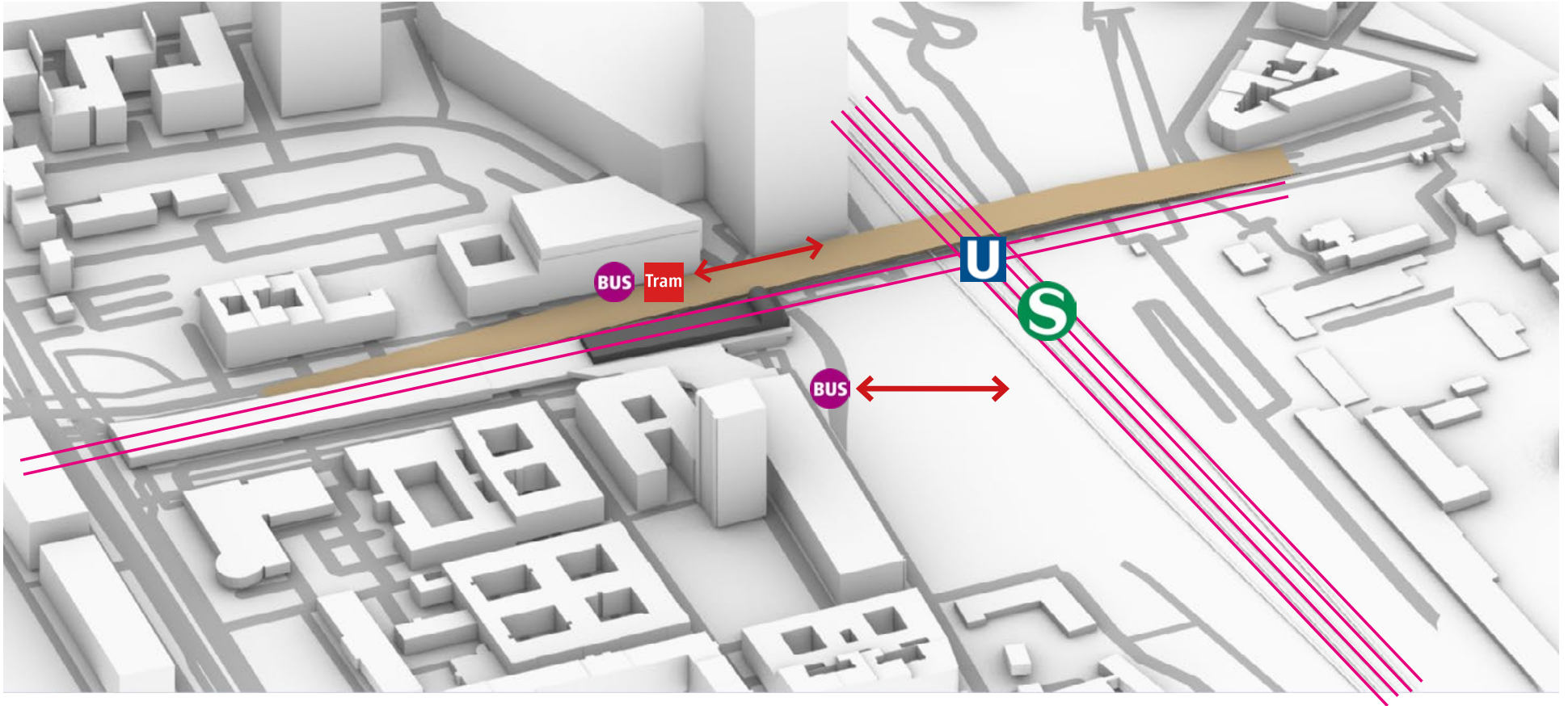
Concept

BUS & TRAM



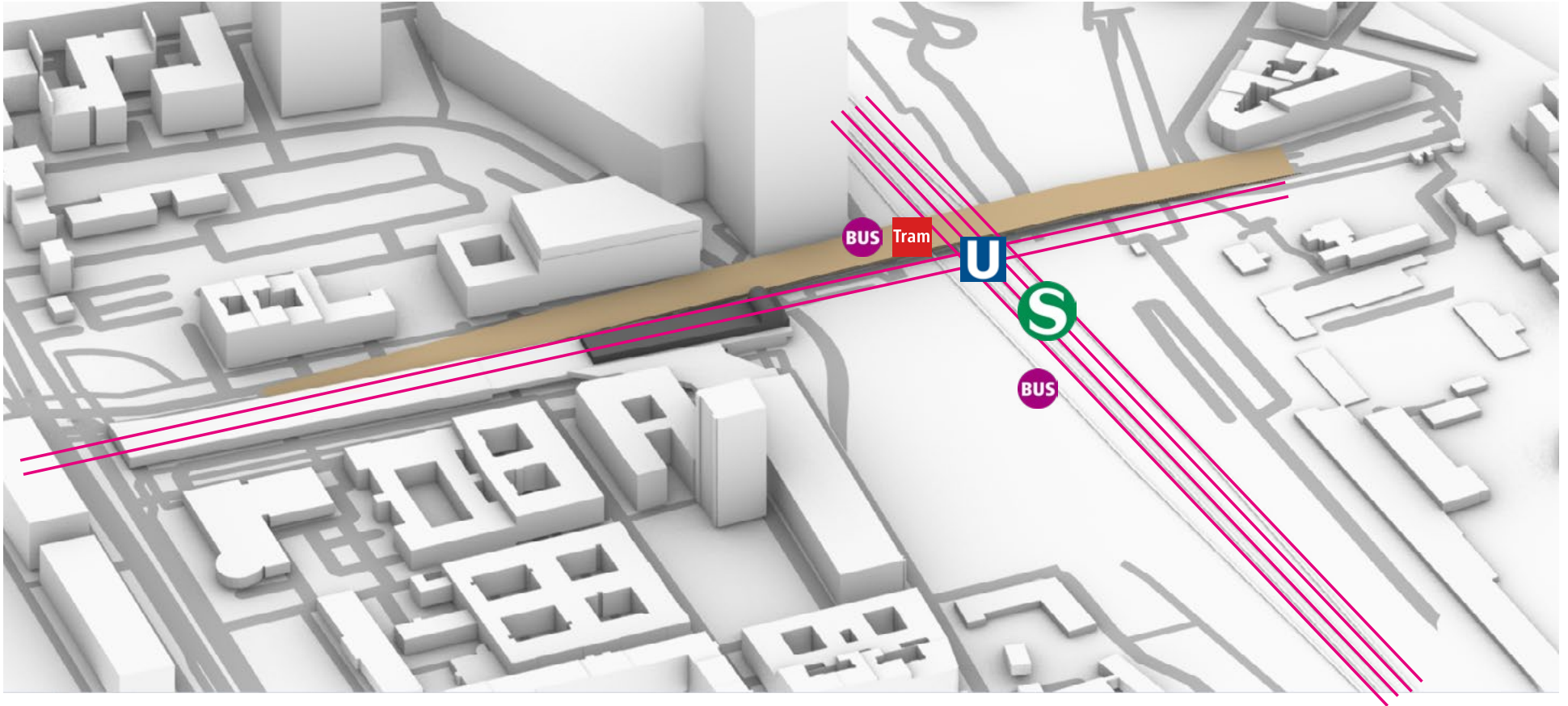
Concept

GET CLOSER



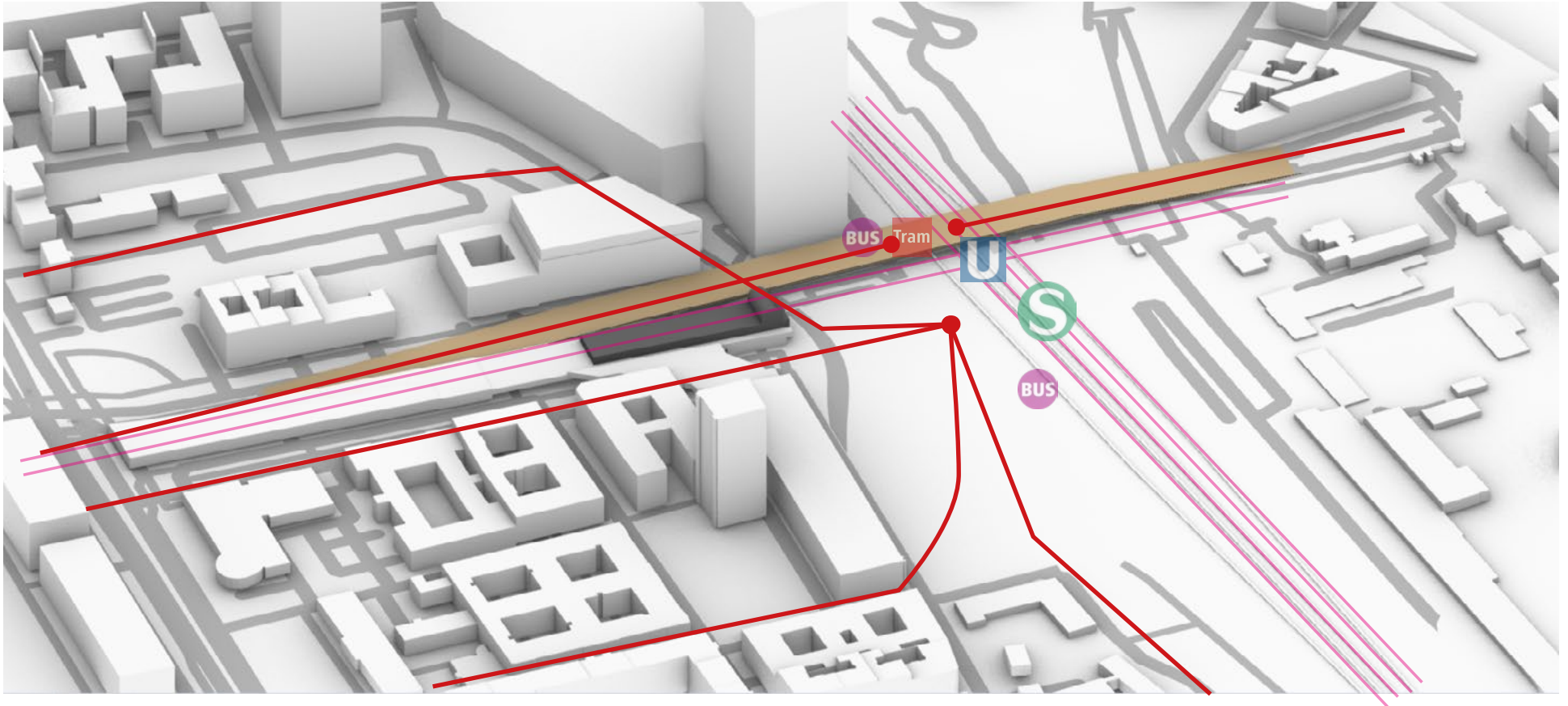
Concept

NEW LAYOUT



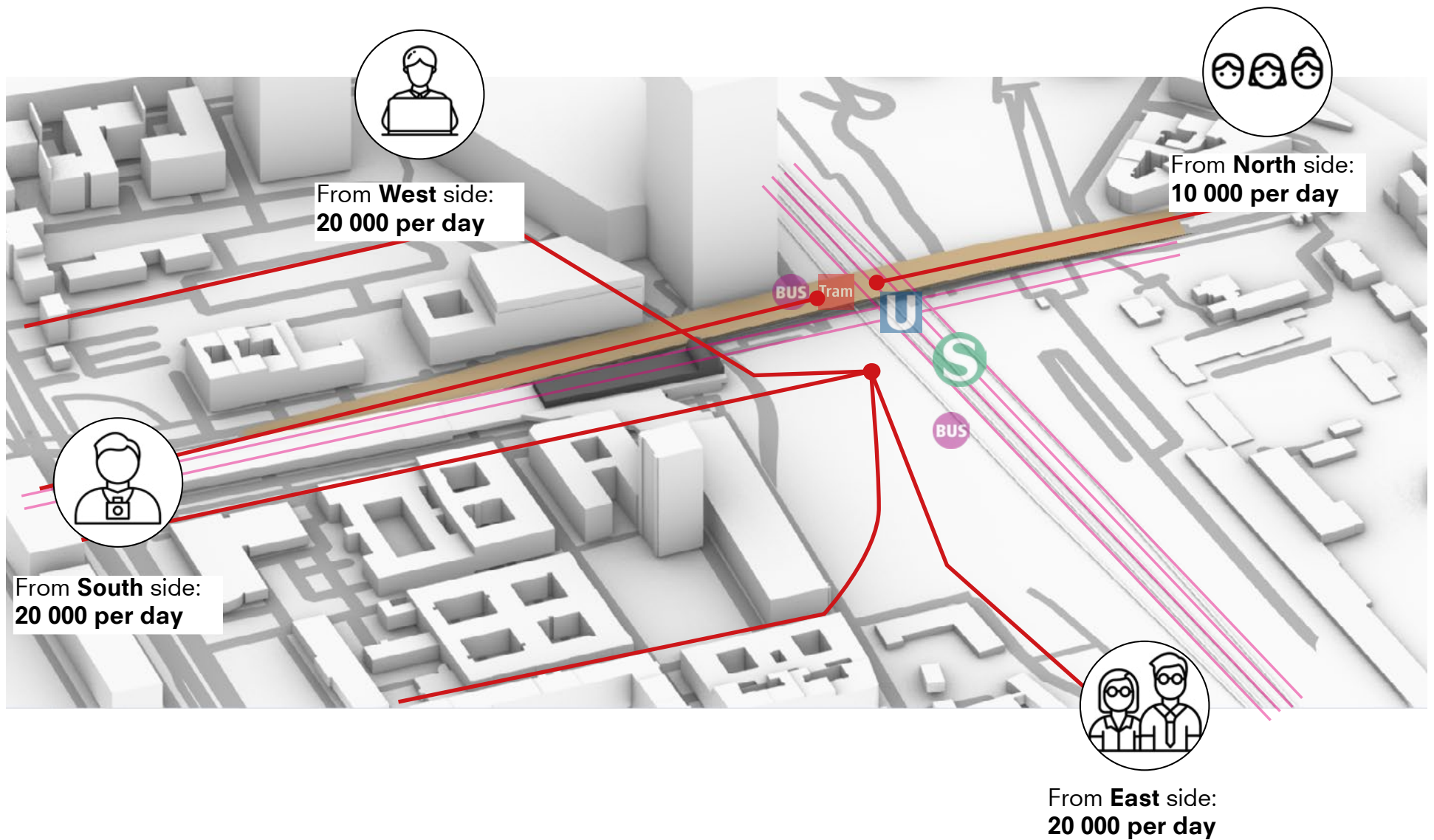
Concept

ACCESSIBILITY



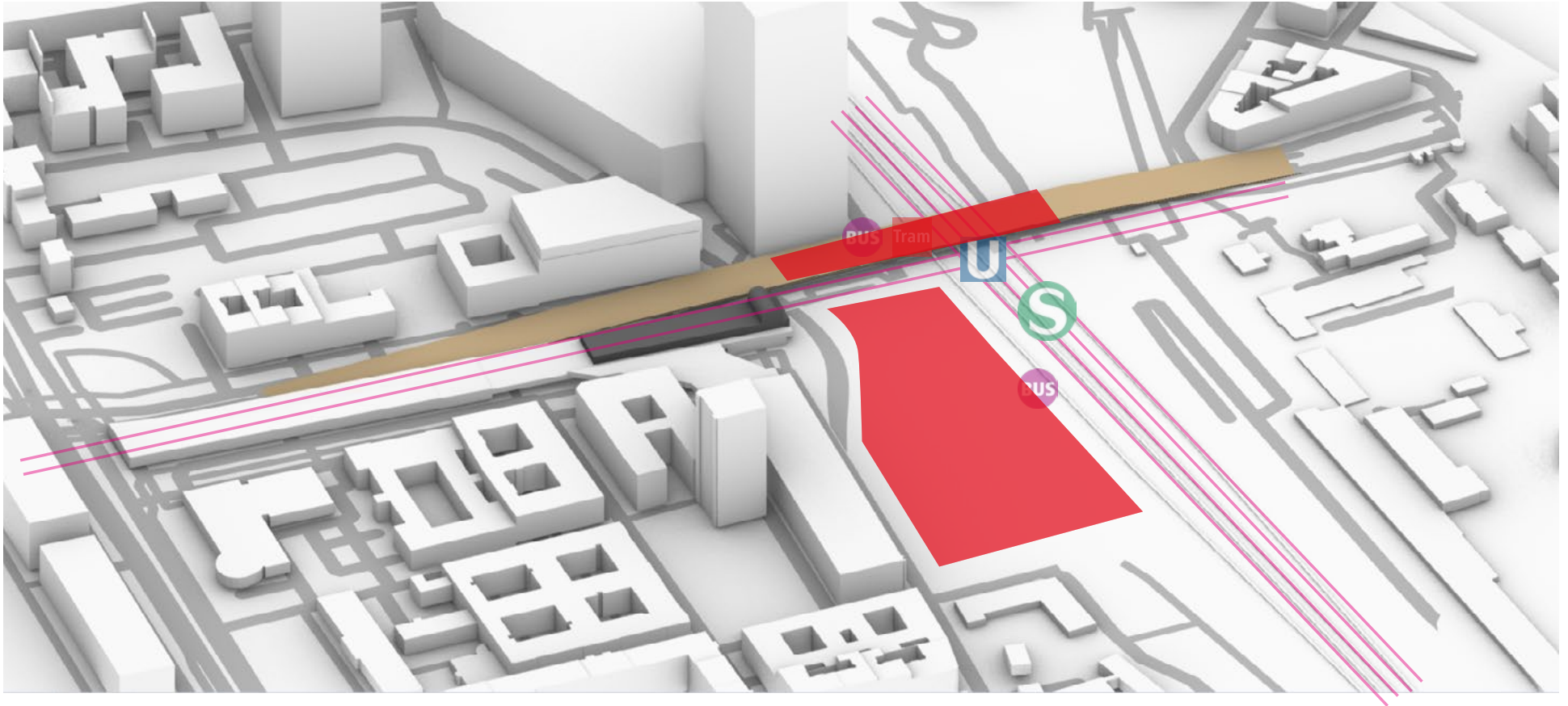
Concept

OMNI-DIRECTIONAL FLOW



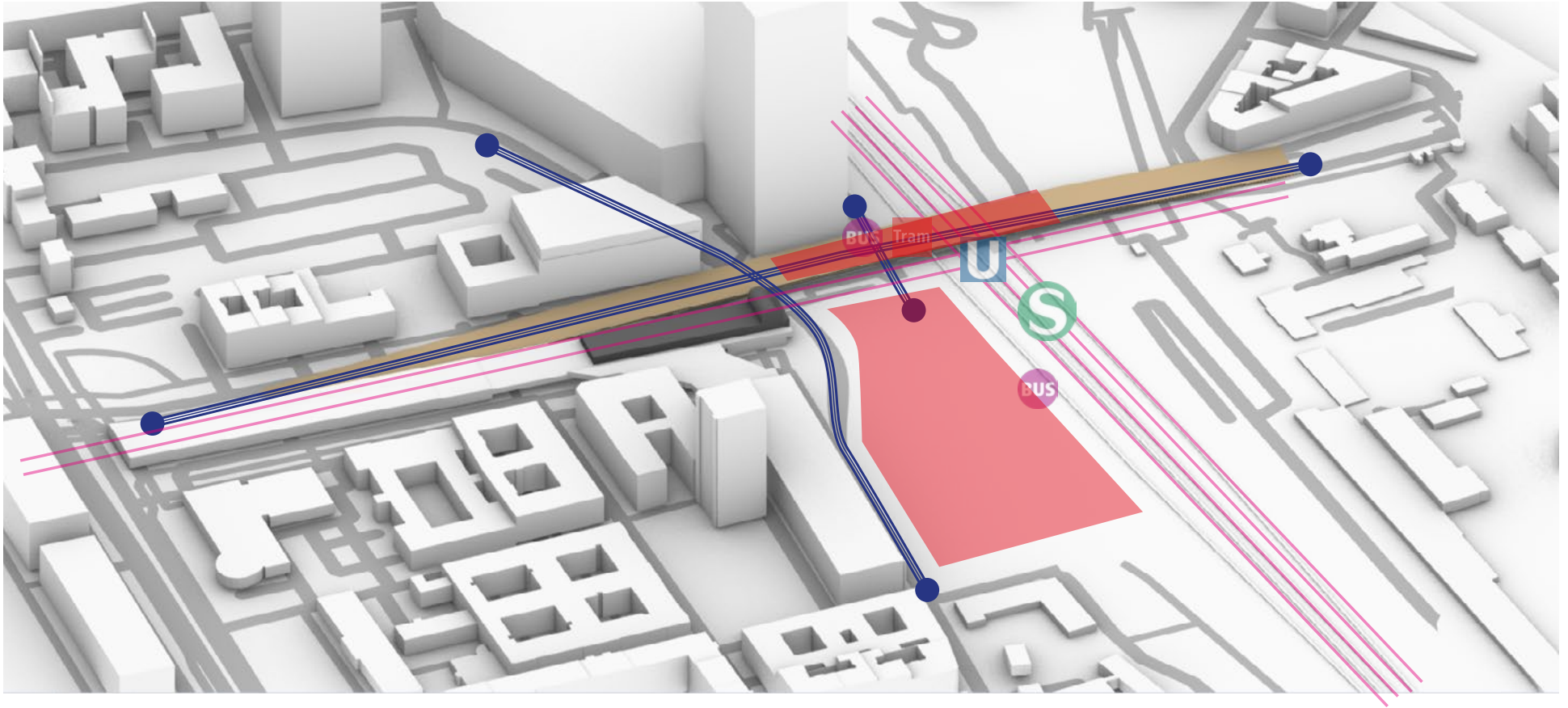
Concept

2 ENTRANCE ZONES

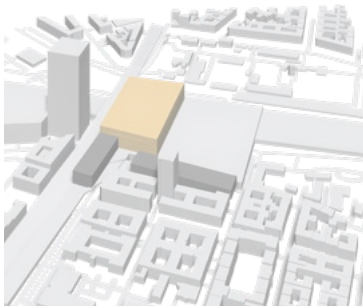


Concept

MAIN AXISES



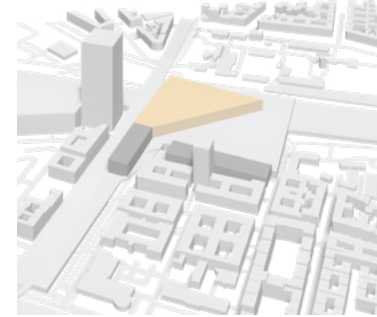
Concept MASSING STUDY



Rectangular



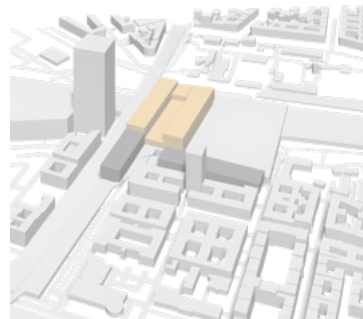
Tower



Triangle



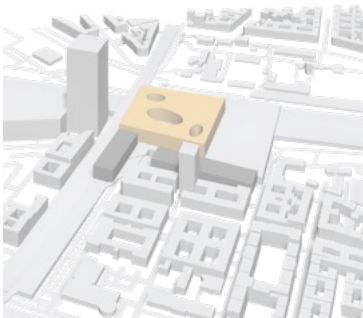
Linear



Linear



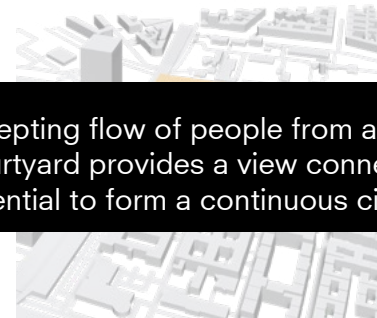
Organic



Holes



Courtyard



Courtyard

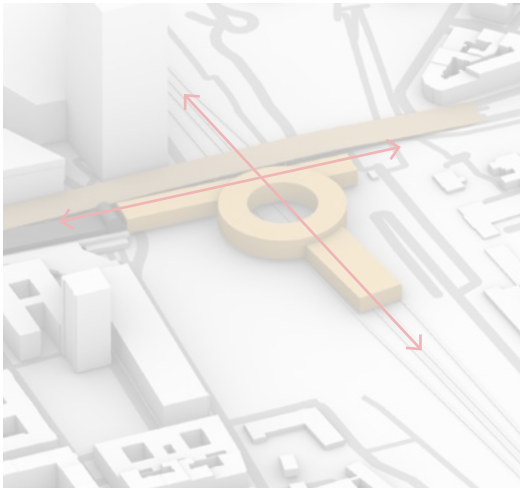
Pros:
1. Accepting flow of people from any direction.
2. Courtyard provides a view connection.
3. Potential to form a continuous circulation.

