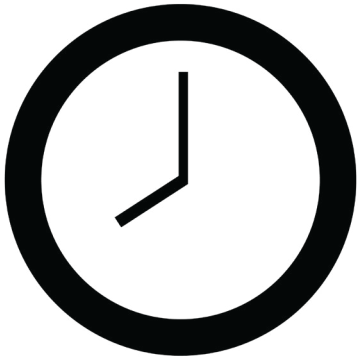


COMPLEX PROJECTS

RUSH HOUR

THE TRAIN STATION AS THE FUTURE DATAPORT

Ruben Vos

29/10/2024

INTRODUCTION

RESEARCH

DESIGN BRIEF

IMPLEMENTATION

REFLECTION


DB


DB

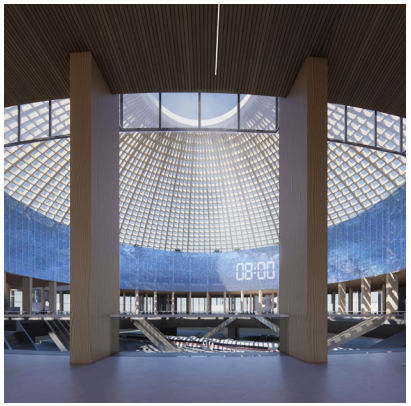

08:00

RESEARCH QUESTION

HOW WILL DATA IMPACT THE DESIGN OF A TRAIN STATION FOR RUSH HOUR?

PROJECT SUMMARY

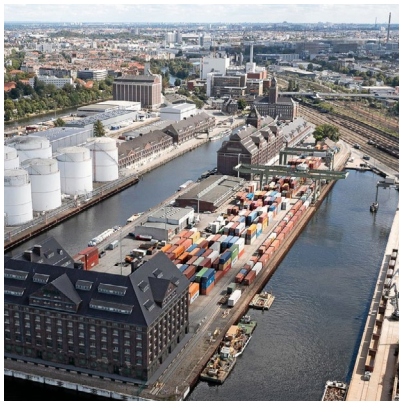
WHAT?



Train station with
integrated data centre

Total GFA +-113,000 m2

WHERE?



Berlin Westhafen

FOR WHO?

Federal Ministry of Digital and Transport

Deutsche Bahn

Siemens

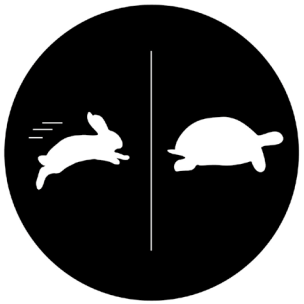
Local daily commuter

Tech worker and student

Operational staff

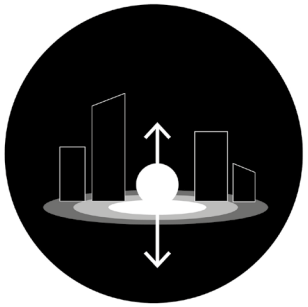
Berliner

THE TRAIN STATION AS THE FUTURE DATAPORT

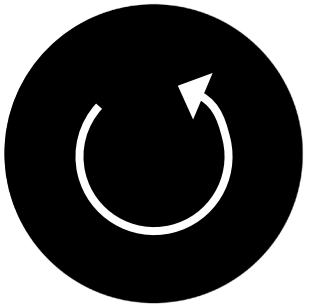


COMBINING RUSH AND SLOW

EXCHANGING FLOW OF PEOPLE, DATA AND GOODS

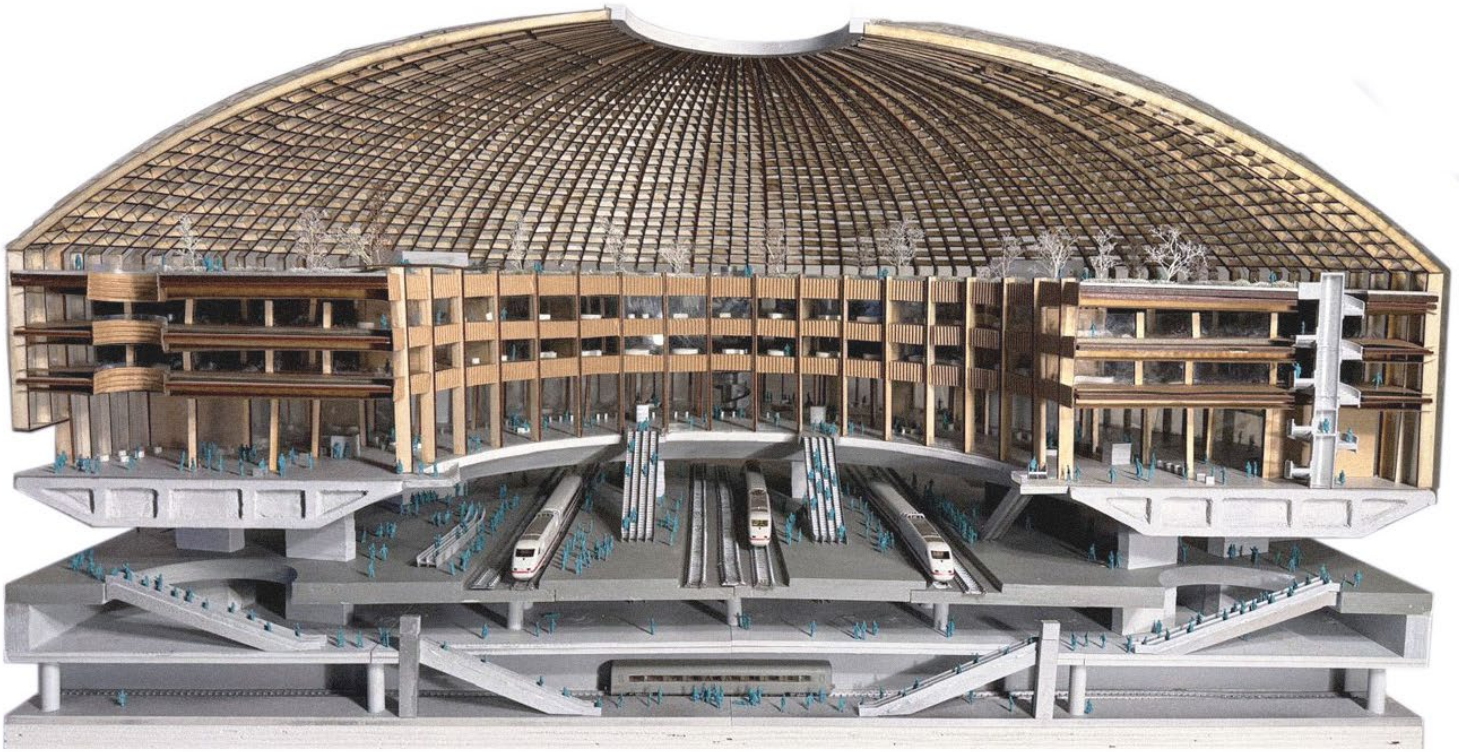


URBAN ANCHOR OF THE DATA SOCIETY

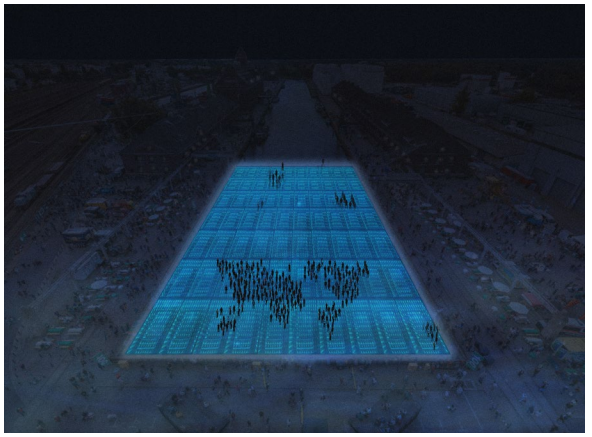


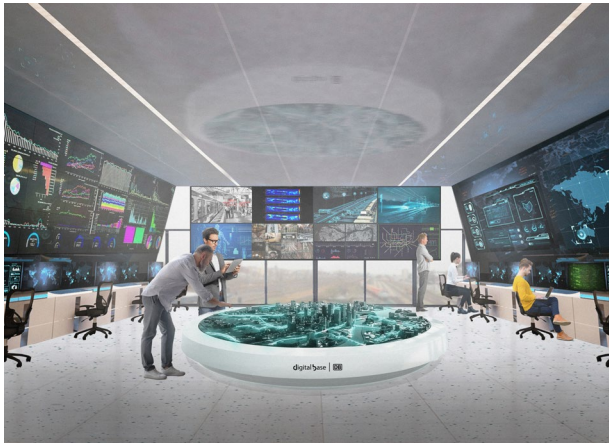
CIRCULAR MEGASTRUCTURE

THE TRAIN STATION AS THE FUTURE DATAPORT



THE TRAIN STATION AS THE FUTURE DATAPORT





INTRODUCTION

RESEARCH

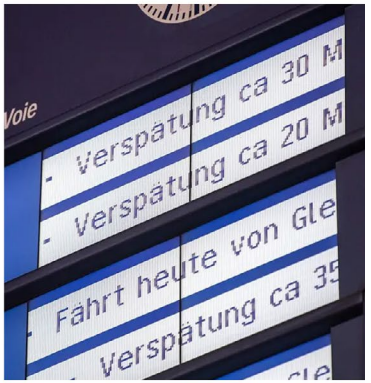
DESIGN BRIEF

IMPLEMENTATION

REFLECTION

Client Research

WHAT HAPPENED TO DEUTSCHE BAHN?



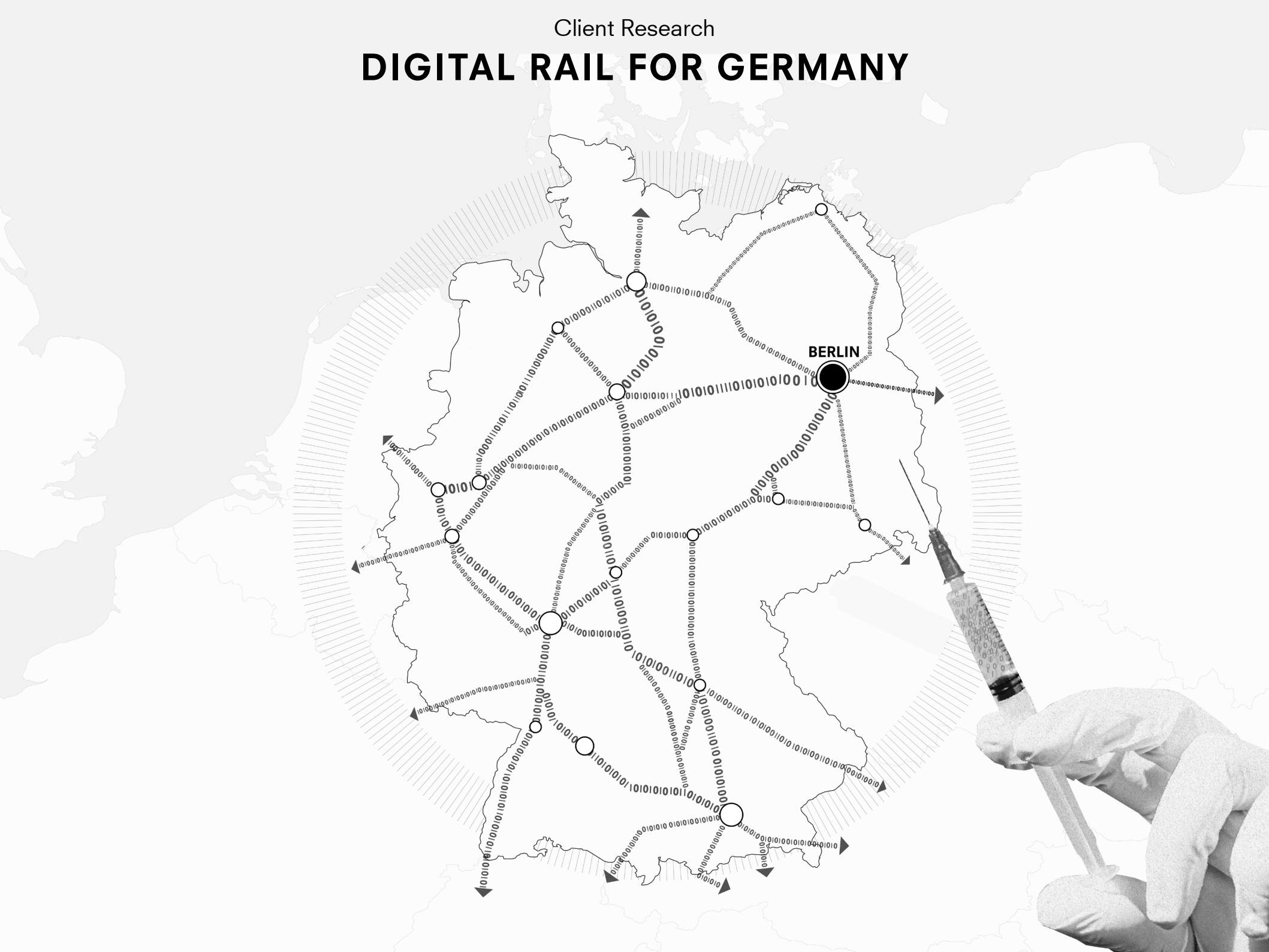
Client Research

NO LONGER BEST OF THE CLASS


Bundesministerium
für Digitales
und Verkehr
"The rail infrastructure has been neglected for decades and brought to its absolute limits. This is no longer acceptable and unworthy of modern economy"
Volker Wissing, German Minister of Digital and Transport (2023)

Client Research

DIGITAL RAIL FOR GERMANY

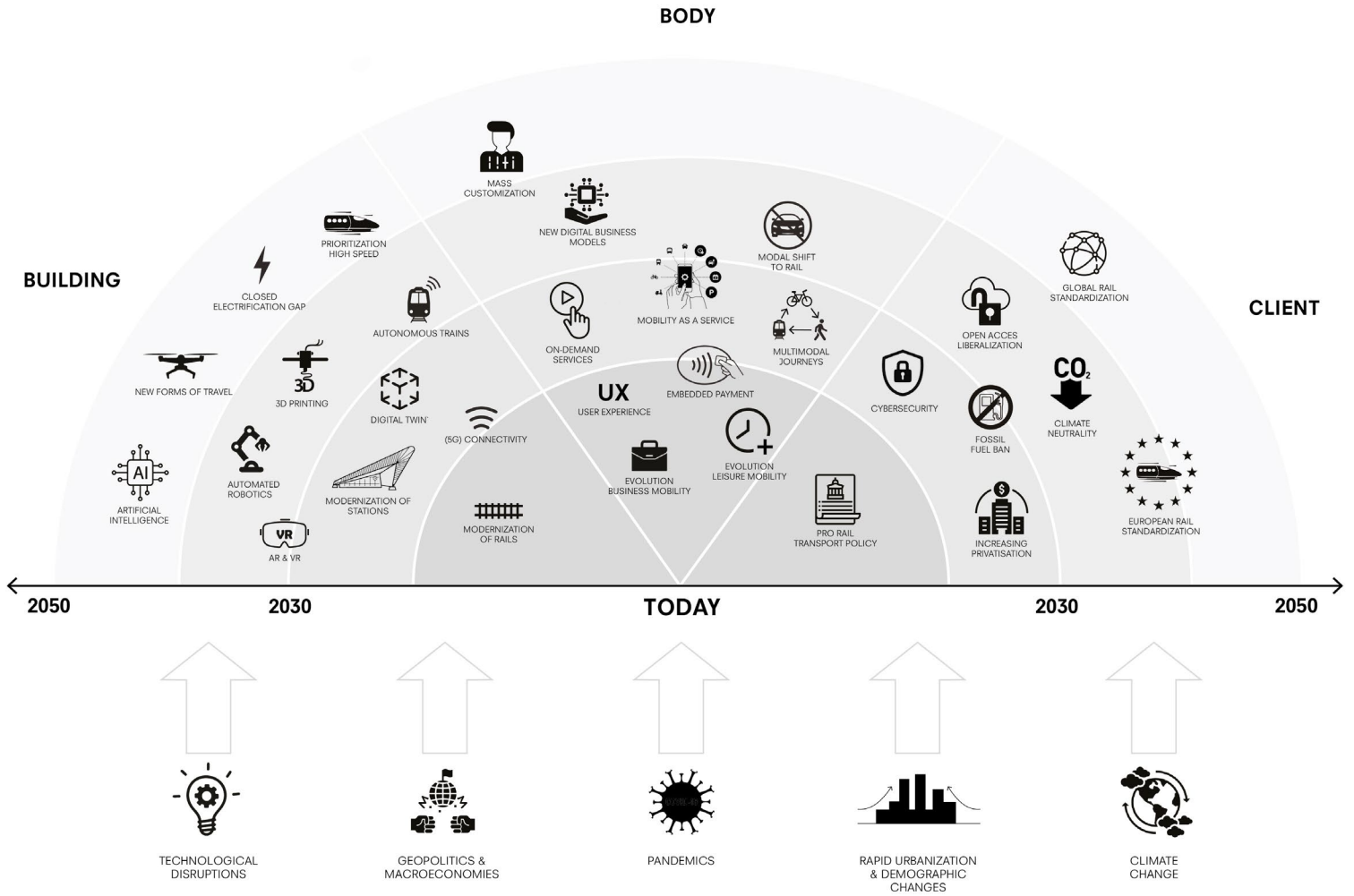


Client Research

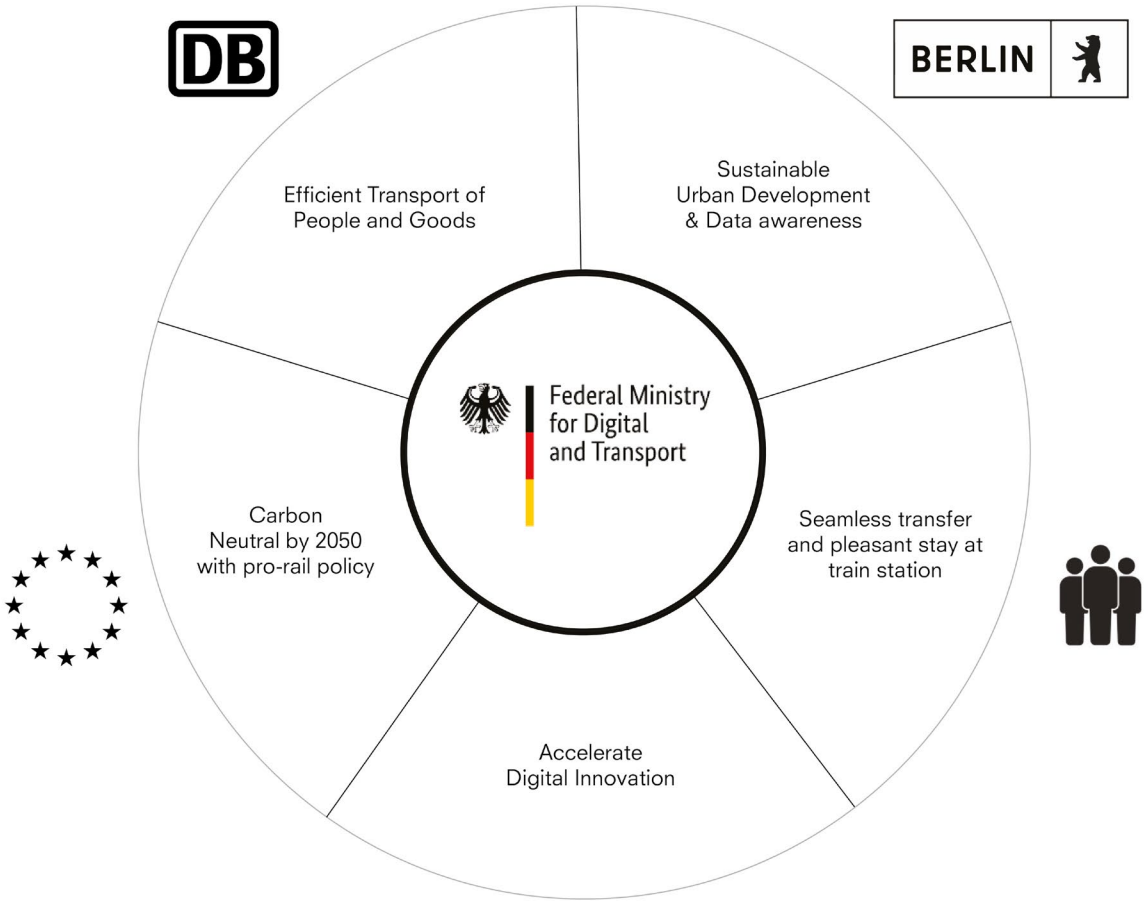
DIGITAL RAIL FOR BERLIN

Client Research

DIGITAL RAIL 2050

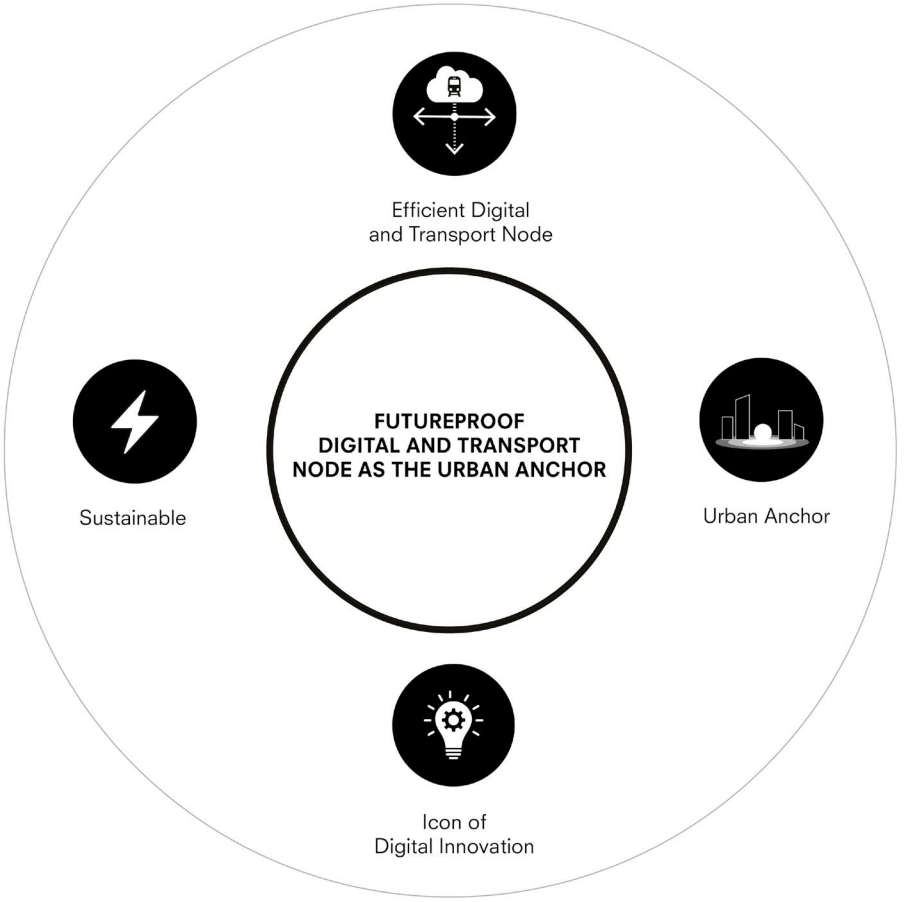


CLIENT AMBITIONS



Client Research

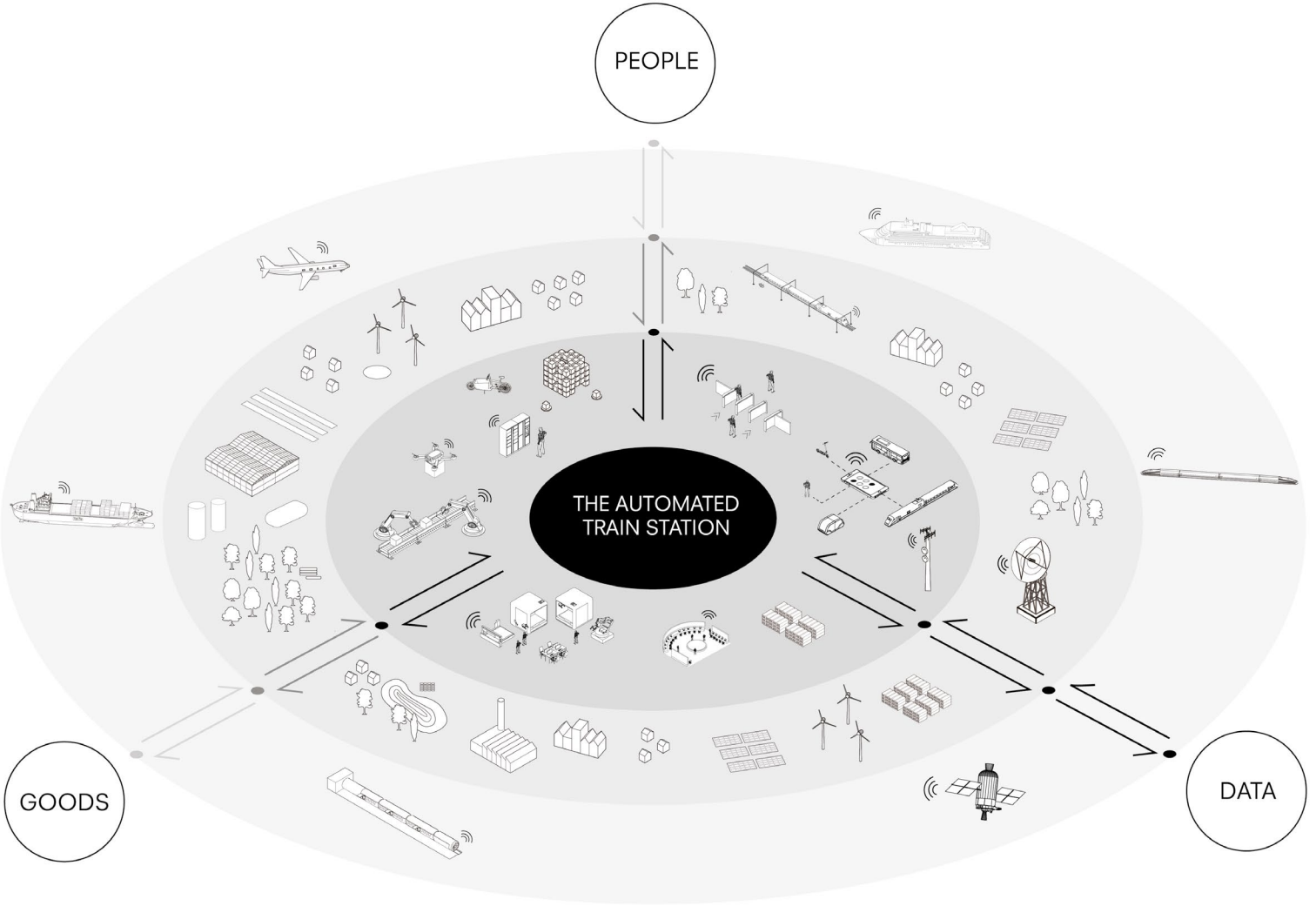
ALGINED CLIENT AMBITIONS



FUTURE DIGITAL & TRANSPORT NODE

Site Research

FUTURE DIGITAL & TRANSPORT NODE

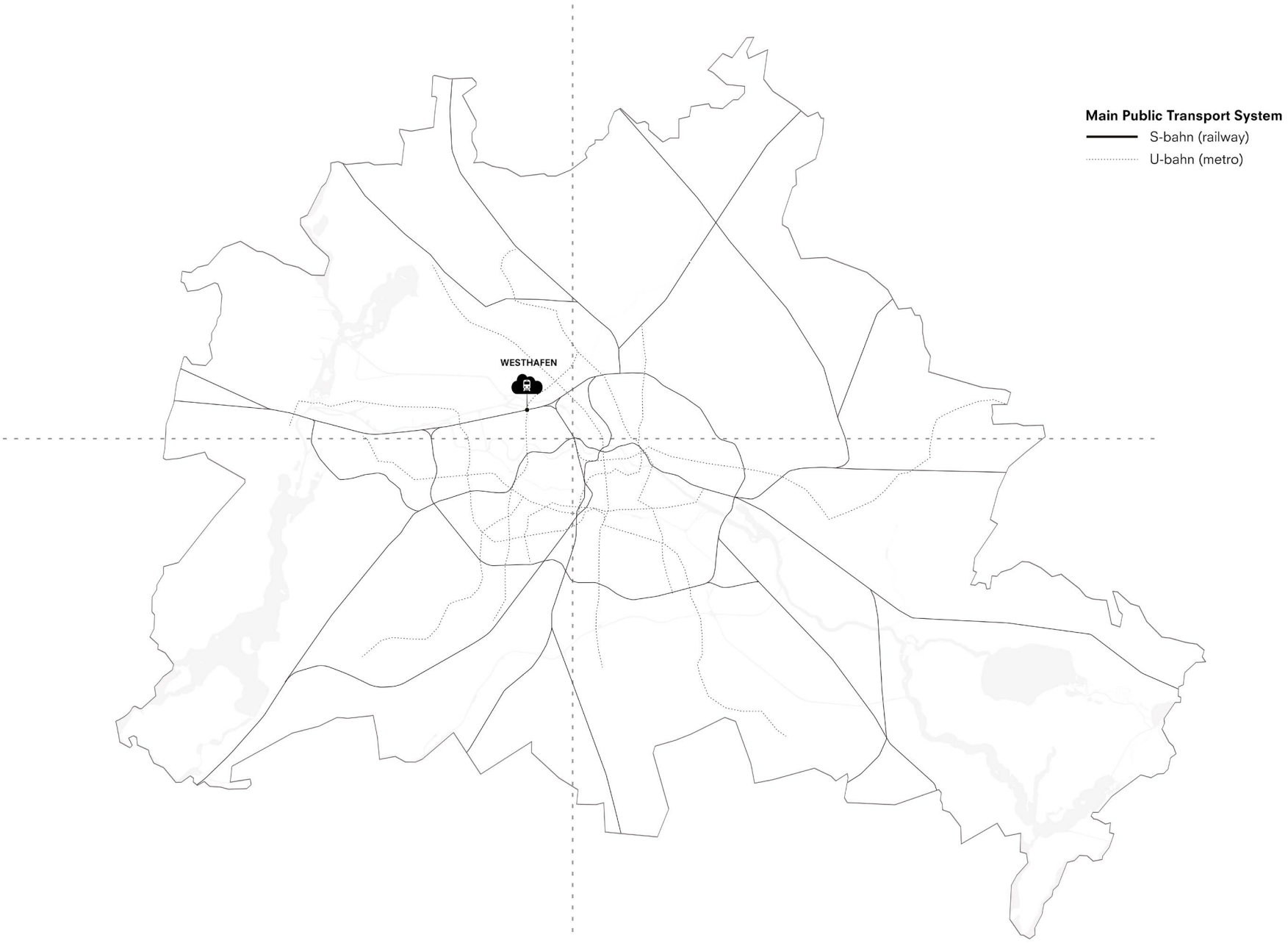


Site Research

SITE SELECTION CRITERIA

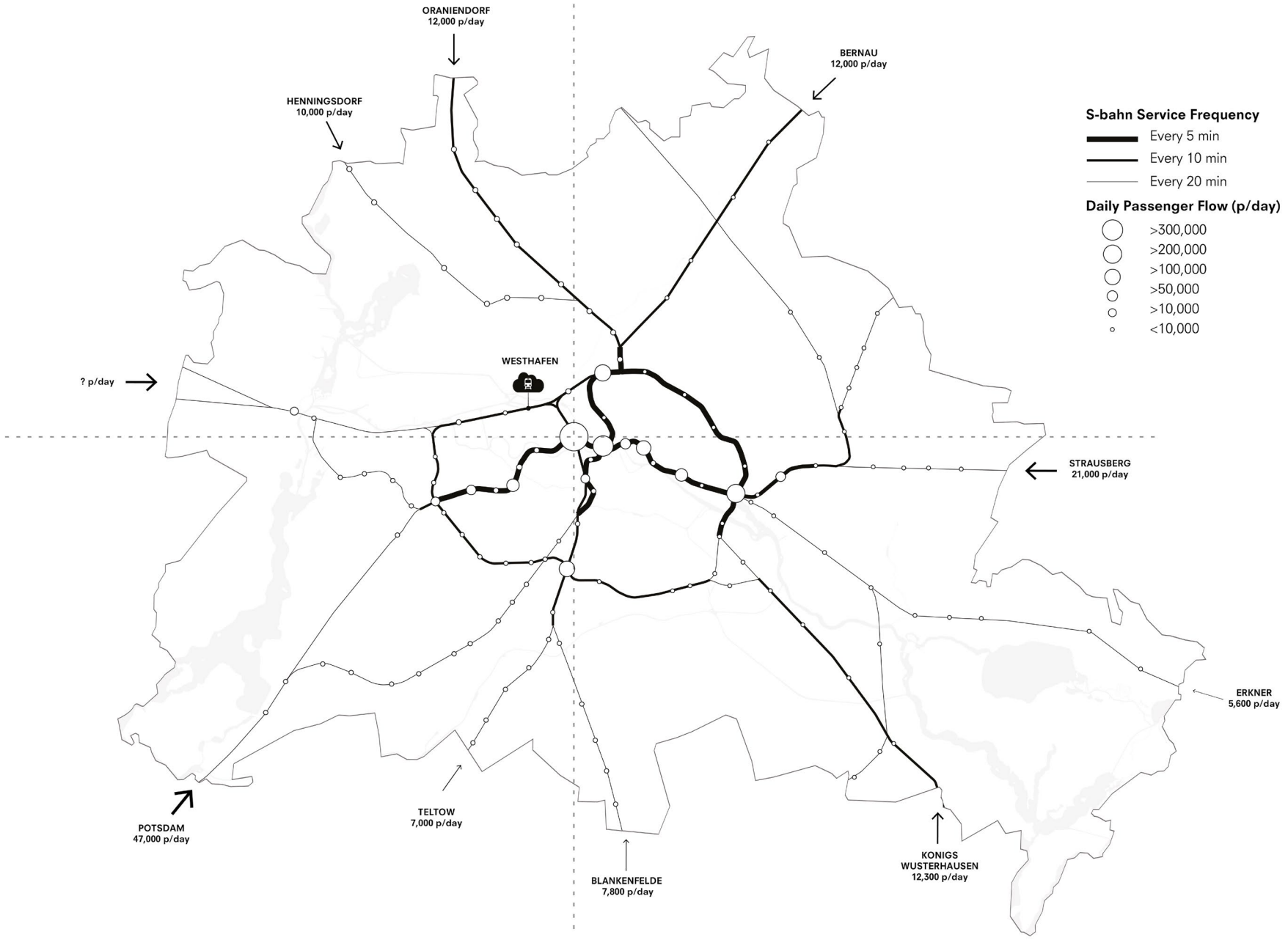
Site Research

BERLIN WESTHAFEN



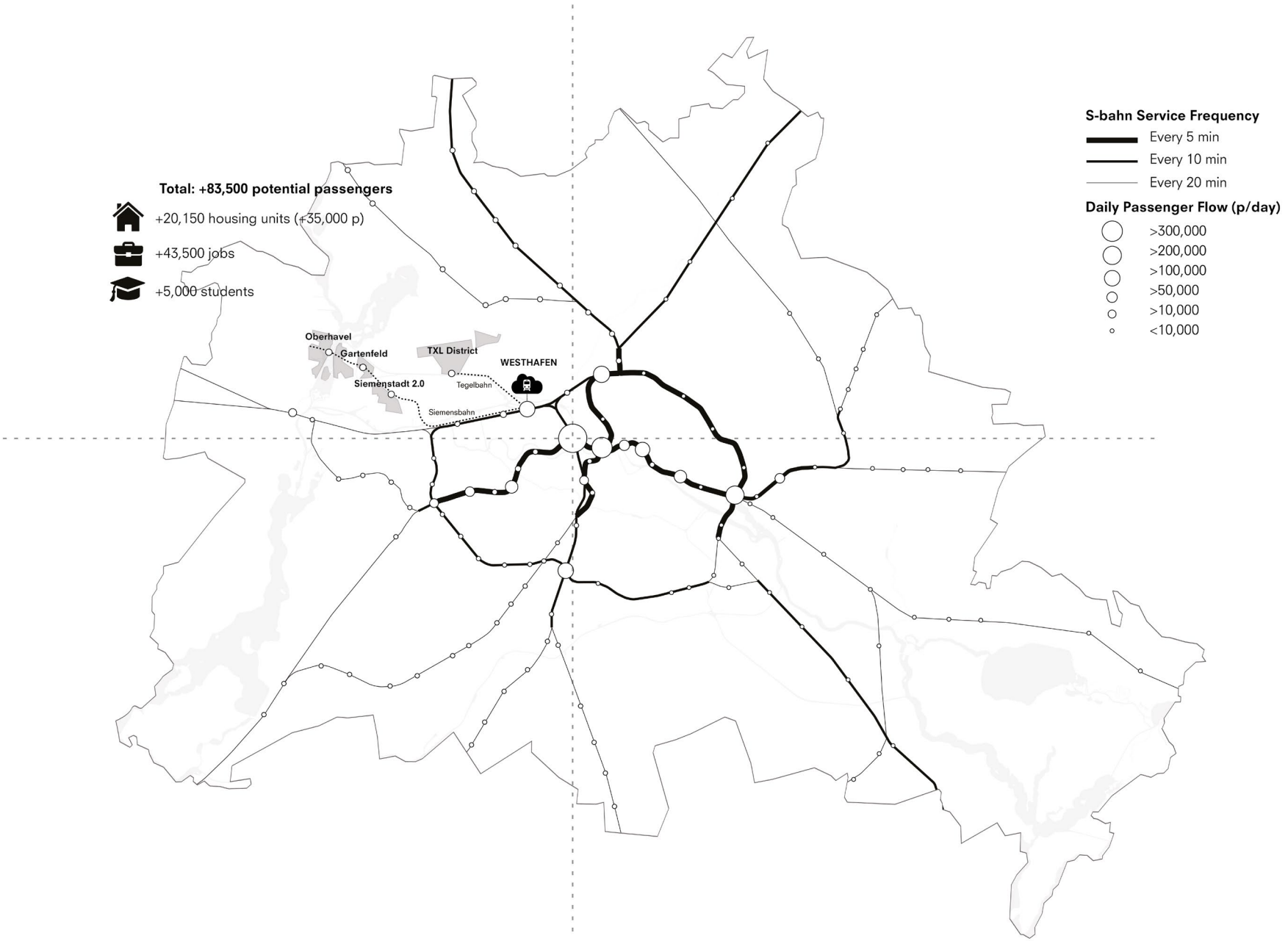
Site Research

DAILY PASSENGER FLOW



Site Research

FUTURE TECH DEVELOPMENT



Site Research

FUTURE TECH DEVELOPMENT

Site Research

GATEWAY OF INNOVATION ECOSYSTEM

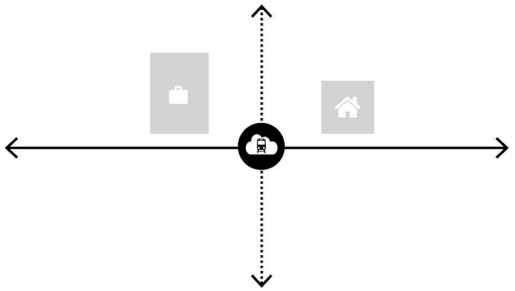

Gartenfield
Hamburg
Amsterdam
Siemenstadt 2.0
TXL District-
Urban Tech Republic
Westhafen
TU Berlin
Campus
Moabit
Hauptbanhof &
Europacity