Concept

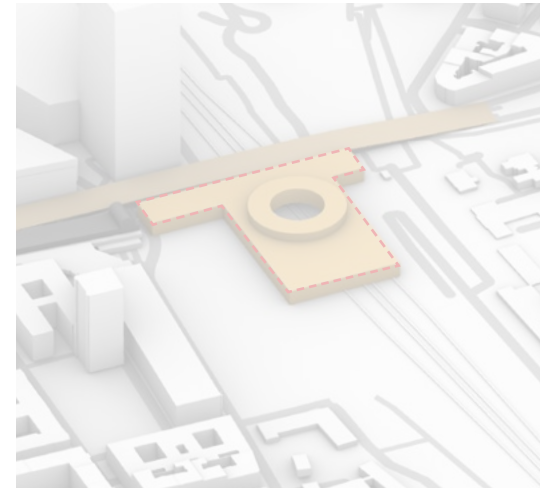
MASSING DEVELOPMENT



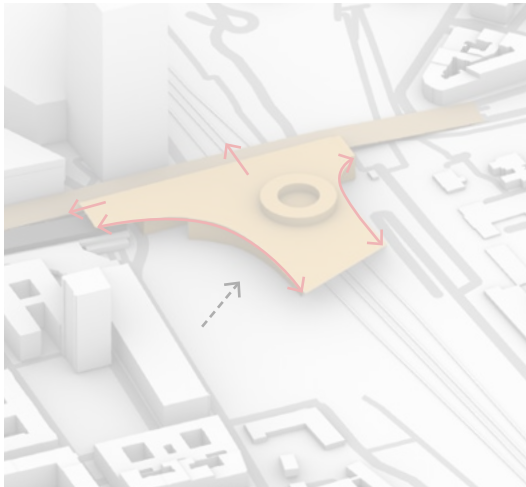
Circular courtyard typology



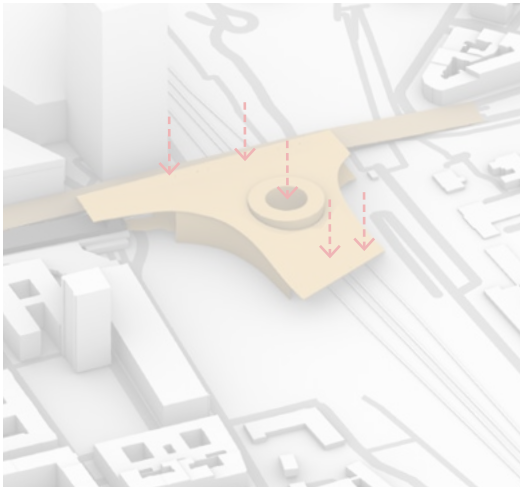
T-shaped platform area



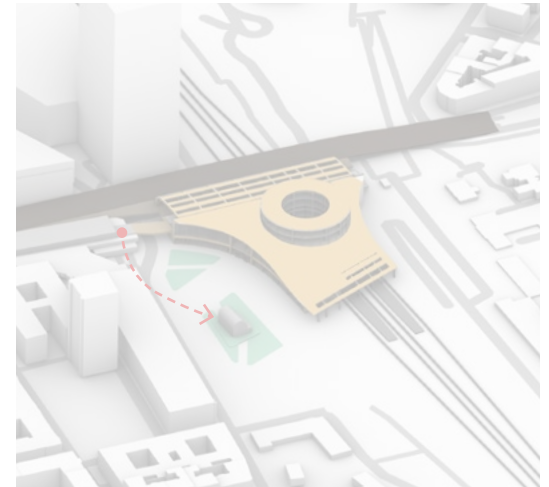
One integrated roof



Optimized roof shape



Central atrium and skylight



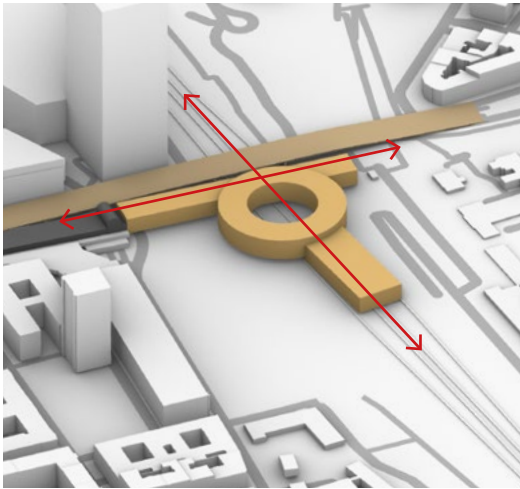
New entrance plaza

Concept

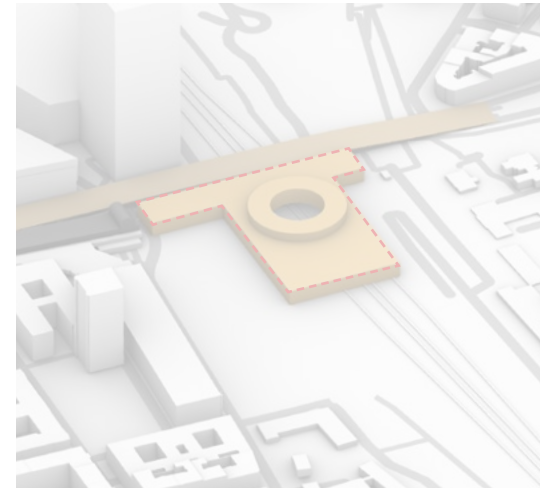
MASSING DEVELOPMENT



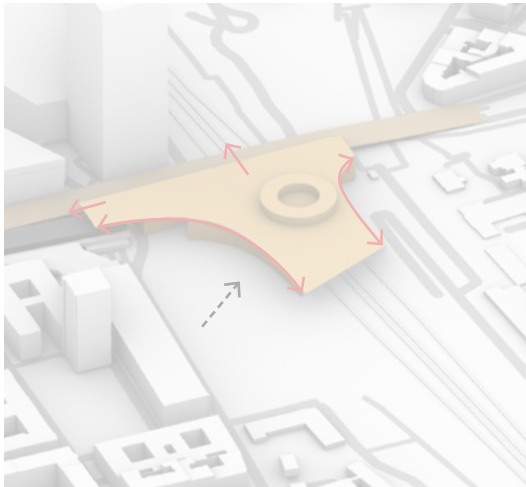
Circular courtyard typology



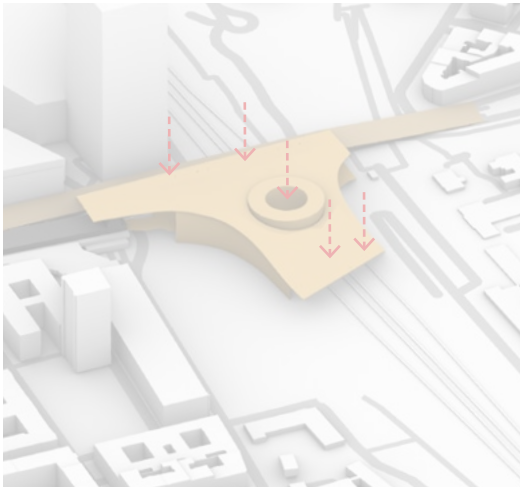
T-shaped platform area



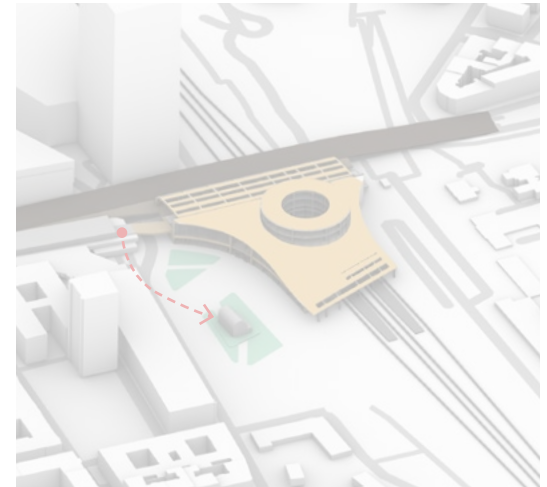
One integrated roof



Optimized roof shape



Central atrium and skylight



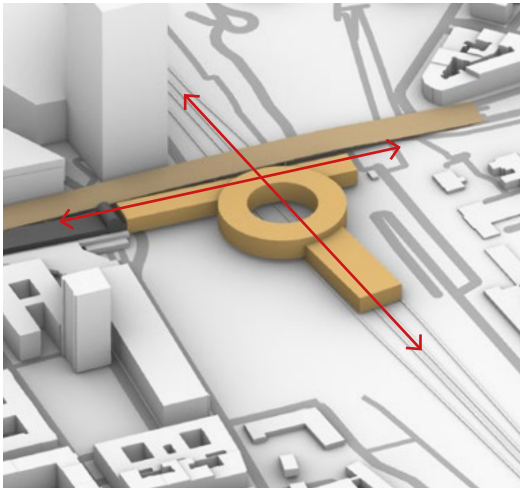
New entrance plaza

Concept

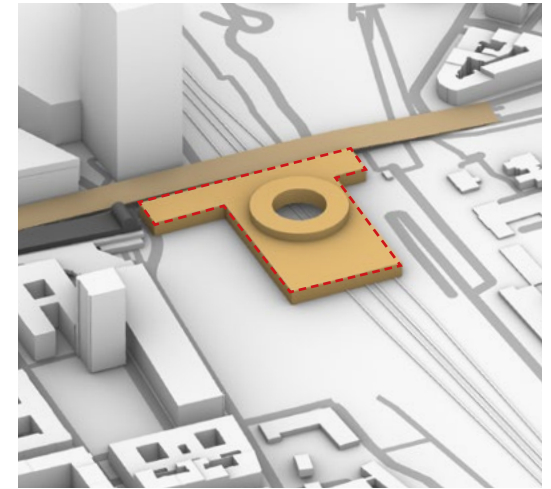
MASSING DEVELOPMENT



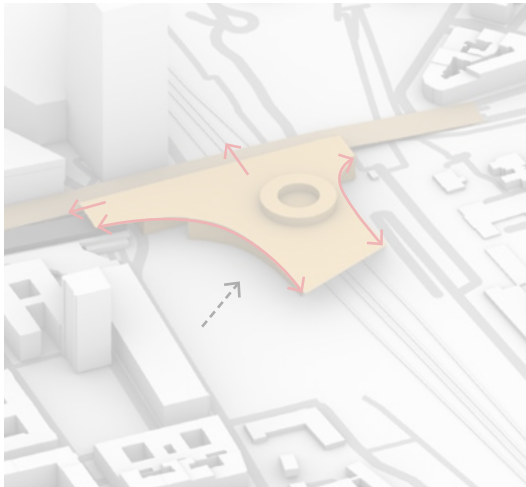
Circular courtyard typology



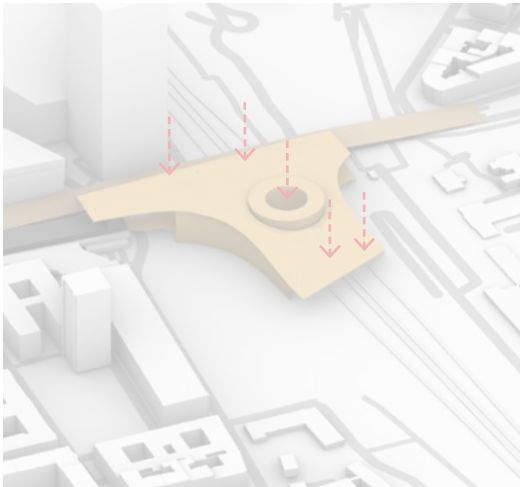
T-shaped platform area



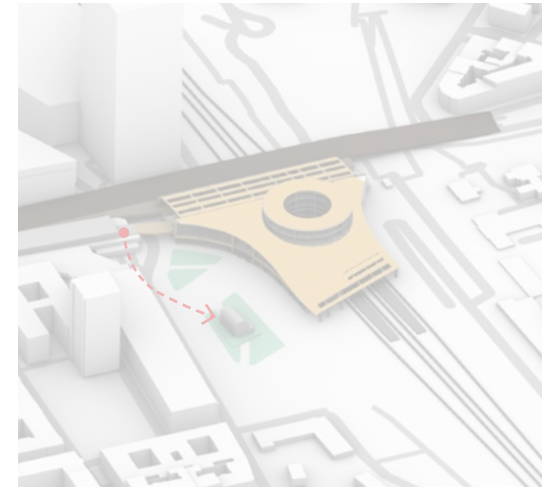
One integrated roof



Optimized roof shape



Central atrium and skylight



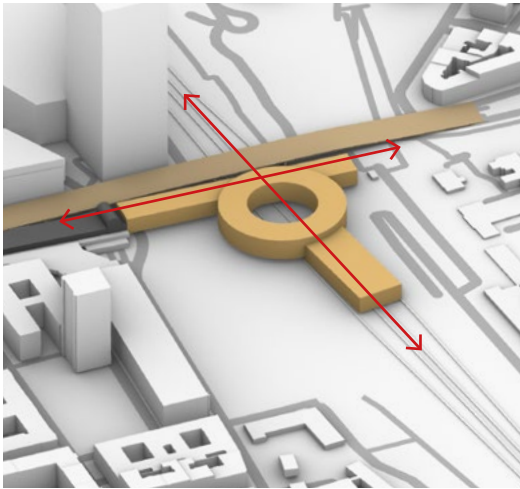
New entrance plaza

Concept

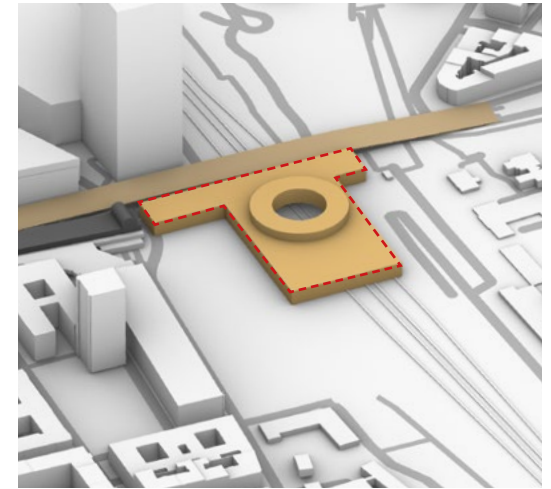
MASSING DEVELOPMENT



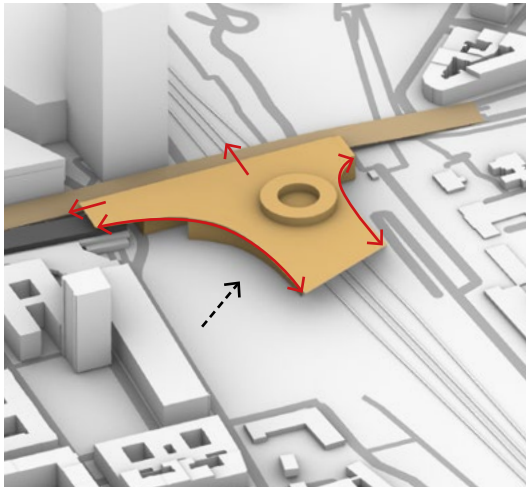
Circular courtyard typology