Site Research

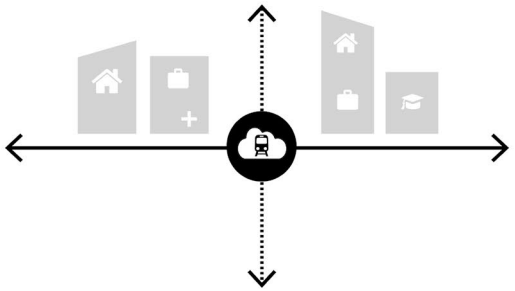
(INTER)NATIONAL GATEWAY

Site Research

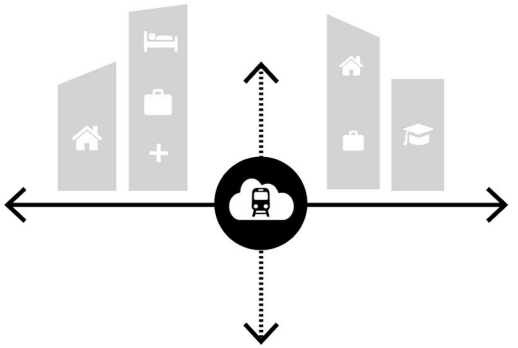
NODE & PLACE DEVELOPMENT



2030



2045



2060

Site Research

WESTHAFEN

Site Research

WESTHAFEN

Site Research

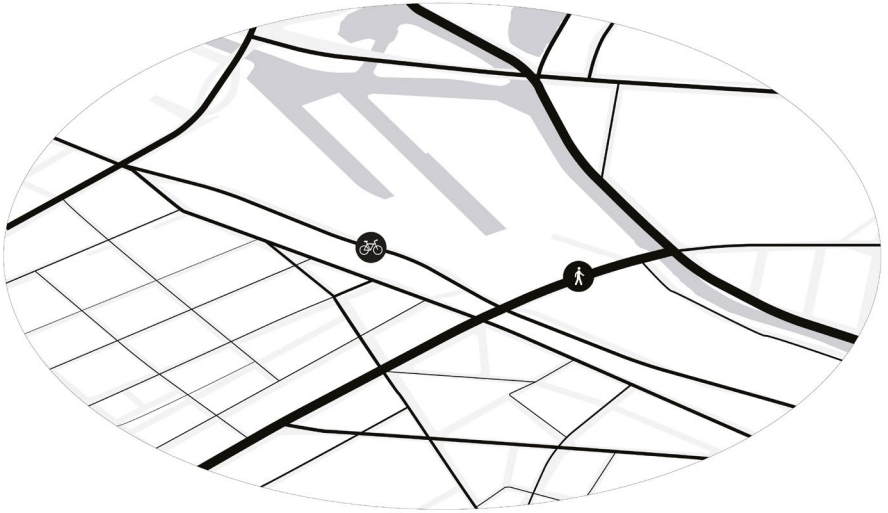
WESTHAFEN

Site Research

WESTHAFEN

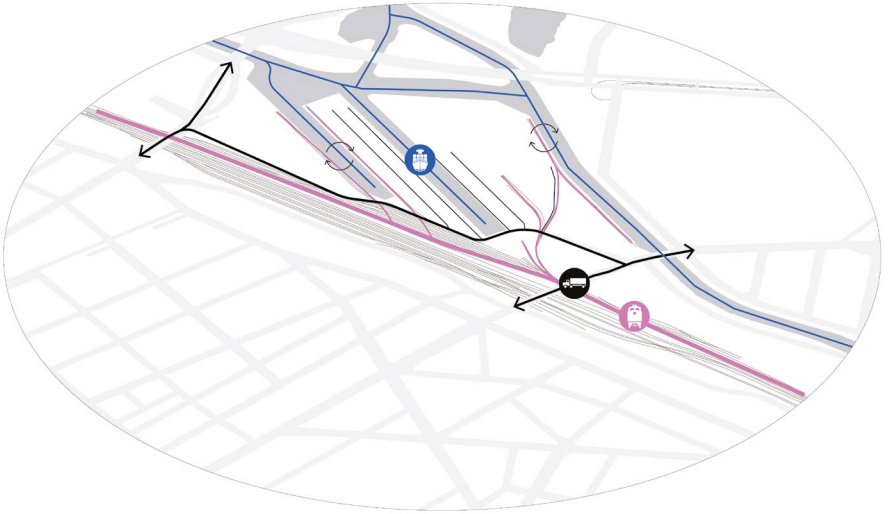
Site Research

MOBILITY FLOWS



Slow Mobility

Motorized Vehicles

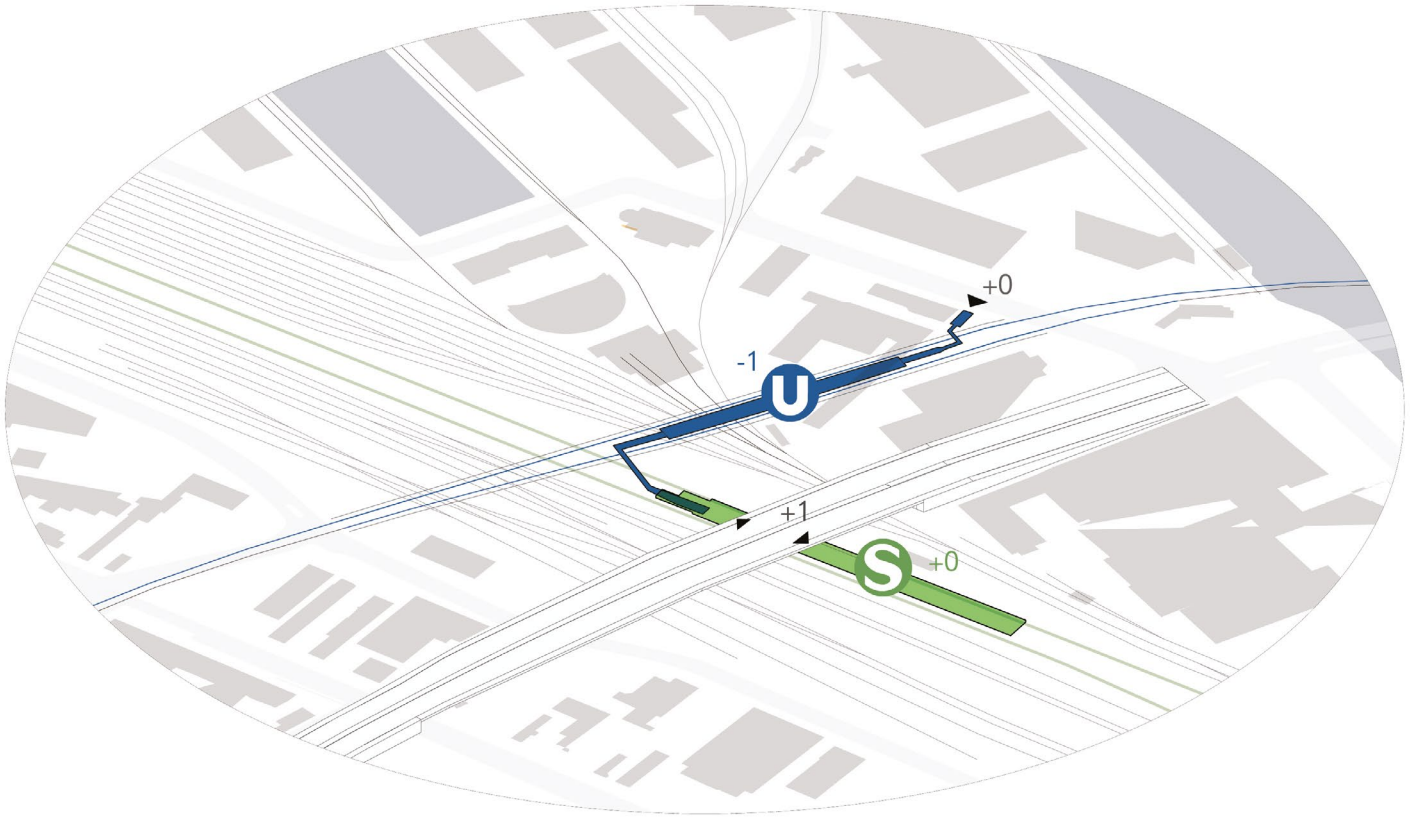


Industrial Logistics

Public Transport

Site Research

PUBLIC TRANSPORT

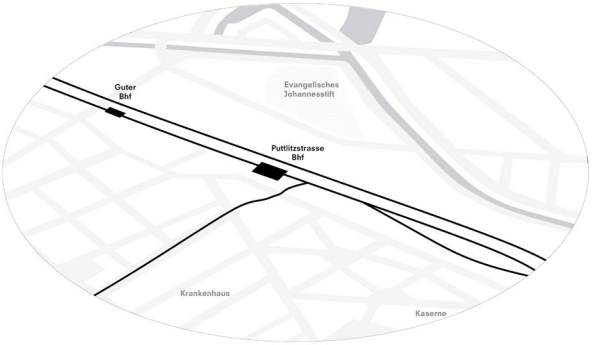


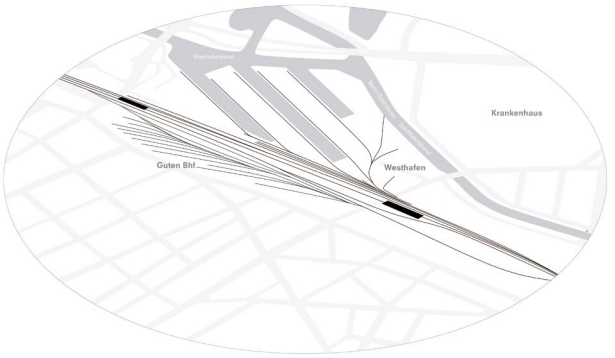
Site Research

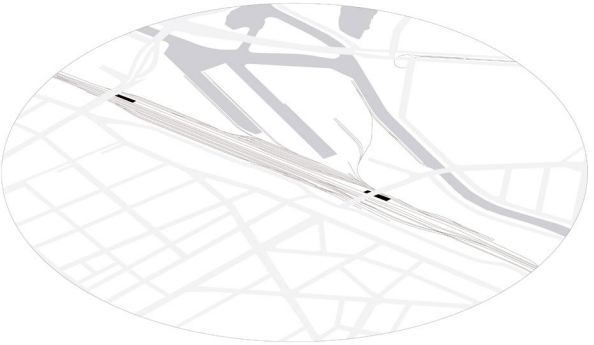
S&U BAHN STATION

Site Research

SITE HISTORY







19th Century

Protestant institution

20th Century

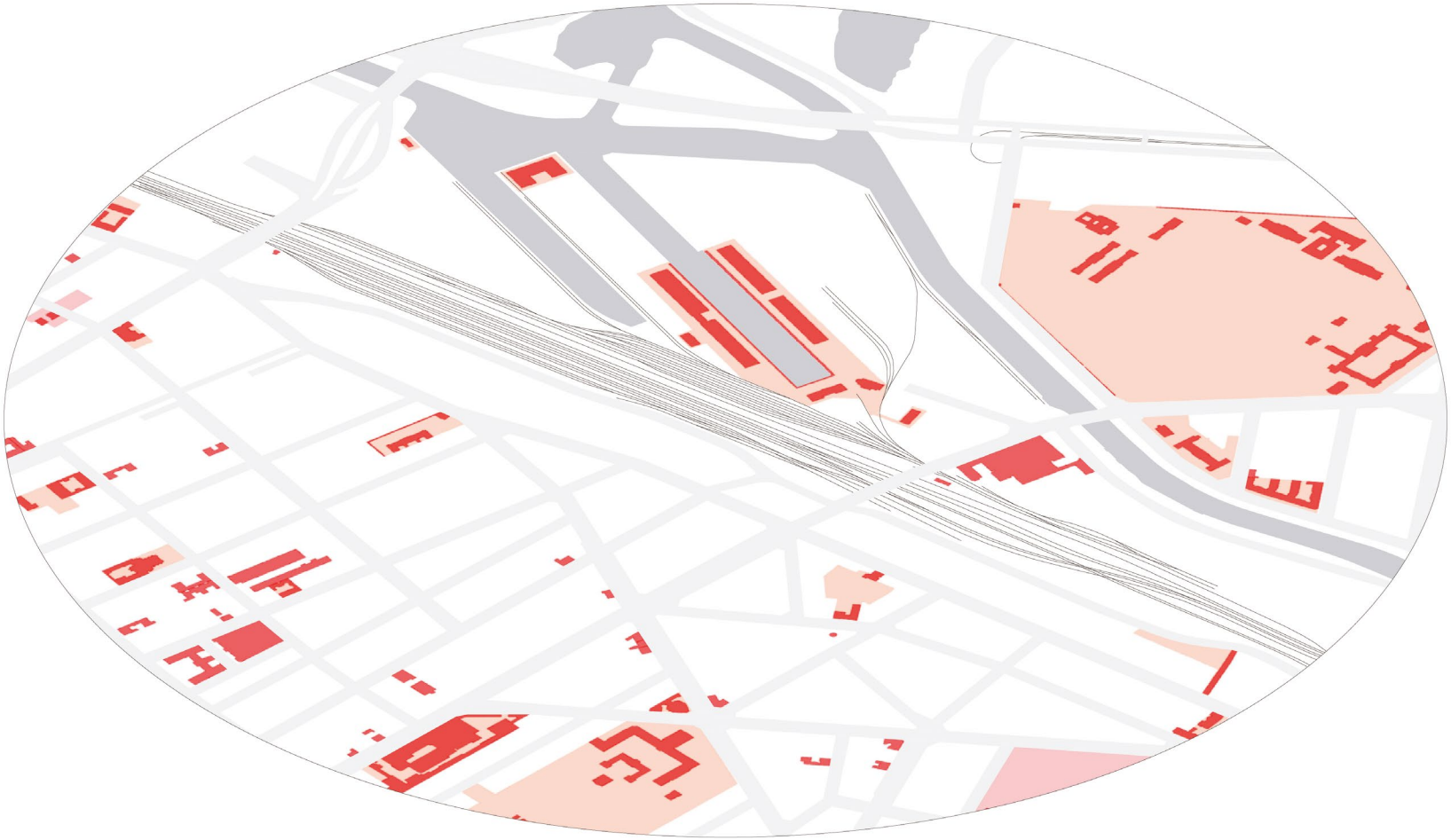
Industrial Port

21st Century

Mixed-Used
Innovation District

Site Research

PROTECTED MONUMENTS

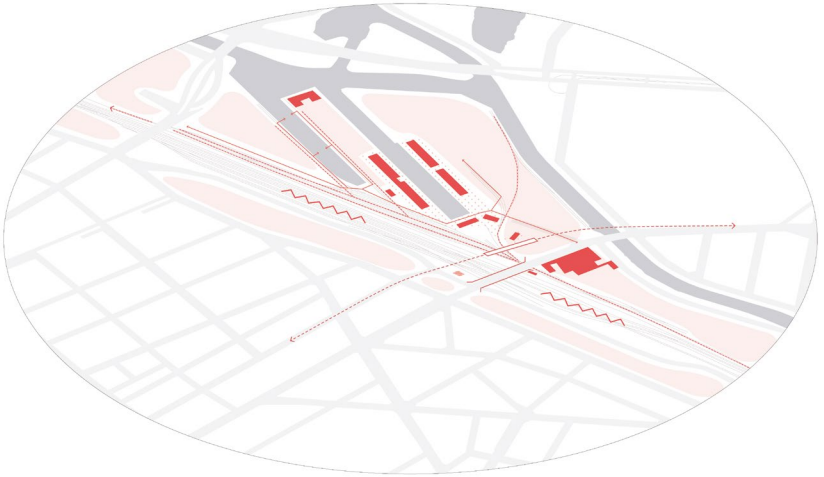


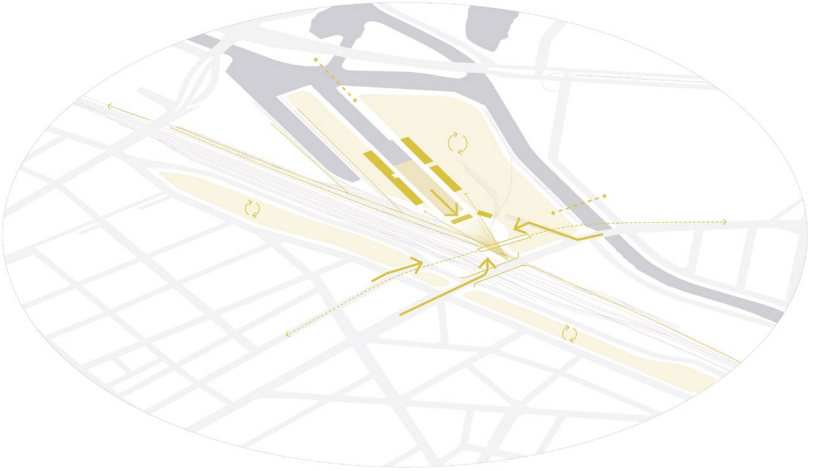
Site Research

PROTECTED MONUMENTS

Site Research

CONSTRAINTS & OPPORTUNITIES



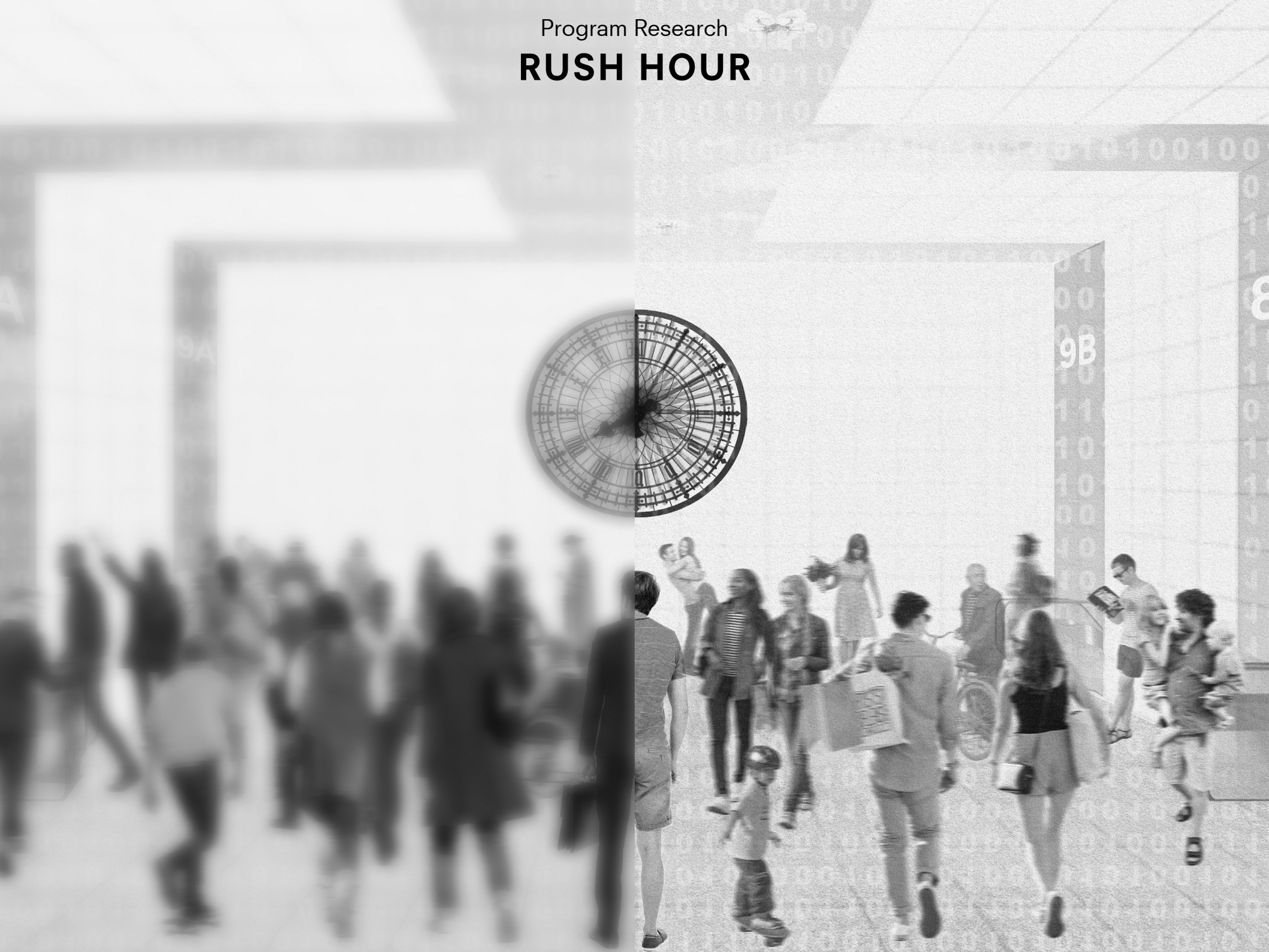


- Protected Buildings
- Protected Area
- Industrial Area (in operation)
- Logistic route (HGVs)
- Freight yard (cargo trains)
- Railway barrier
- Traffic bridge
- U-bahn route
- U-bahn station
- Energy Substation Railway

- Monumental Buildings
- Key view to historic clock tower
- Potential Urban Development
- Freight yard (cargo trains)
- Traffic bridge
- U-bahn route
- U-bahn station
- Potential Access Points
- Potential Urban Connections
- Water basin as square + Data Centre

Program Research

RUSH HOUR



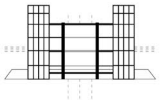
BUT WHAT IS THE BENCHMARK?

GERMAN	DUTCH	INTERNATIONAL CENTRAL	INTERNATIONAL HIGH SPEED
 BERLIN HBF	 ROTTERDAM CS	 VIENNA HBF	 GARE DO ORIENTE
 BERLIN OSTKREUZ	 UTRECHT CS	 ZURICH HBF	 GARE KENITRA
 LEIPZIG HBF	 AMSTERDAM CS	 LONDON KINGS CROSS	 GARE LILLE-EUROPE
 HANNOVER HBF	 ARNHEM CS	 HELSINKI CENTRAL	 LIEGE-GUILLEMINS

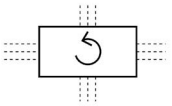
Program Research

STATION DATABASE

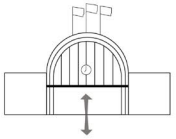
GERMAN



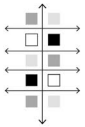
BERLIN HBF



BERLIN
OSTKREUZ

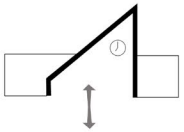


LEIPZIG
HBF

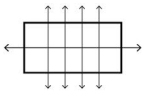


HANNOVER
HBF

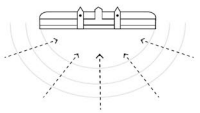
DUTCH



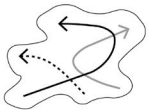
ROTTERDAM
CS



UTRECHT CS



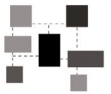
AMSTERDAM
CS



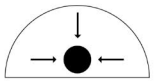
ARNHEM CS

INTERNATIONAL CENTRAL

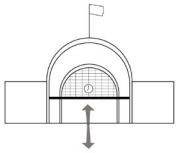
VIENNA HBF



ZURICH HBF

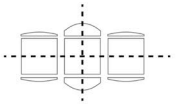


LONDON KINGS
CROSS

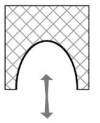


HELSINKI
CENTRAL

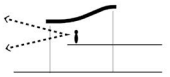
INTERNATIONAL HIGH SPEED



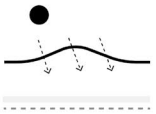
GARE DO
ORIENTE



GARE KENITRA



GARE
LILLE-EUROPE

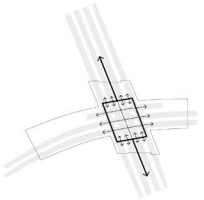


LIEGE-
GUILLEMINS

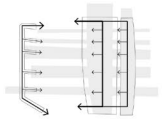
Program Research

FLOWS

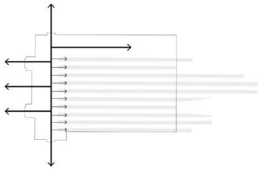
GERMAN



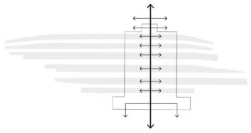
BERLIN HBF



BERLIN
OSTKREUZ

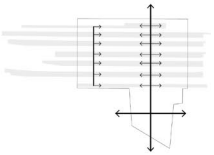


LEIPZIG
HBF

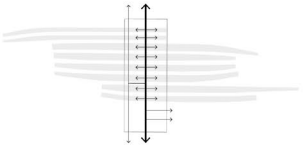


HANNOVER
HBF

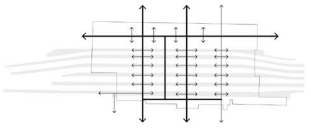
DUTCH



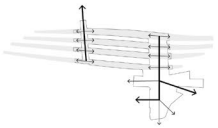
ROTTERDAM
CS



UTRECHT CS

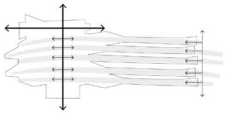


AMSTERDAM
CS

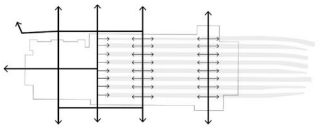


ARNHEM CS

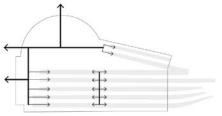
INTERNATIONAL CENTRAL



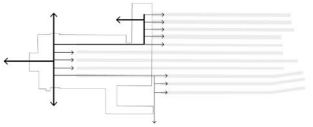
VIENNA HBF



ZURICH HBF

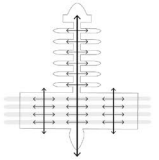


LONDON KINGS
CROSS

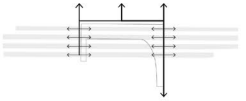


HELSINKI
CENTRAL

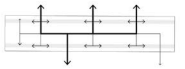
INTERNATIONAL HIGH SPEED



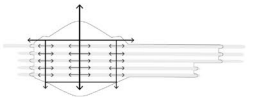
GARE DO
ORIENTE



GARE KENITRA



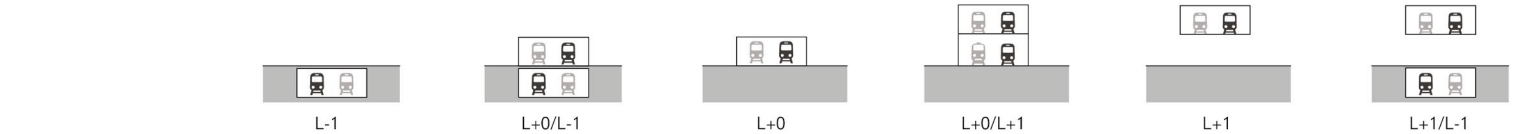
GARE
LILLE-EUROPE



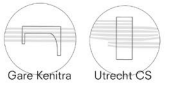
LIEGE-
GUILLEMINS

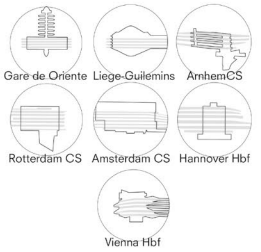
Program Research

TYPOLOGY



RUNNING



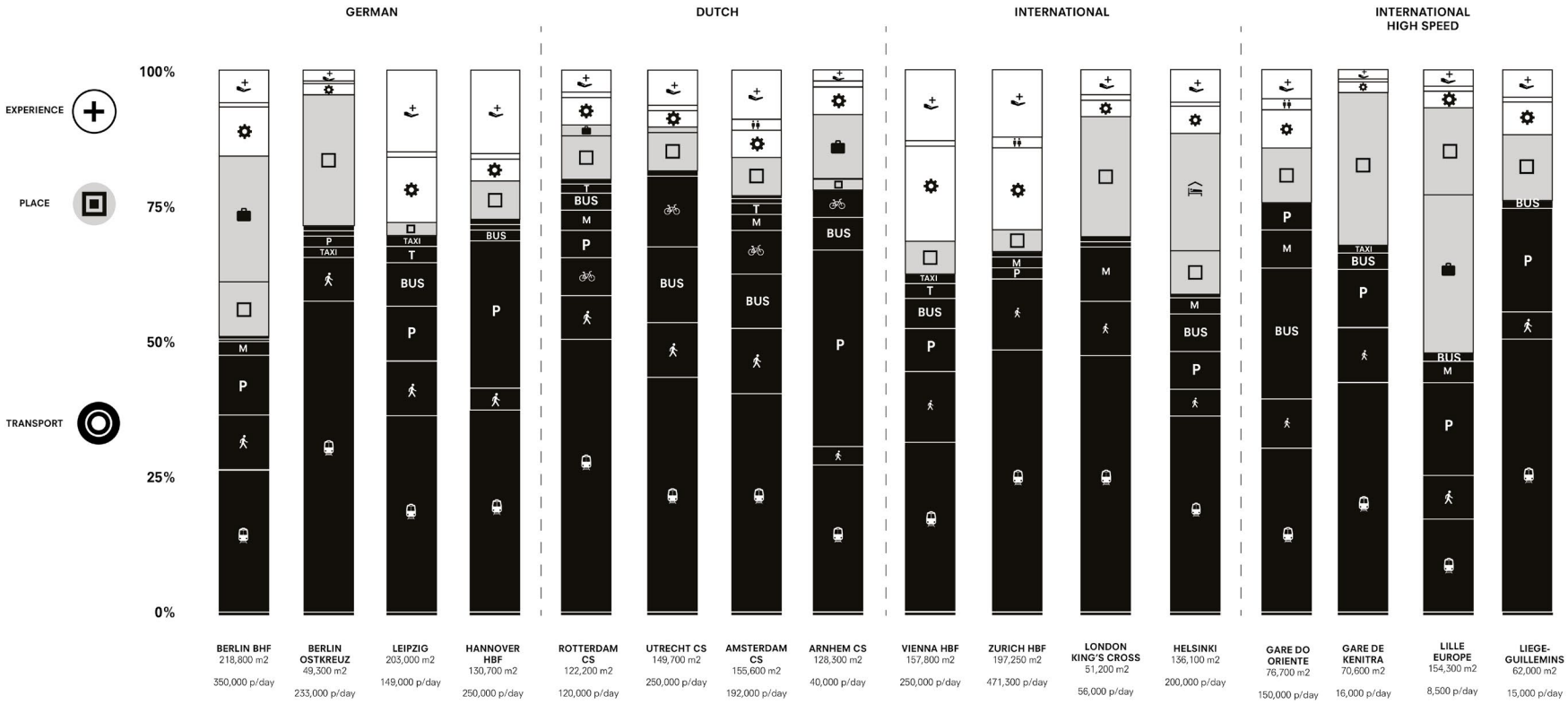


CROSSING

TERMINUS

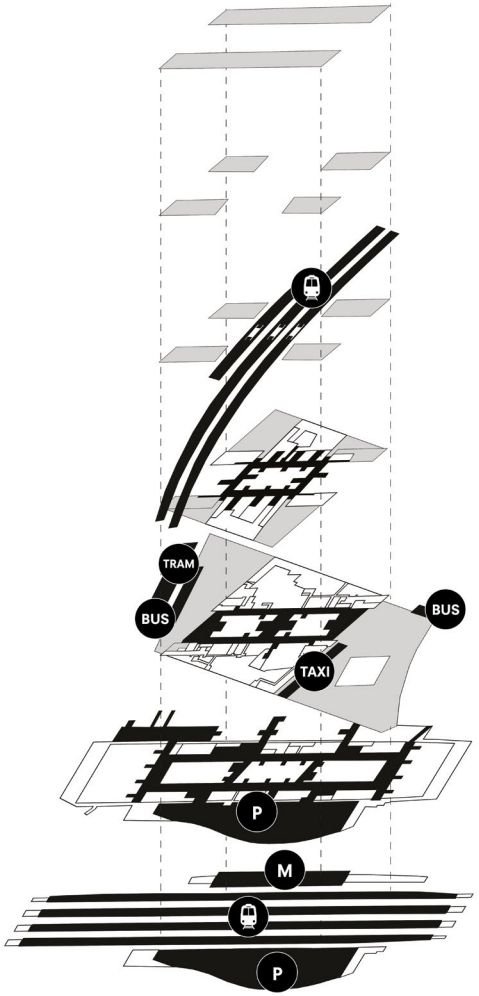
Program Research

PROGRAM

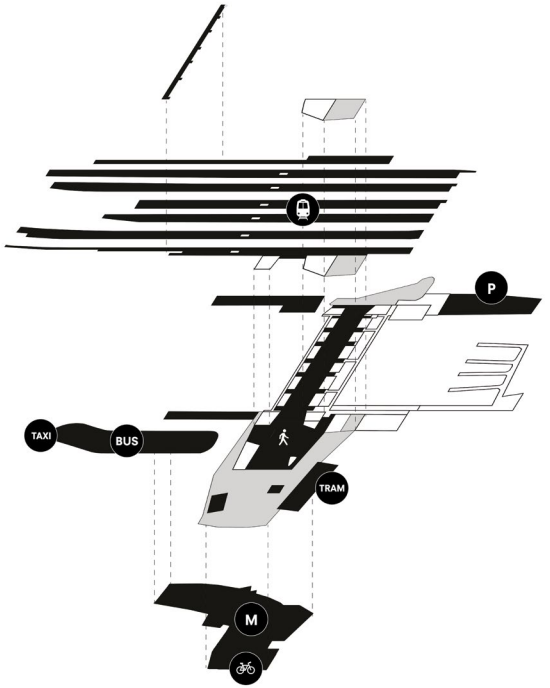


Program Research

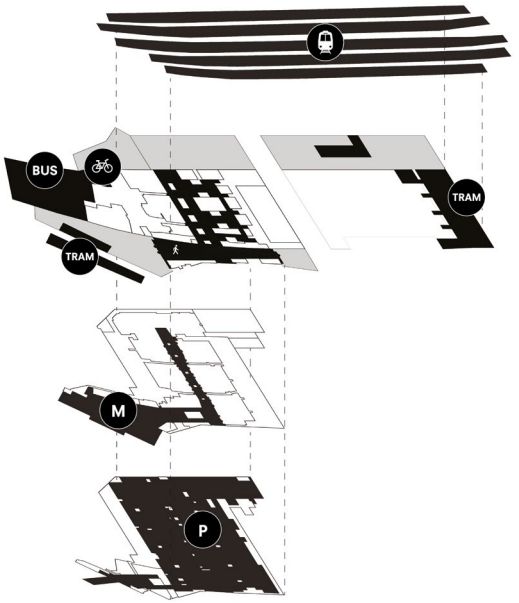
REFERENCES



Berln Hbf



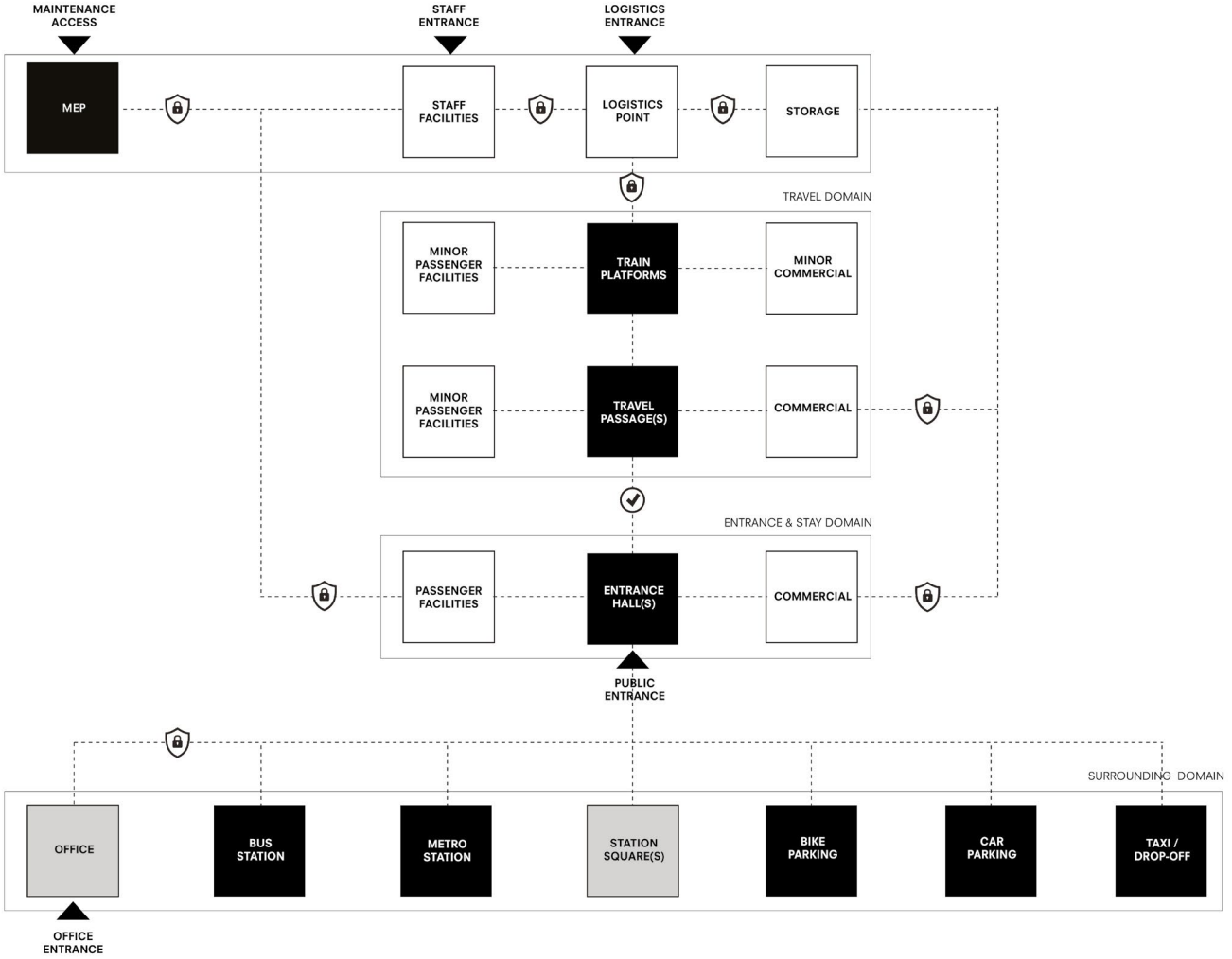
Rotterdam CS



Vienna Hbf

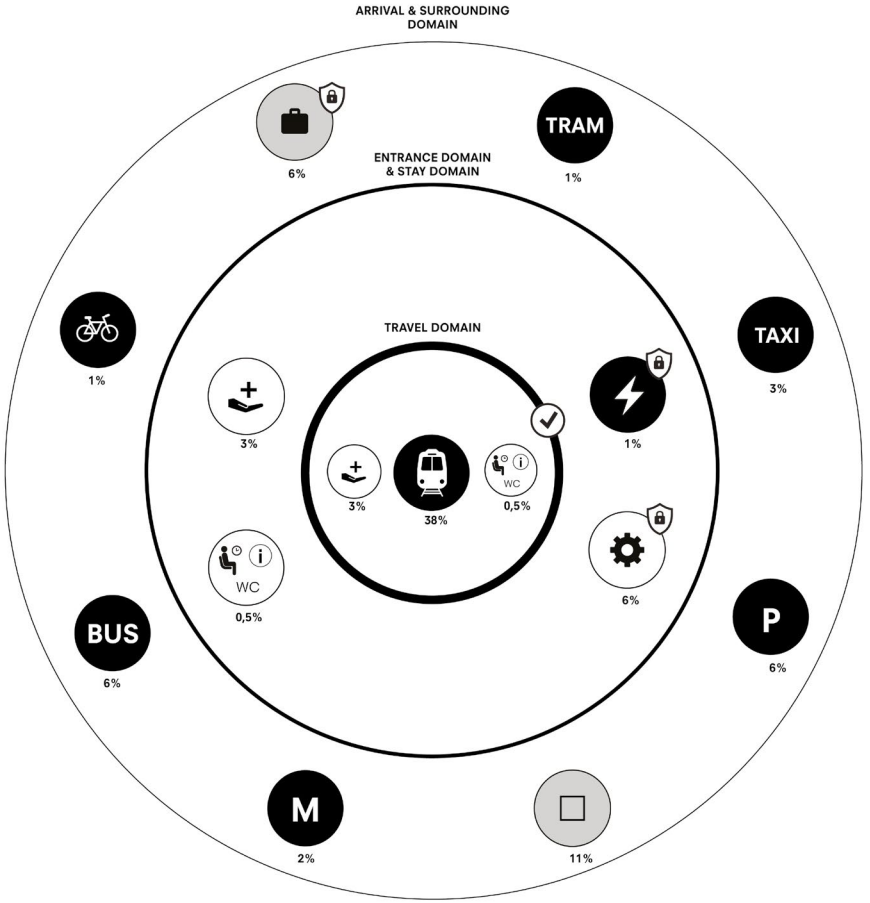
Program Research

RELATION SCHEME



Program Research

PROGRAMMATIC DOMAINS



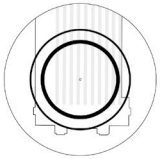
Program Research

PROGRAMMATIC DOMAINS

GERMAN

BERLIN HBF

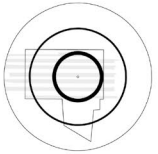
BERLIN OSTKREUZ



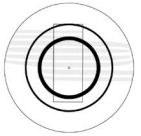
LEIPZIG HBF

HANNOVER HBF

DUTCH



ROTTERDAM CS



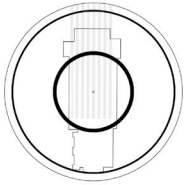