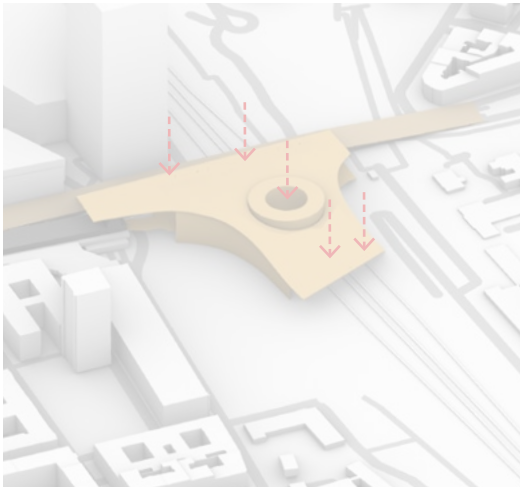
T-shaped platform area



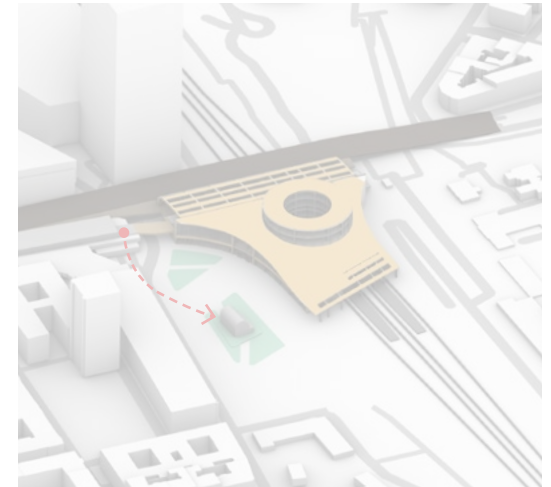
One integrated roof



Optimized roof shape



Central atrium and skylight



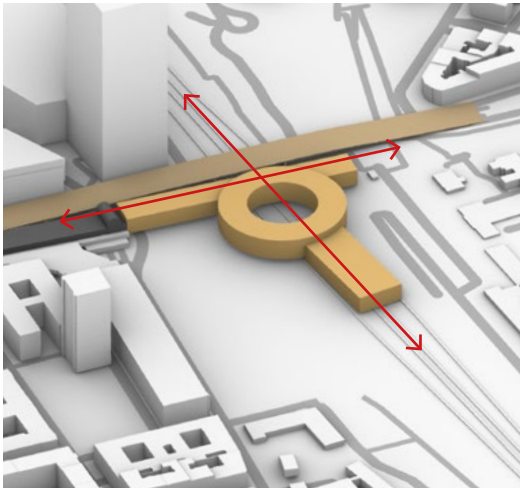
New entrance plaza

Concept

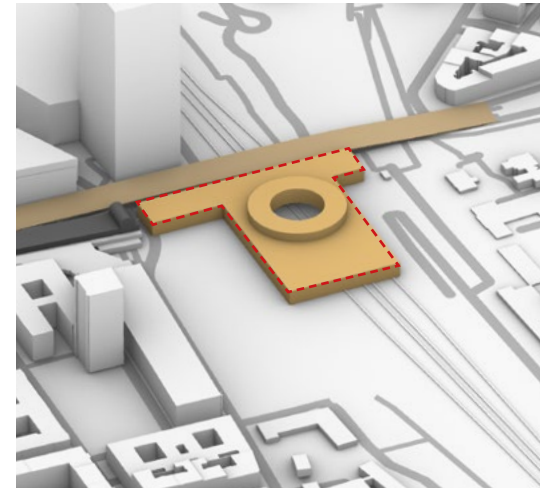
MASSING DEVELOPMENT



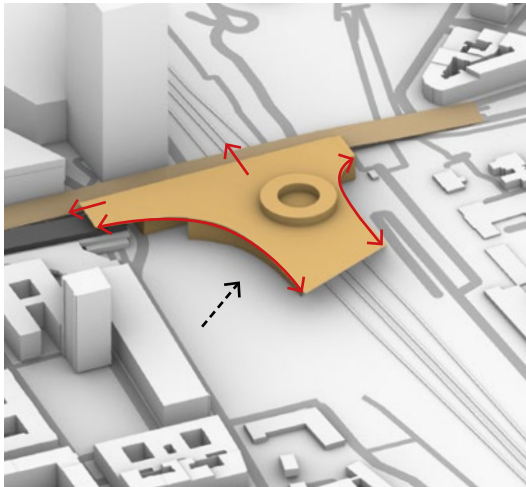
Circular courtyard typology



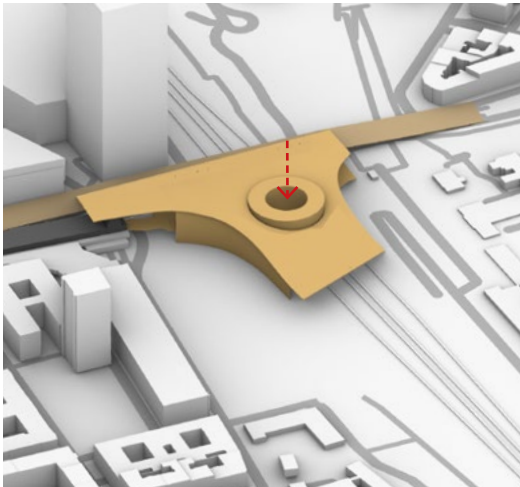
T-shaped platform area



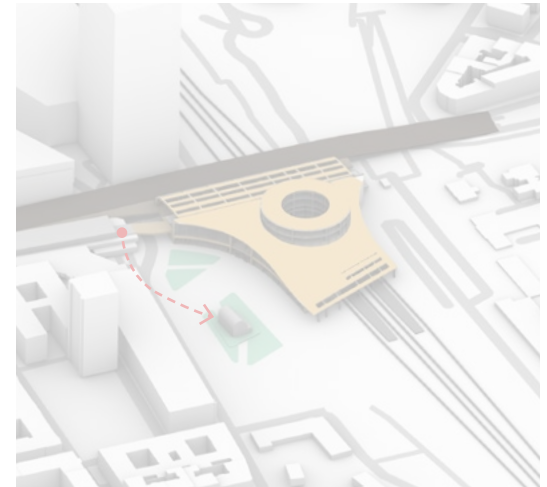
One integrated roof



Optimized roof shape



Open a central atrium



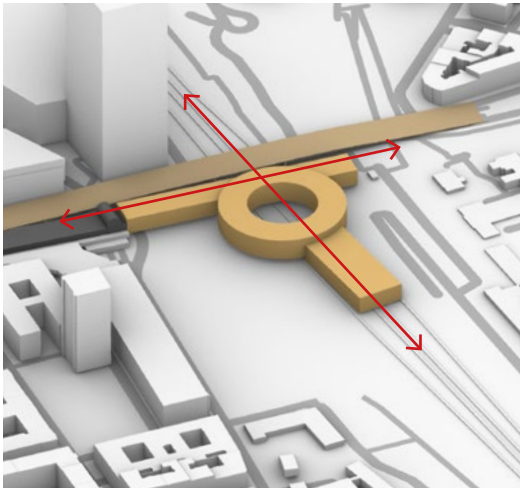
Opening on the roof

Concept

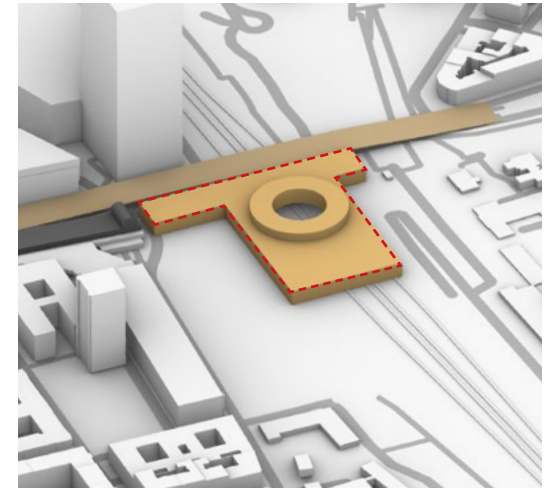
MASSING DEVELOPMENT



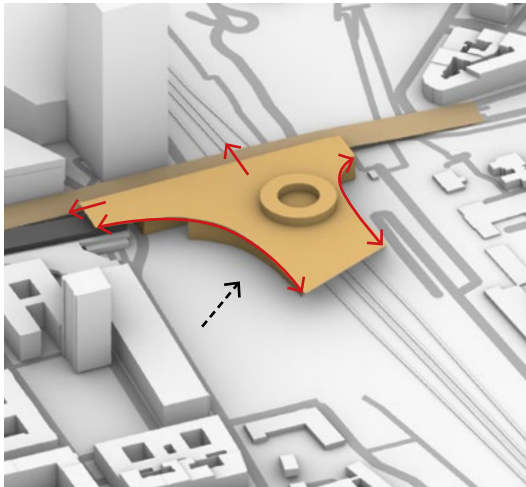
Circular courtyard typology



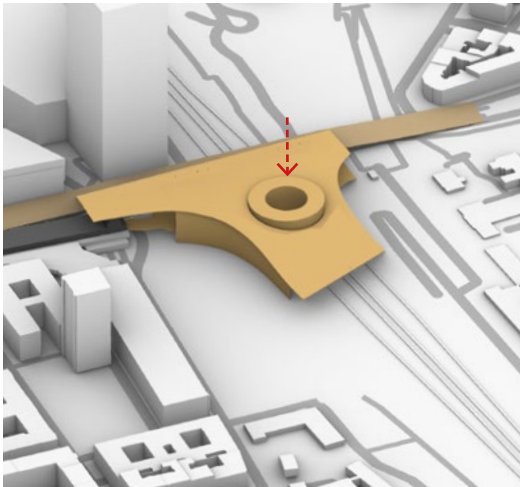
T-shaped platform area



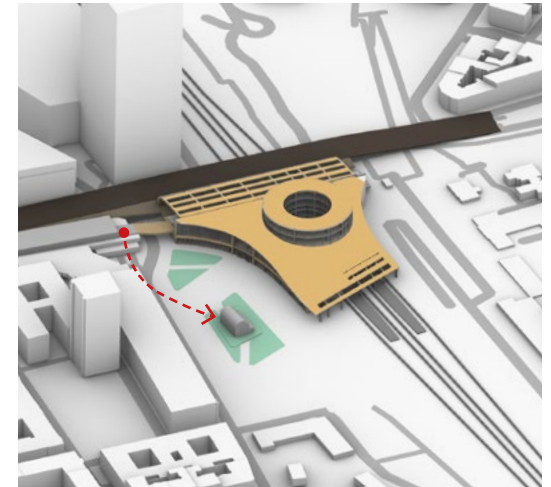
One integrated roof



Optimized roof shape



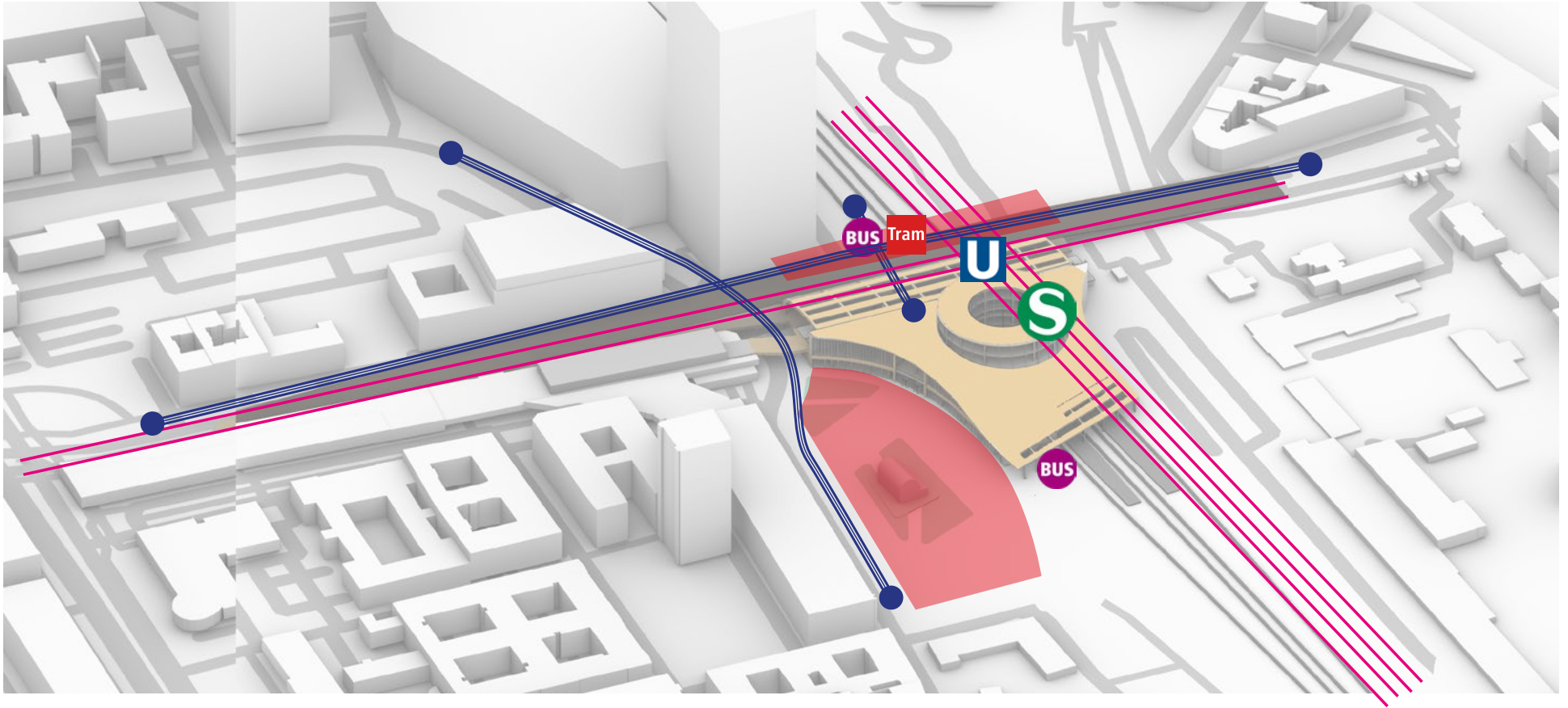
Open a central atrium



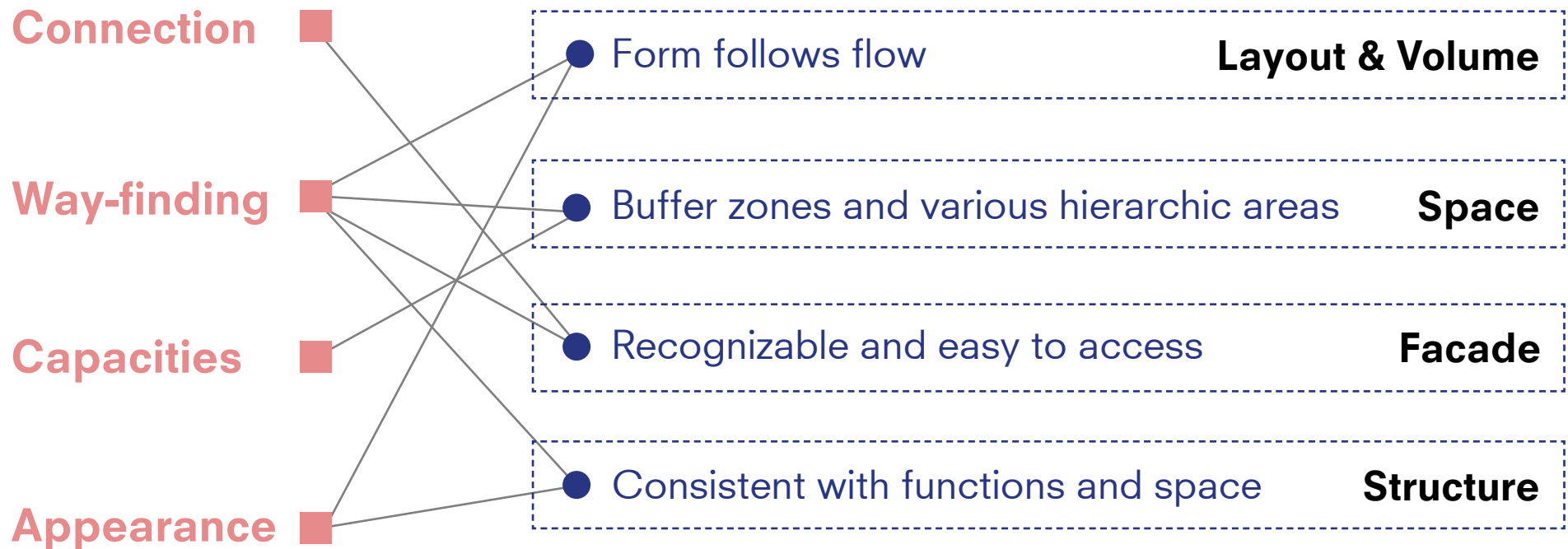
Openings on the roof

Concept

MASSING DEVELOPMENT



SUMMARY OF CONCEPT



SUMMARY OF CONCEPT

Design & implementation

- Form follows flow

Layout & Volume

- Buffer zones and various hierarchic areas

Space

- Recognizable and easy to access

Facade

- Consistent with functions and space

Structure

CONTENTS