UTRECHT CS

AMSTERDAM CS

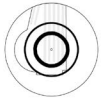
ARNHEM CS

INTERNATIONAL CENTRAL

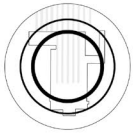
VIENNA HBF



ZURICH HBF

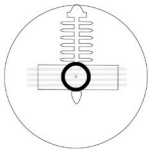


LONDON KINGS CROSS



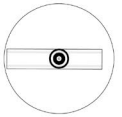
HELSINKI CENTRAL

INTERNATIONAL HIGH SPEED

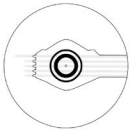


GARE DO ORIENTE

GARE KENITRA

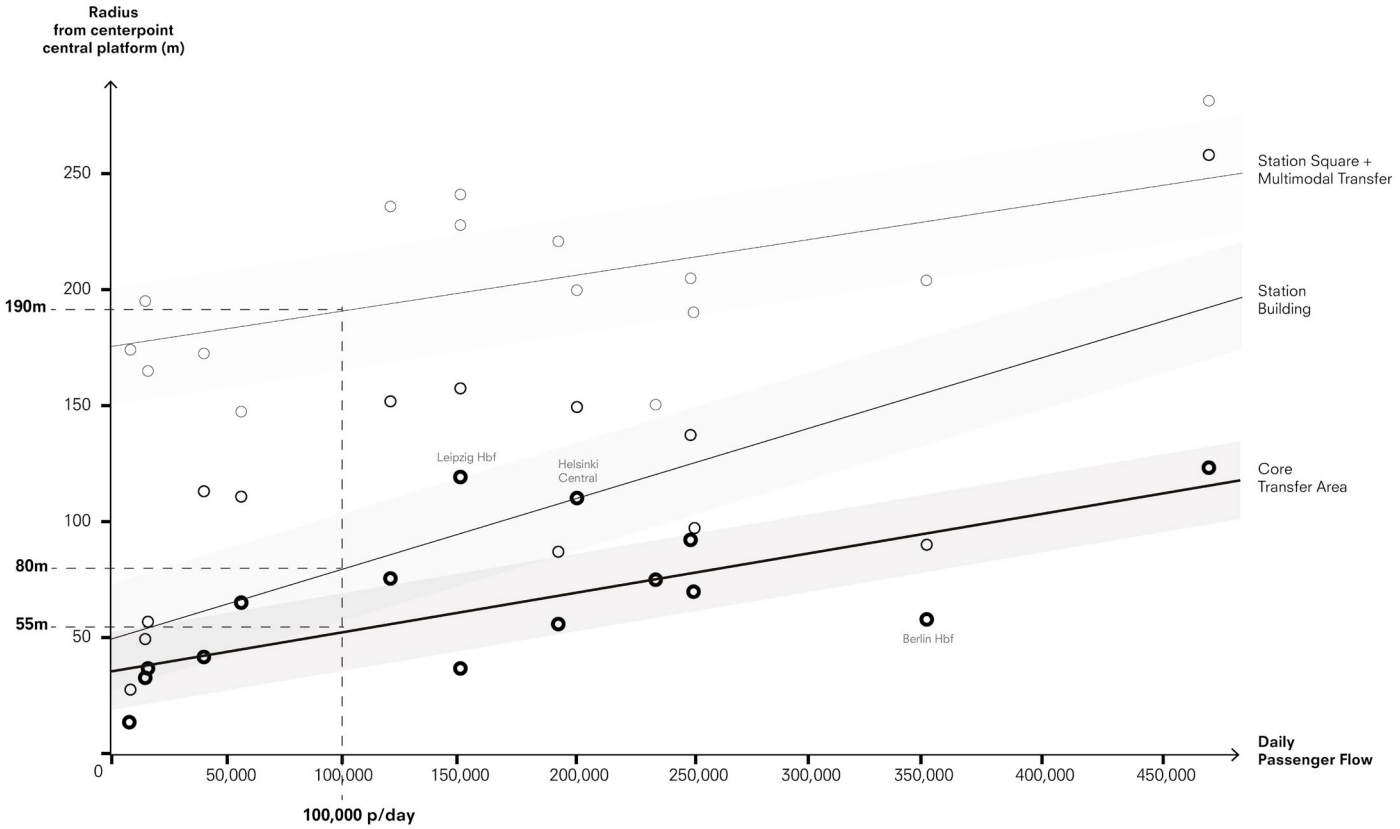


GARE LILLE-EUROPE



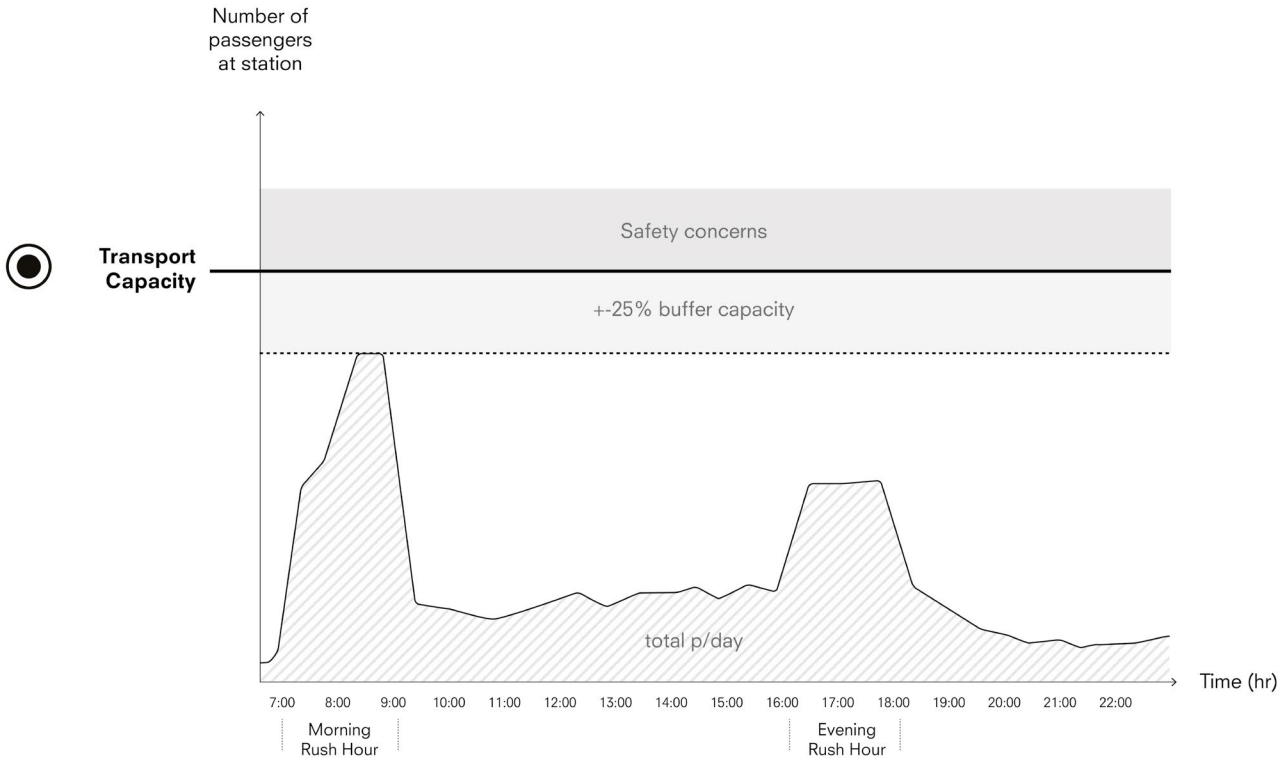
LIEGE-GUILLEMINS

PROGRAMMATIC DOMAINS



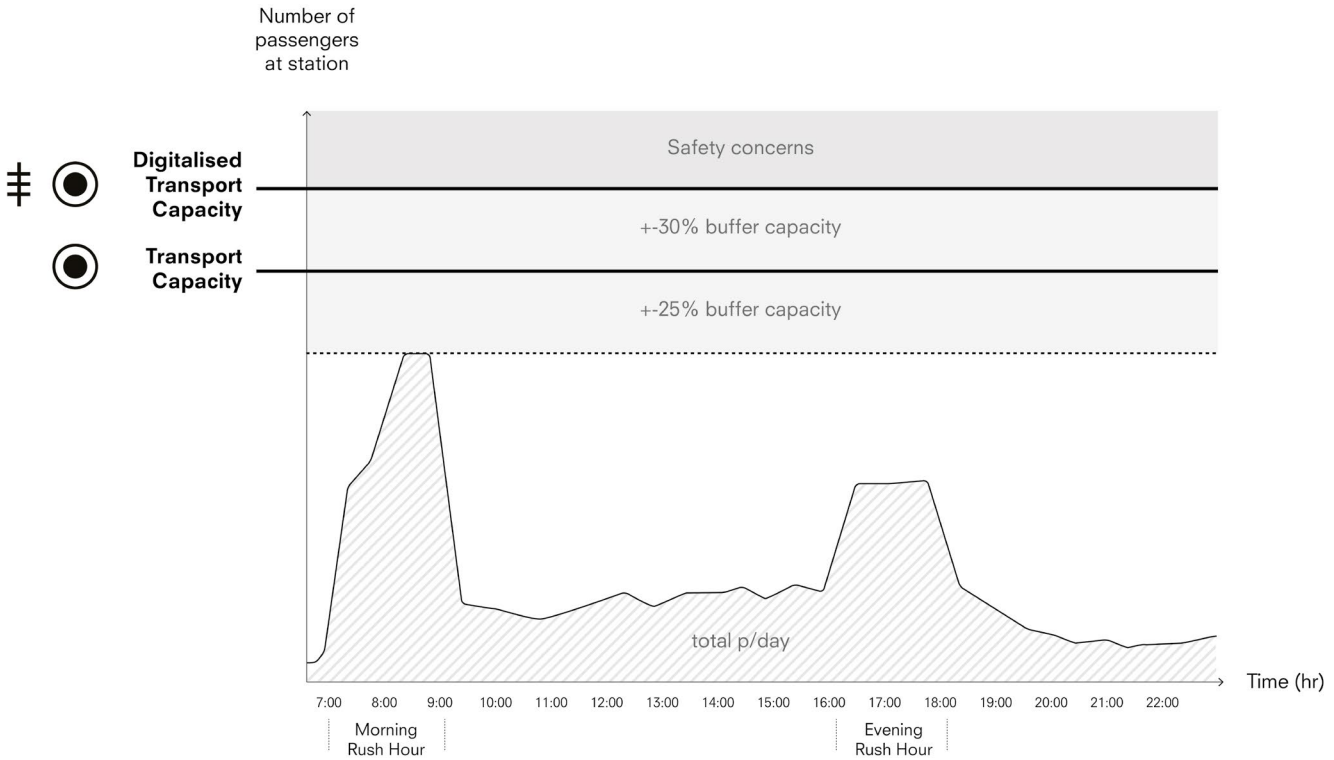
Program Research

STATION CAPACITY



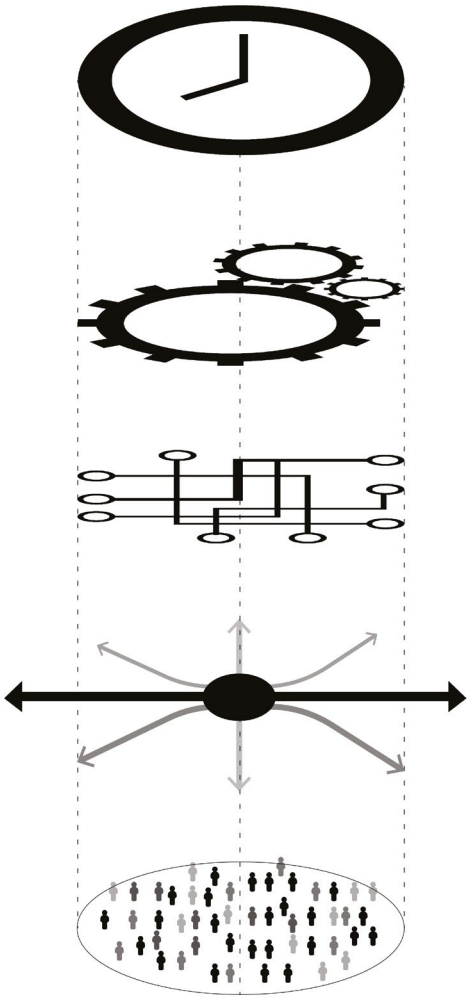
Program Research

DIGITALISED STATION CAPACITY



Program Research

DIGITAL BACKBONE



TRANSPORT

Improved
Building Efficiency

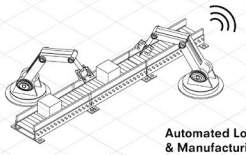
DIGITAL

Improved
Body Experience

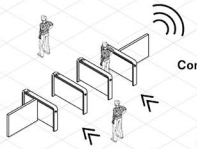
EXPERIENCE

Program Research

DIGITAL BACKBONE

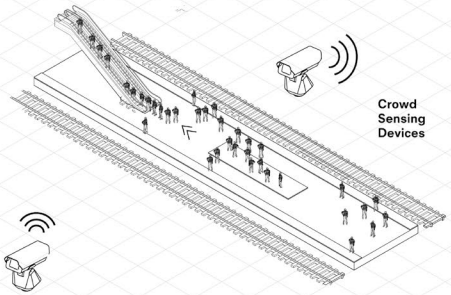


Automated Logistics
& Manufacturing



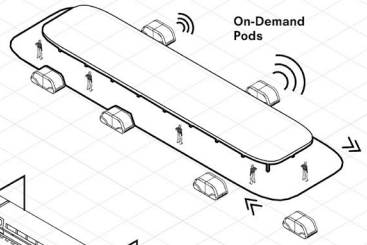
Contactless Check-in

Drones

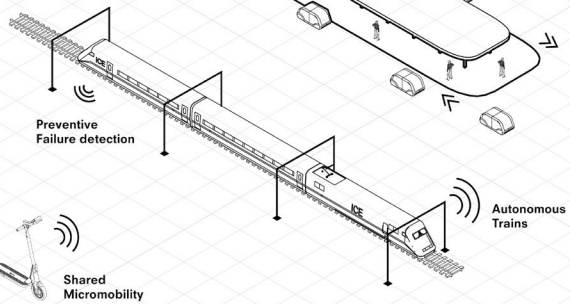


Crowd
Sensing
Devices

Safety
Monitoring



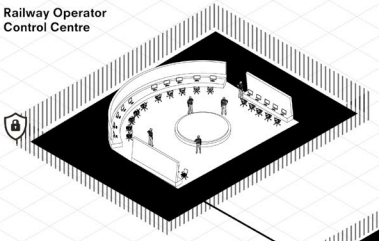
On-Demand
Pods



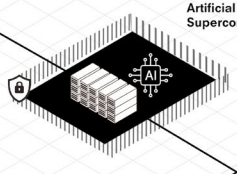
Preventive
Failure detection

Autonomous
Trains

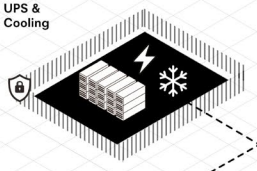
Shared
Micromobility



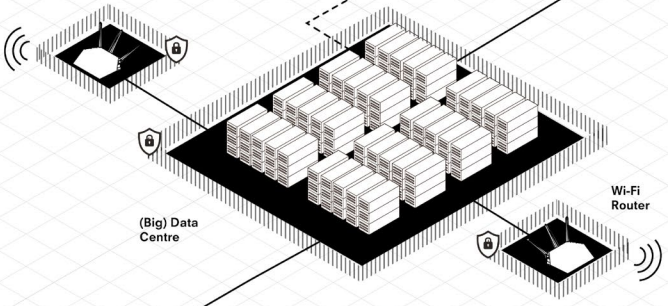
Railway Operator
Control Centre



Artificial Intelligence
Supercomputer

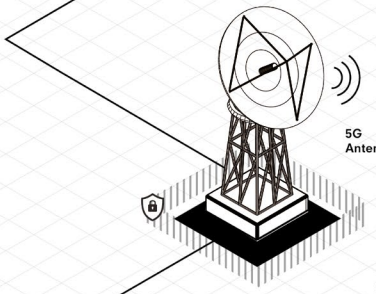


UPS &
Cooling



Wi-Fi
Router

(Big) Data
Centre



5G
Antenna

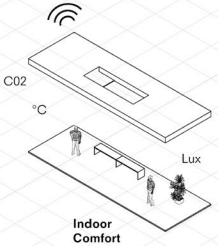
GPS Tracking

Optic Fibre

Delivery
Pick-up points

Smart Ticketing &
Self-Service

High-Speed
Connectivity

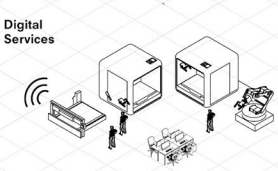


C02

°C

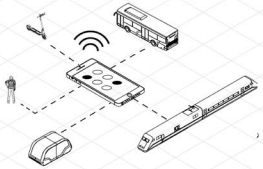
Lux

Indoor
Comfort

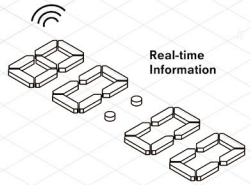


Digital
Services

Digital Infotainment /
Wayfinfing



MaaS



Real-time
Information

INTRODUCTION

RESEARCH

DESIGN BRIEF

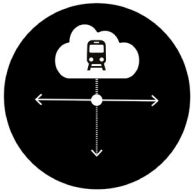
IMPLEMENTATION

REFLECTION

Design brief

PROJECT AMBITIONS

CLIENT



Digital & Transport Node

Sustainable

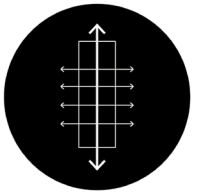
Urban Anchor

Icon of Innovation

PROGRAM

Size Proportional to Rush Hour Demand

Transport Core



Simple Wayfinding

Digital Infrastructure for Optimization

SITE

Gateway Acces into Westhafen

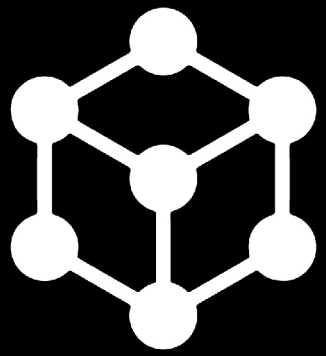
Overcome Rail barrier

Close connection to Existing Metro

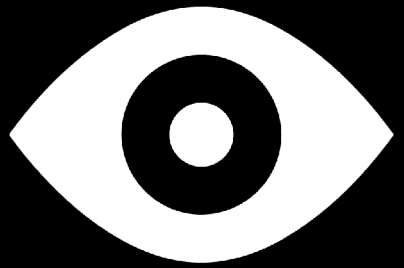
Landmark Quality

Design brief

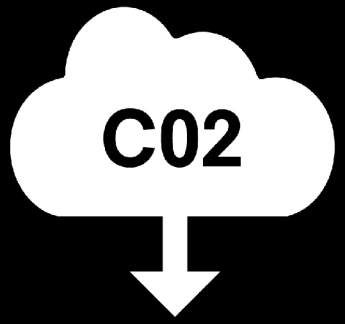
BERLIN DATATECTURE STRATEGY



DECENTRALISE



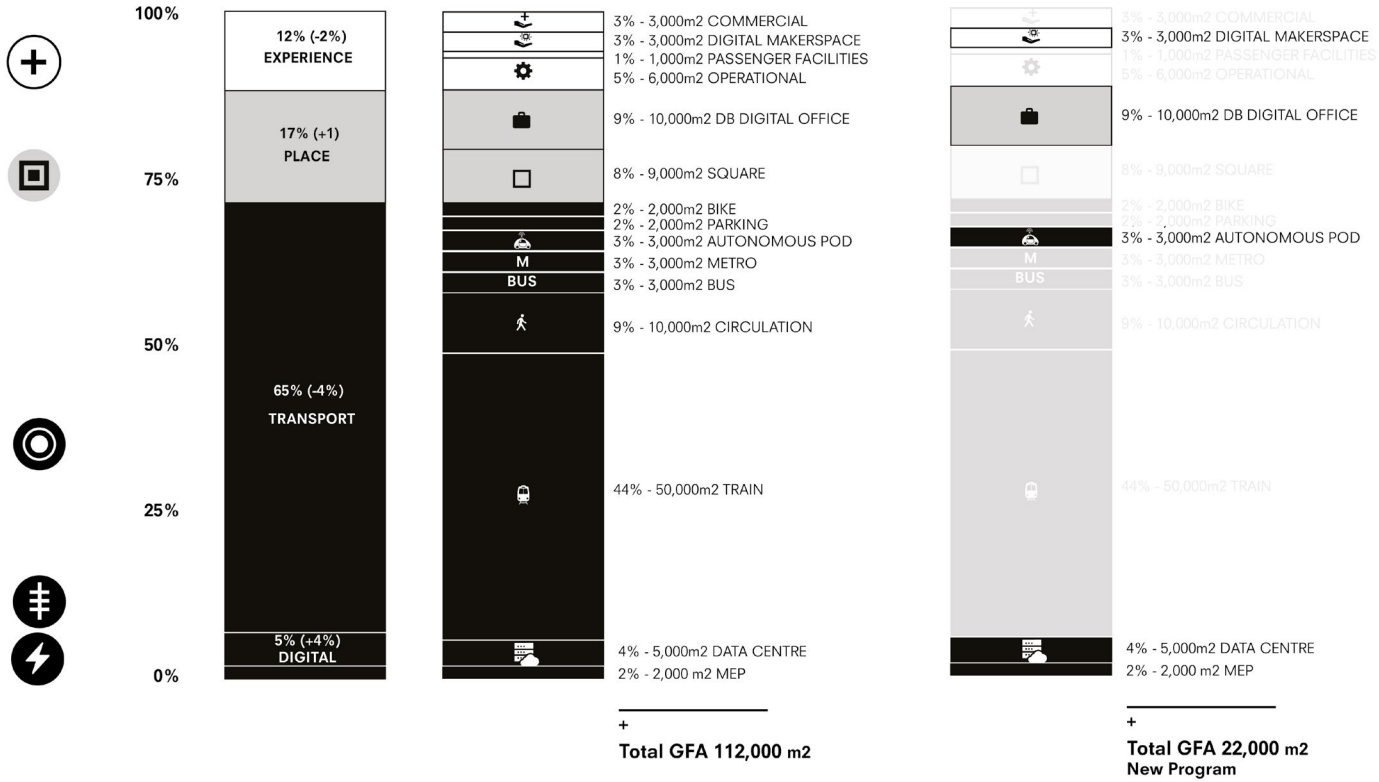
DISPLAY



DECARBONISATION

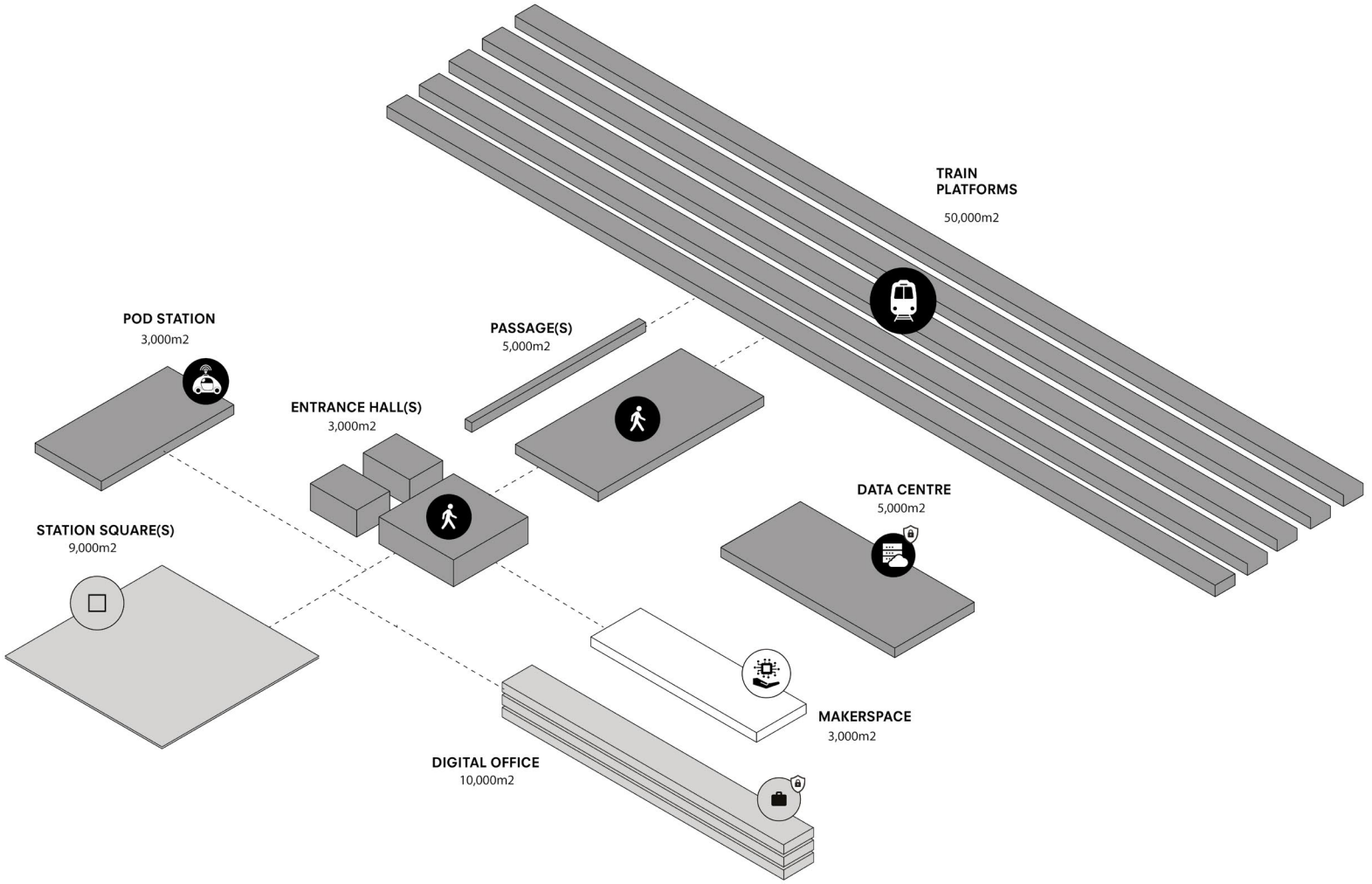
Design brief