1. INTRODUCTION

2. RESEARCH & DESIGN BRIEF

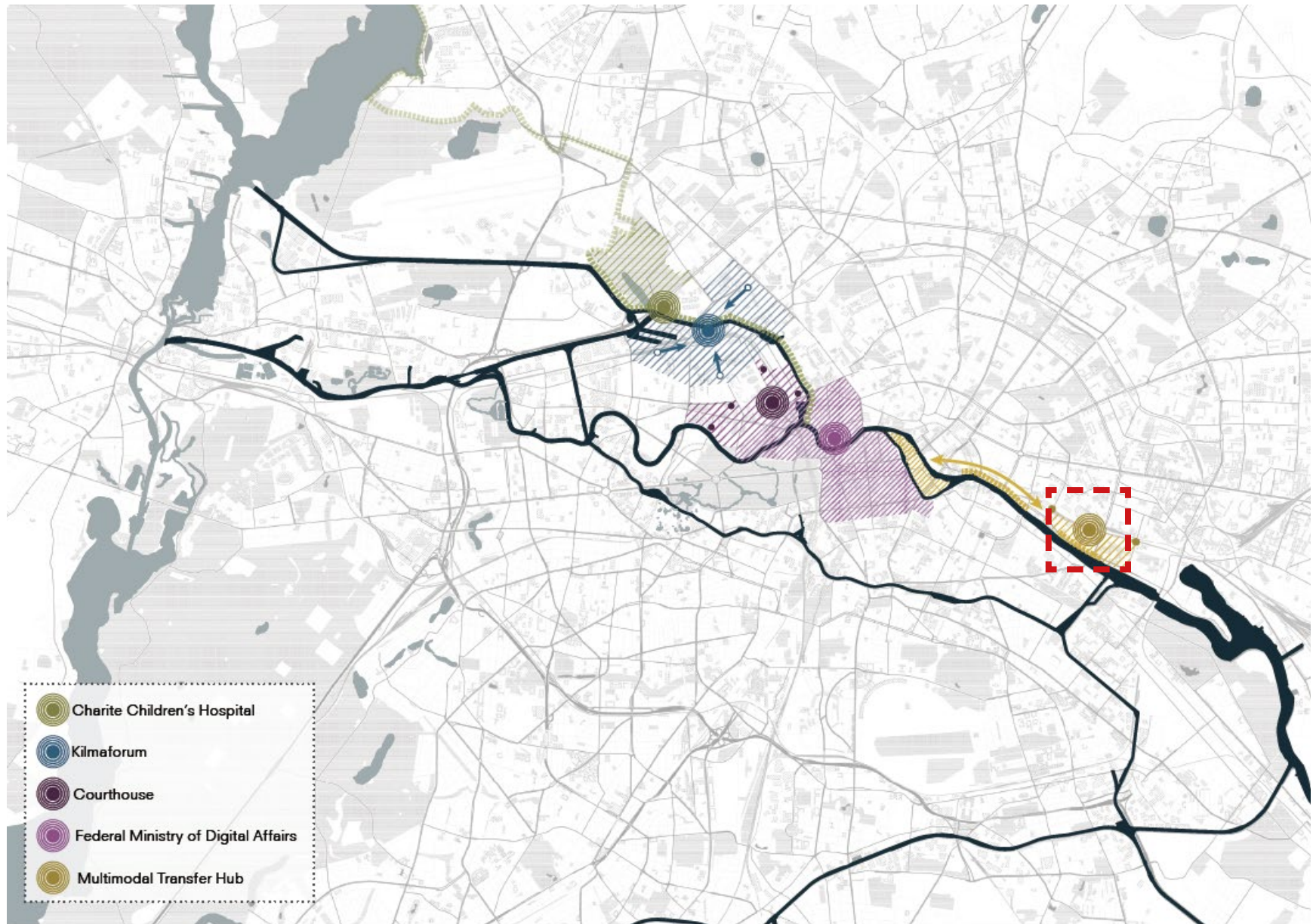
3. CONCEPT

4. DESIGN

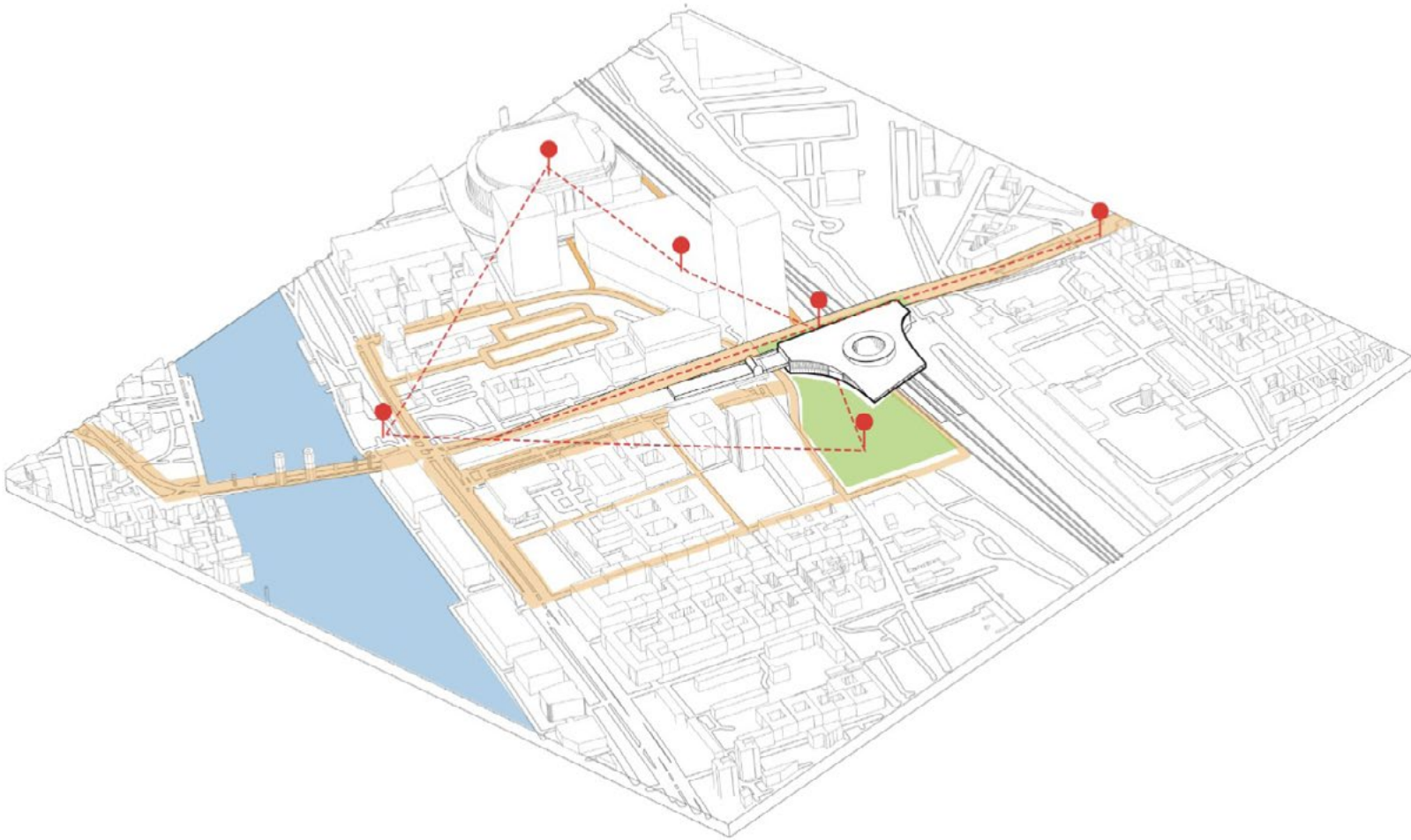
5. CONCLUSION

Design

GROUP VISION



ENHANCE MOBILITY BETWEEN COMMUNITIES



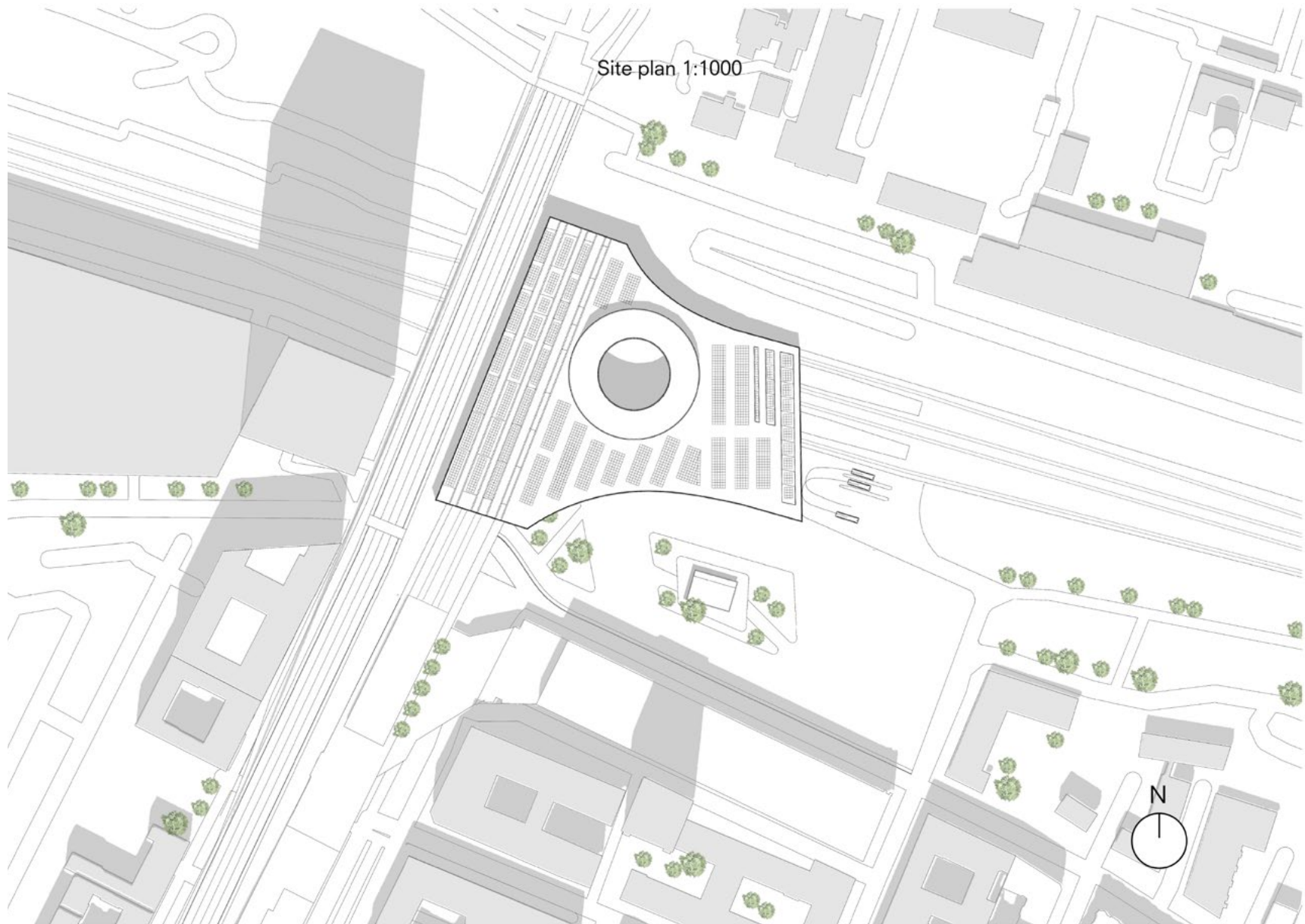
Design

A CHAOTIC AREA



Design

SITE PLAN



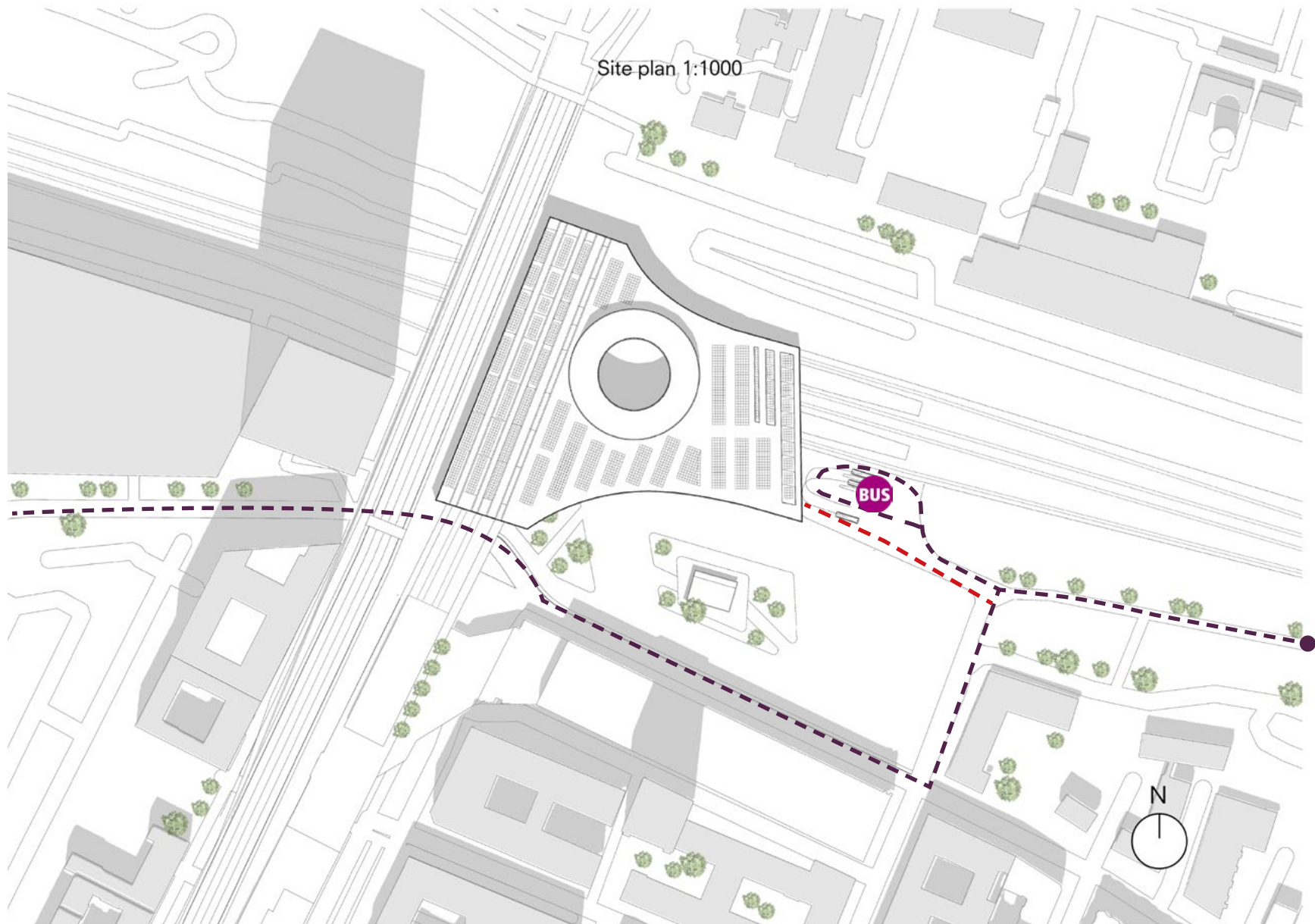
Design

VERTICAL NODE

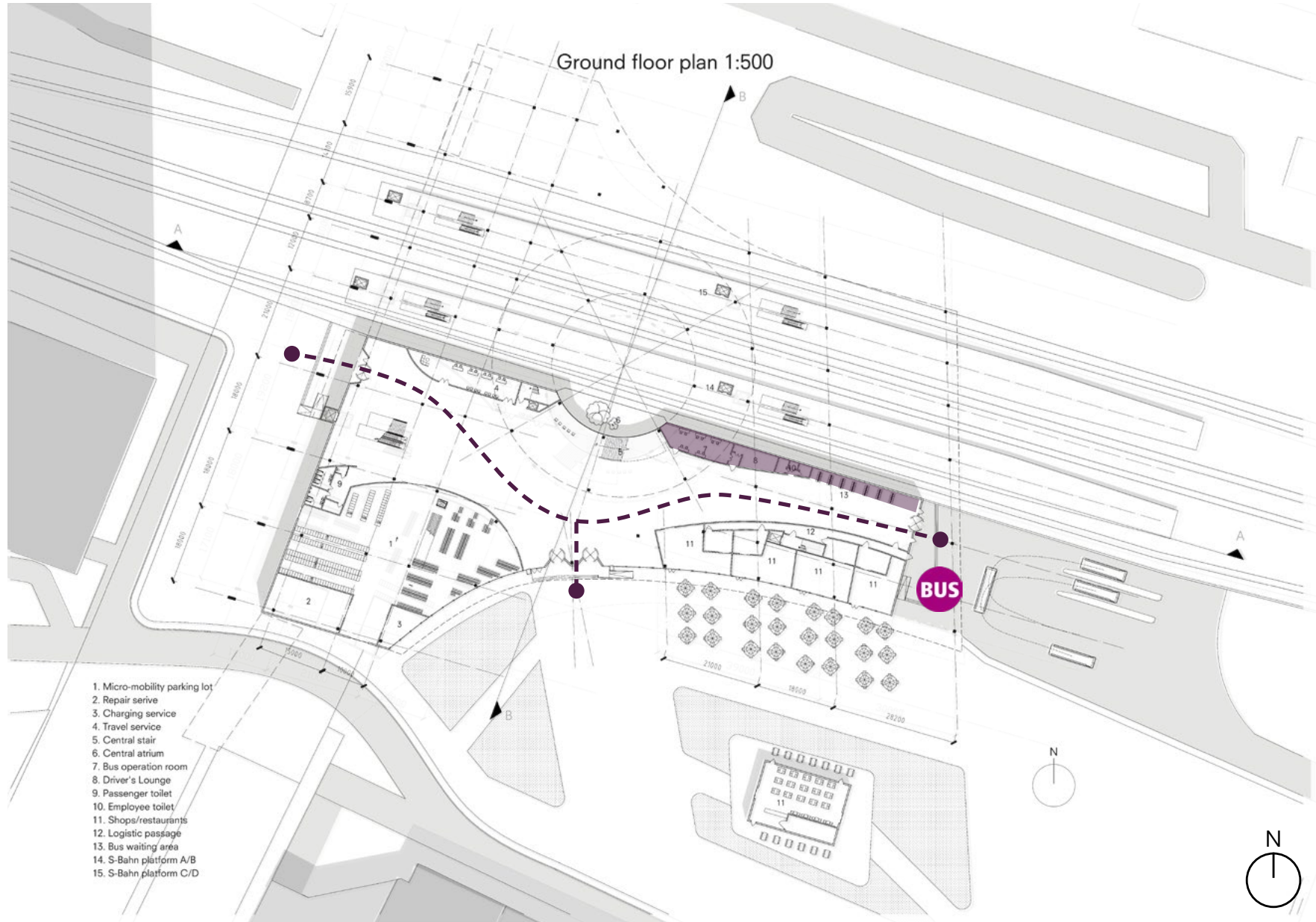


Design

BUS & LOGISTIC ROUTES

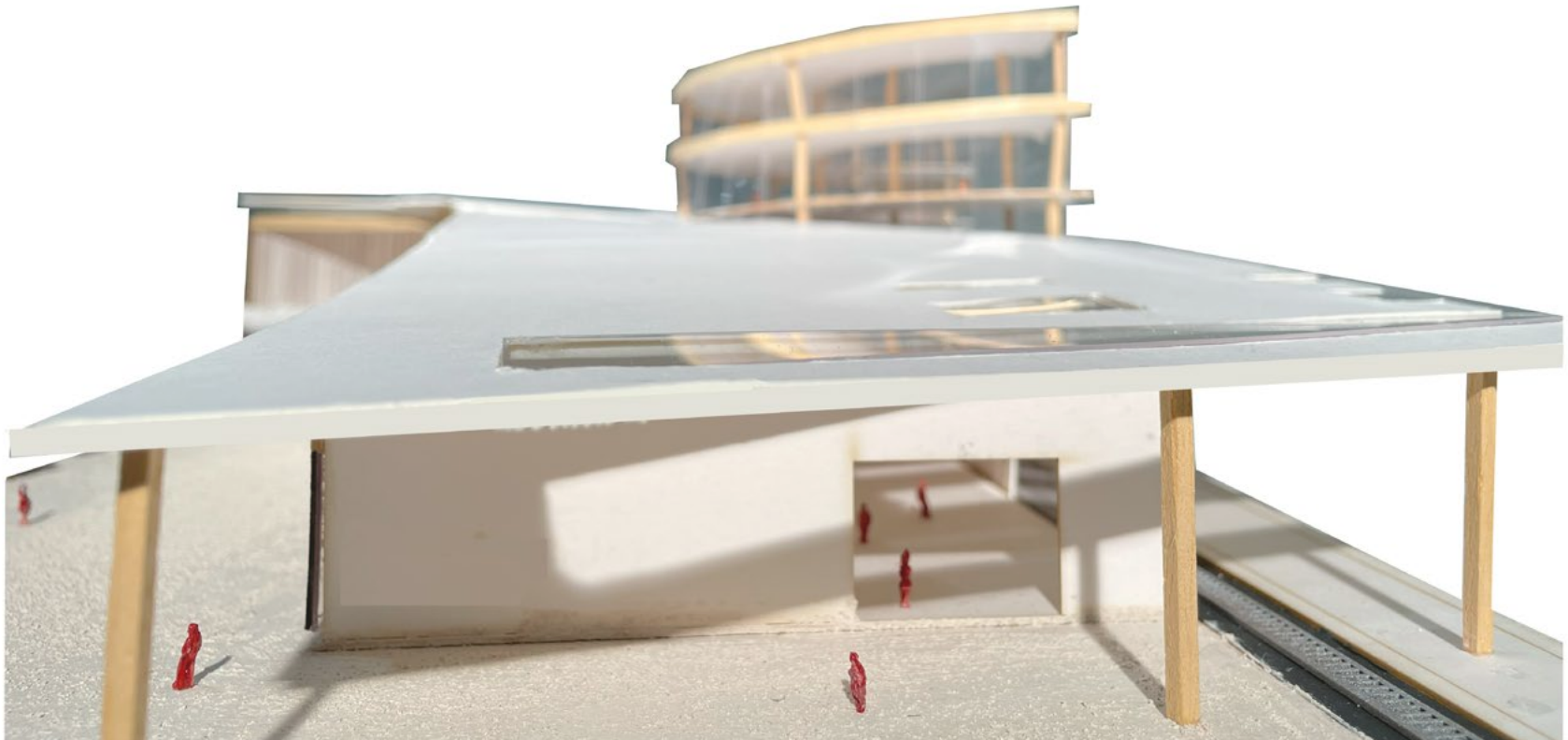


Design CONNECTIVITY



Design

BUS STATION



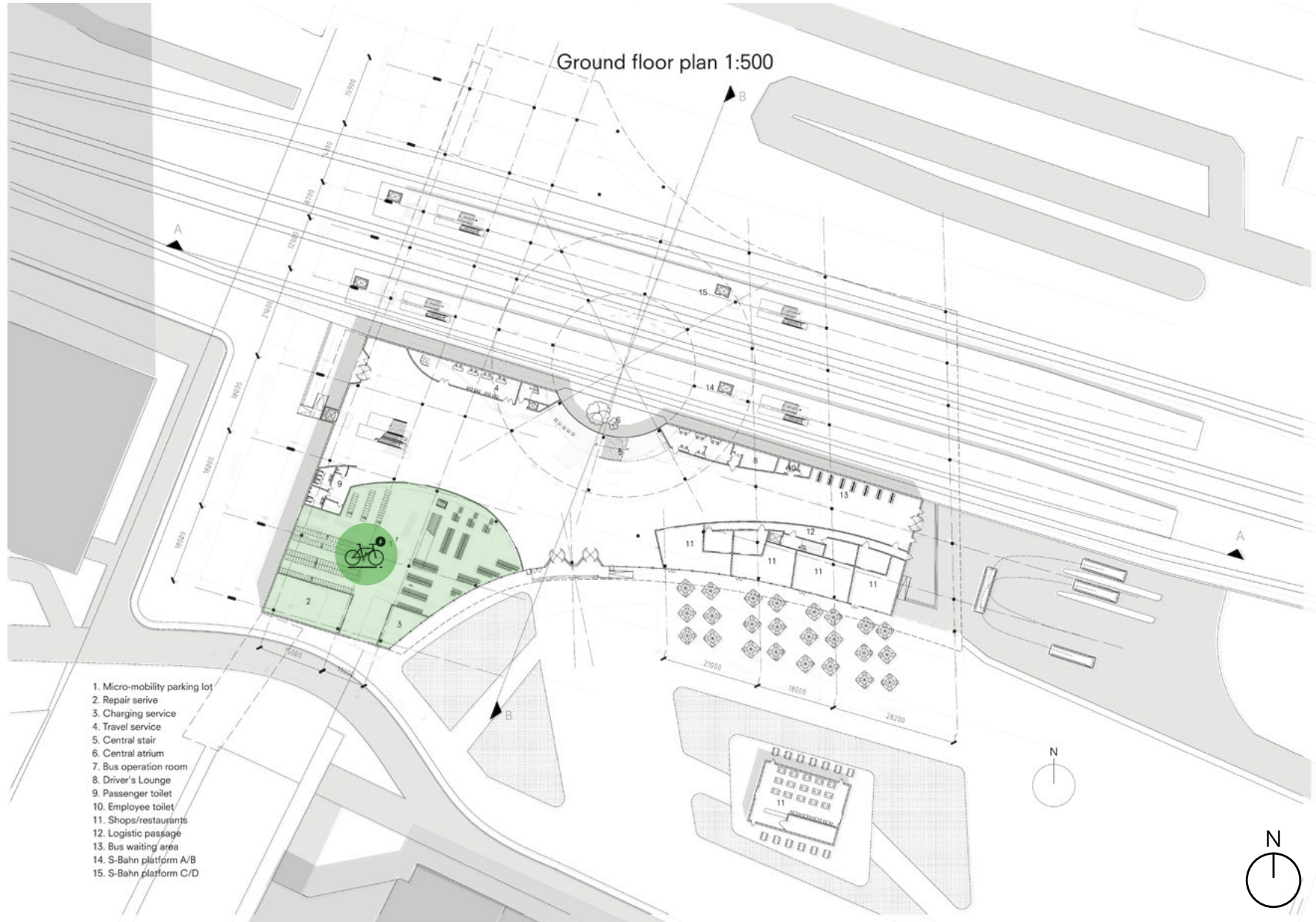
Design

BUS STATION

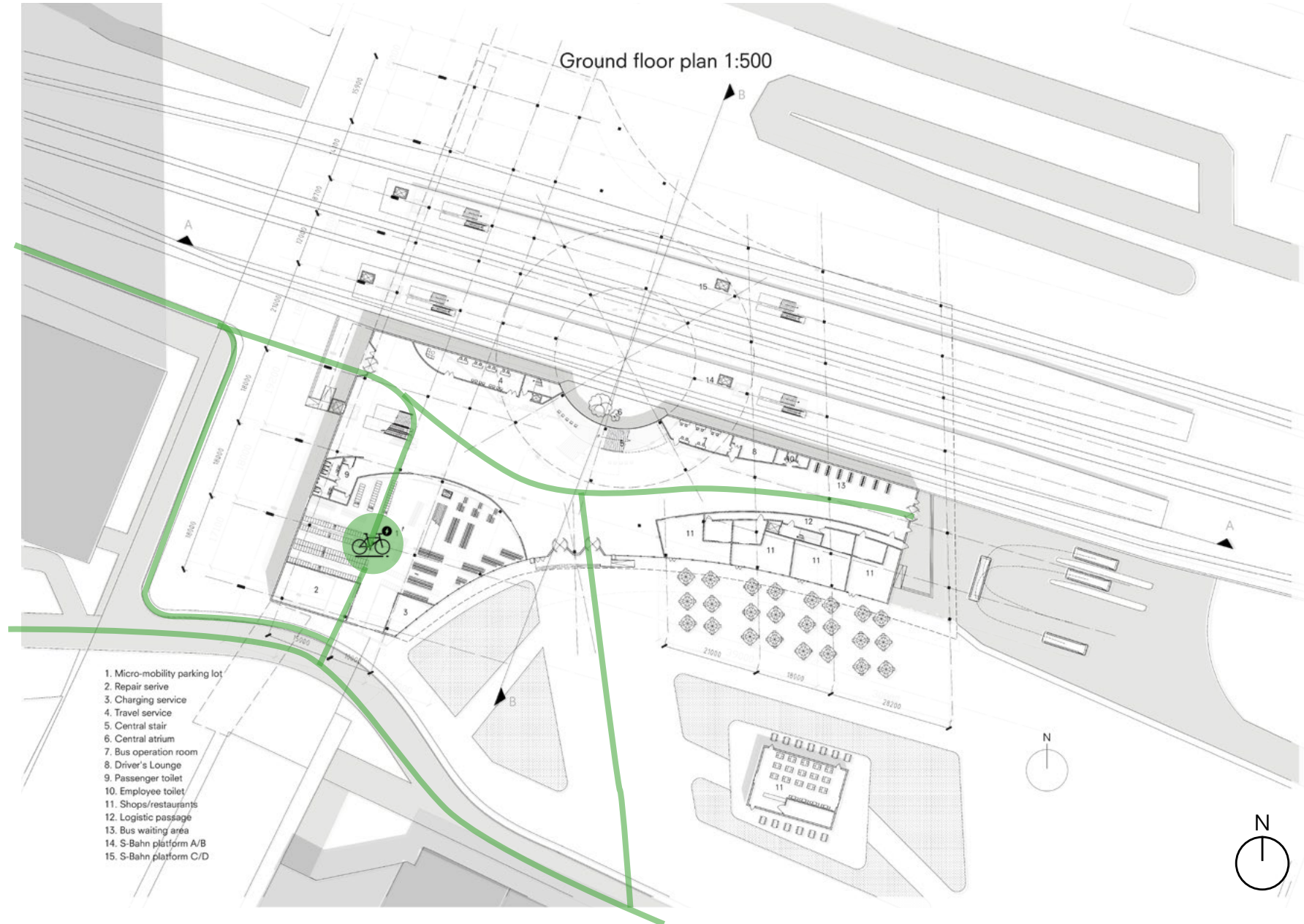


Design

MICRO-MOBILITY HUB

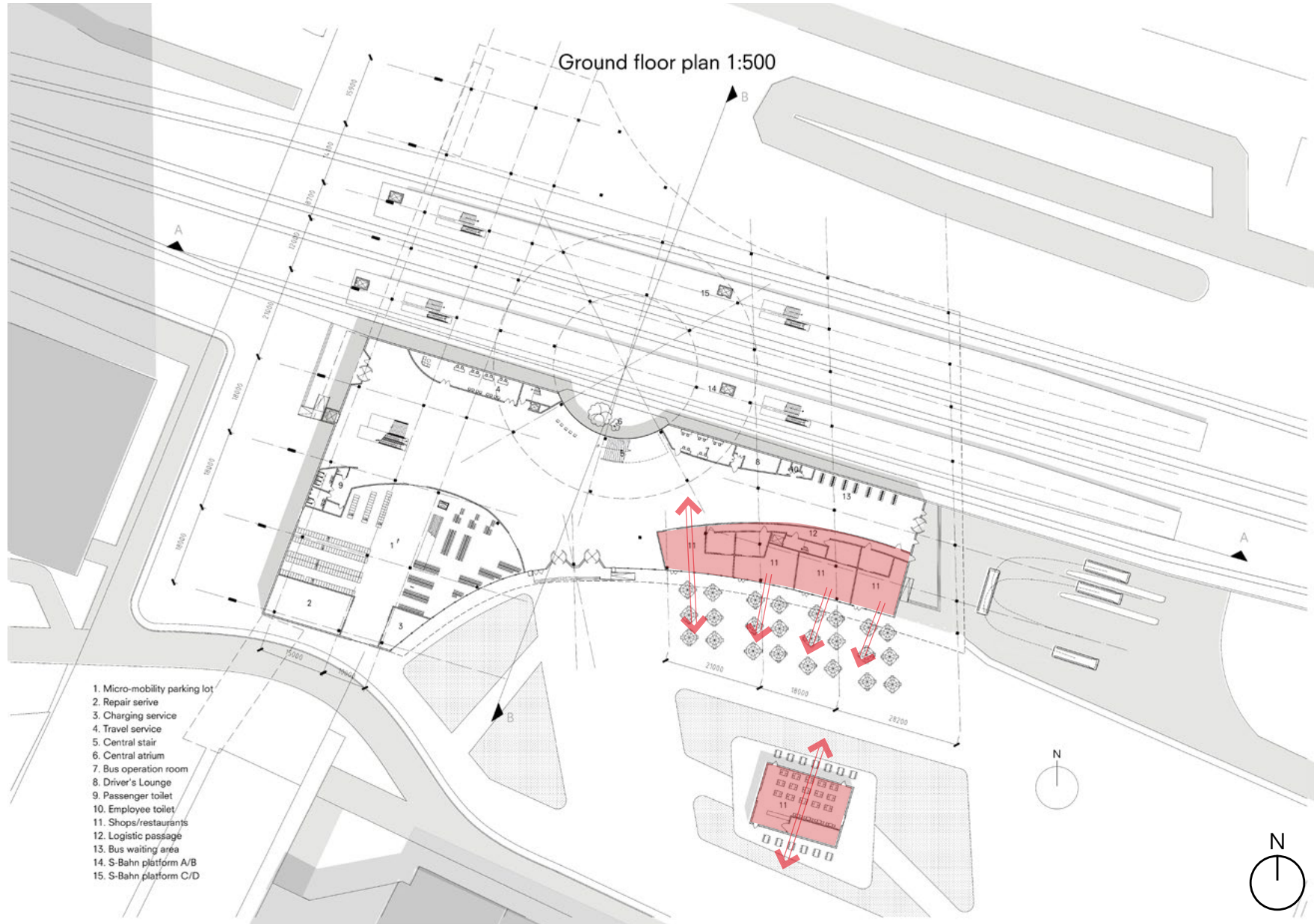


Design CONNECTIVITY



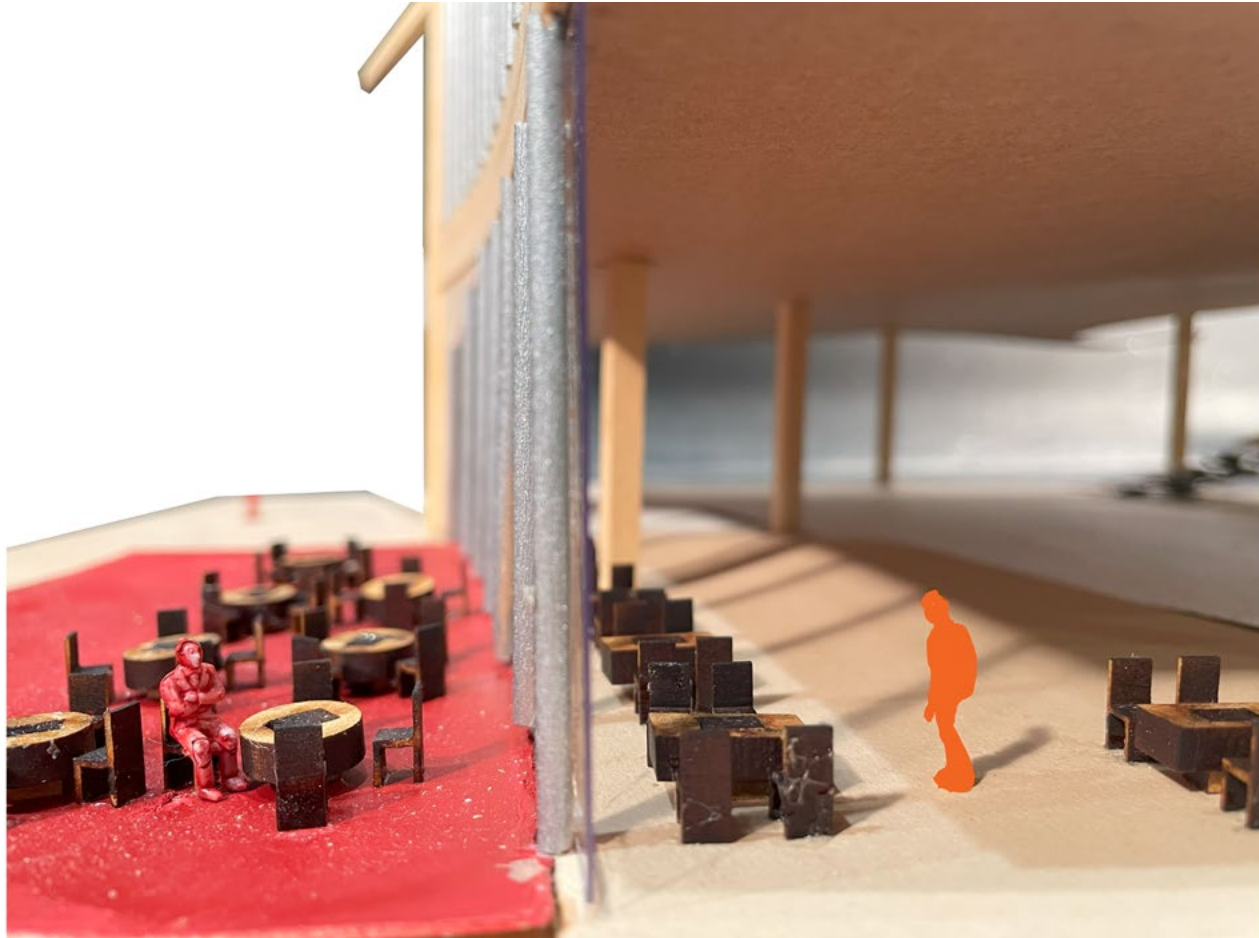
Design

COMMERCIAL WITH URBAN ACTIVITY



Design

COMMERCIAL WITH URBAN ACTIVITY



Design

COMMERCIAL WITH URBAN ACTIVITY



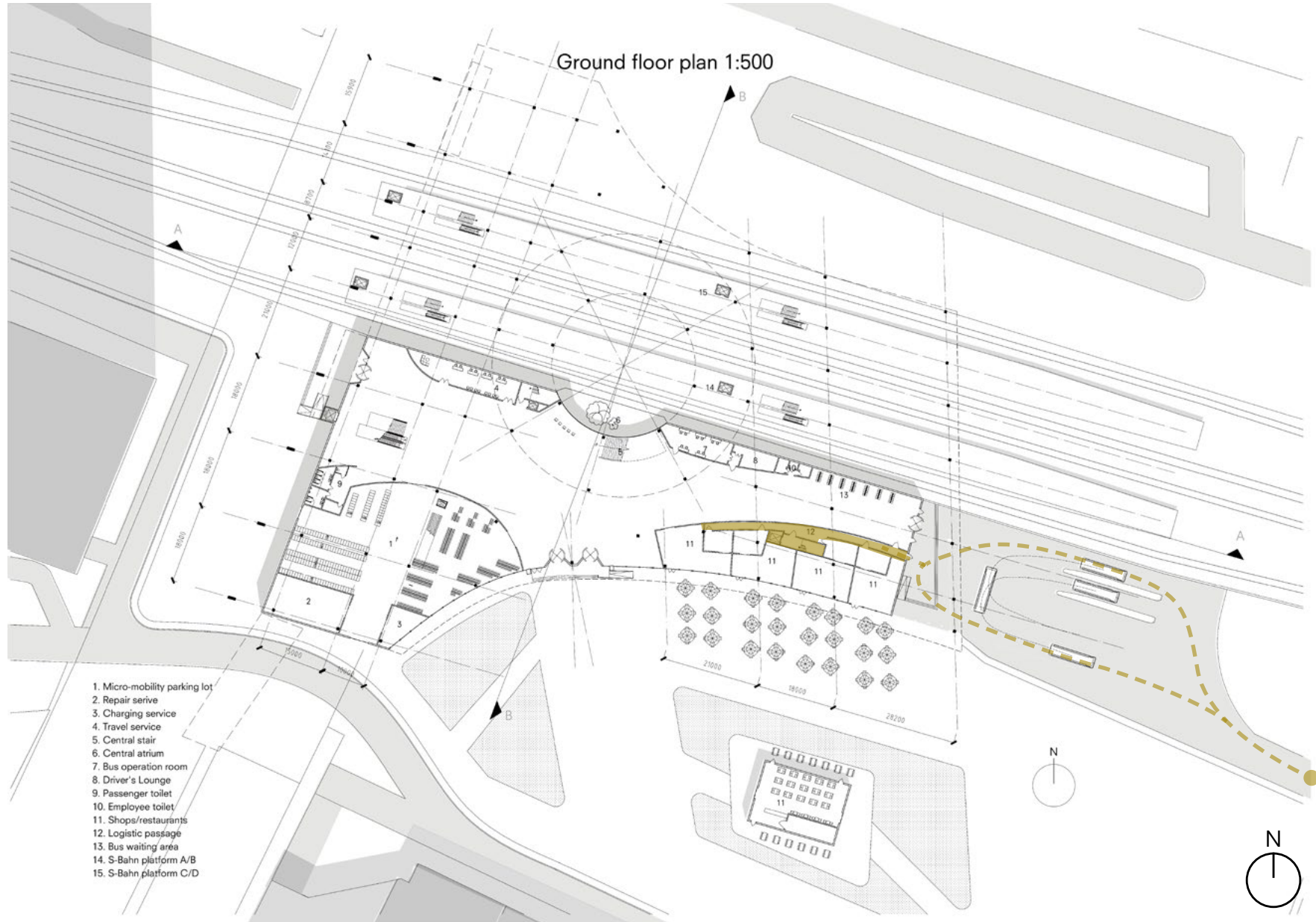
COMMERCIAL WITH URBAN ACTIVITY

Annual Christmas Market at Bahnhof Potsdamer Platz



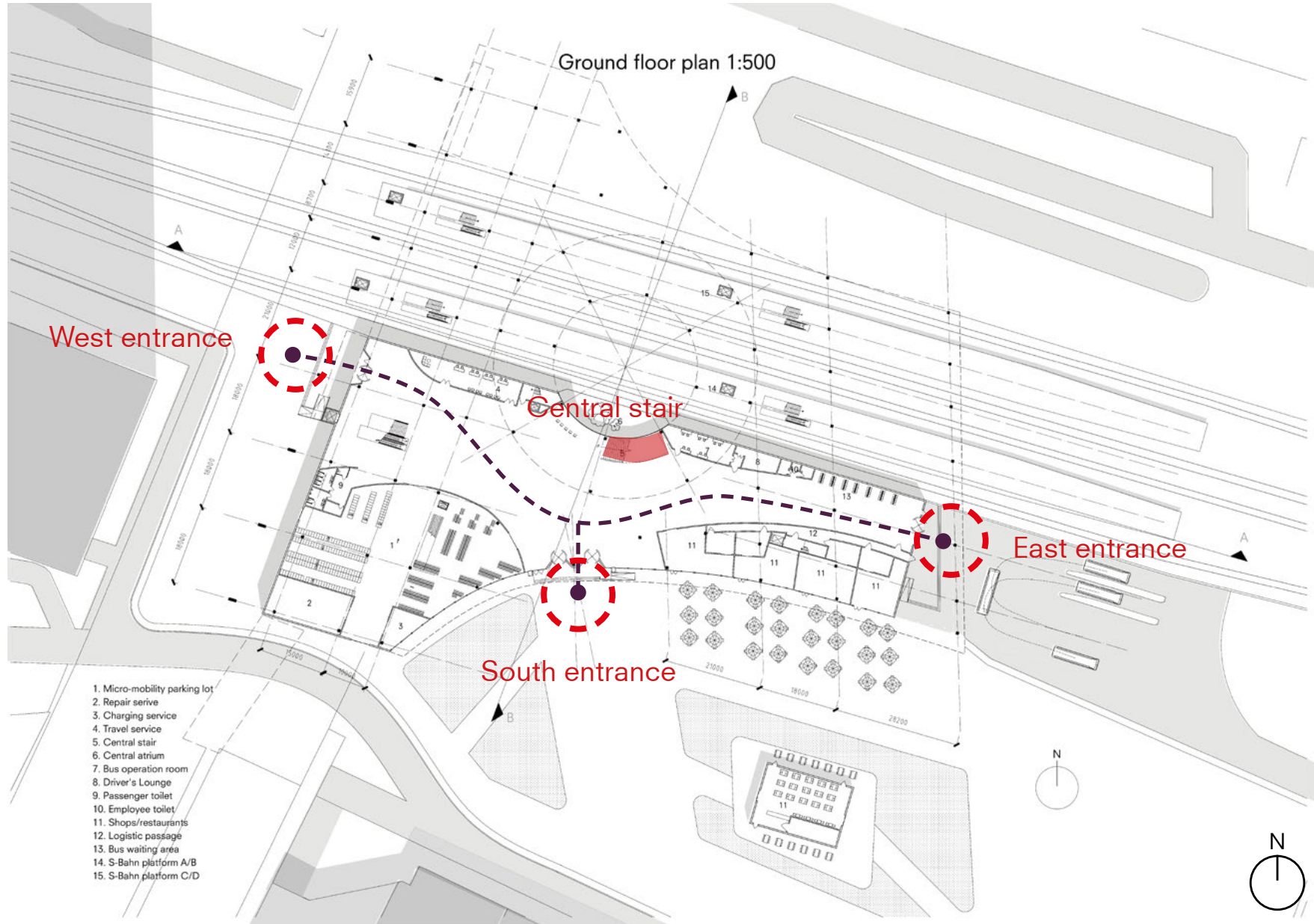
Design

LOGISTIC PASSAGE



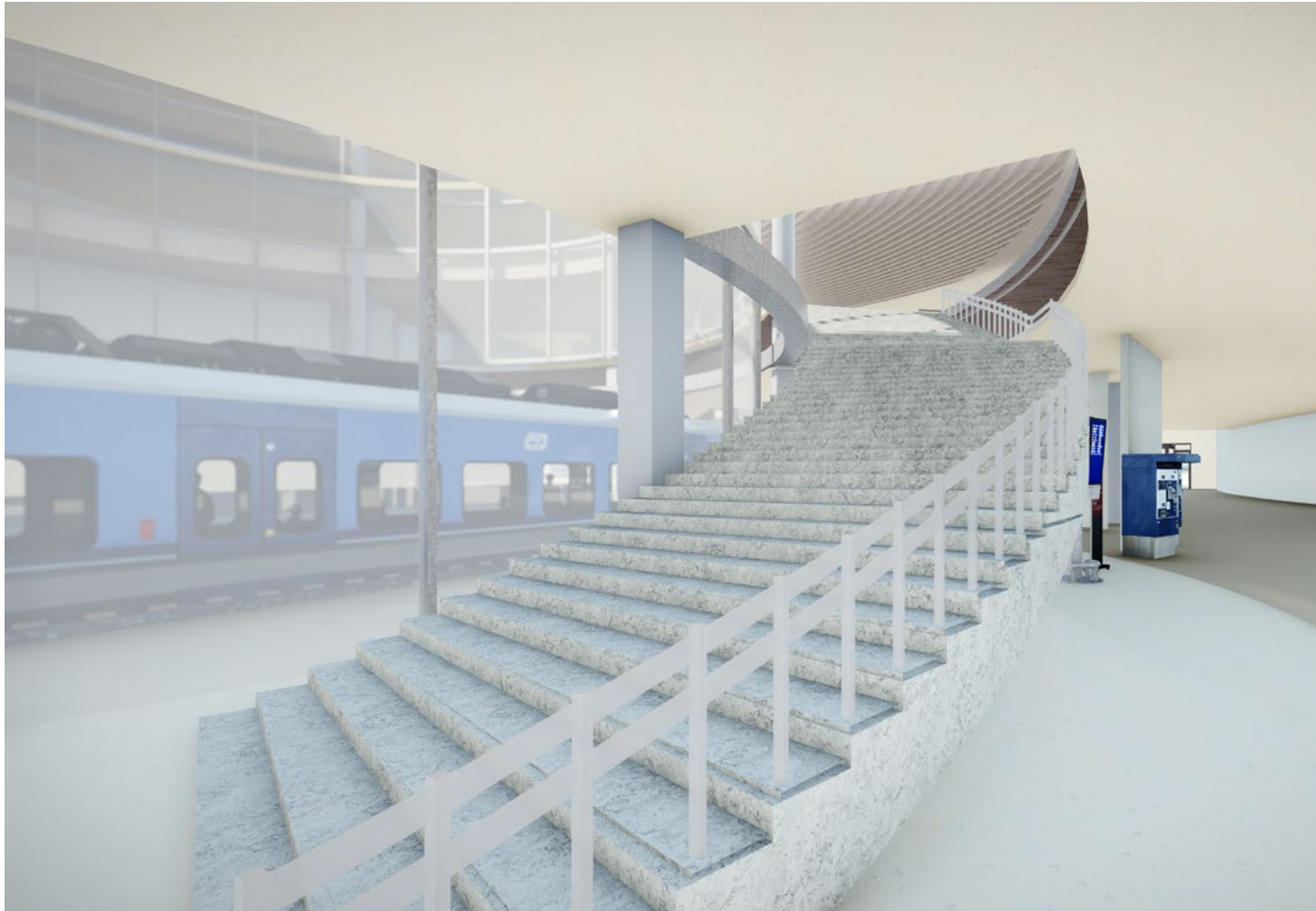
Design

3 ENTRANCES/EXITS

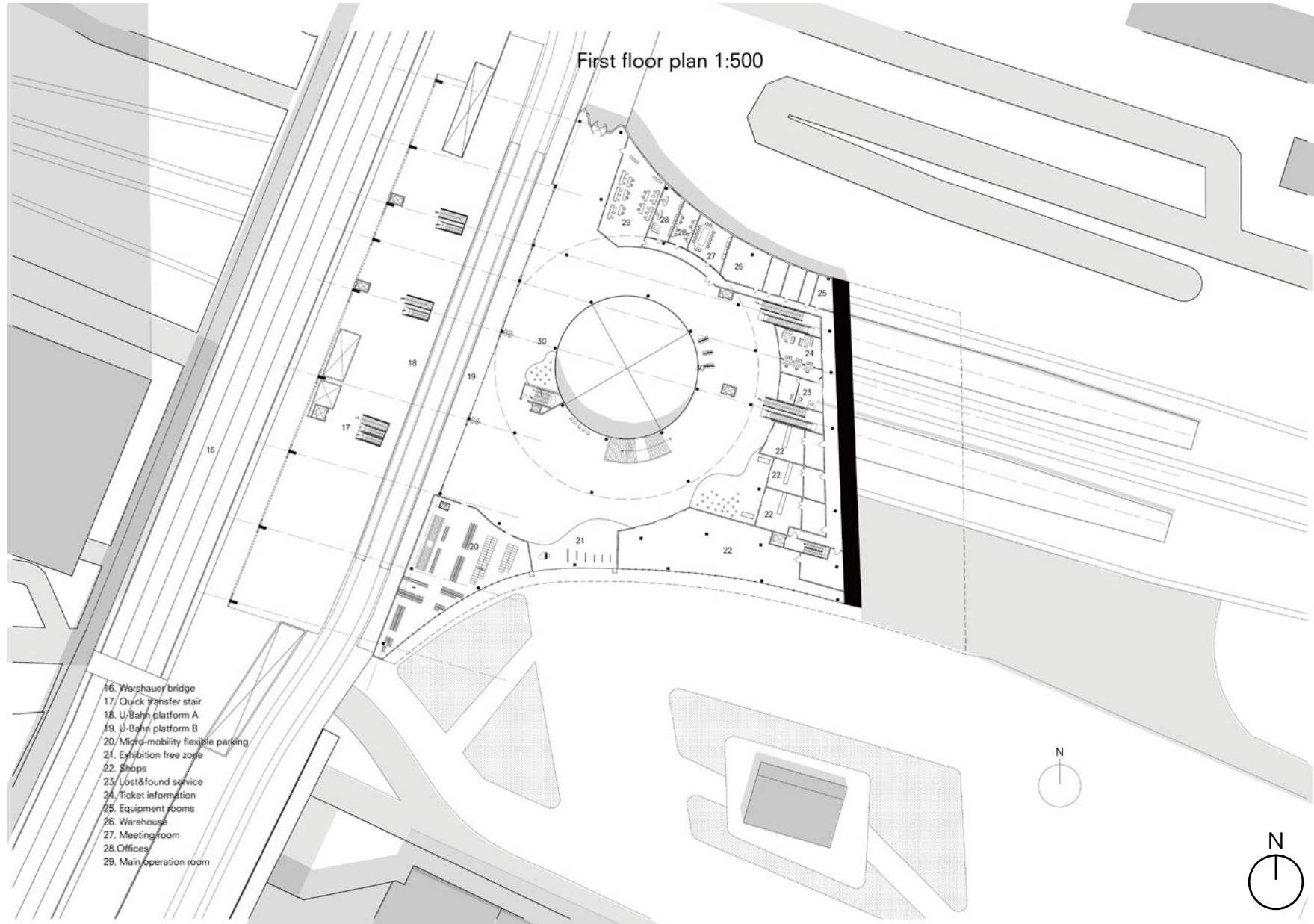


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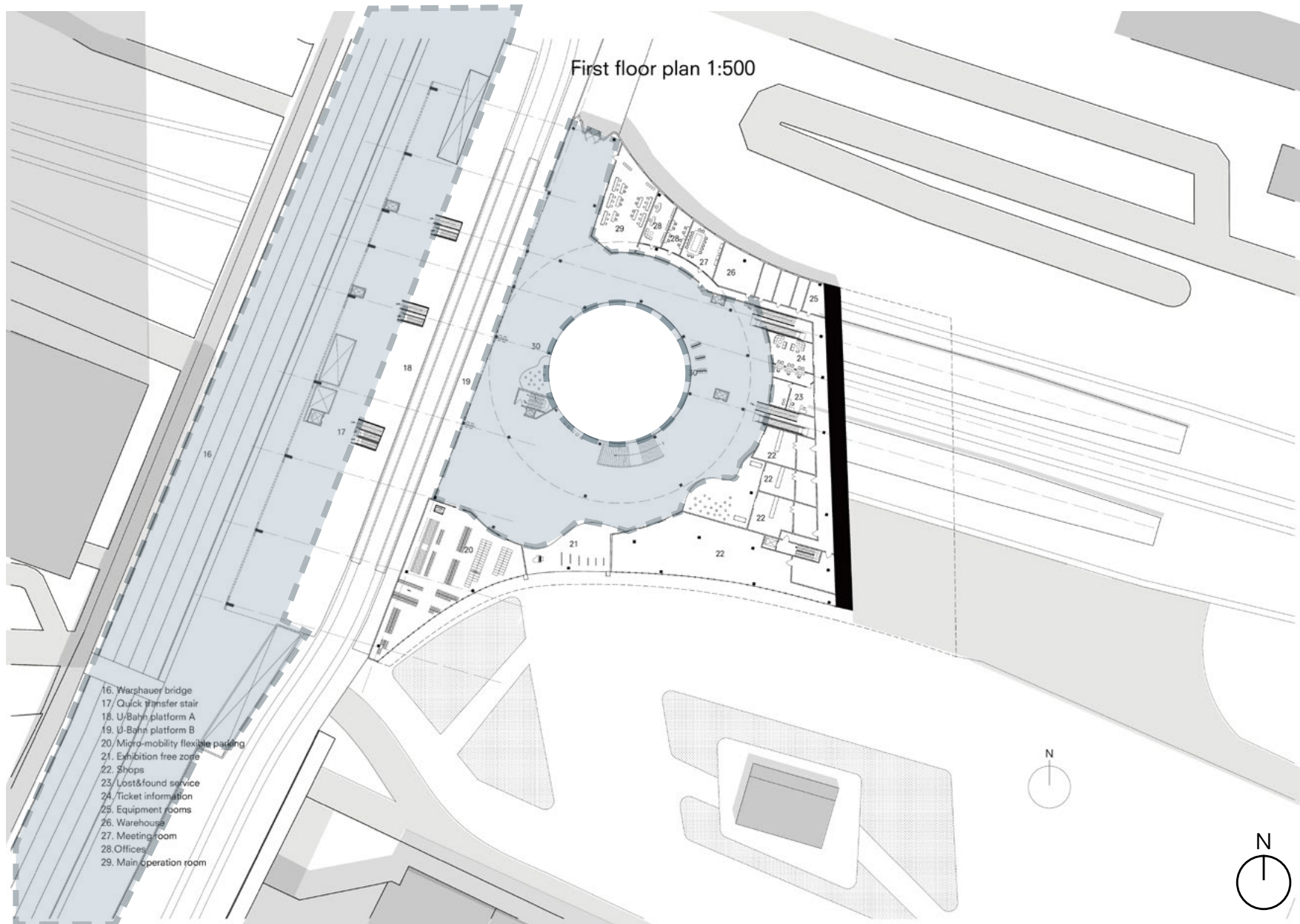
CENTRAL STAIR TO UPPER FLOOR



Design FIRST FLOOR



DESIGN PRINCIPLE OF CIRCULATION SPACE



DESIGN PRINCIPLE OF CIRCULATION SPACE

- Buffer zones and various hierarchic areas **Space**

Sitting



Standing



Walking



Slow



Fast

DESIGN PRINCIPLE OF CIRCULATION SPACE

Sitting



Standing



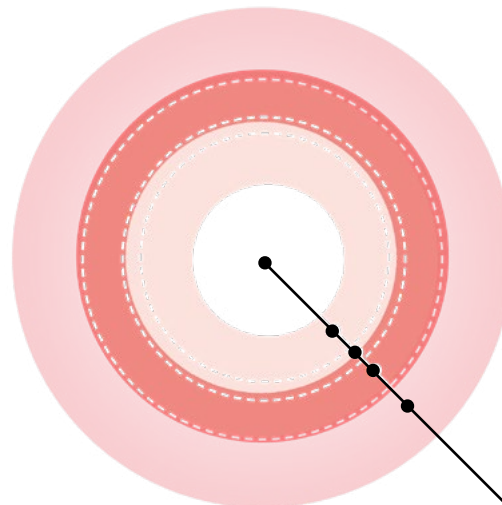
Walking



Slow



Fast



Central atrium

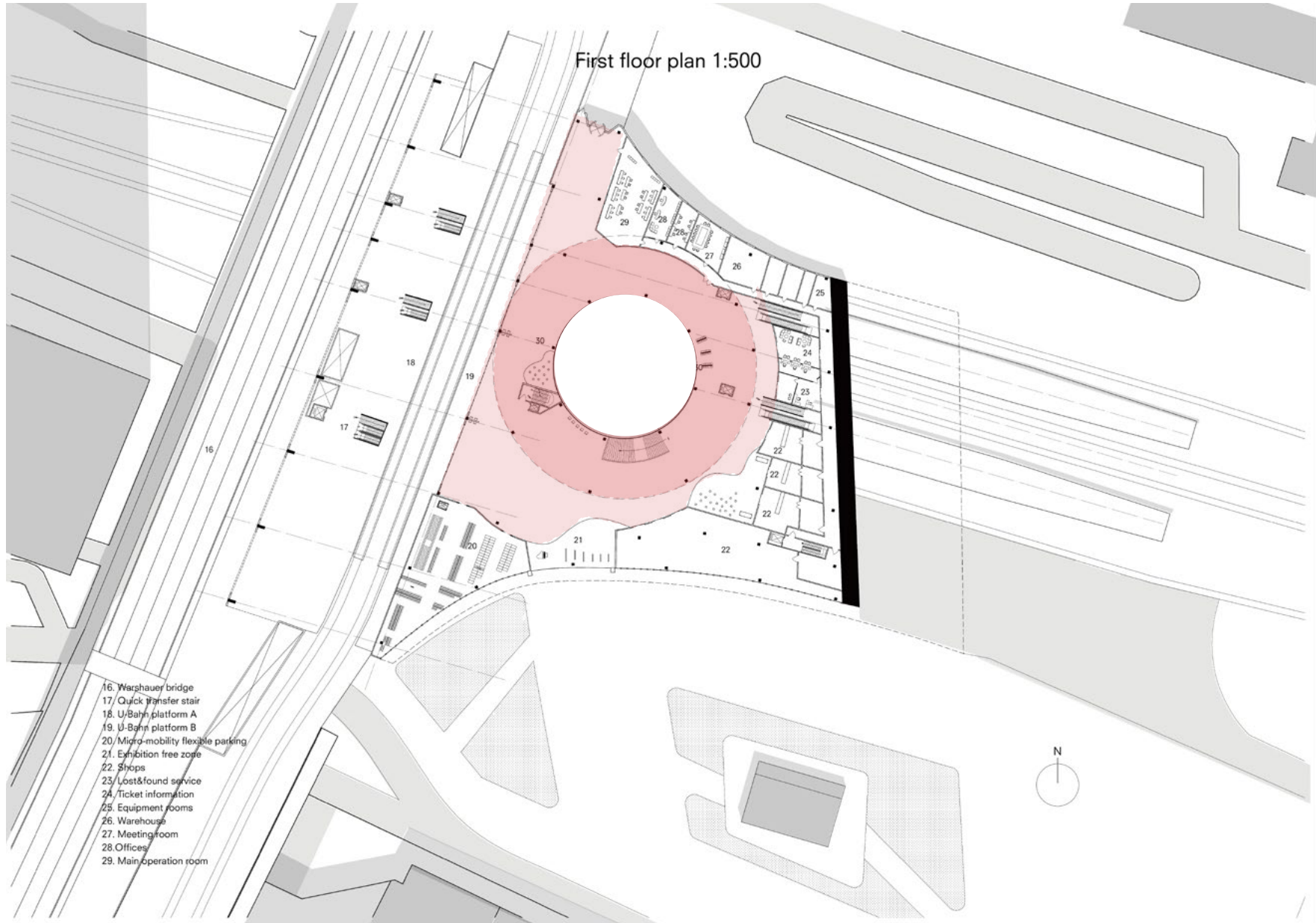
Vertical transportation zone

Fast & busy circulation

Flexible recreation zone

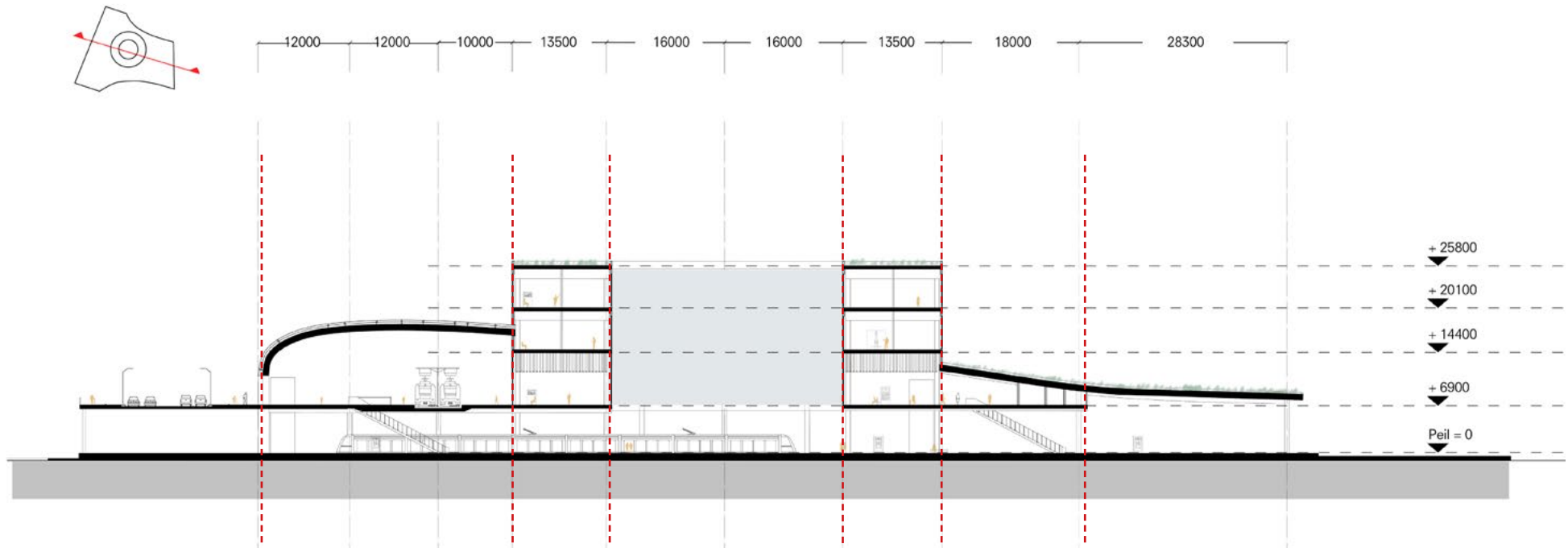
Functional zone

DESIGN PRINCIPLE OF CIRCULATION SPACE



Design

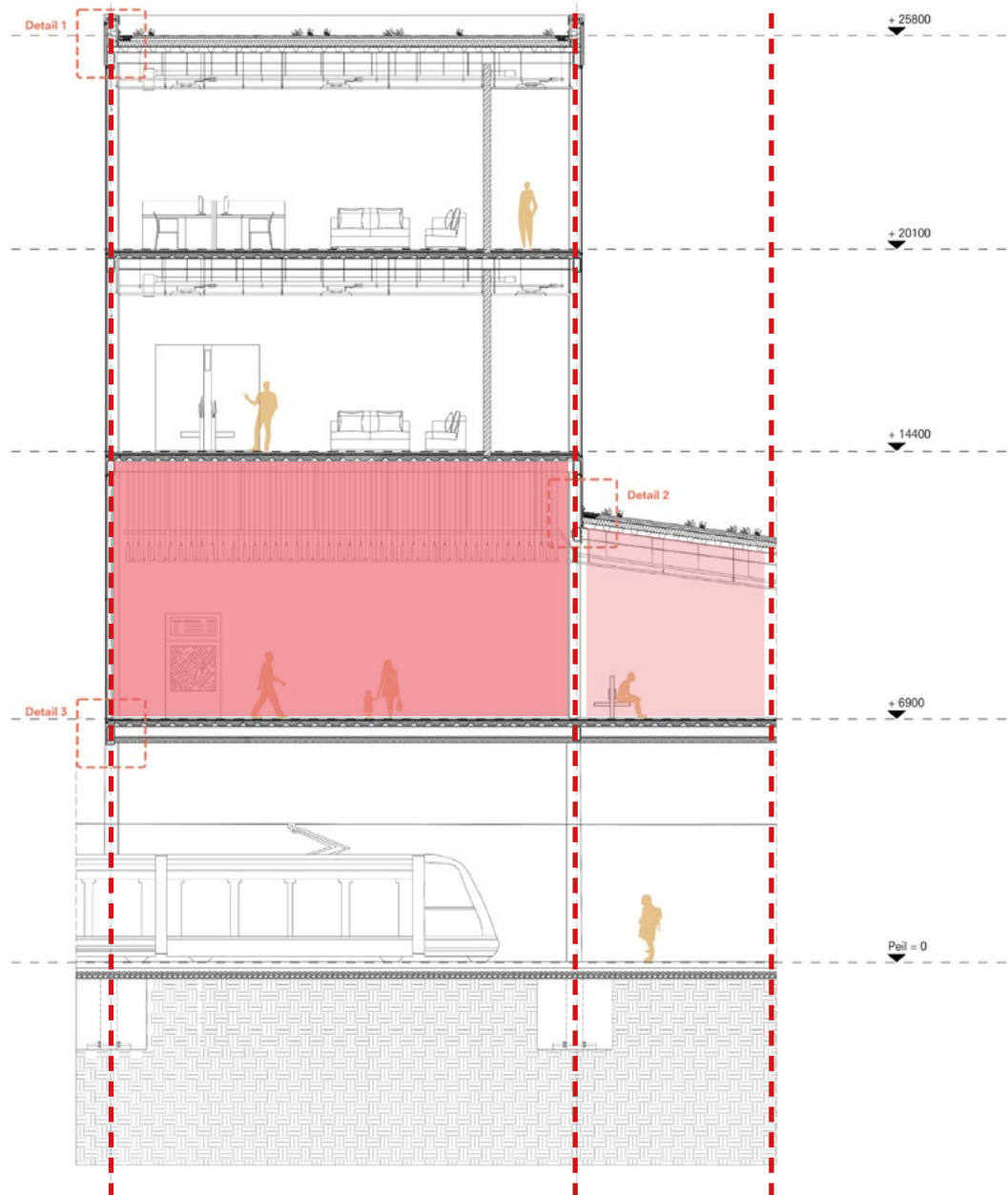
DIFFERENT HIERARCHIC AREAS



DIFFERENT HIERARCHIC AREAS



DIFFERENT HIERARCHIC AREAS



Design

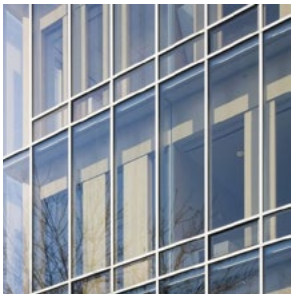
INTERIOR IMPRESSION



Design MATERIALIZATION



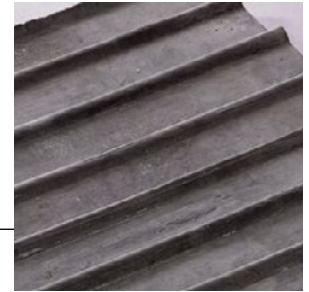
Ceiling - White Oak Planks



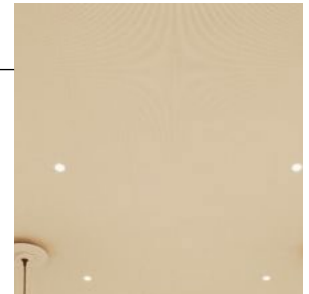
Low E double glazings



Epoxy flooring



Plaster board column wraps



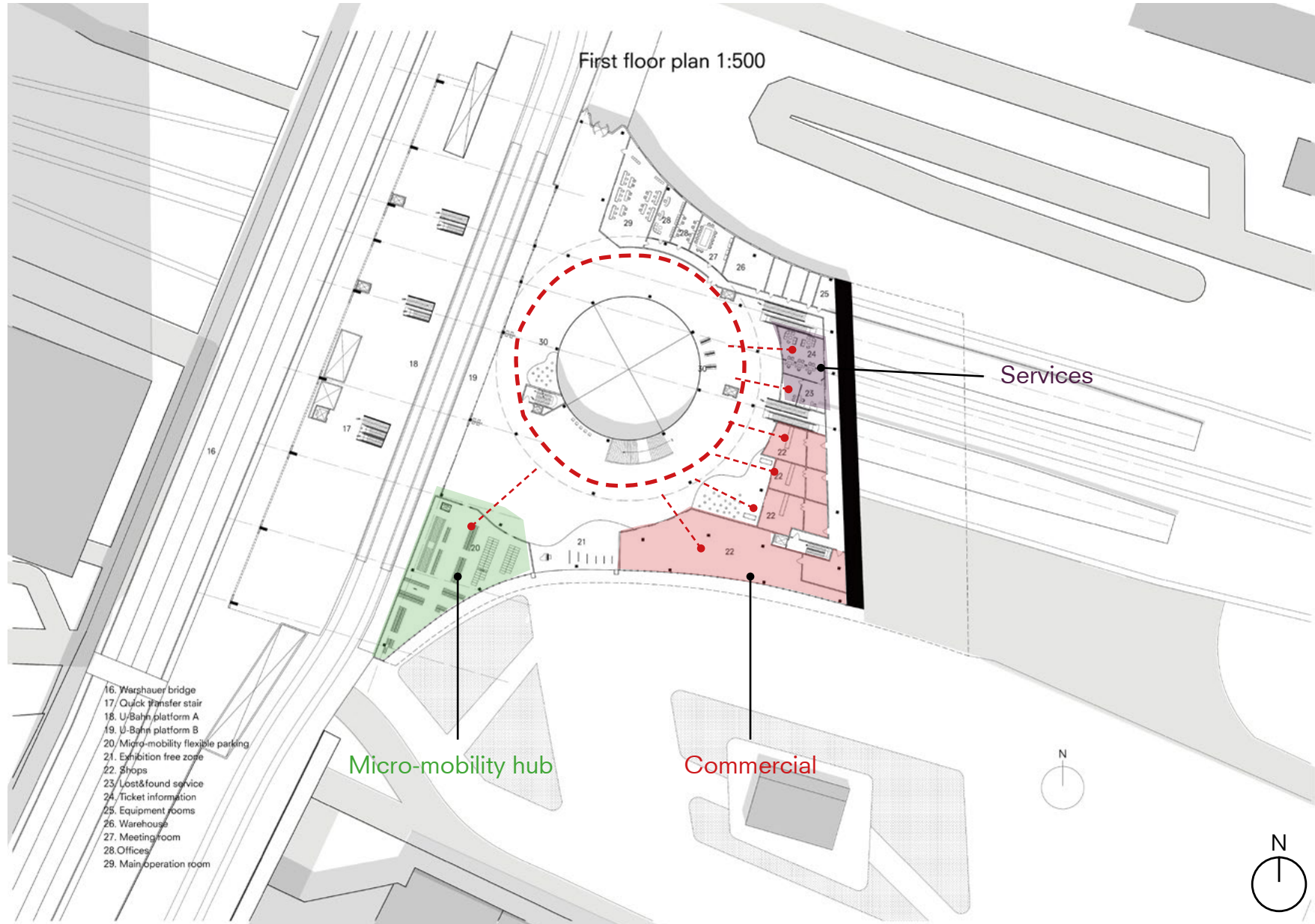
Ceiling - Acoustic gypsum ceiling



Parquet flooring

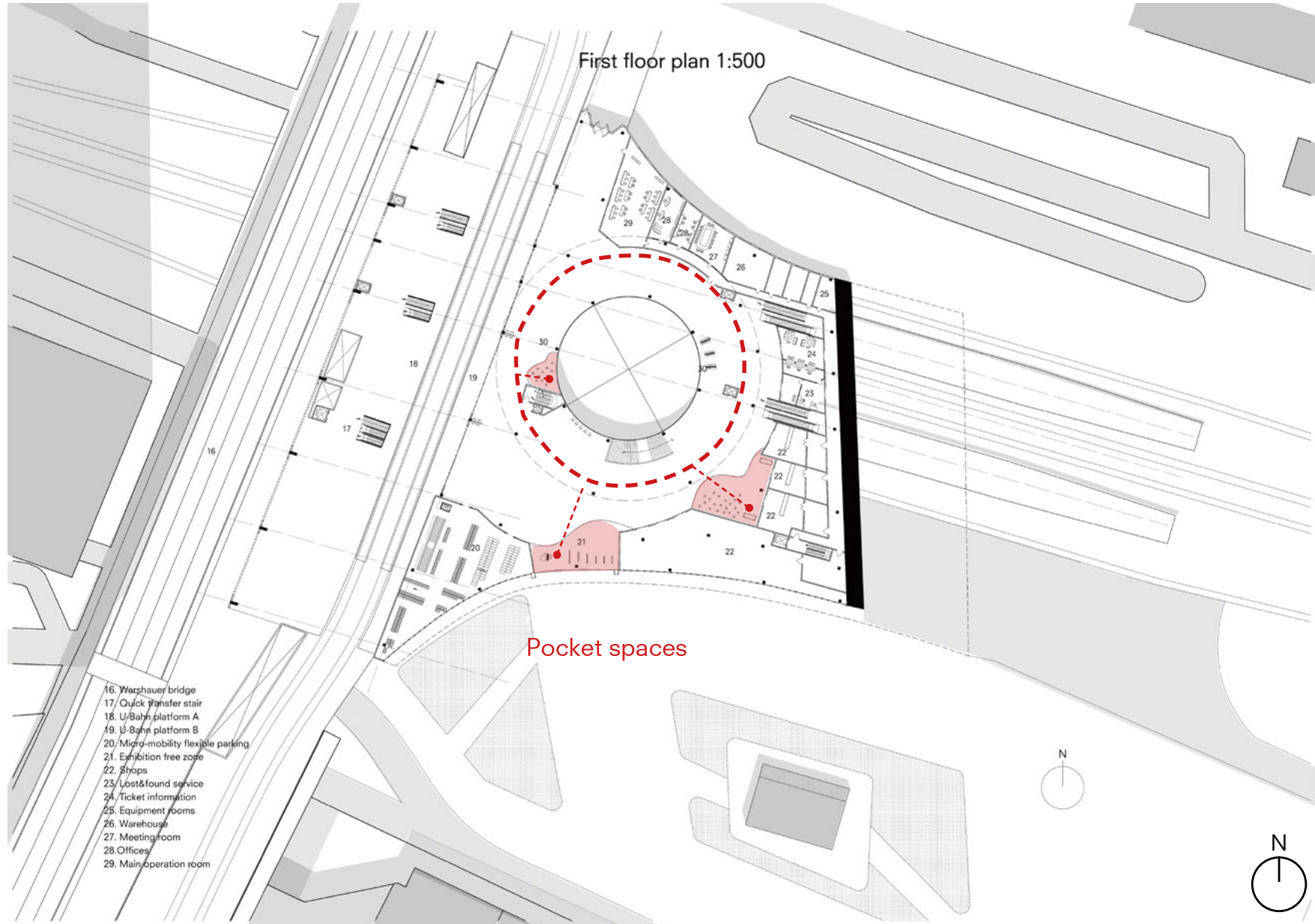
Design

FUNCTIONAL AREAS



Design

FUNCTIONAL AREAS



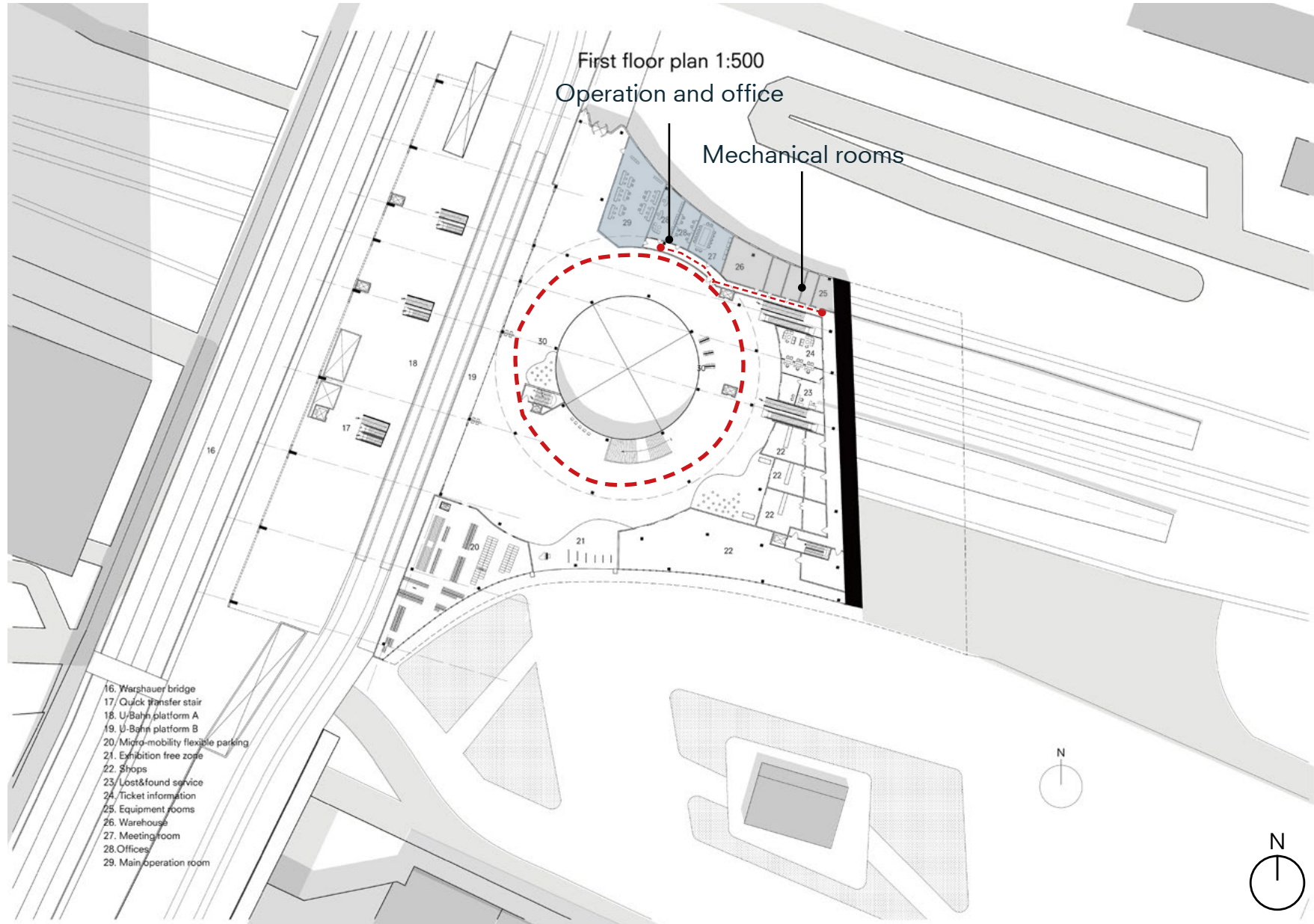
Design

POCKET SPACE



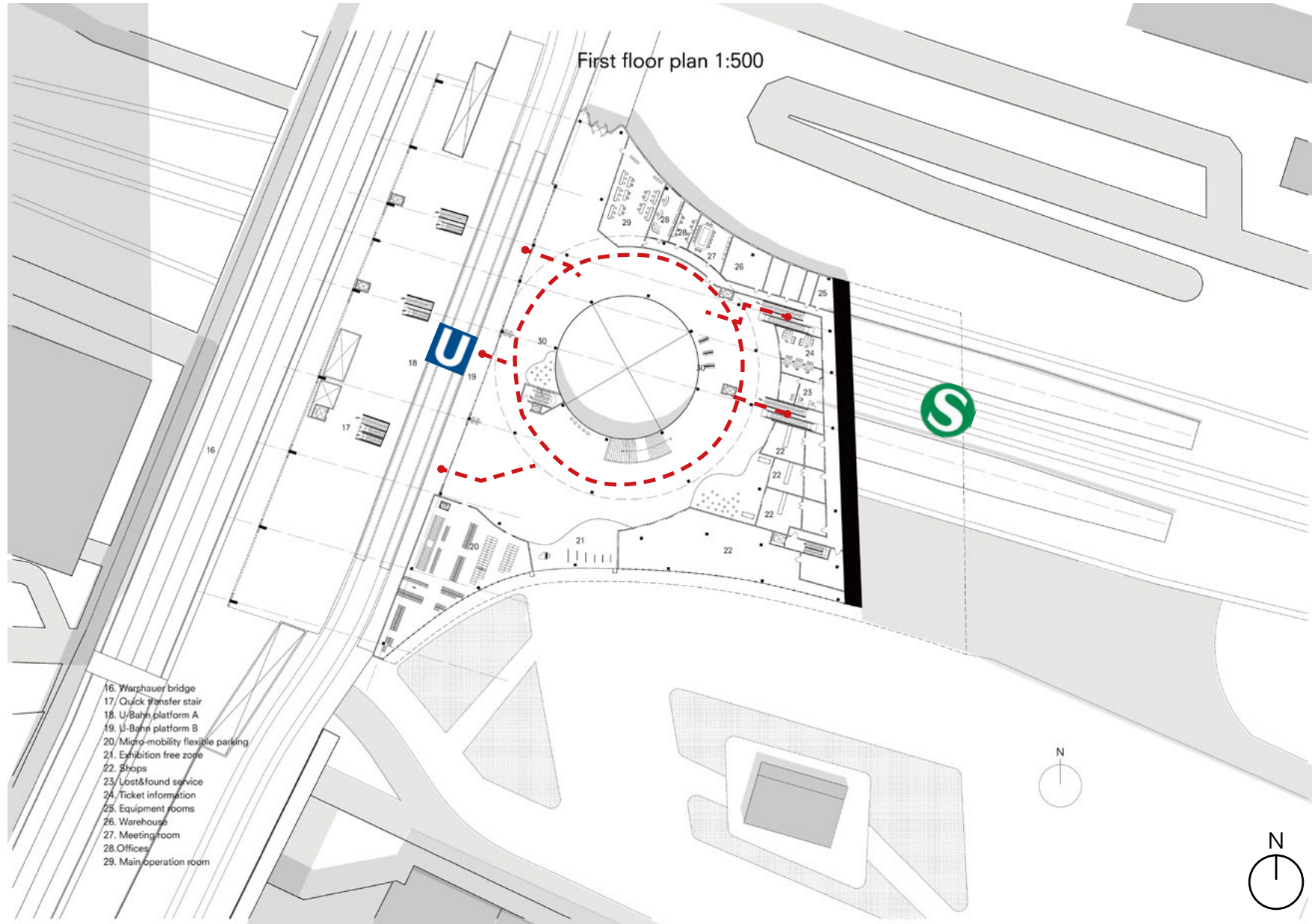
Design

EQUIPMENT ROOMS



Design

U-BAHN & S-BAHN