PROGRAM BREAKDOWN



Design brief

SPATIAL REQUIREMENT

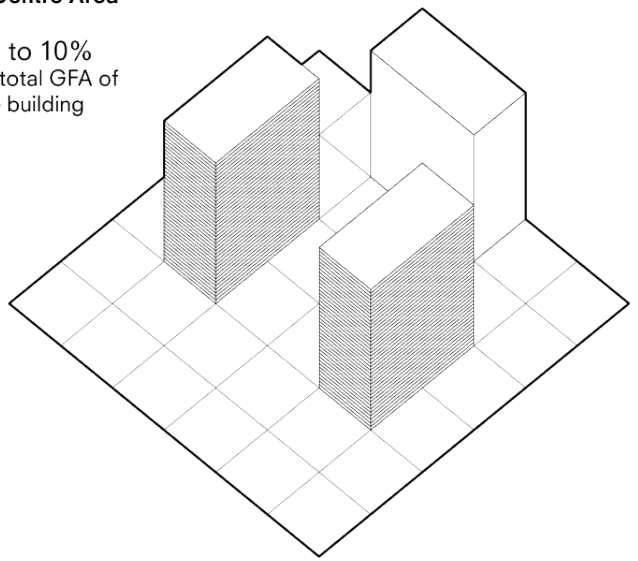


Design brief

DATA CENTRE REQUIREMENT

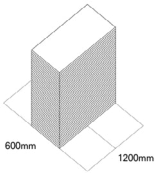
Data Centre Area

5% to 10%
of the total GFA of
the building



Design brief

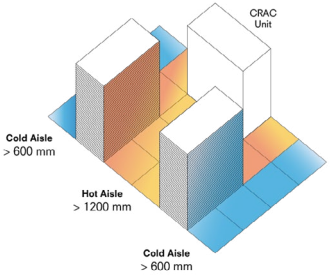
DATA CENTRE REQUIREMENT



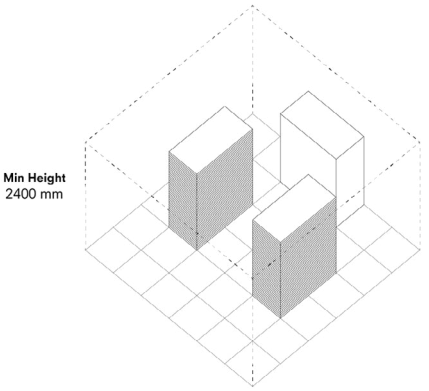
Data Rack

1200 x 600 x 42U
1U = 45mm

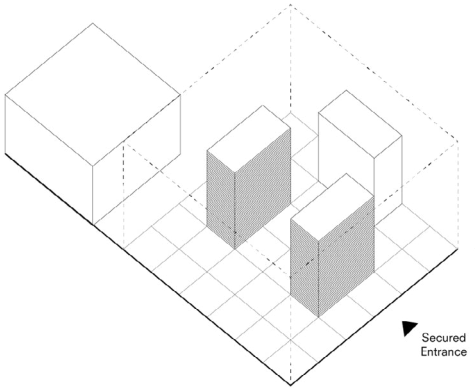
UNIT



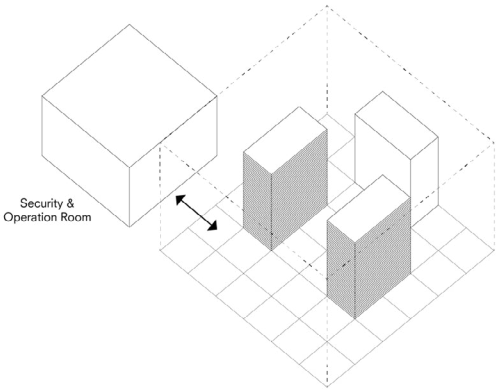
AISLE



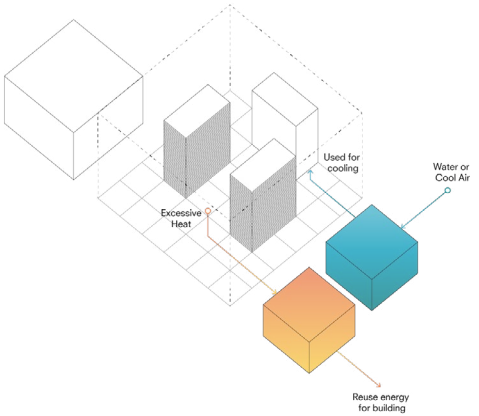
HEIGHT



SECURITY



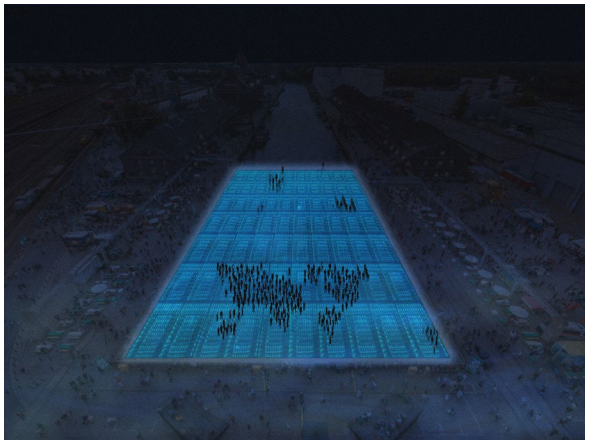
OPERATION

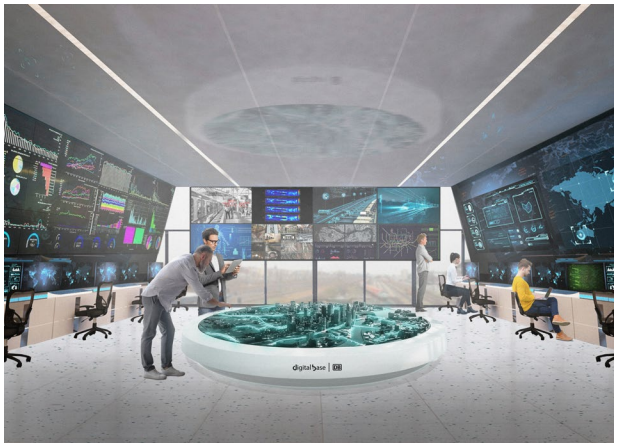


ENERGY

Design brief

FLOW OF PEOPLE, DATA AND GOODS

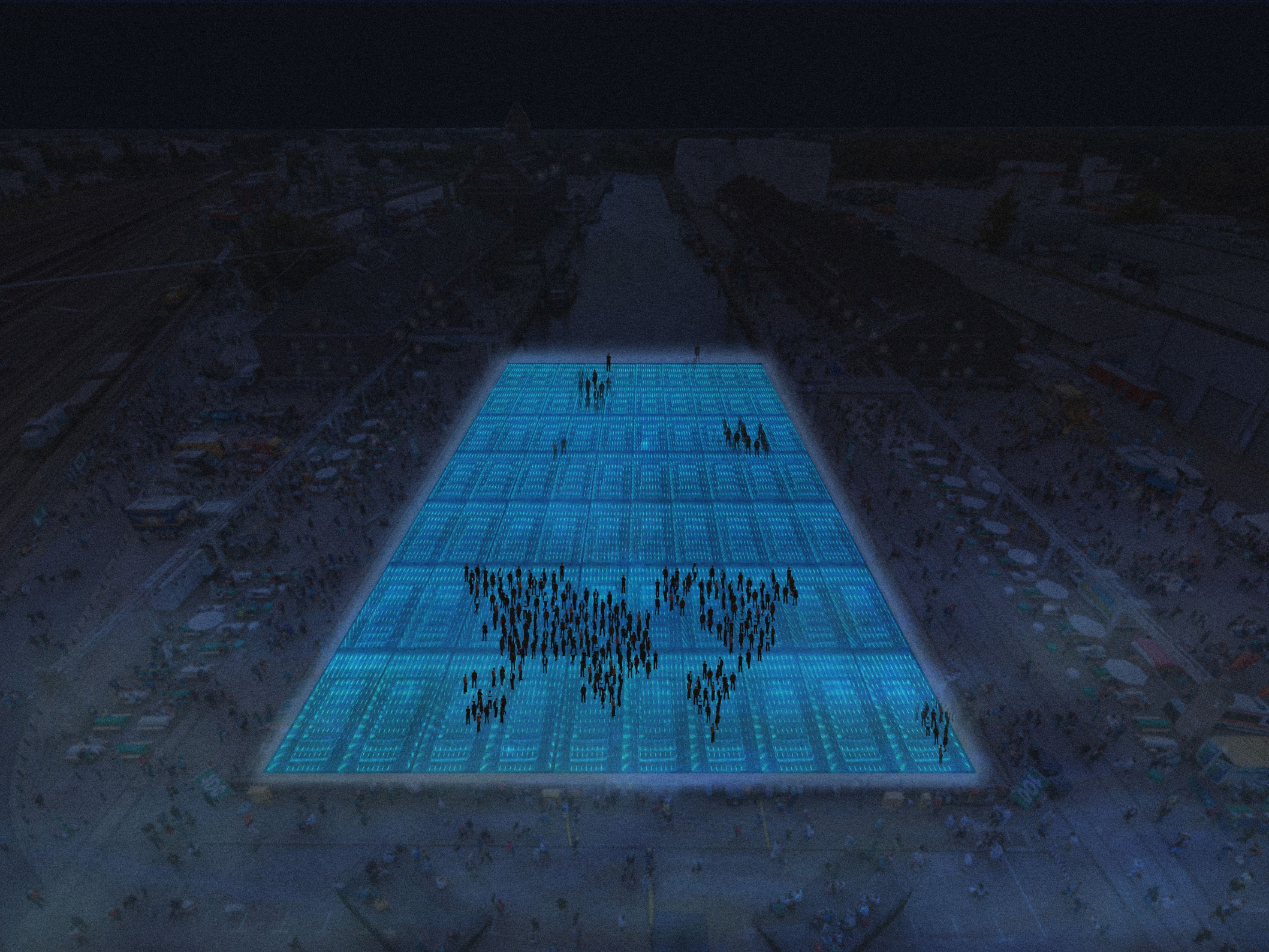





08:00
6G
DB
Choices of Transport
Destination
TXL AIRPORT
ACCEPT
08:00
SmartCheck
SmartCheck
WELCOME
DAVID
DOCK 1
READY IN 1 MIN
TXL AIRPORT
1A
2A
3A
4A
5A
6A
1B
2B
3B
4B
5B


Siemens
Xcelerator


WESTHAFEN
BEHALA
WESTHAFEN
DB
Cargo
SIEMENSTATION
SIEMENS



Design Brief

URBAN GUIDELINES

Core Travel domain
Max distance to nearest entrance hall / ticket barrier

Entrance and Stay domain
Max distance to nearest building entrance / exit

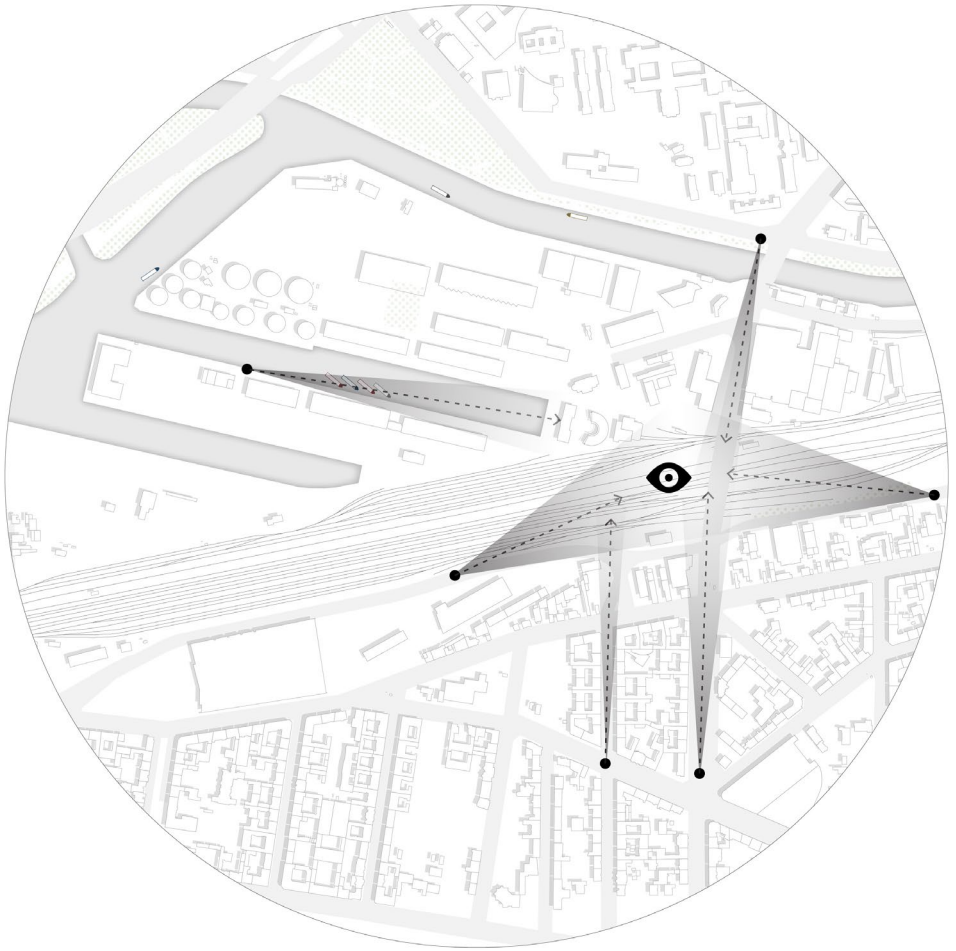
Surrounding domain
Max distance to other modes of transport

Short distances between various modes of transport

Strongly recommended to place station body as close as possible to existing U-bahn station.

Design Brief

URBAN GUIDELINES

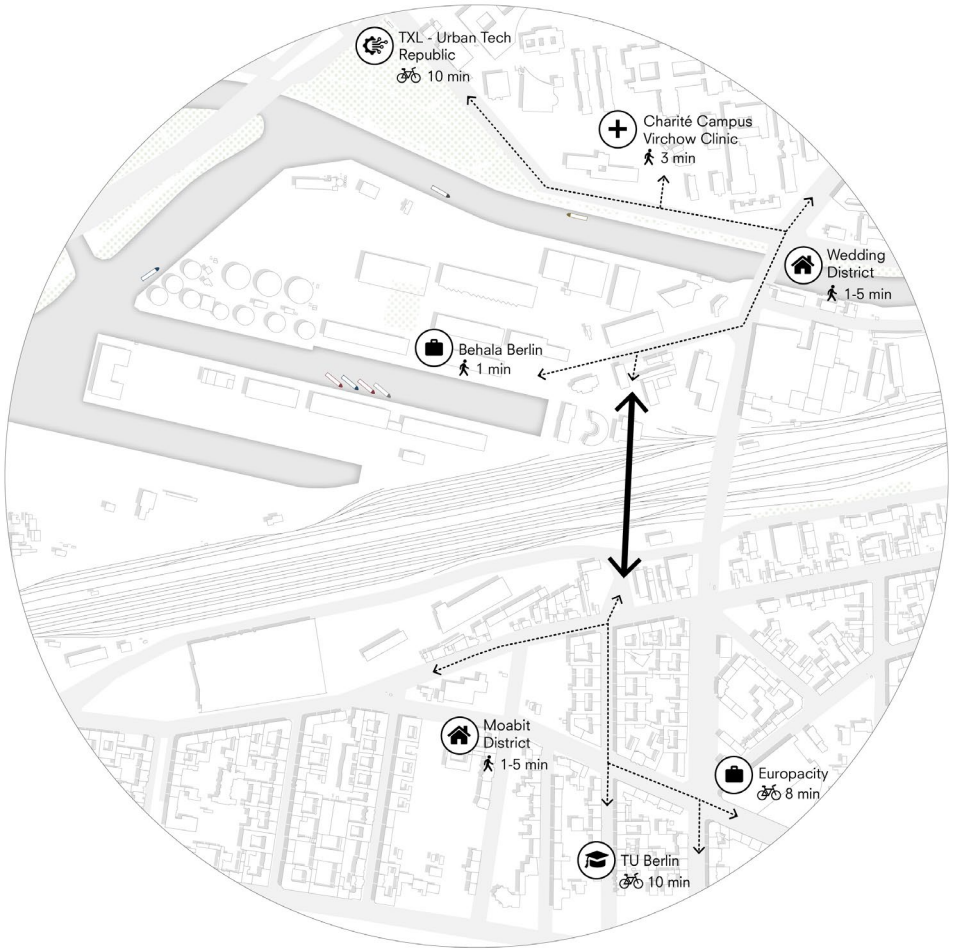


Landmark quality for people and city

Far visibility main entrance at eye-level height

Design Brief

URBAN GUIDELINES



Overcome Urban Spatial Railway Line

N-S Pedestrian Connectivity.

Design Brief

URBAN GUIDELINES

Public Gateway Acces to Westhafen site

E-W Pedestrian Connectivity.

INTRODUCTION

RESEARCH

DESIGN BRIEF

IMPLEMENTATION

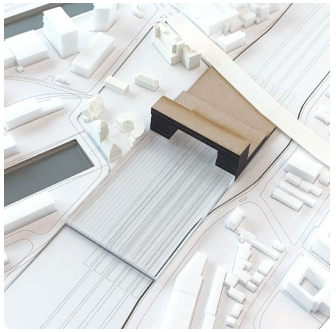
REFLECTION

Design Implementation

3X3 DESIGN STUDY

CLIENT

High-rise



Digital Gateway

Urban Anchor

PROGRAM

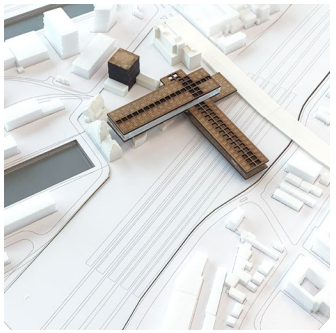
Flow

Dataport

Playstation

SITE

Accessibility



Building Integration

Harbour Constraint

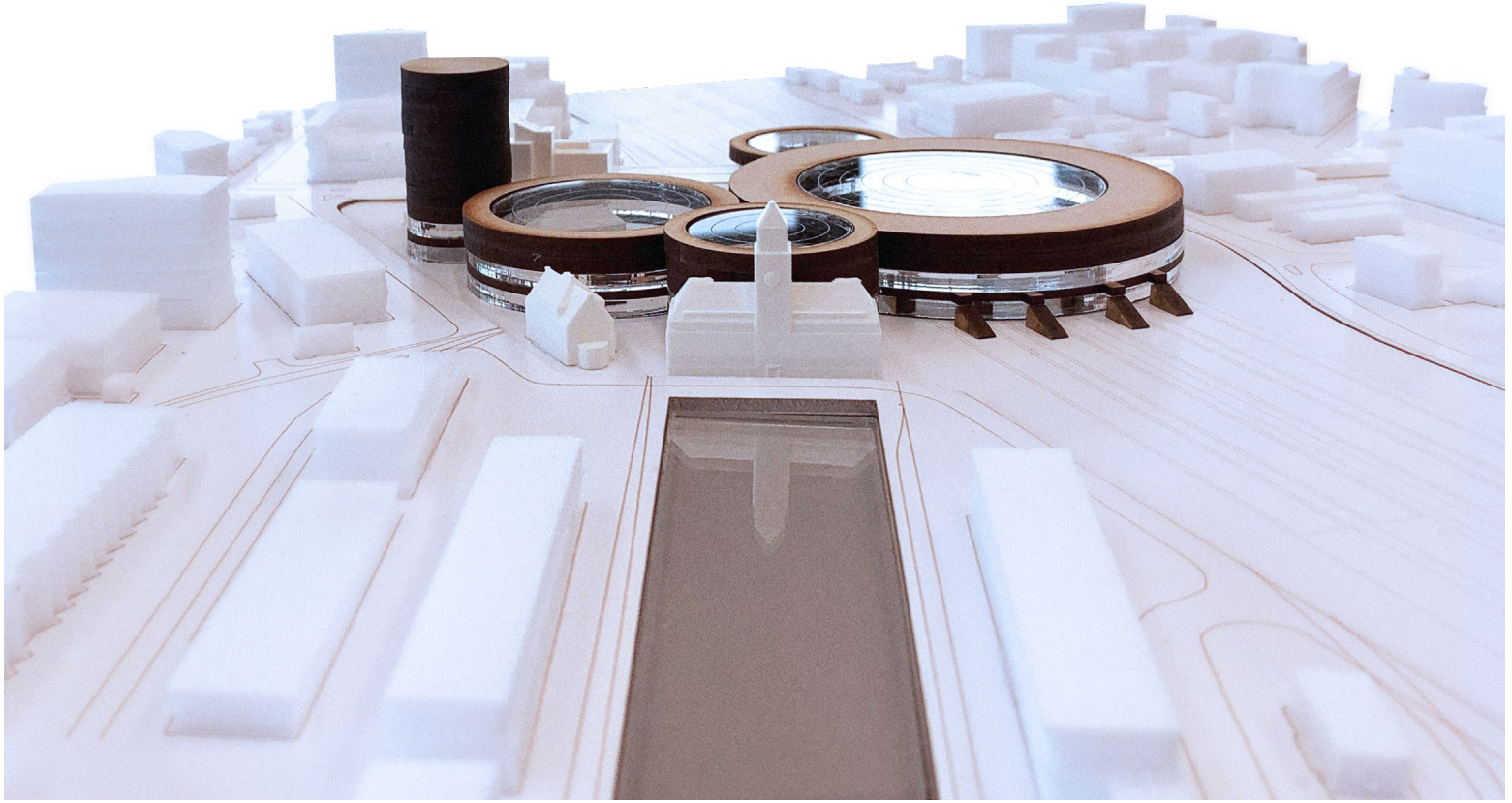
Design Implementation

3X3 DESIGN STUDY

KEY CRITERIA	DESIGN OPTIONS									
	PROGRAM			SITE				CLIENT		
	Flow	Urban Dataport	Playstation	Accesibility	Building Integration	Harbour Constraint	Urban Gateway	High-rise (Siemens)	Digital Gate (Government)	Urban Anchor (Municipality)
										
PROGRAM Core Functionality	● ● ○	● ● ○	● ○ ○	● ● ●	● ● ○	● ● ○	● ● ●	● ● ○	● ● ○	● ● ○
SITE Urban integration	● ● ○	● ● ○	● ● ○	● ● ●	● ● ●	● ○ ○	● ● ●	● ● ○	● ● ○	● ● ●
CLIENT Iconicness	● ● ○	● ● ●	● ● ○	● ● ○	● ● ○	● ○ ○	● ● ○	● ● ○	● ● ●	● ● ●
DIGITAL LENS Digitalisation Game-Changer	● ○ ○	● ● ●	● ● ○	● ○ ○	● ● ○	● ○ ○	● ● ○	● ● ○	● ● ○	● ● ●
		★					★			★