Design

INTERIOR IMPRESSION

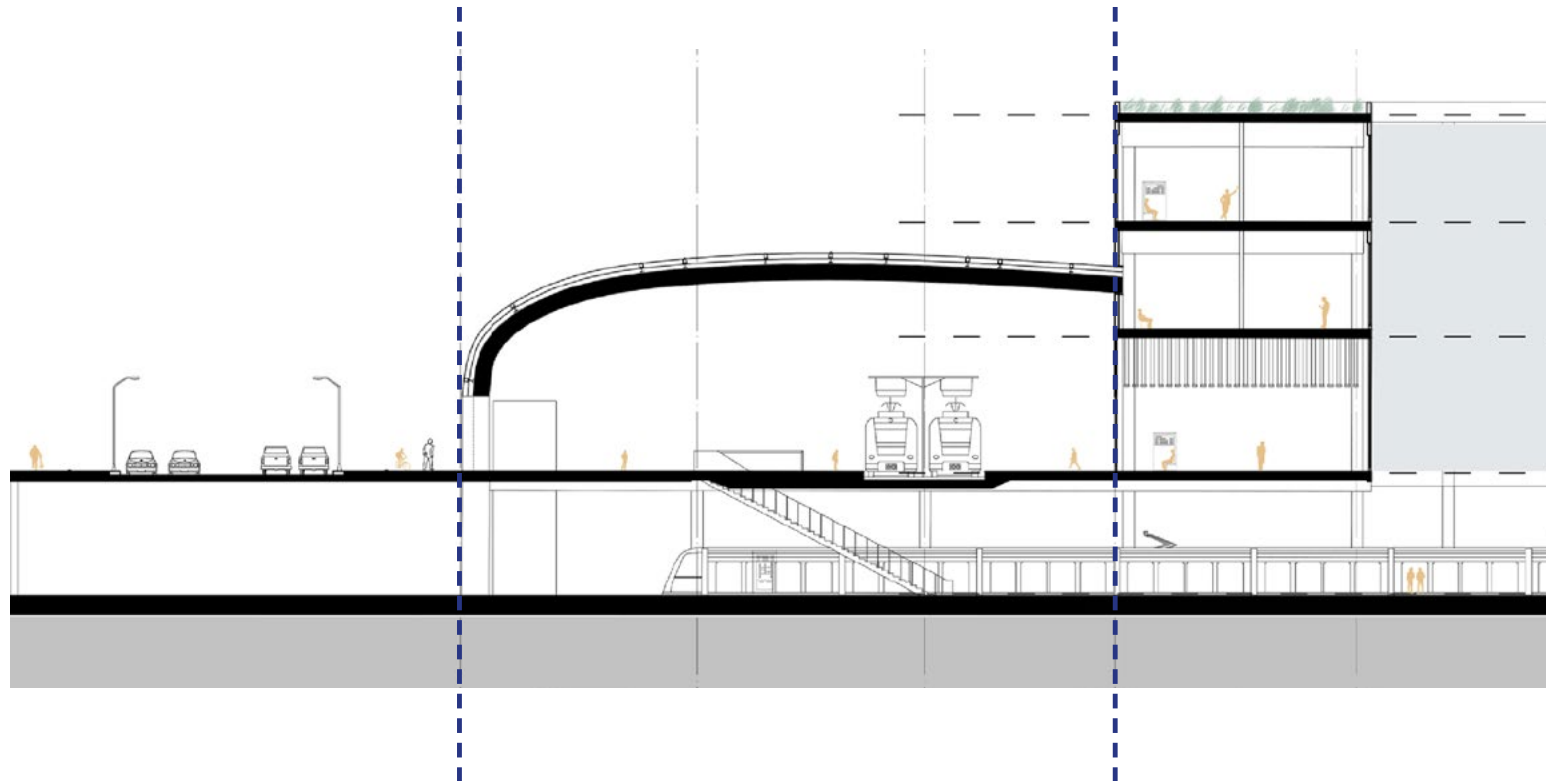


Design

U-BANH PLATFORM

City

Building



Sidewalk Bike Car Bike Sidewalk

Road area

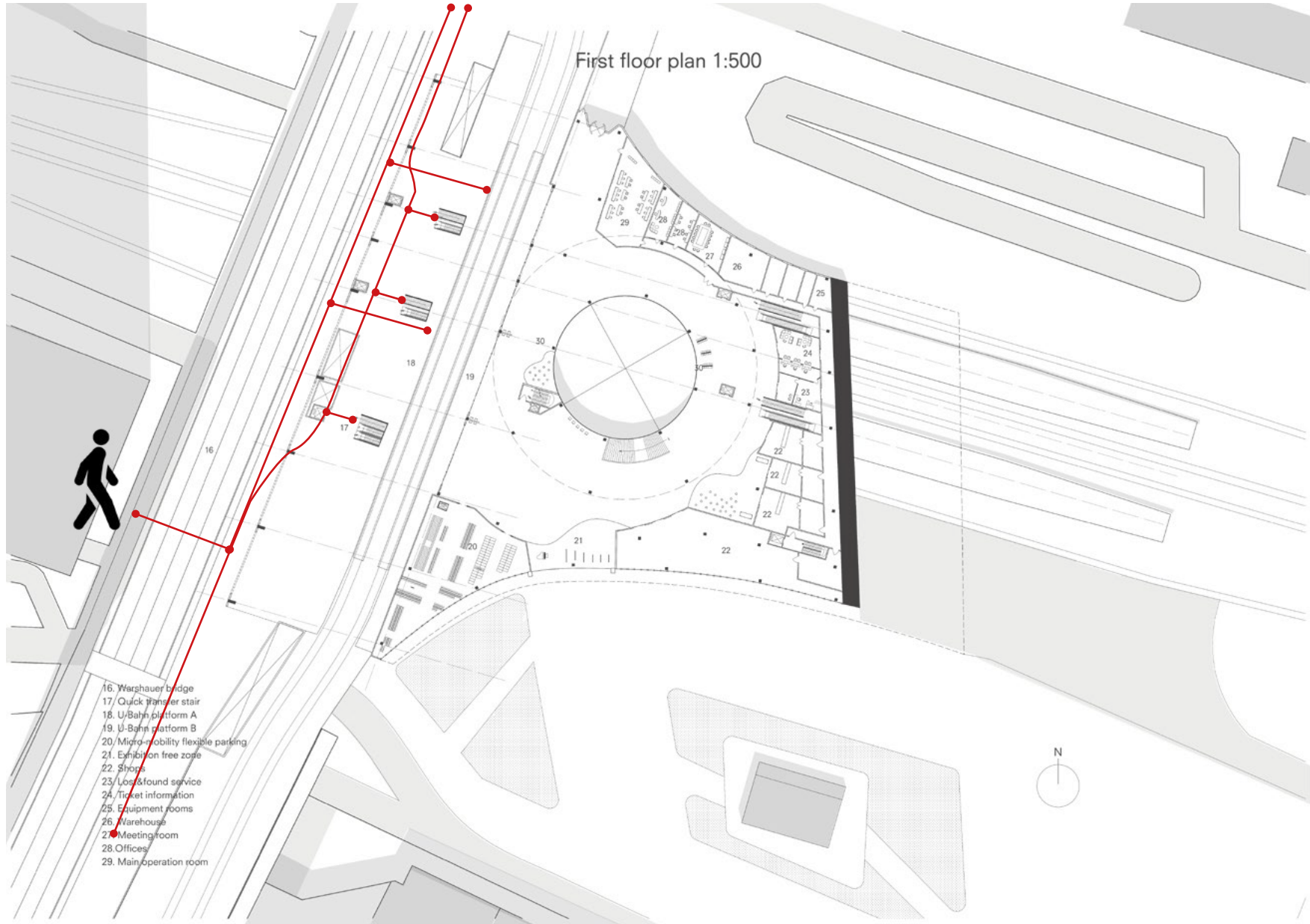
Vertical
Transportation

Platform

Hall

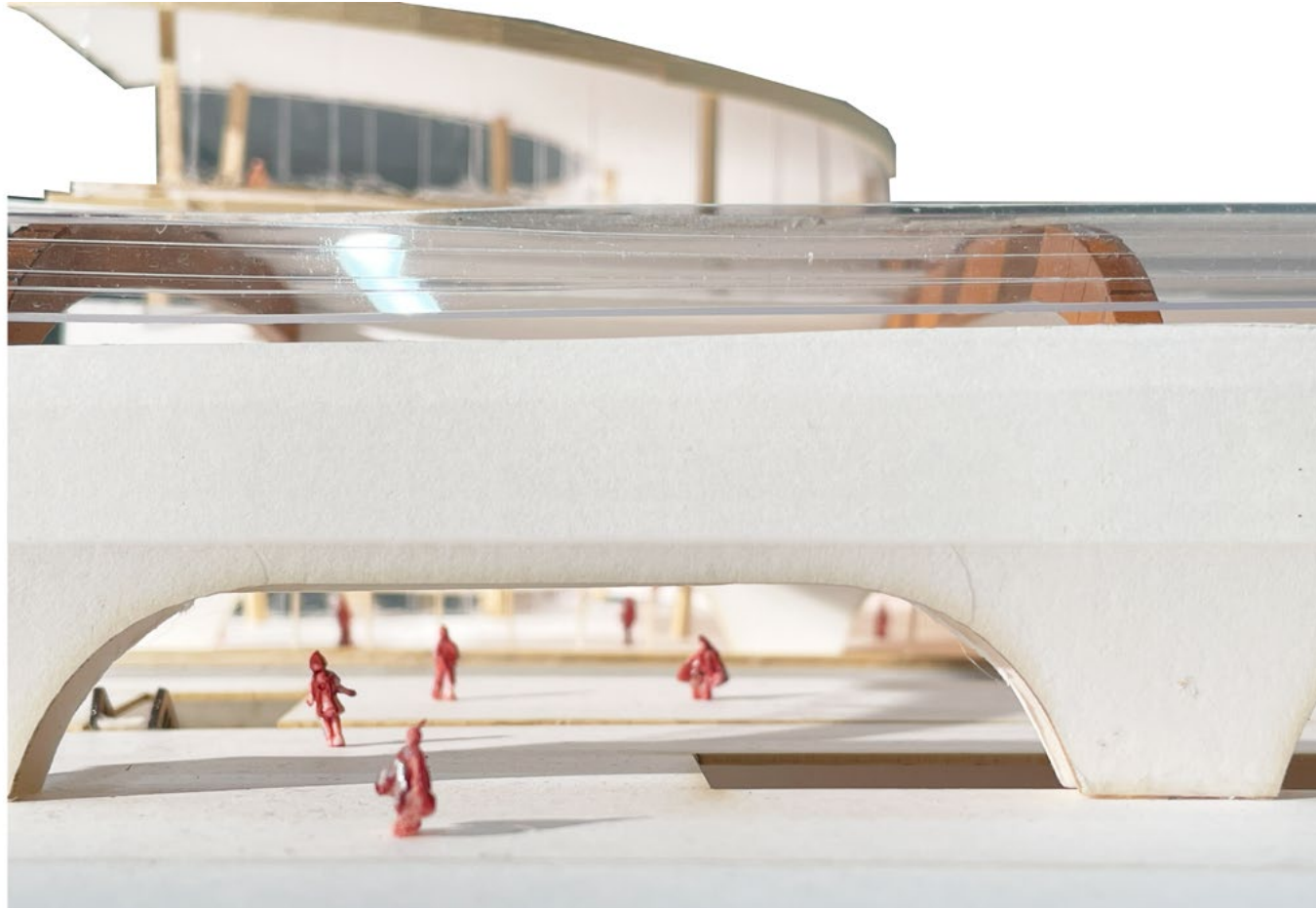
Design

PEDESTRIAN ROUTES



Design

PEDESTRIAN ROUTES



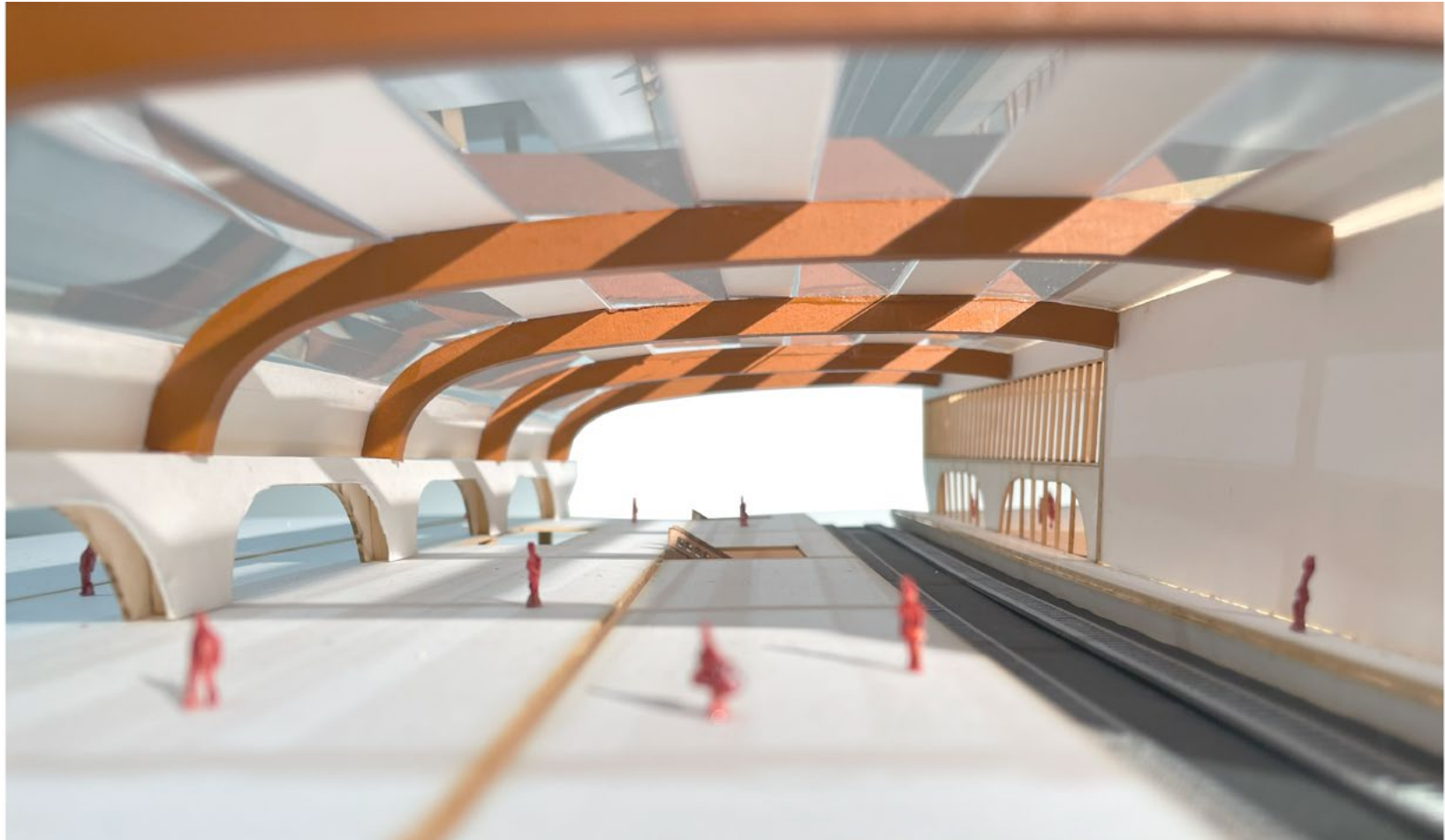
Design

PEDESTRIAN ROUTES



Design

U-BAHN PLATFORM



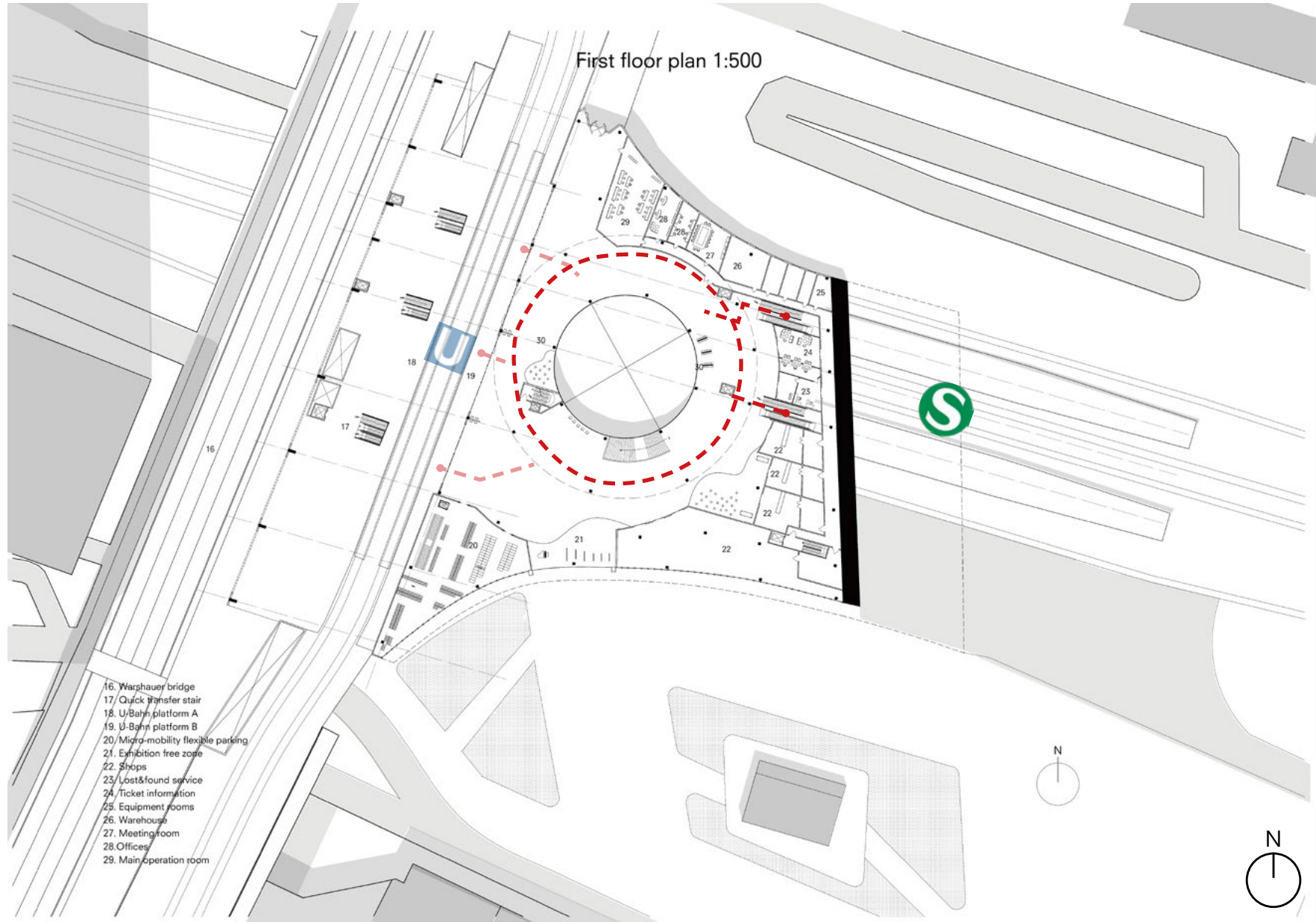
Design

U-BAHN PLATFORM



Design

S-BAHN PLATFORM



Design

S-BAHN PLATFORM



Design

S-BAHN PLATFORM

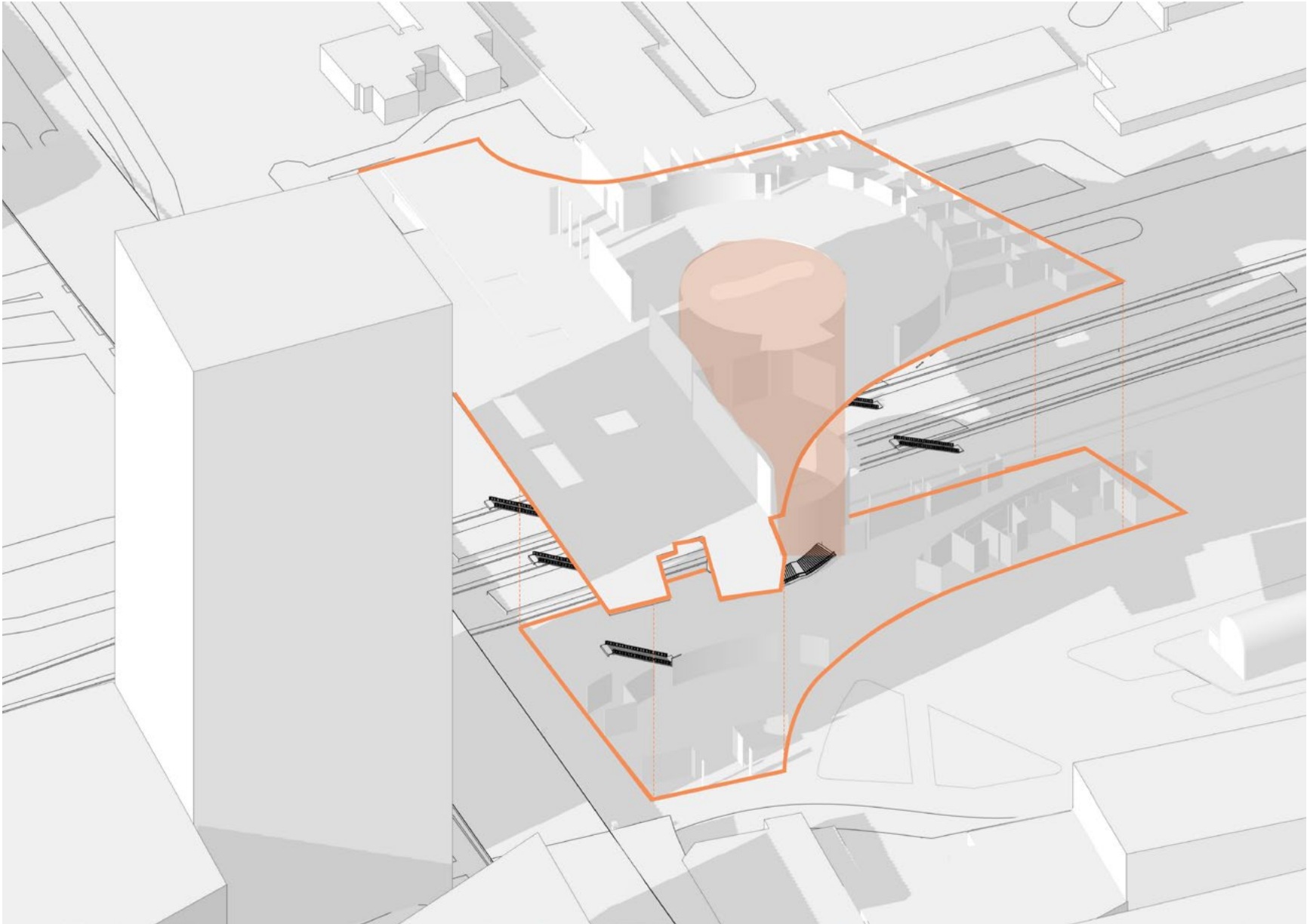


Design

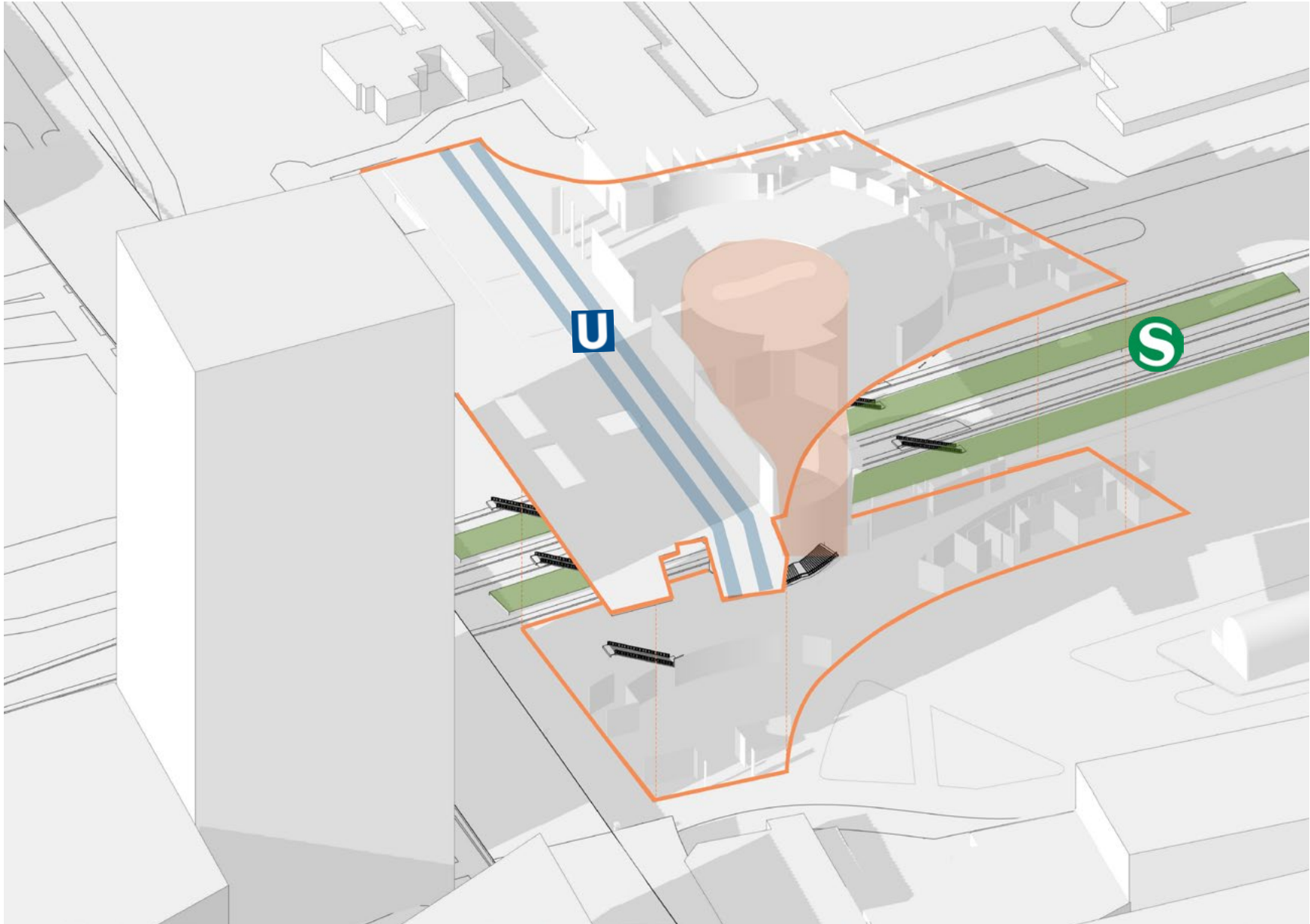
CURRENT TRANSFER BRIDGE



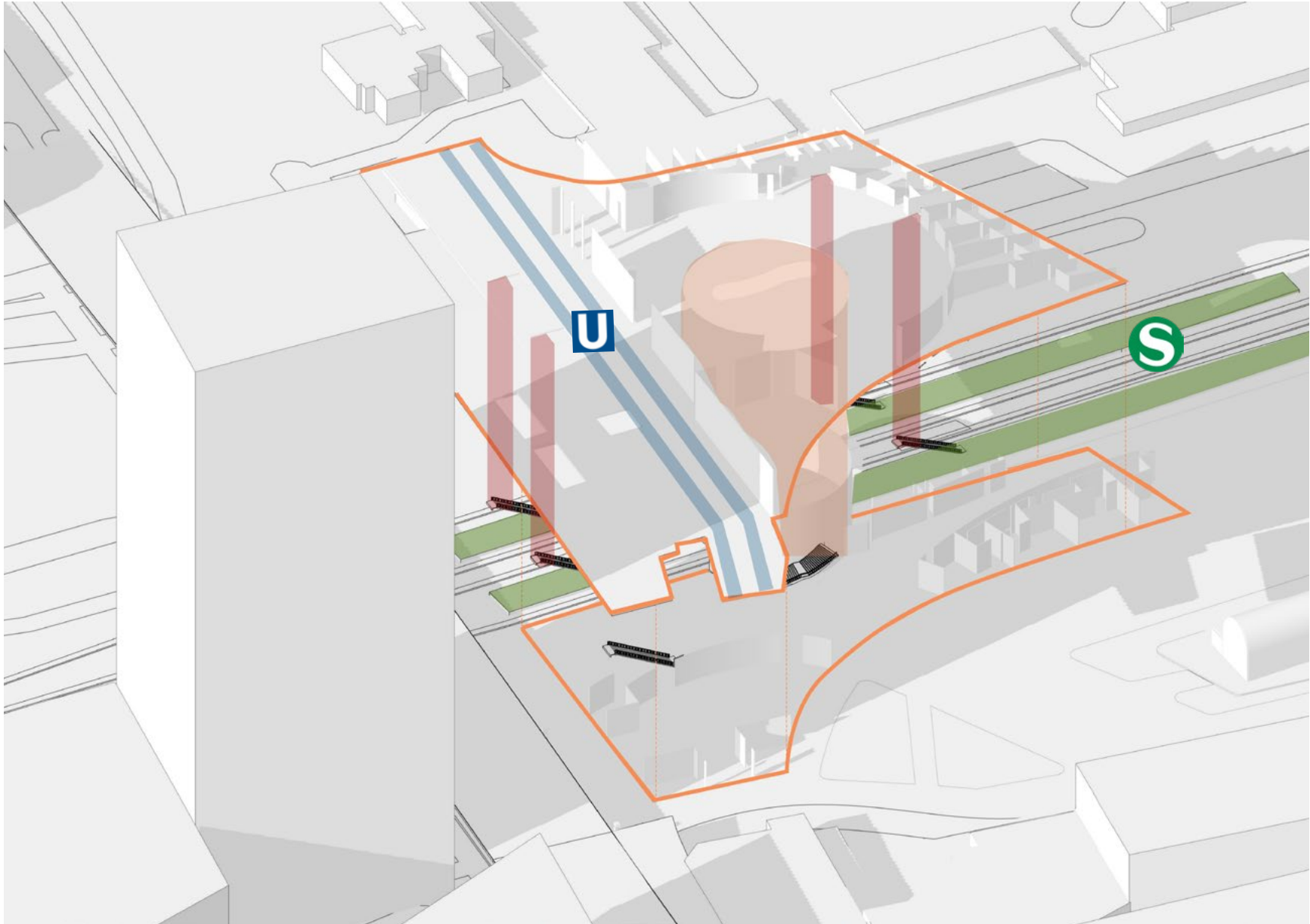
CENTRAL ATRIUM - LANDMARK



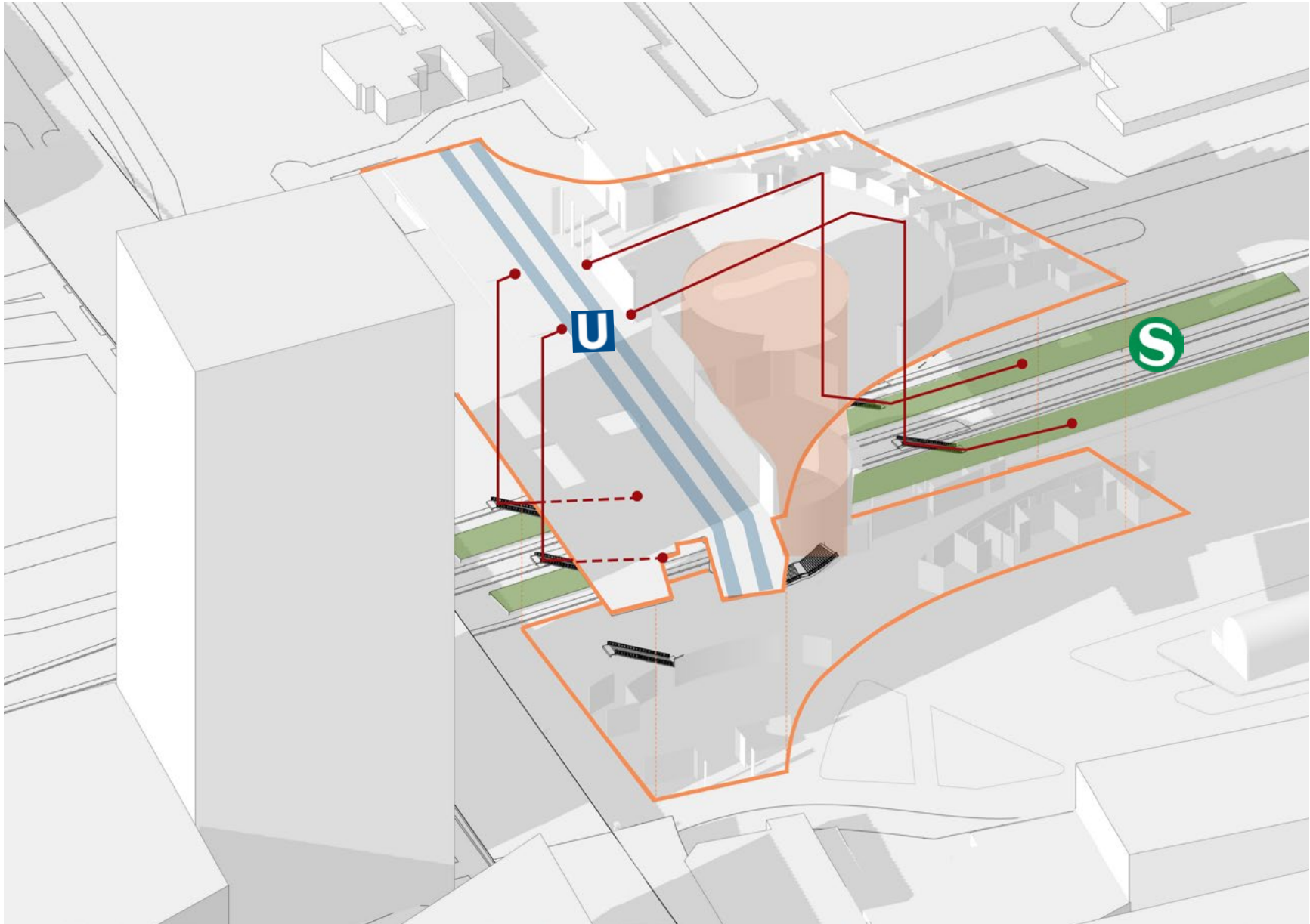
CROSSED PLATFORMS



VERTICAL TRANSPORT



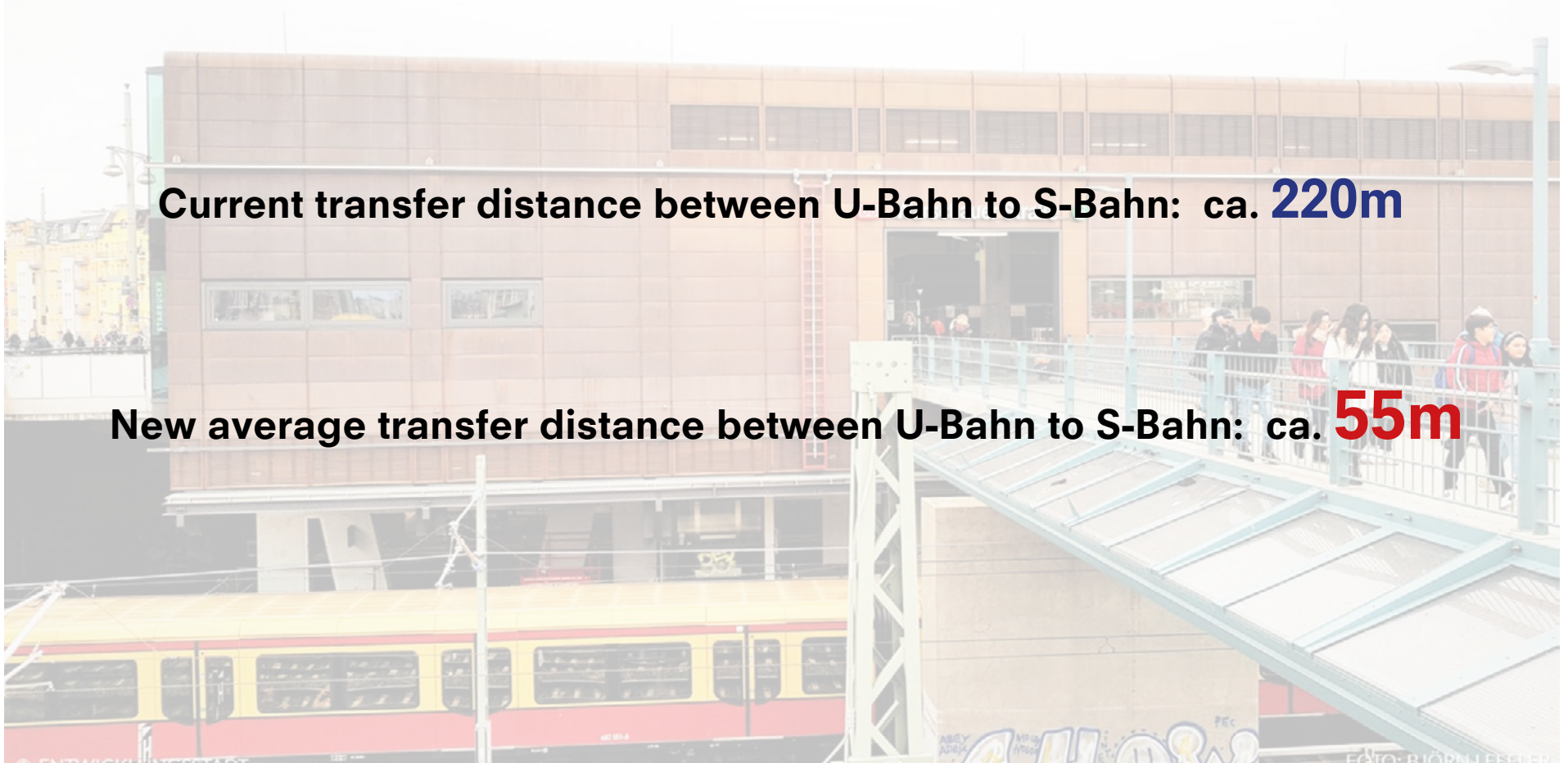
QUICK TRANSFER ROUTE



DISTANCE REDUCED BY 75%

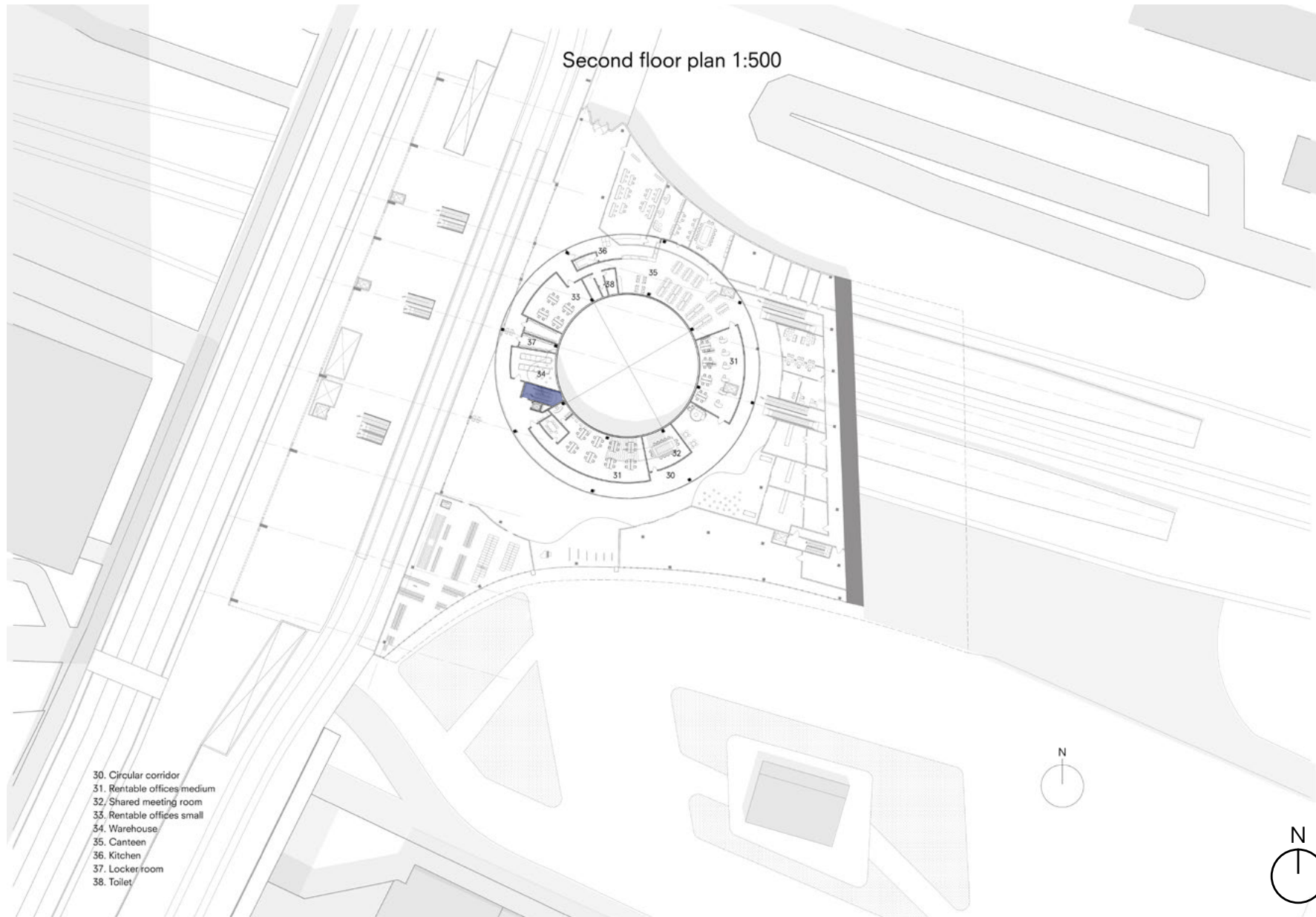
Current transfer distance between U-Bahn to S-Bahn: ca. **220m**

New average transfer distance between U-Bahn to S-Bahn: ca. **55m**



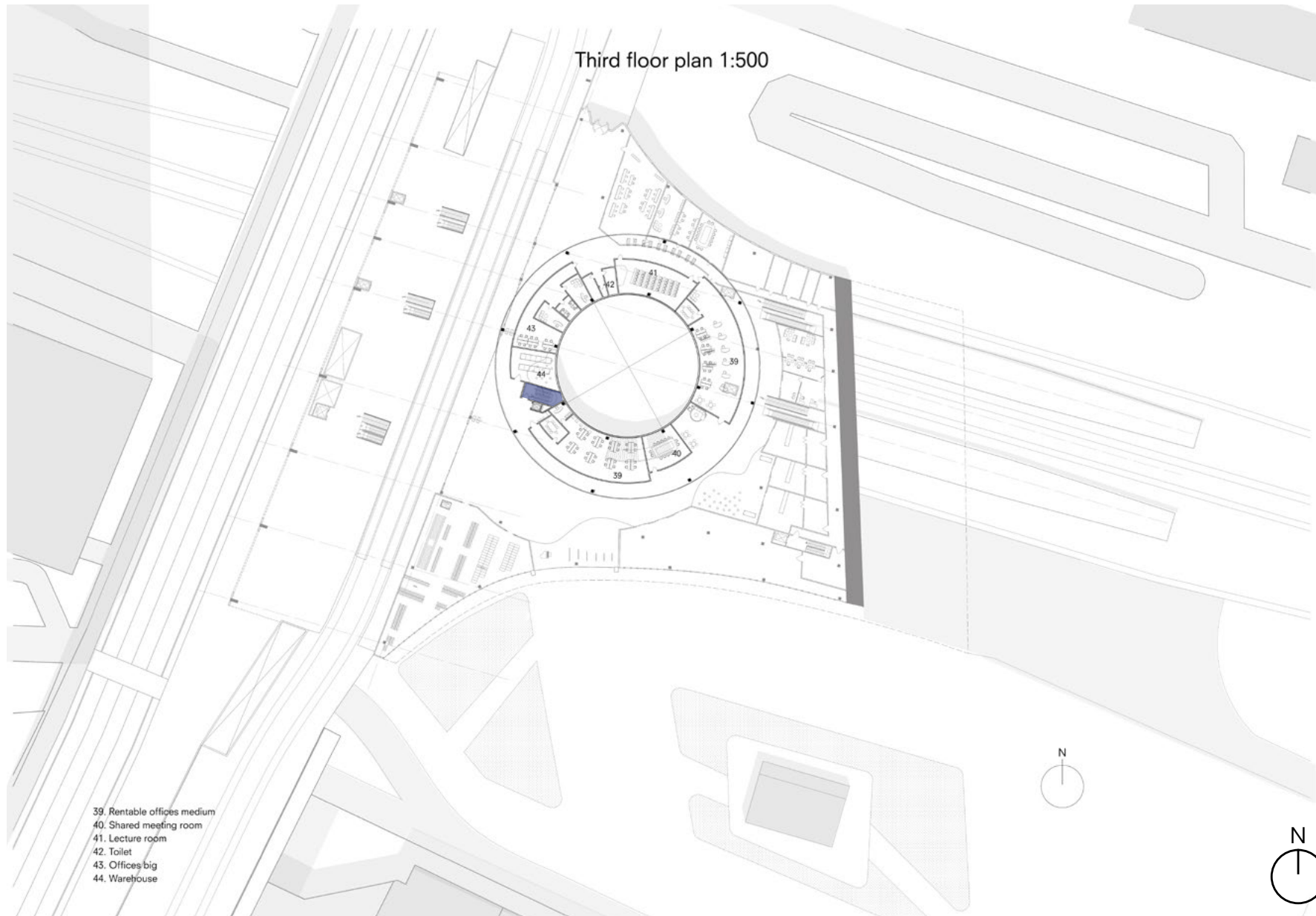
Design

SECOND FLOOR



Design

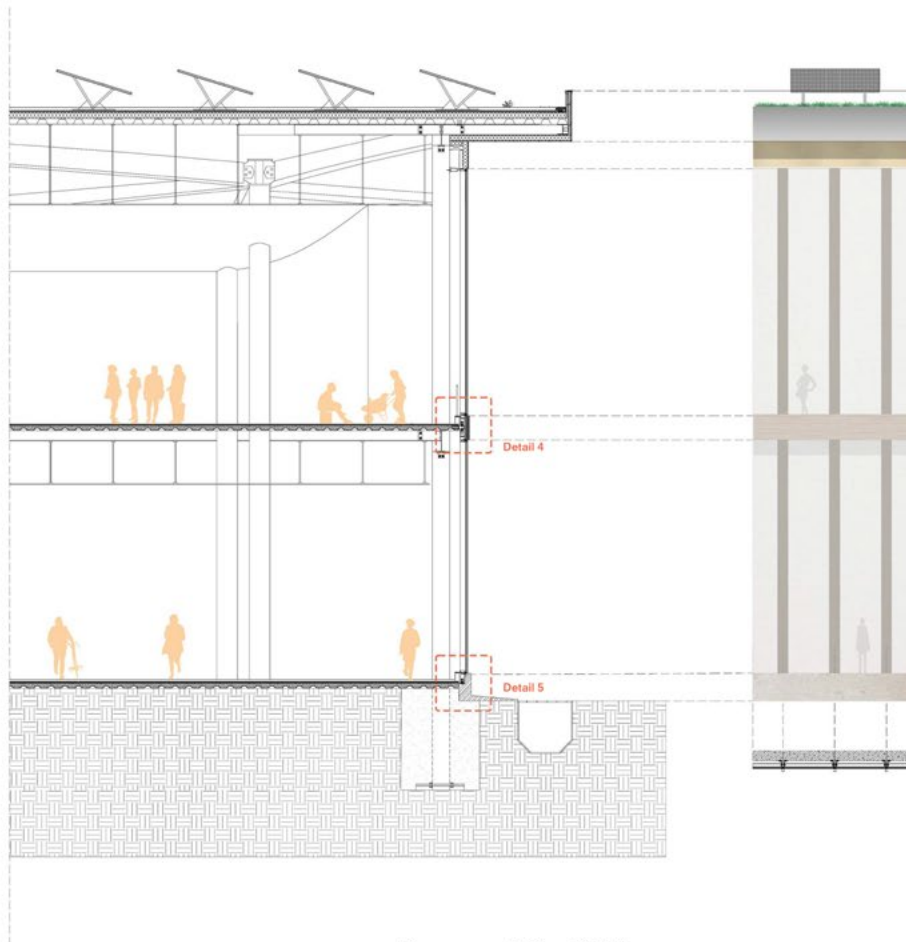
THIRD FLOOR



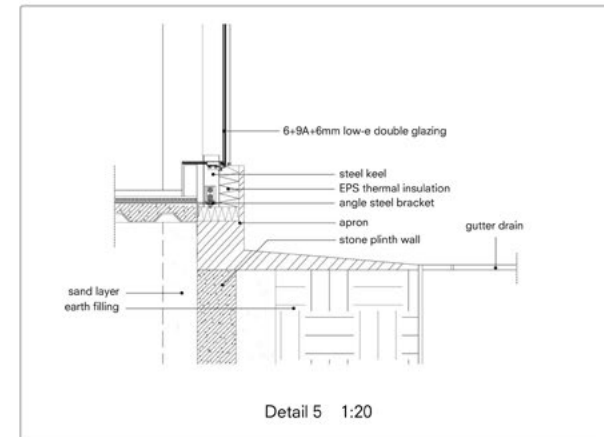
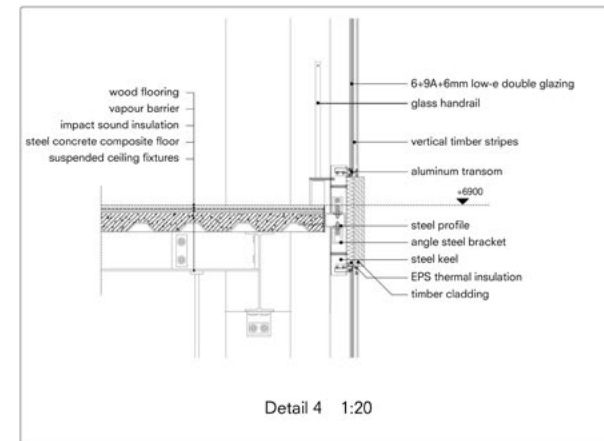
Design FACADE