Design Implementation

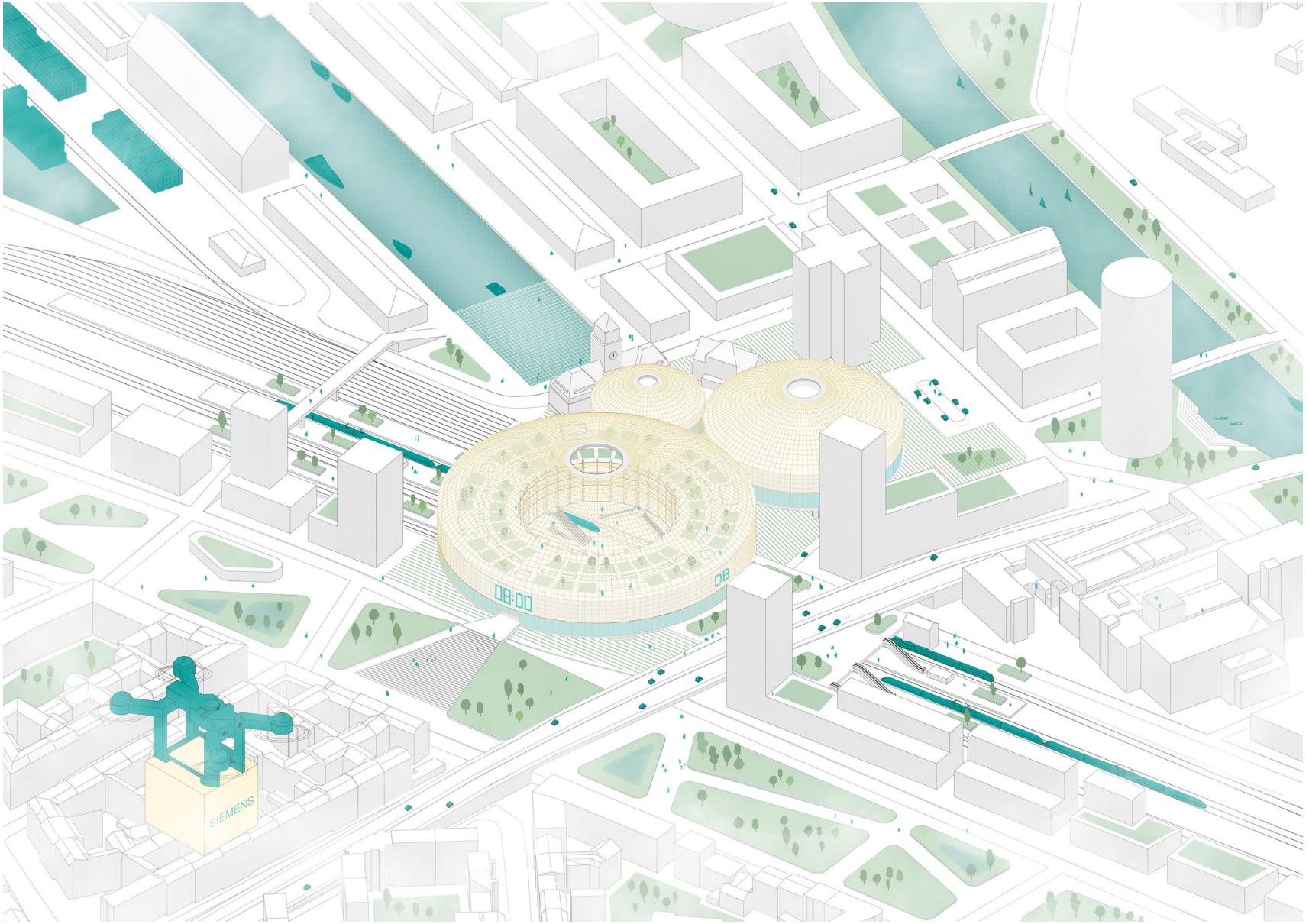
3X3 DESIGN STUDY



Urban Anchor

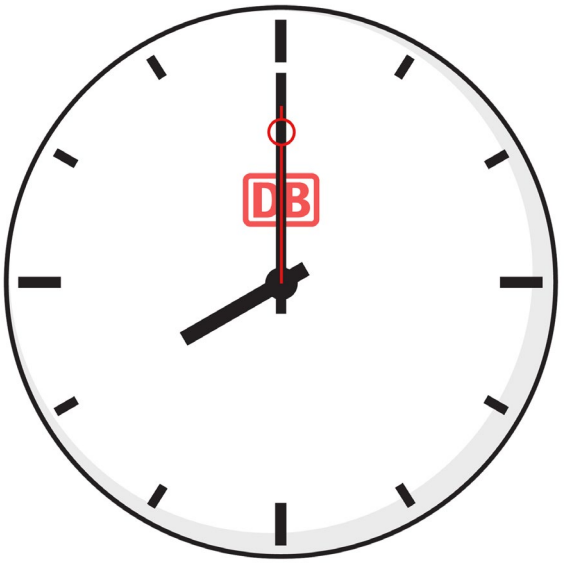
Design Implementation

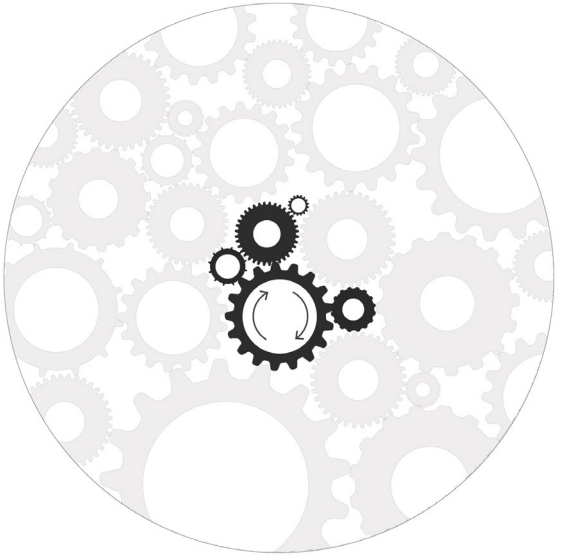
WESTHAFEN 2050

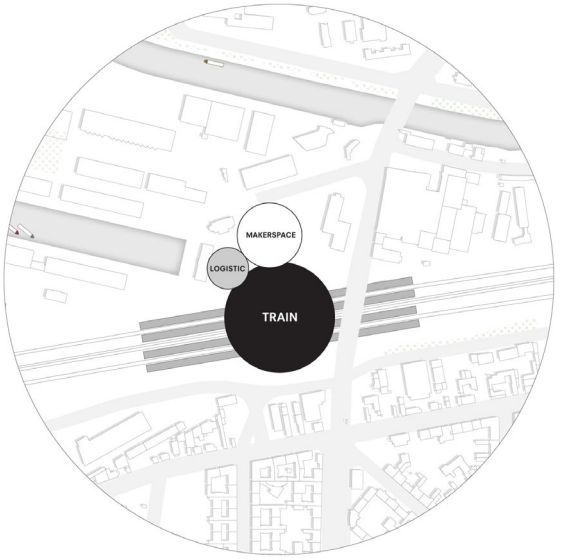


Design Implementation

CONNECTED CLOCKWORK

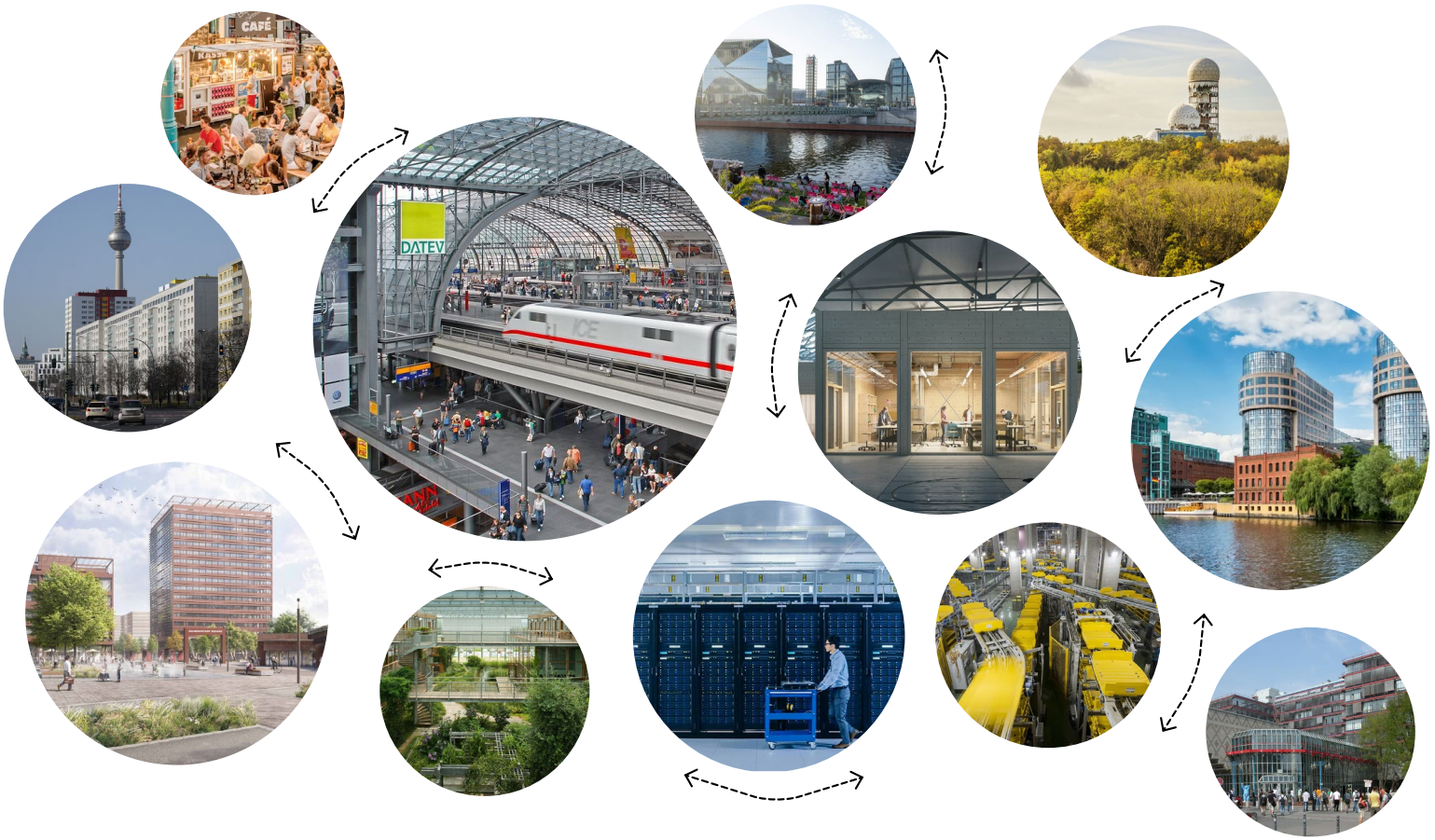






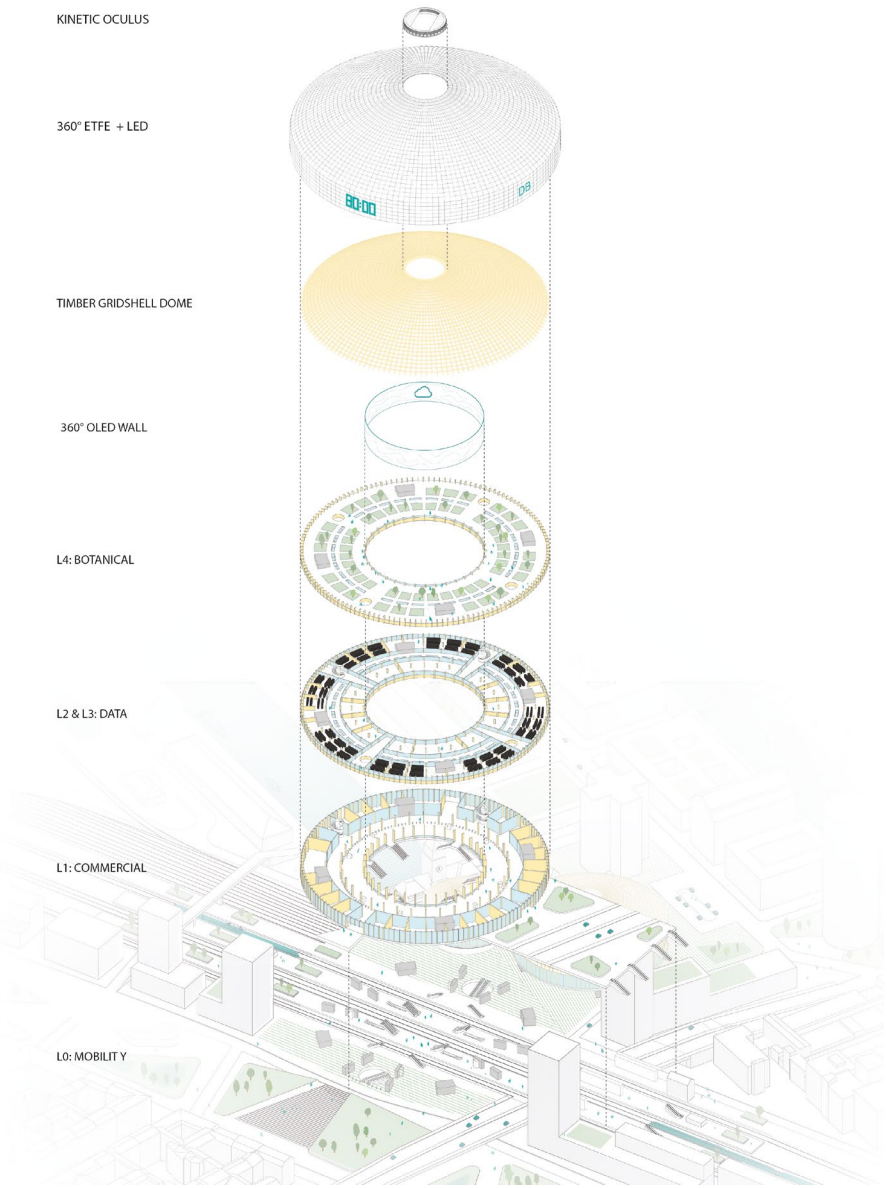
Design Implementation

CONNECTED CLOCKWORK



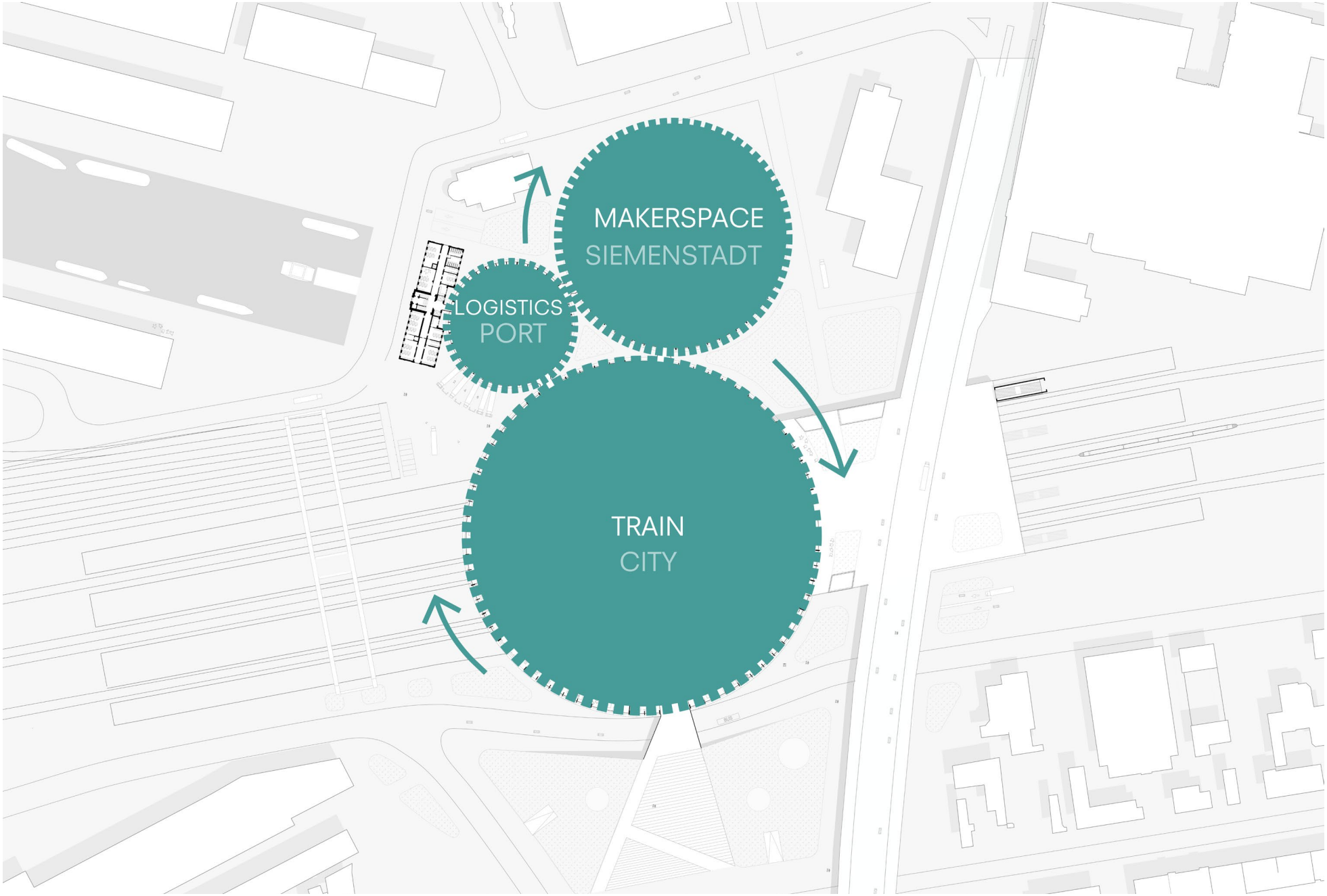
Design Implementation

CONNECTING CLOCKWORK



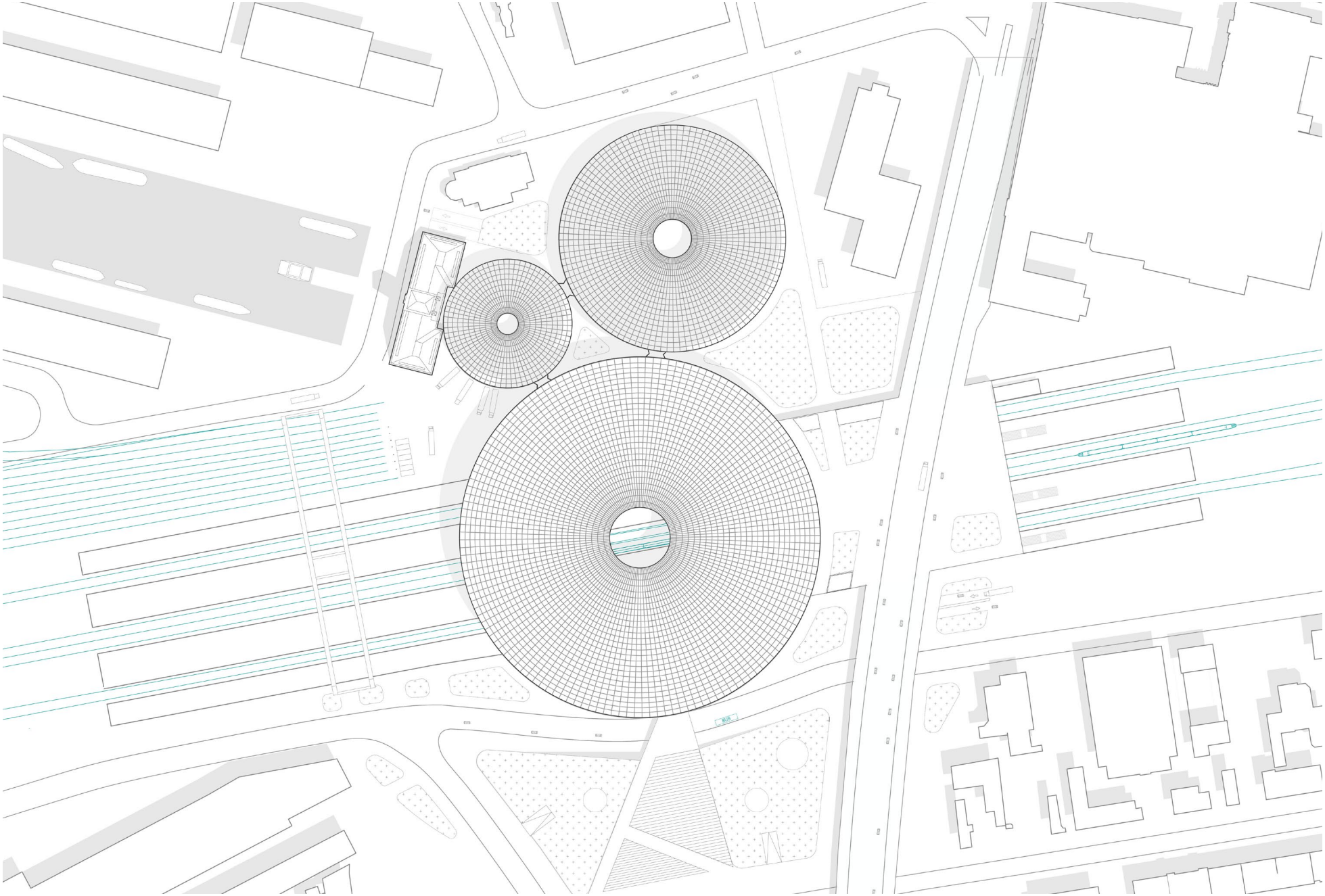
Design Implementation

CONNECTED CLOCKWORK