- Recognizable and easy to access

Facade



Fragment 2 1:75

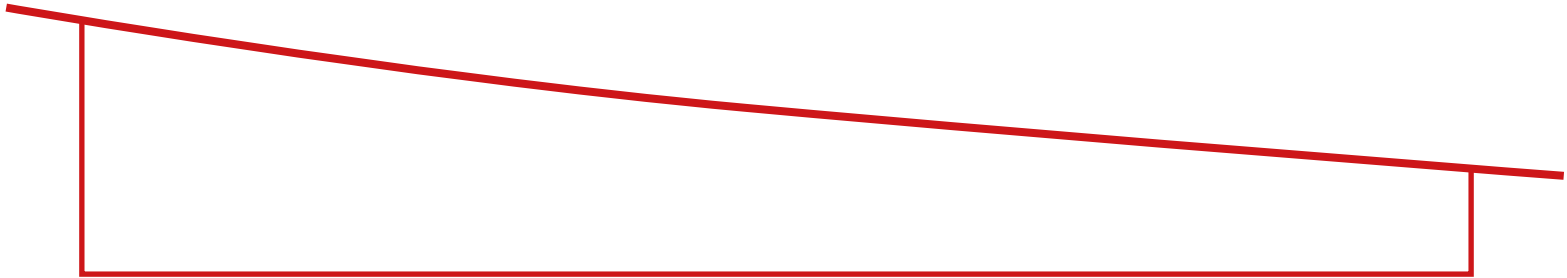


Design

CURVED ROOF

- Recognizable and easy to access

Facade

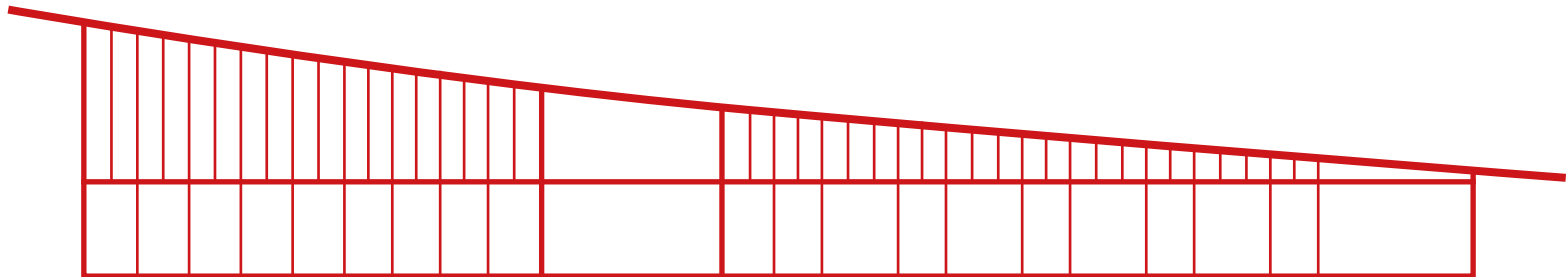


Design

HUMAN SCALE

- Recognizable and easy to access

Facade

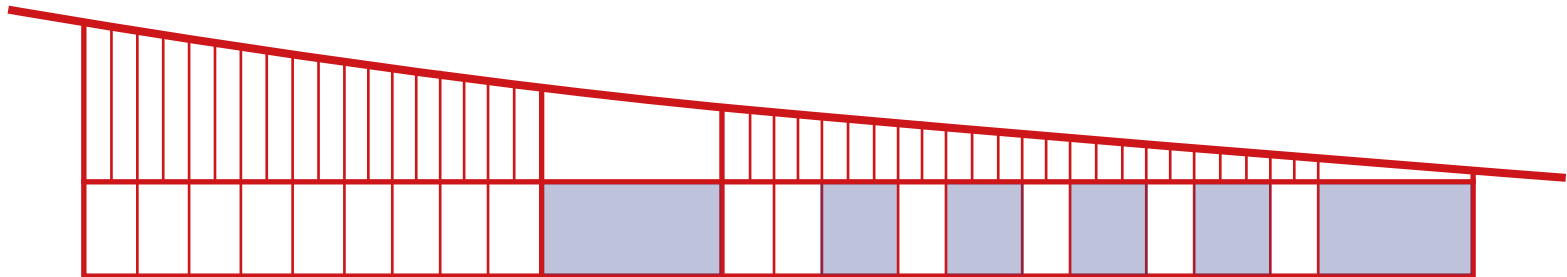


Design

ENTRANCES

- Recognizable and easy to access

Facade



Design

SOUTH FACADE



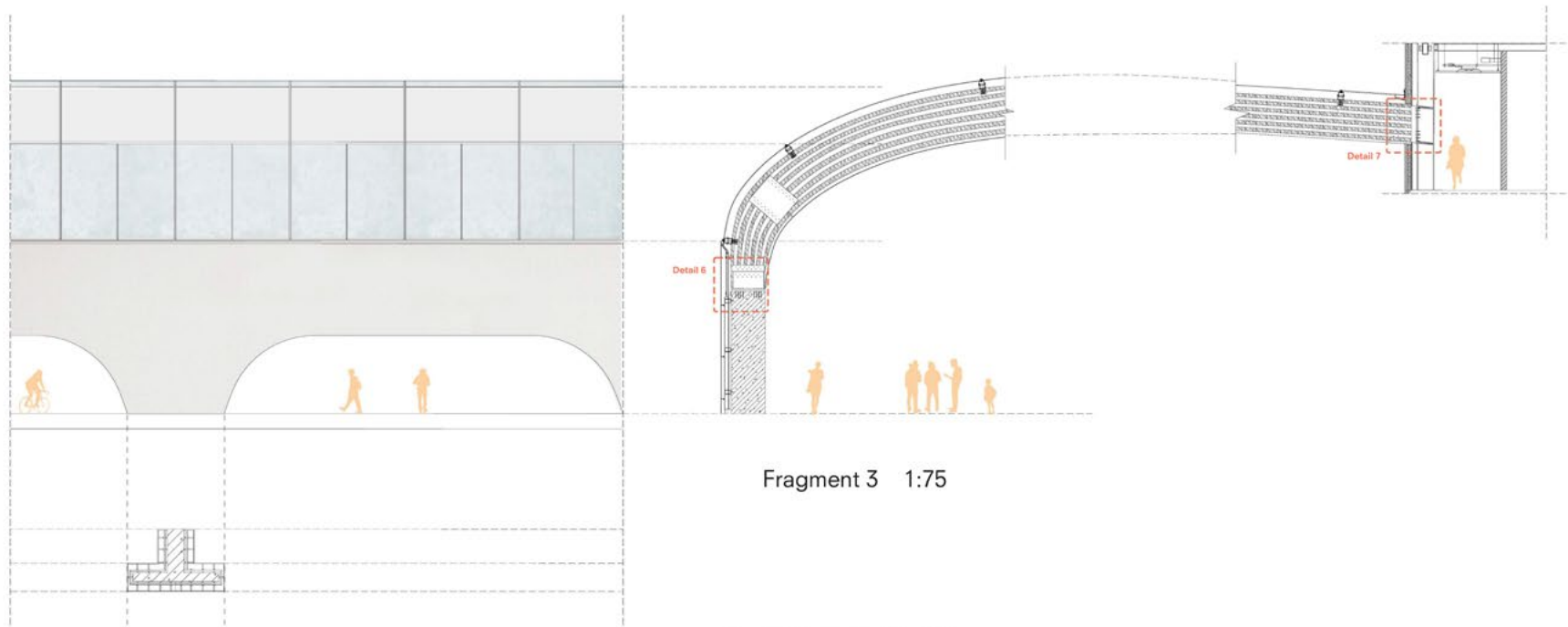
Design

SOUTH FACADE

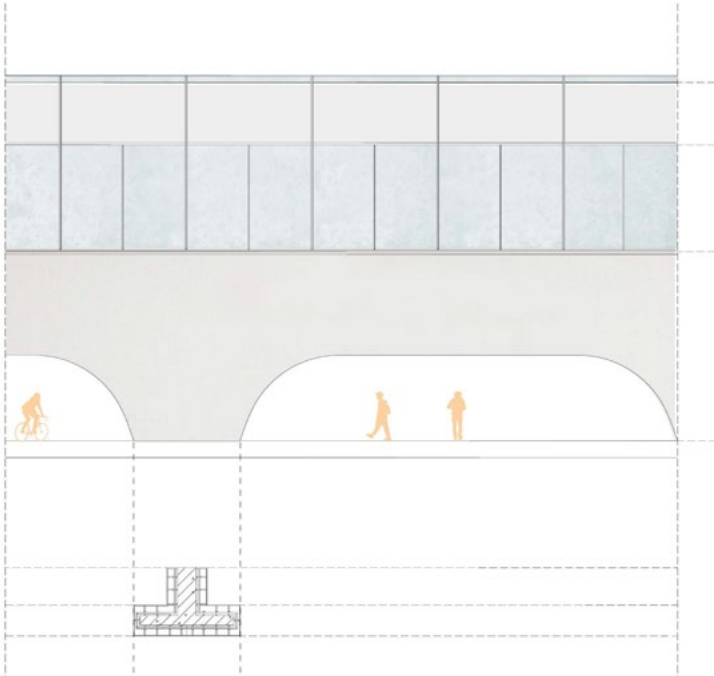


Design

WEST FACADE



ARCH ELEMENTS FROM OLD BUILDING



Design

WEST FACADE



Design

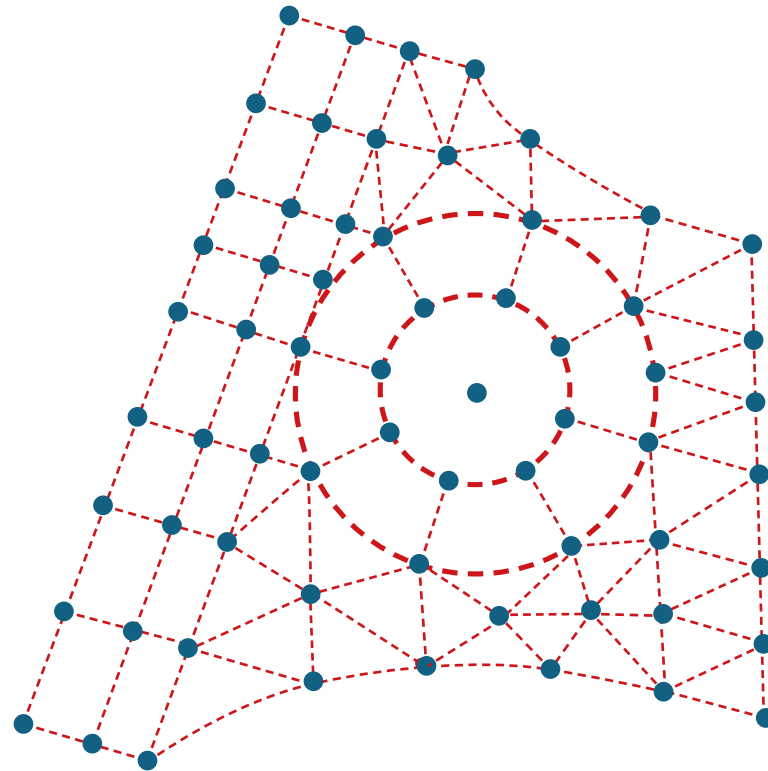
NORTH FACADE



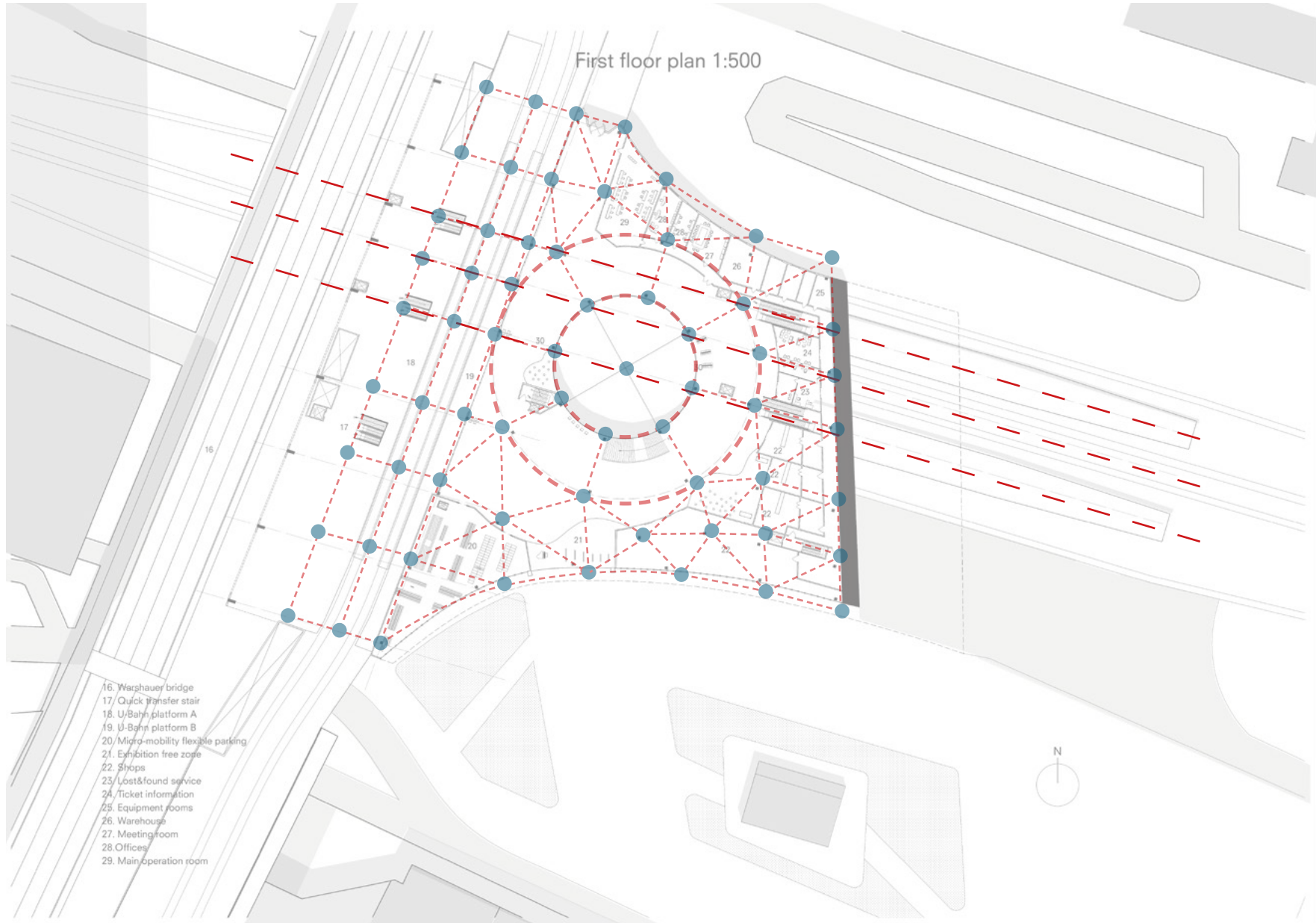
Design STRUCTURE

- Consistent with functions and space

Structure

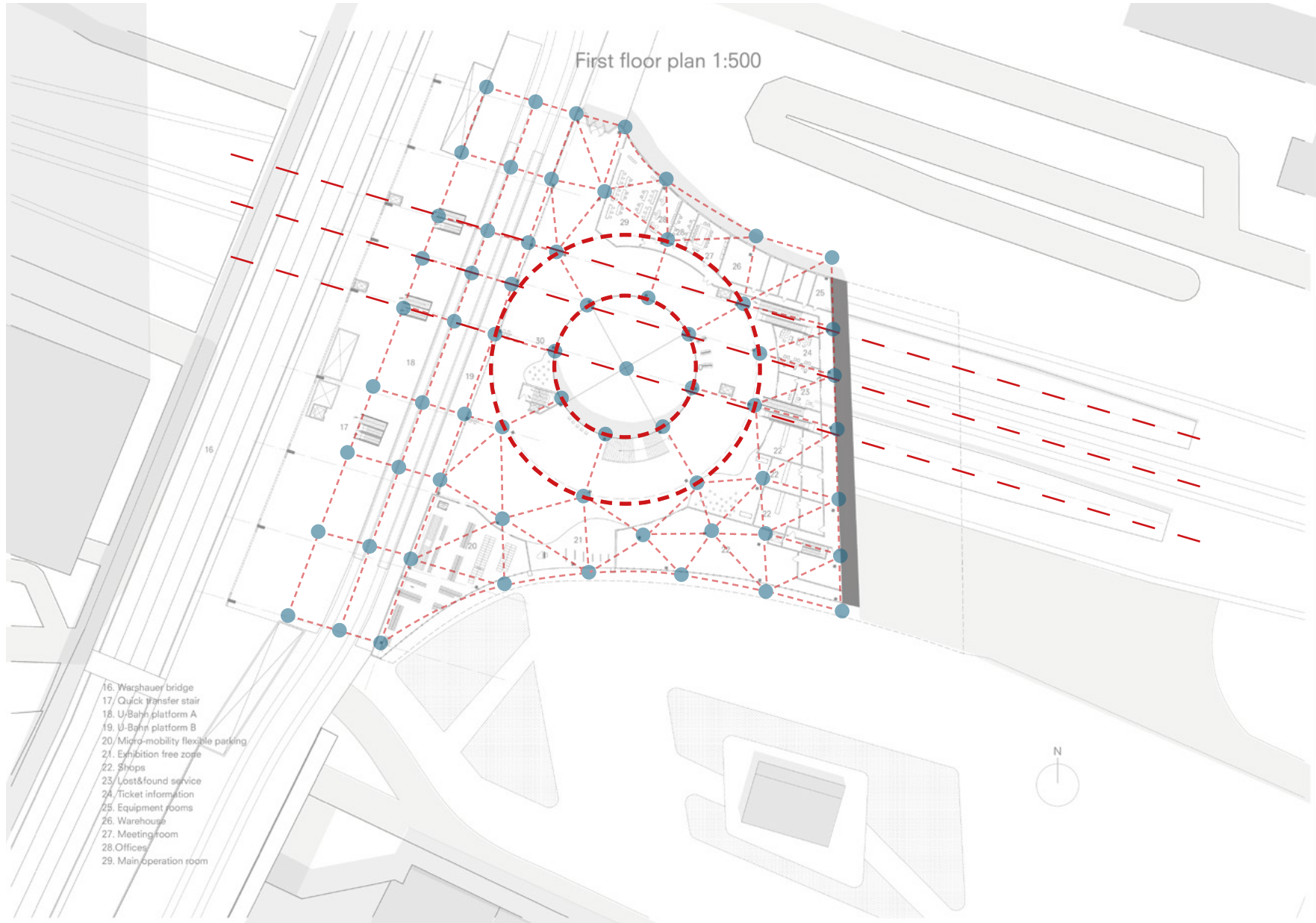


ALIGN TO S-BAHN PLATFORM

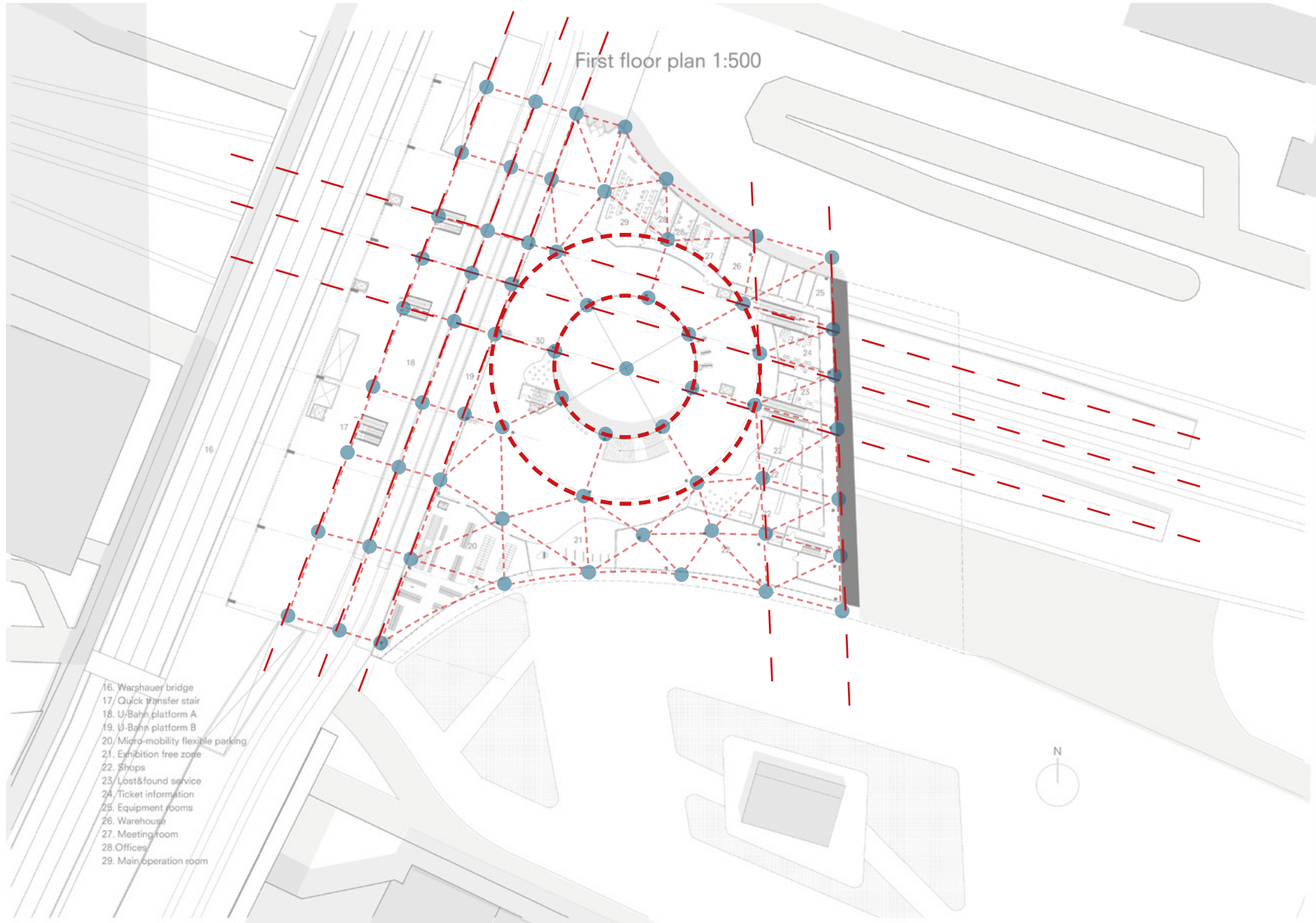


Design

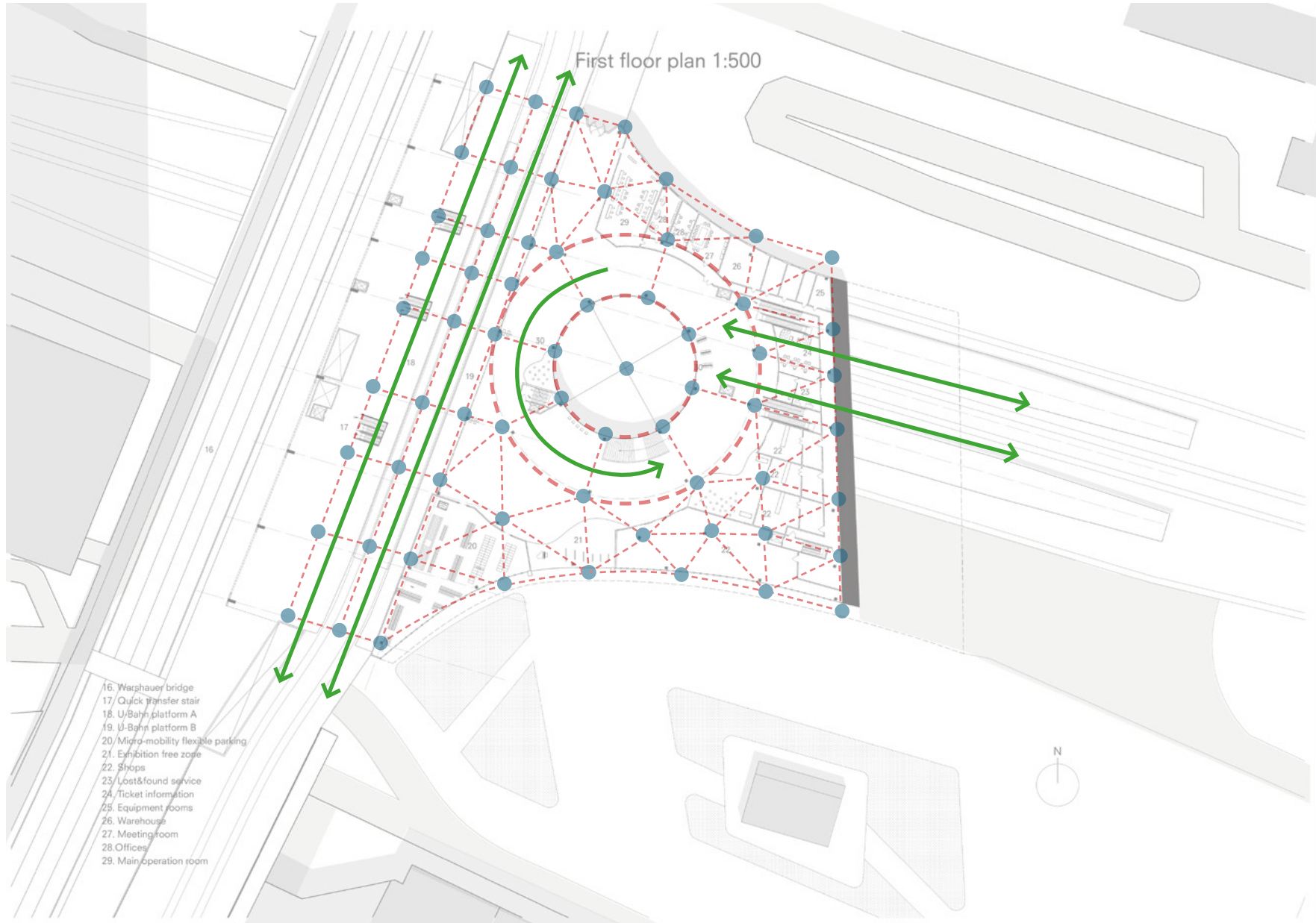
CENTRAL ATRIUM



ALIGN TO U-BAHN PLATFORM



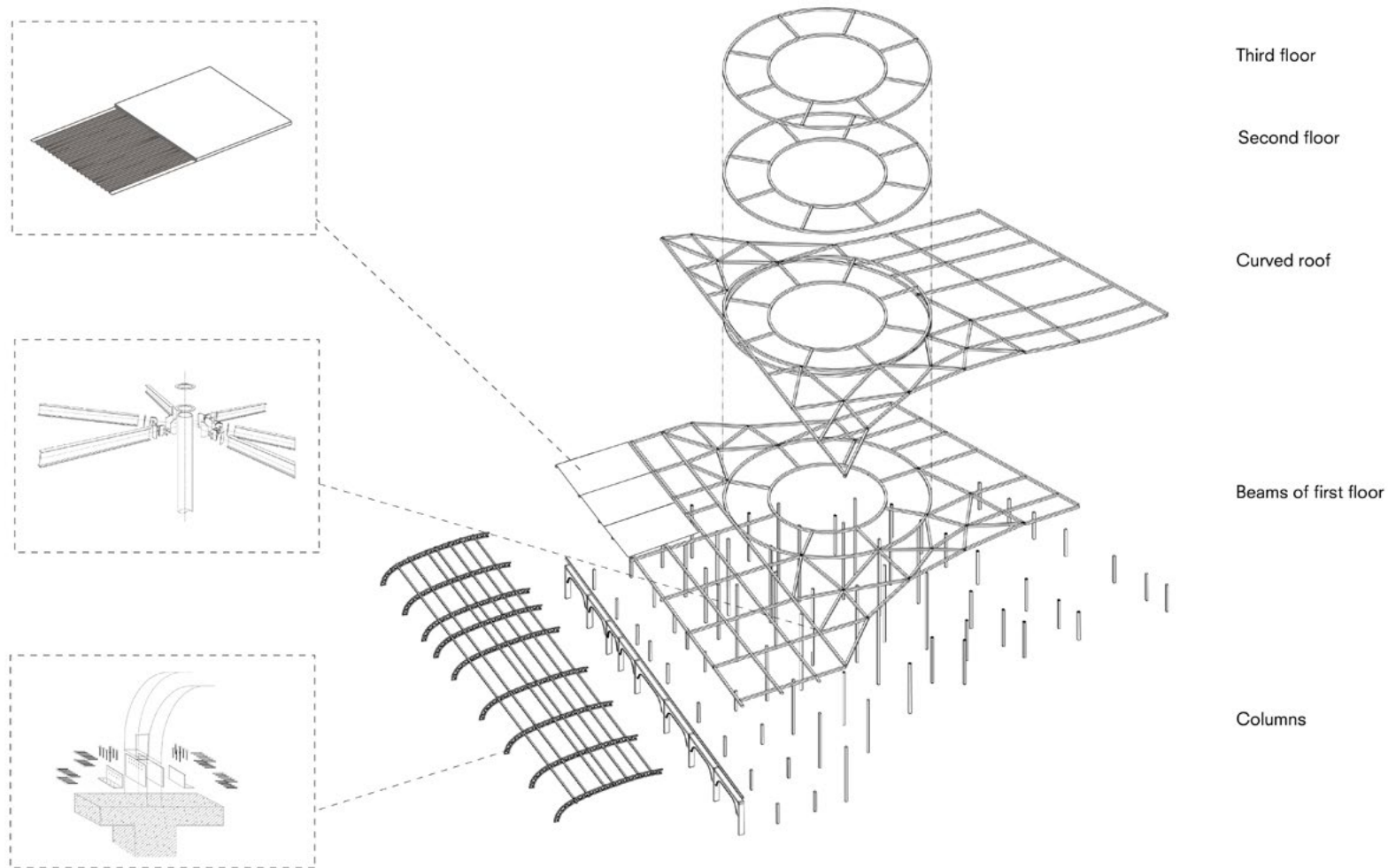
ALIGN TO FUNCTIONS



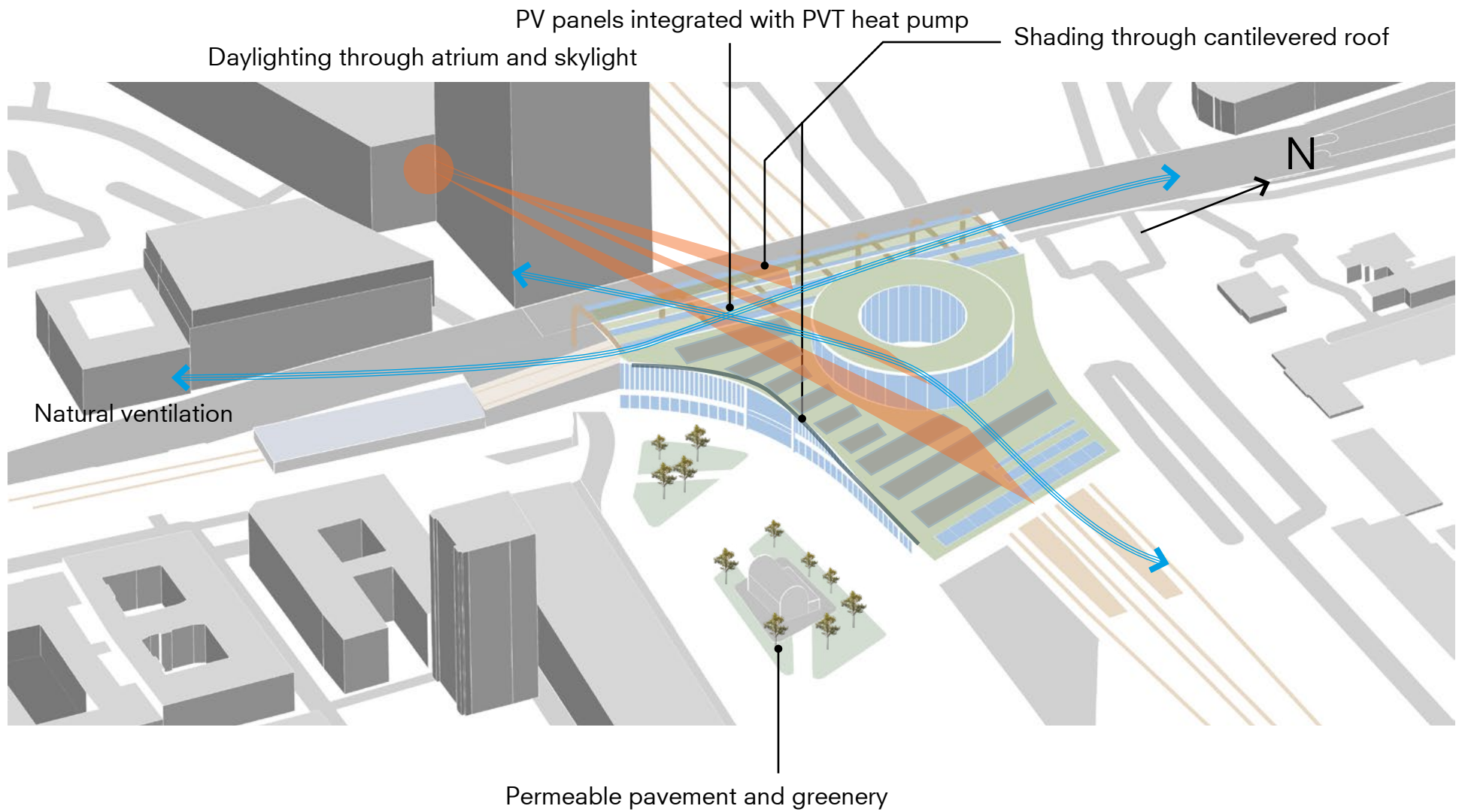
Design

STRUCTURE AXONOMETRIC VIEW

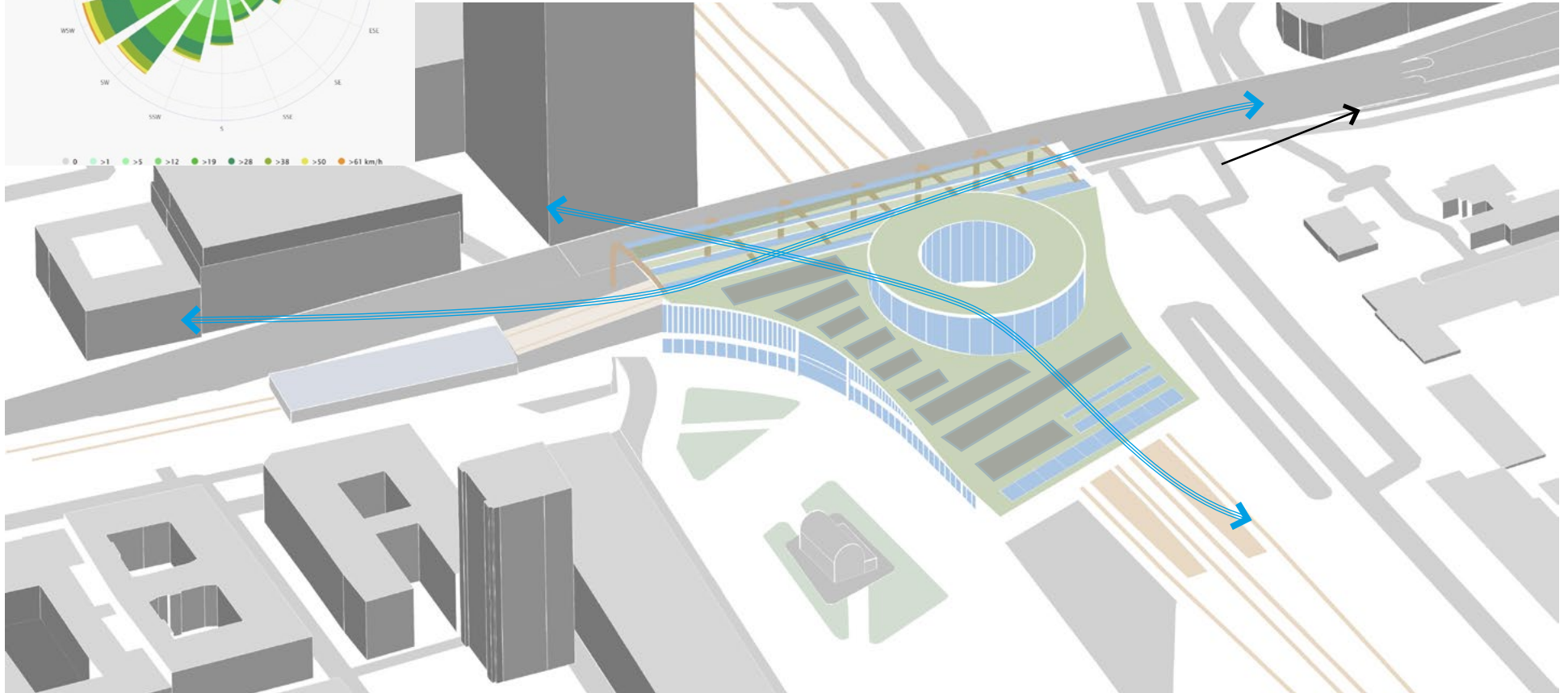
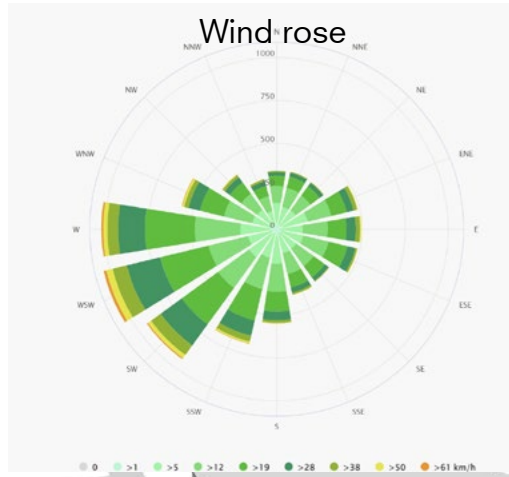
Building construction



Design CLIMATE DESIGN

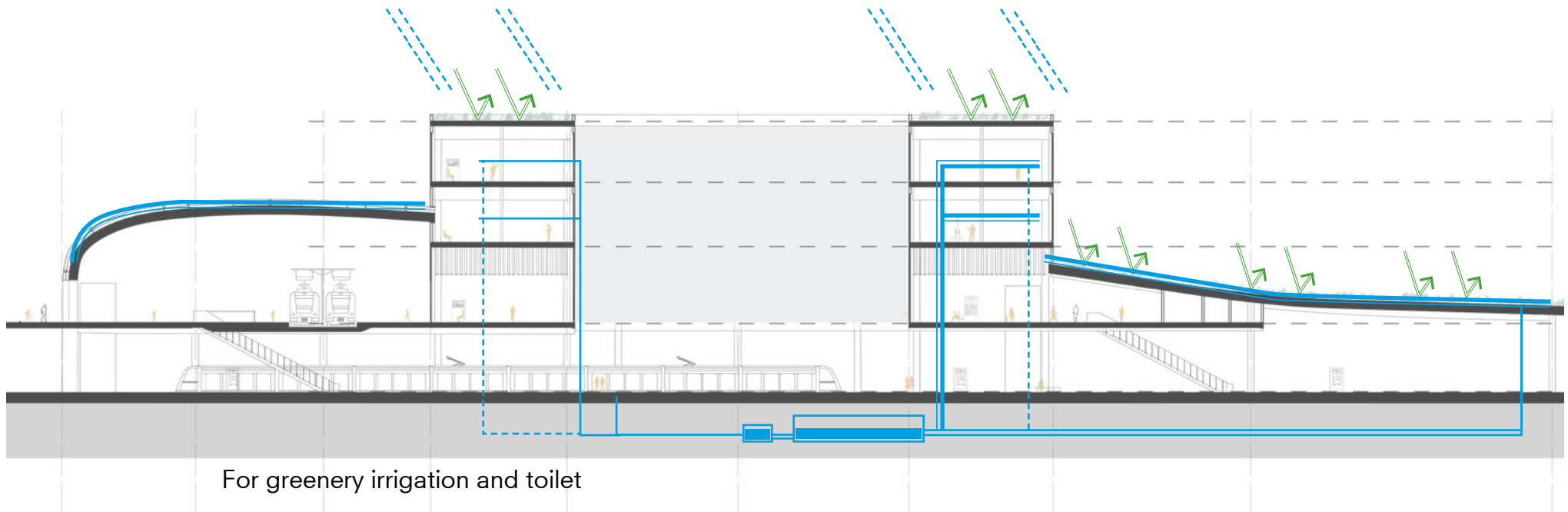


NATURAL VENTILATION



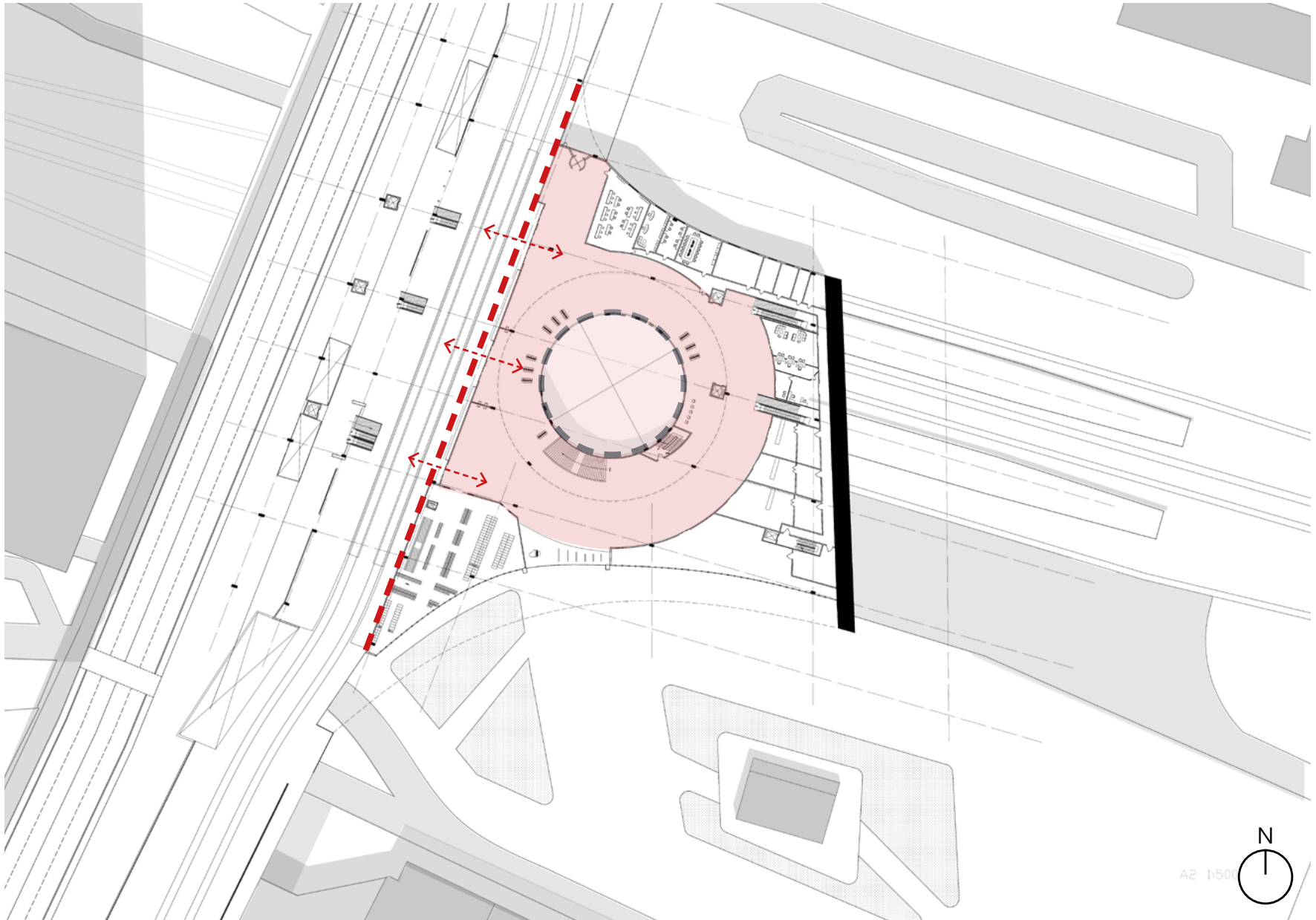
Design

WATER COLLECTION



Design

CLIMATE ZONES

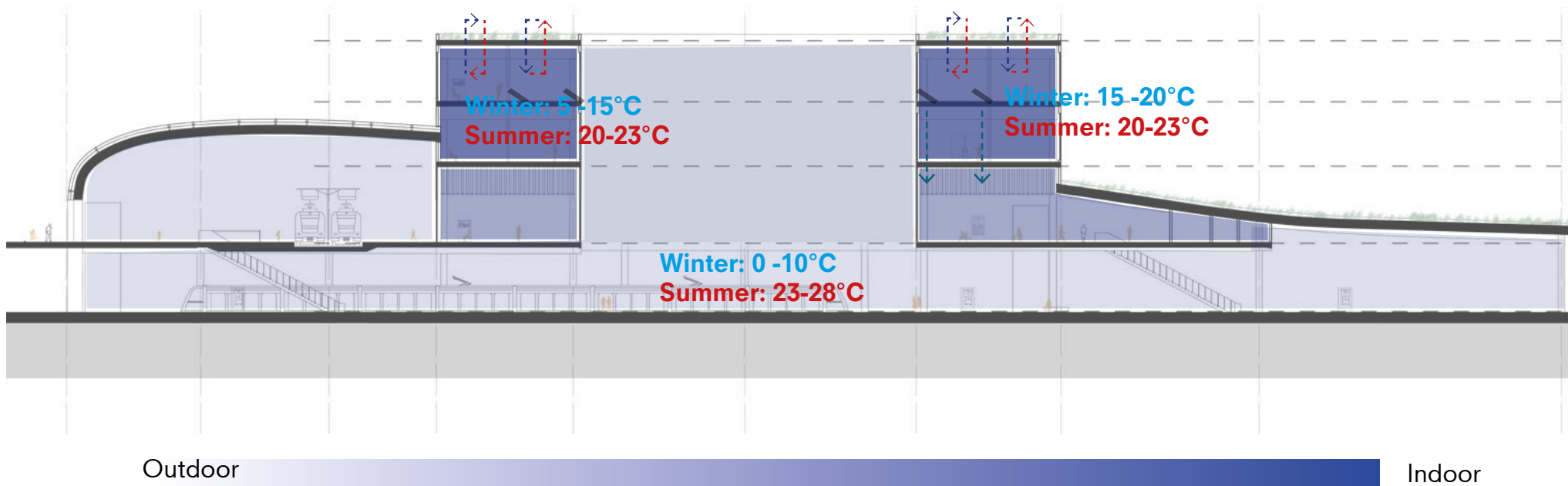


Design

CLIMATE ZONES



Design CLIMATE ZONES



No extra mechanical equipment

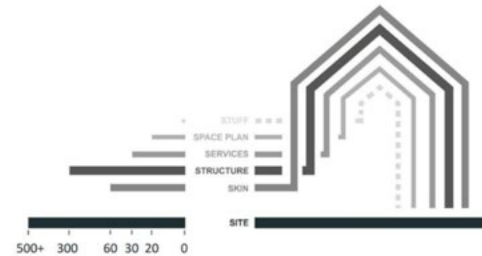
Only cooling in summer

PVT heat pump for heating and cooling

Design CO2 FOOTPRINT

Skin Structure Interior

Facade	Floors	Floors
Roof	Walls	Walls
	Columns	



Structure

Floors: 30.5m³ aluminium roof sheet 2546m³ concrete

Columns and Beams: 471m³ Structural steel 62.1m³ concrete 162m³ CLT

Walls: 250m³ concrete

Skin

Facade: 72m³ Glass panel double glazed 37.5m³ Gypsum fibre board 75.6m³ Glulam
328.8m³ concrete 328.8m³ EPS insulation

Roof: 34.7m³ Glass panel double glazed 3819m³ EPS insulation 203.7m³ PP roofing membrane

Interior

Floors: 128.8m³ Parquet floor 396m³ Epoxy flooring

Walls: 1001m³ concrete 98m³ Gypsum fibre board

Total CO2 footprint:

ca. 5,938,100kg

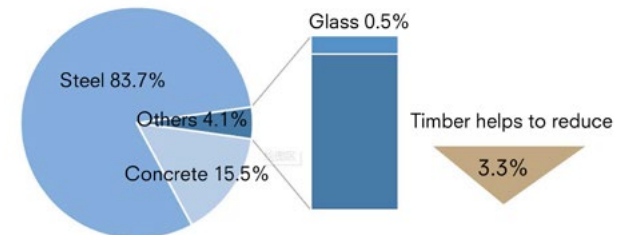
Renewable energy

Total PV panel area: ca. 4400 m²

Generate around 1,606,000 Kw.h/year

Equivalent to the average annual electricity consumption of 250 households in Berlin.

Equivalent to saving 616,000 kg of carbon emissions per year



CONTENTS

1. INTRODUCTION

2. RESEARCH & DESIGN BRIEF

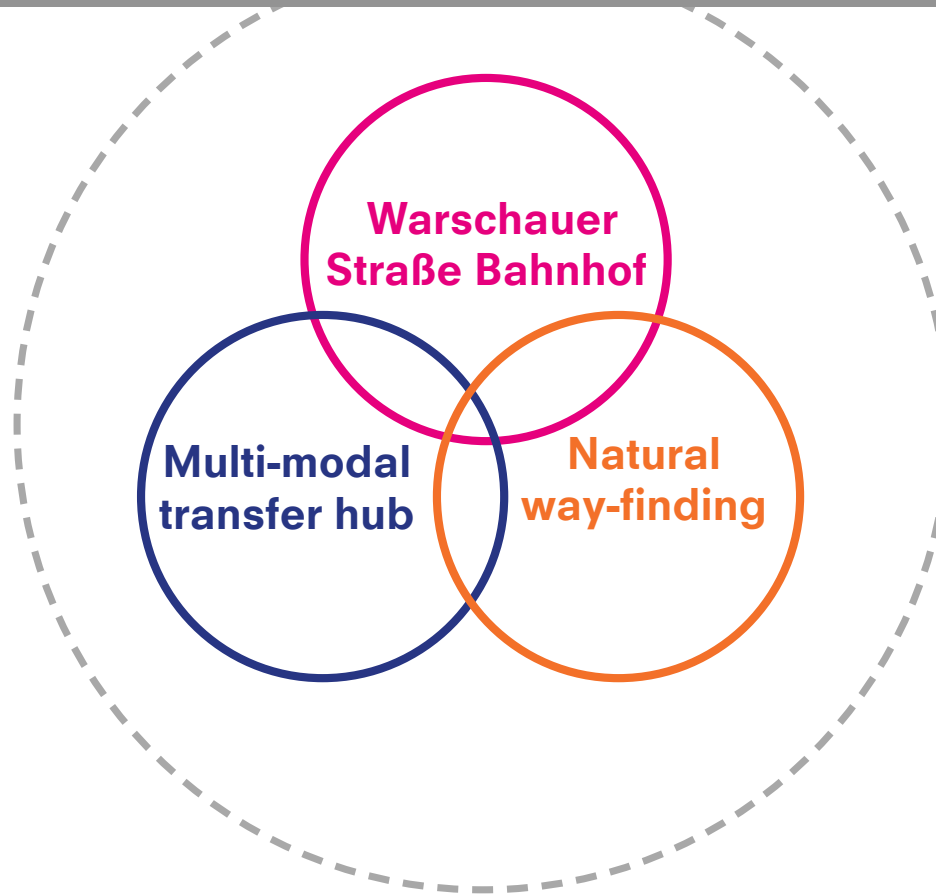
3. CONCEPT

4. DESIGN

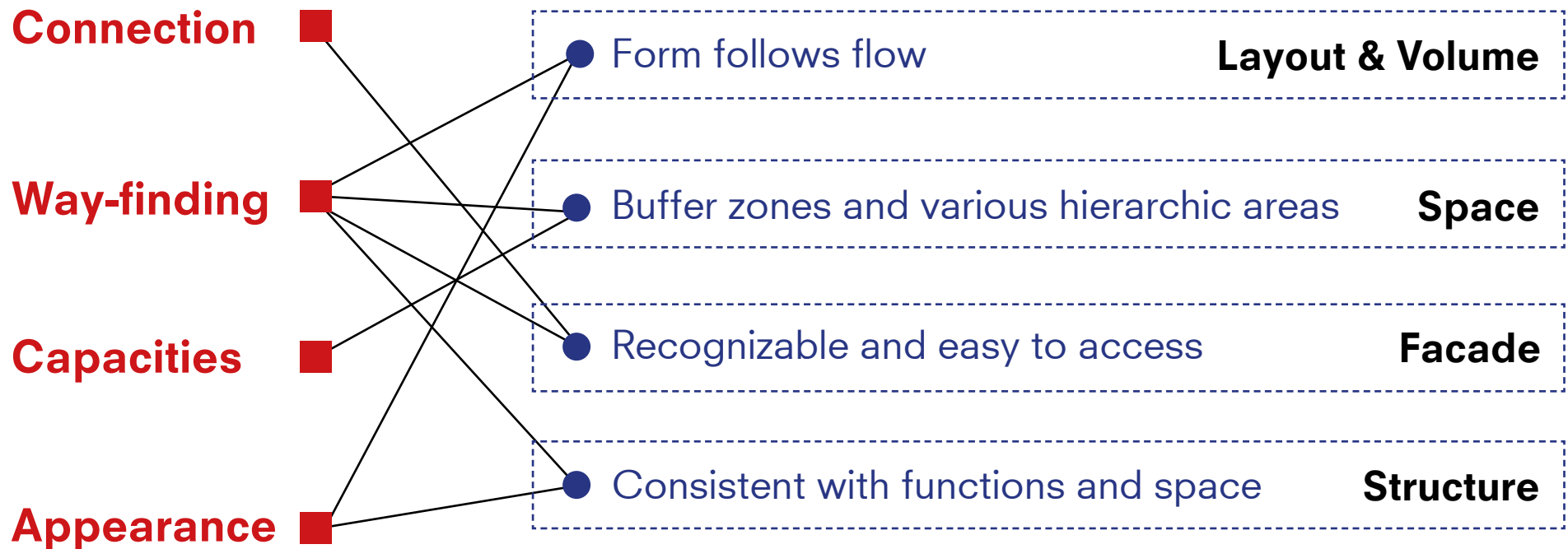
5. CONCLUSION

RESEARCH QUESTION

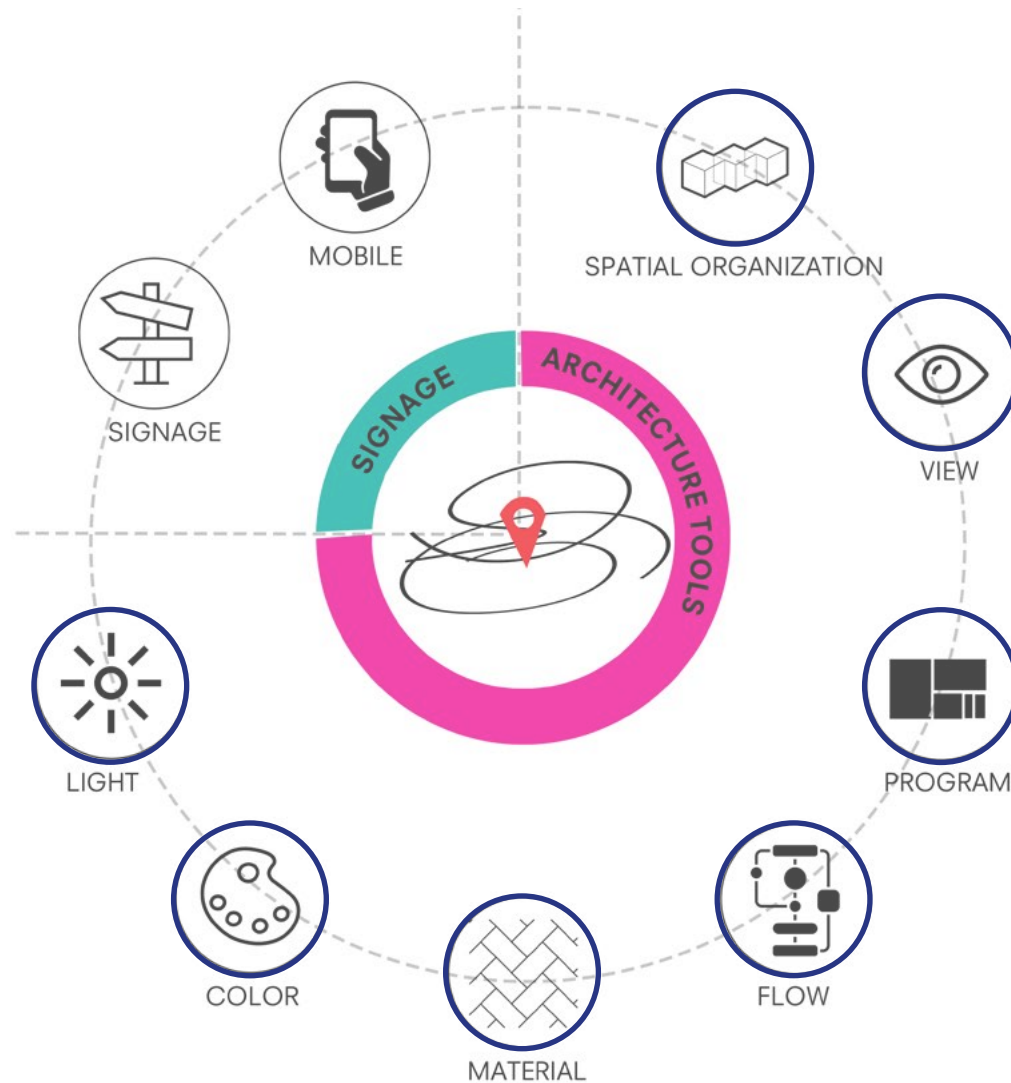
How can architectural spaces guide people to **find routes** at **multi-modal transfer hubs** in **Berlin**?



CONCEPT TO BUILDING



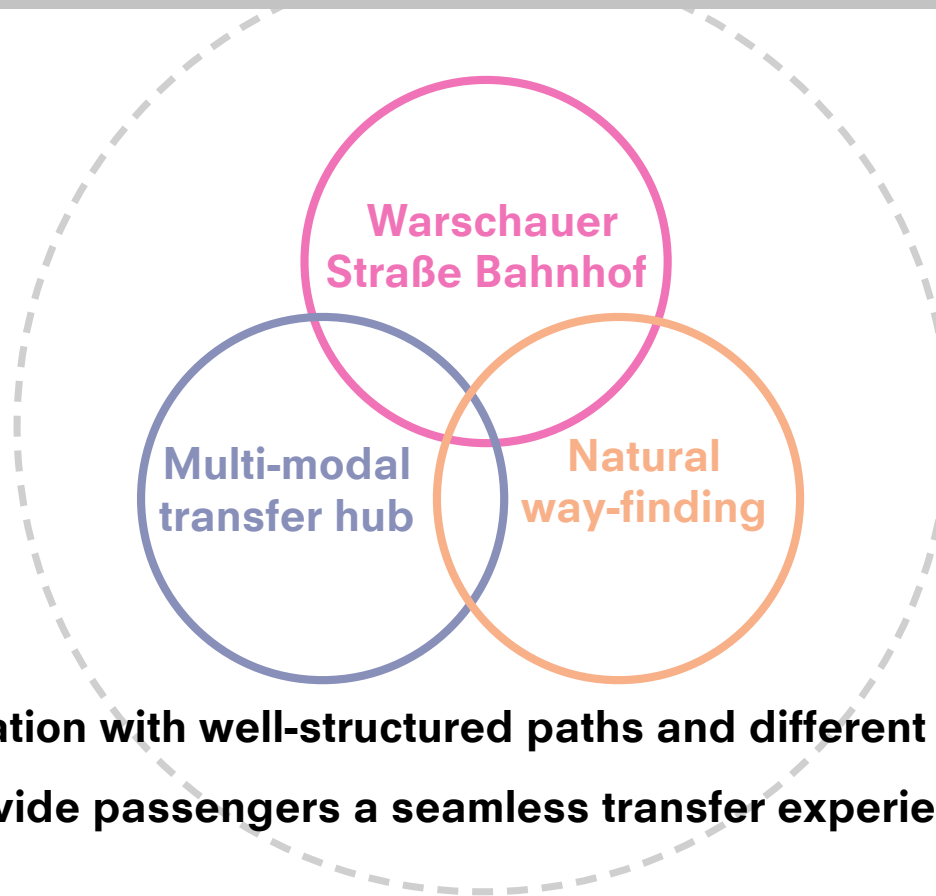
INCORPORATING WAY-FINDING TOOLS INTO DESIGN



Natural way-finding
↑
Passive tools

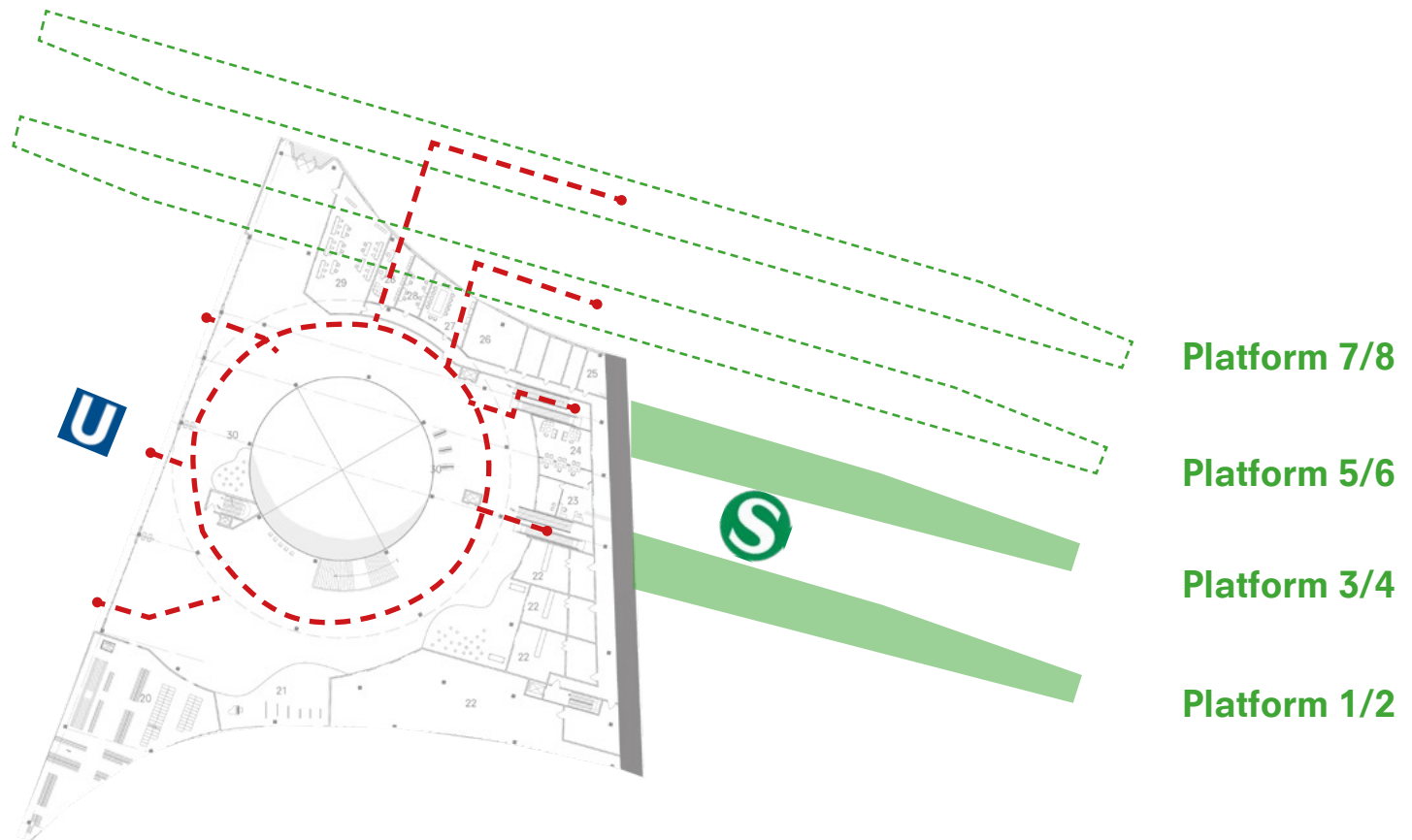
RESEARCH QUESTION

How can architectural spaces guide people to **find routes** at **multi-modal transfer hubs** in **Berlin**?



A highly efficient station with well-structured paths and different hierarchic zones to provide passengers a seamless transfer experience.

POSSIBILITY OF EXPANSION

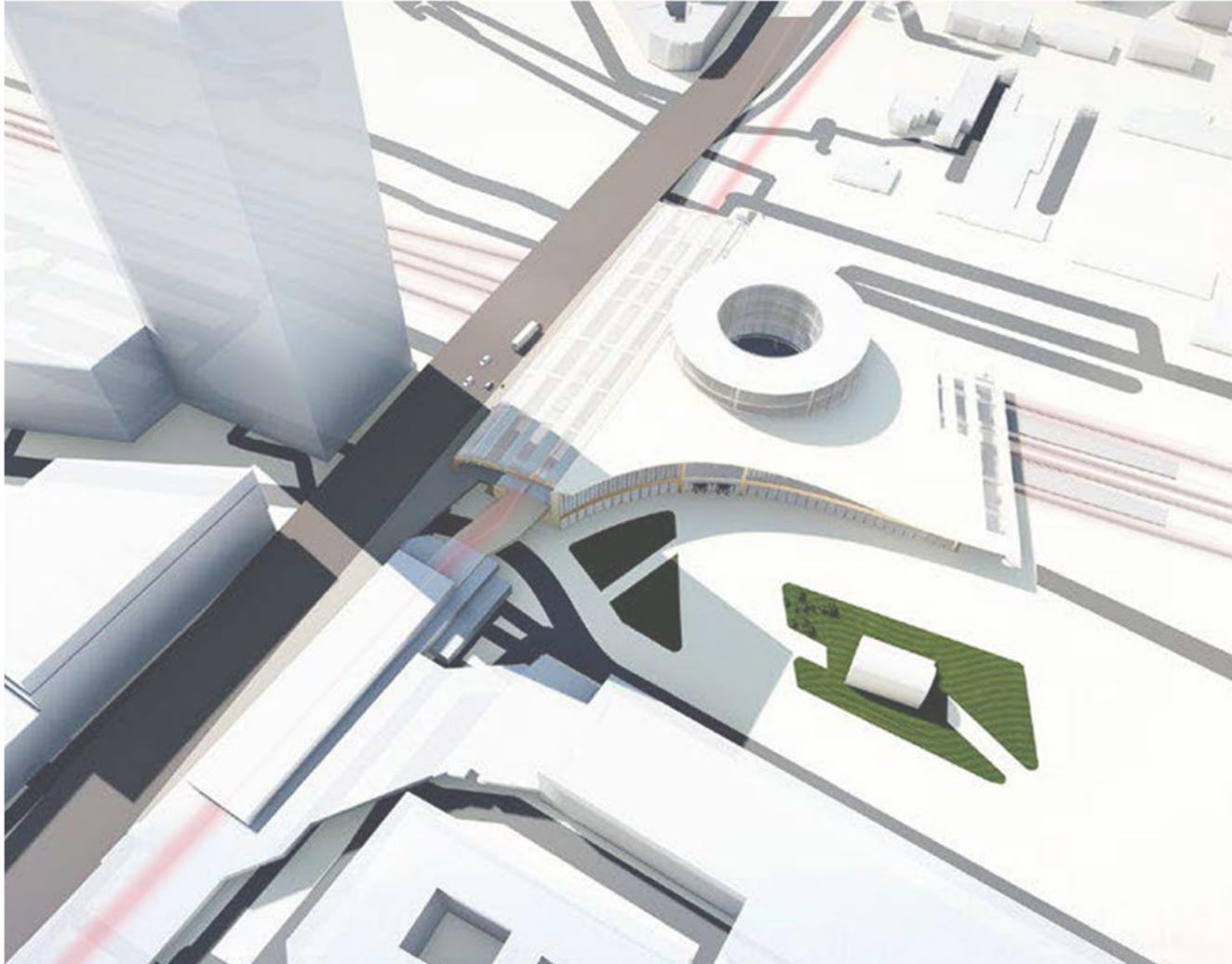


LED DYNAMIC SCREEN ATRIUM



Conclusion

REFLECTION



An aerial architectural rendering of a city block. The scene features a central circular building with a dark interior, surrounded by various rectangular buildings of different heights. A prominent green rooftop garden with a white cylindrical structure is visible on one of the buildings. A dark, winding path or road cuts through the block. The overall style is clean and modern, with soft shadows and a light color palette.

Thank you!