Design Implementation

ROOF PLAN

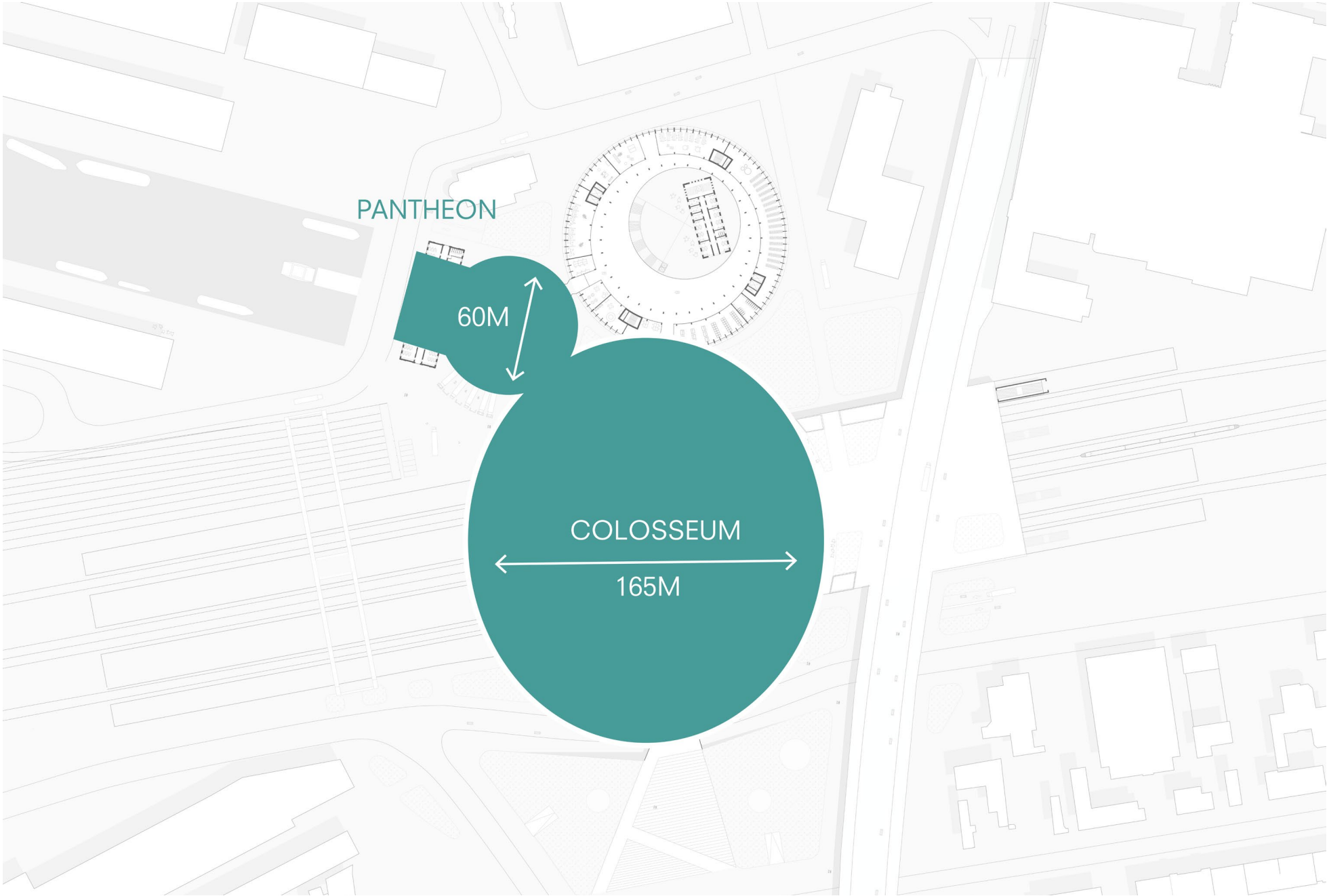


Design Implementation

RELATABLE SCALE

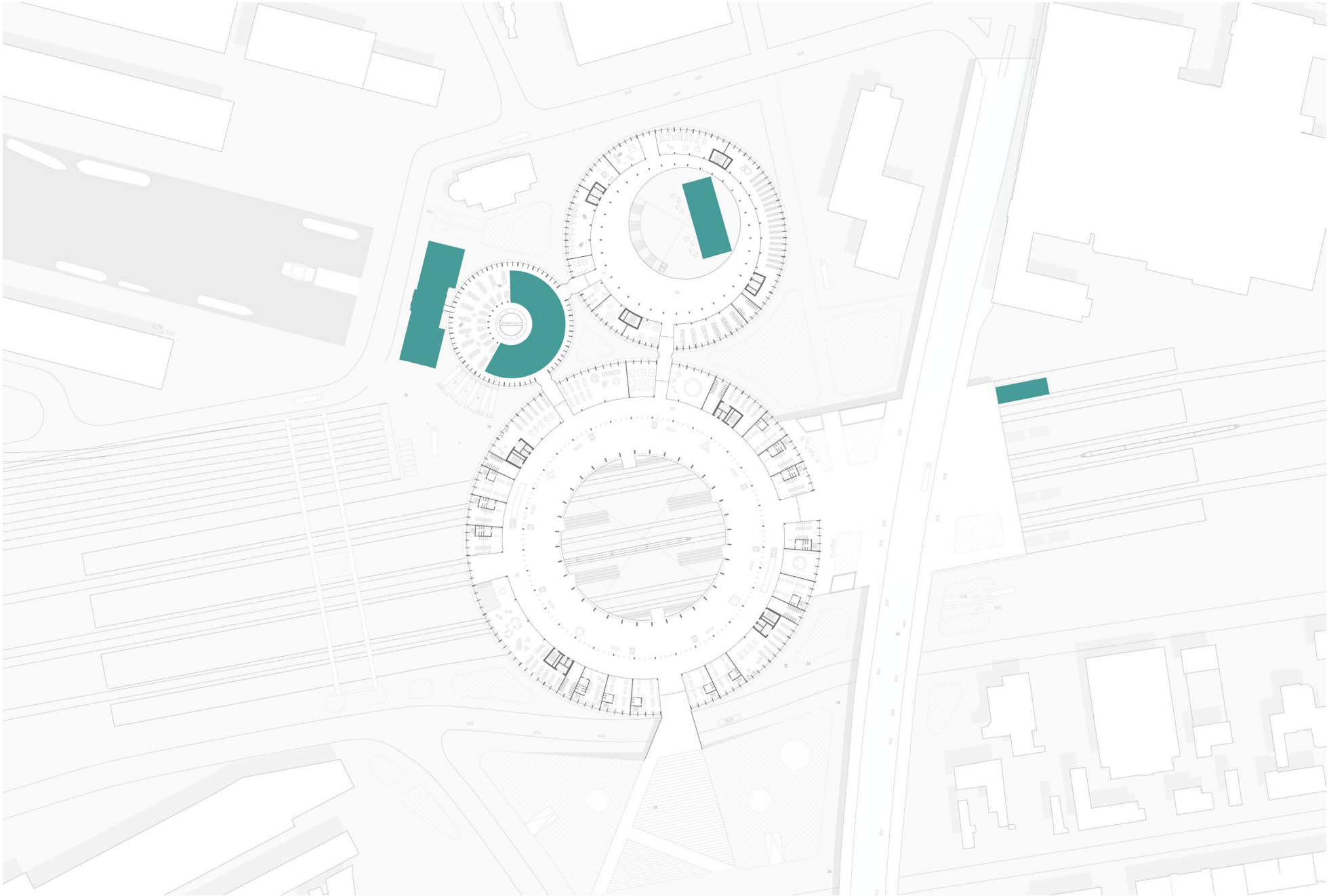
Design Implementation

RELATABLE SCALE



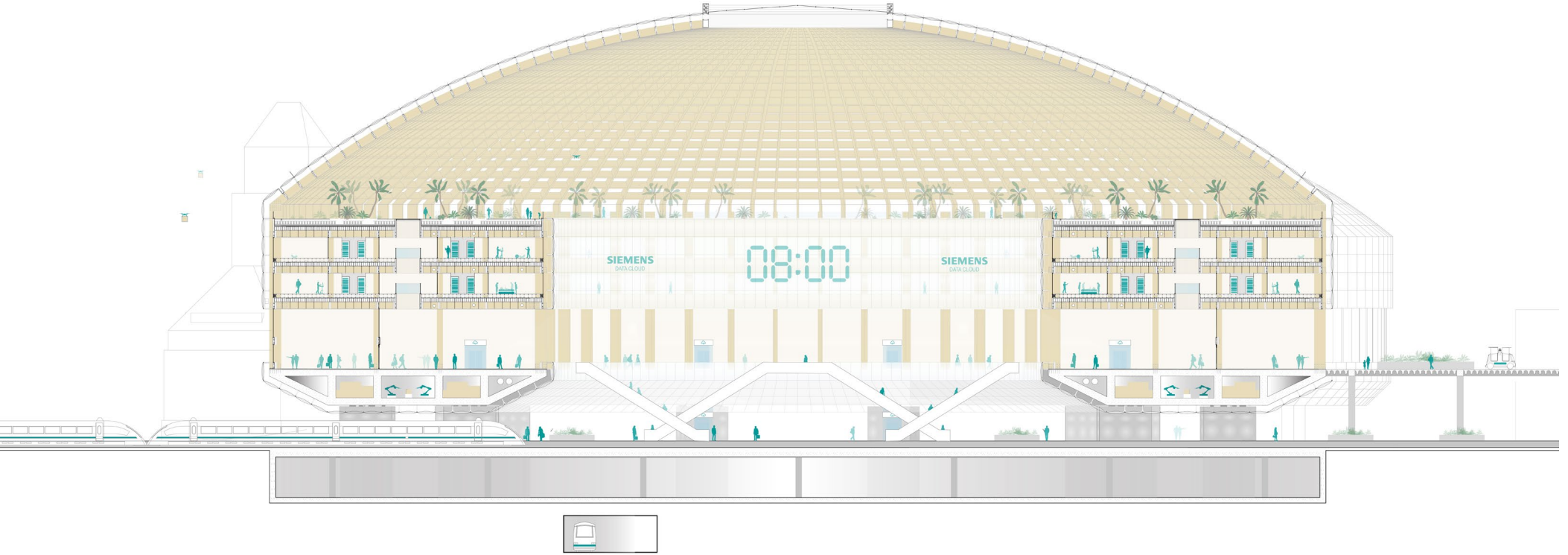
Design Implementation

INTEGRATION OF EXISTING (HERITAGE) BUILDINGS

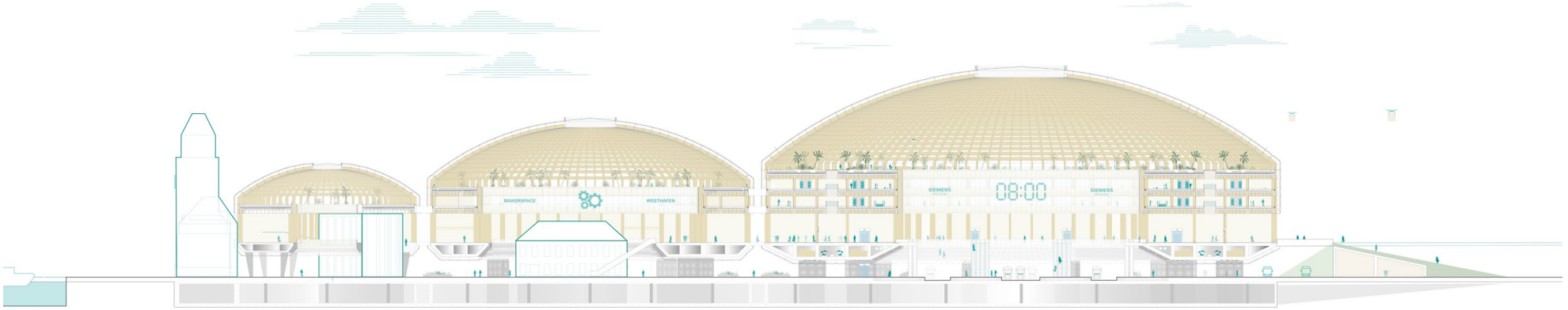


Design Implementation

SECTION

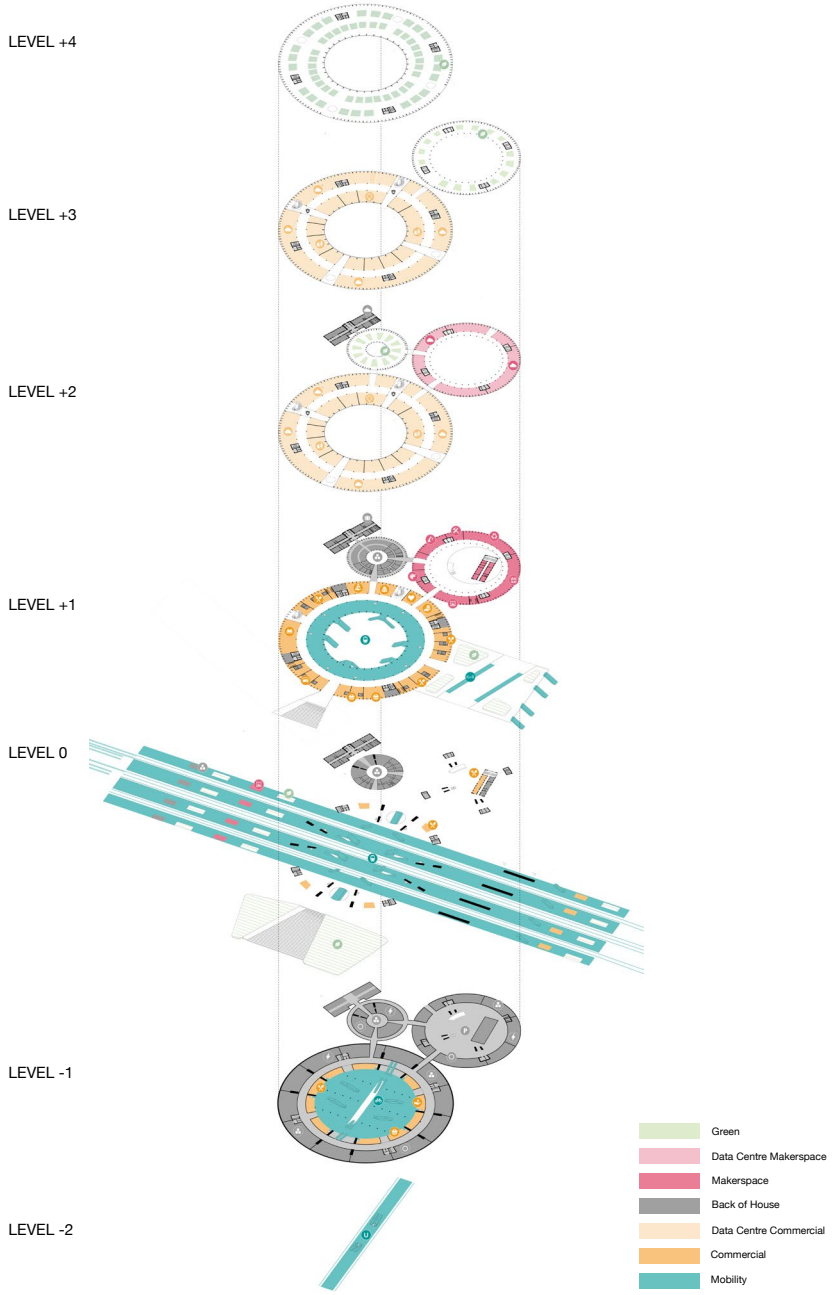


URBAN CONNECTION



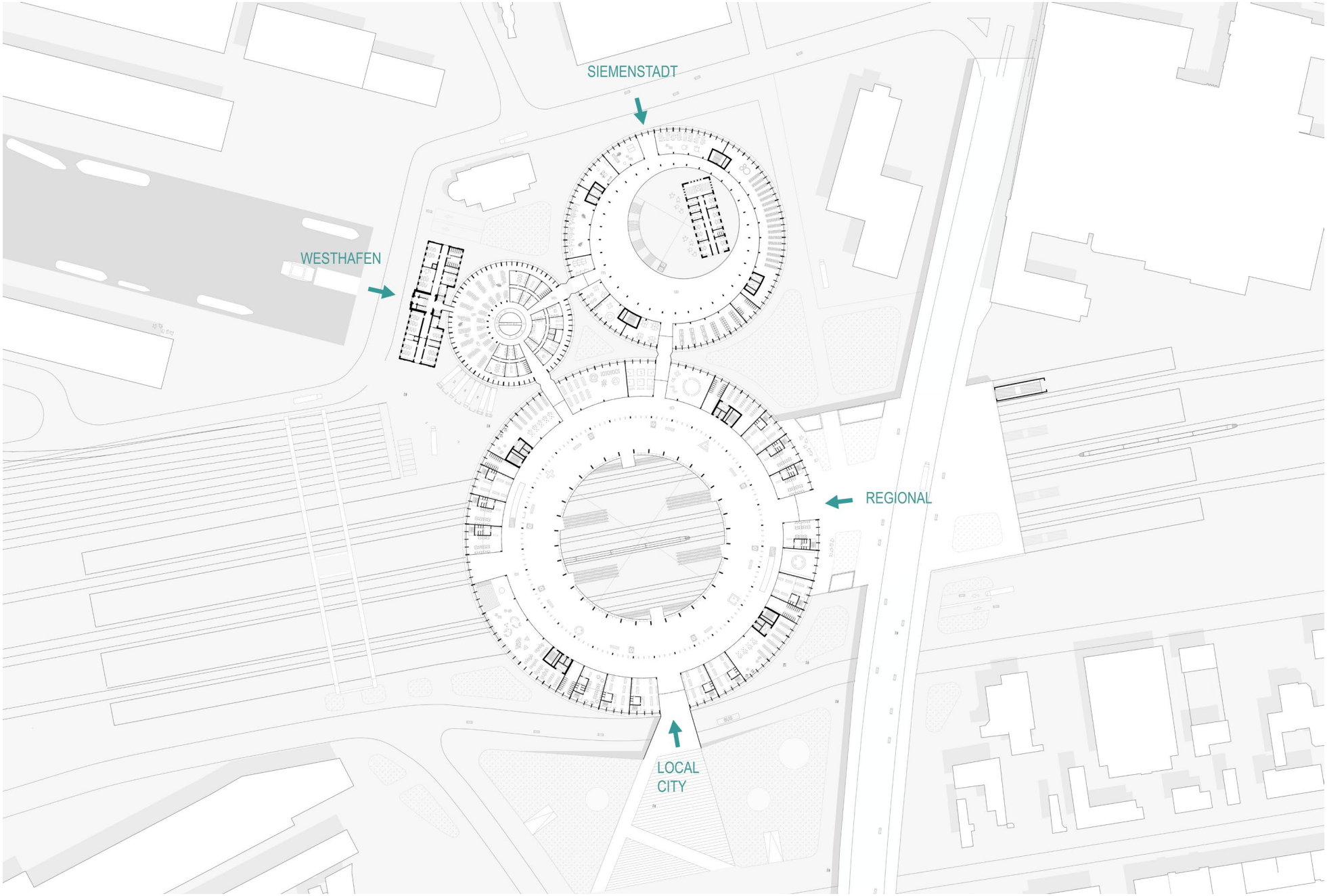
Design Implementation

VERTICAL ORGANISATION



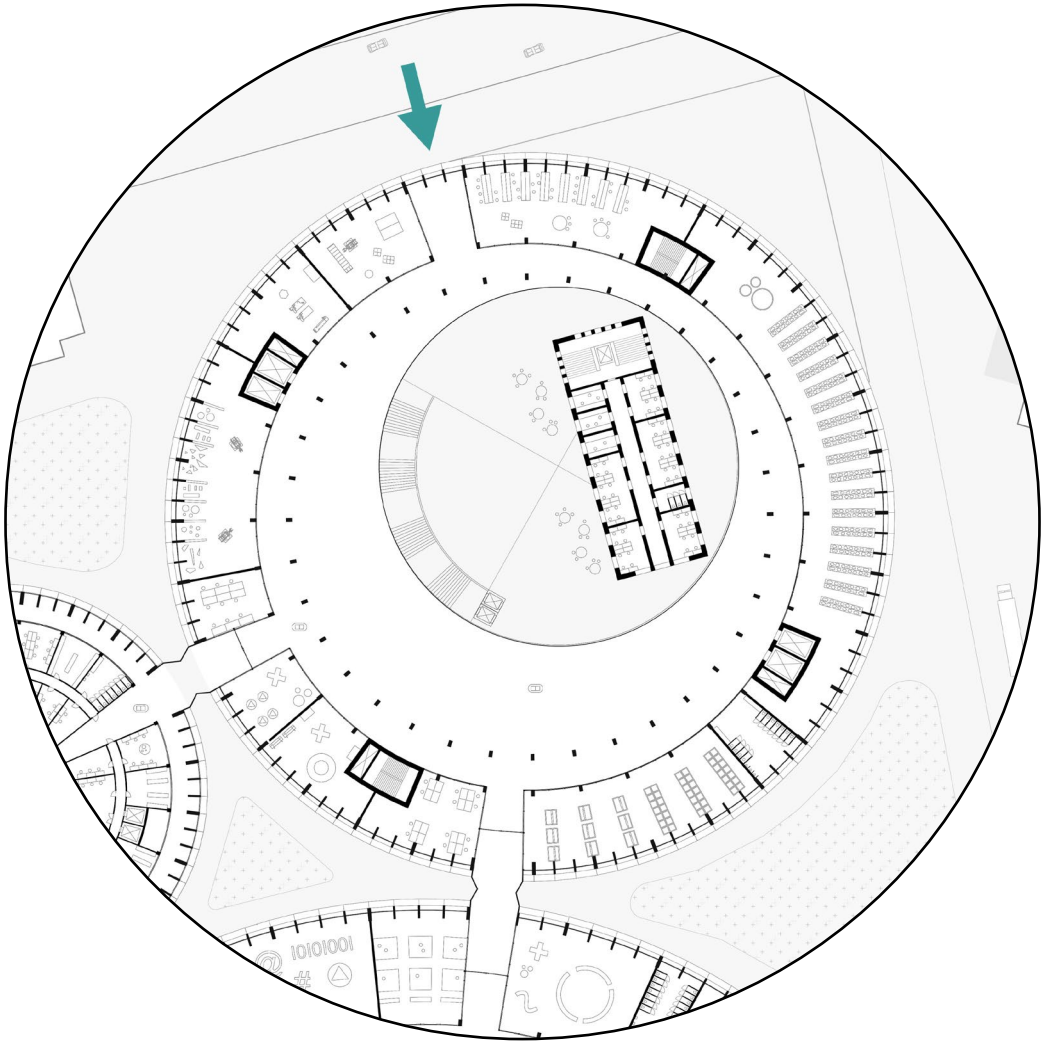
Design Implementation

MAIN ENTRANCES



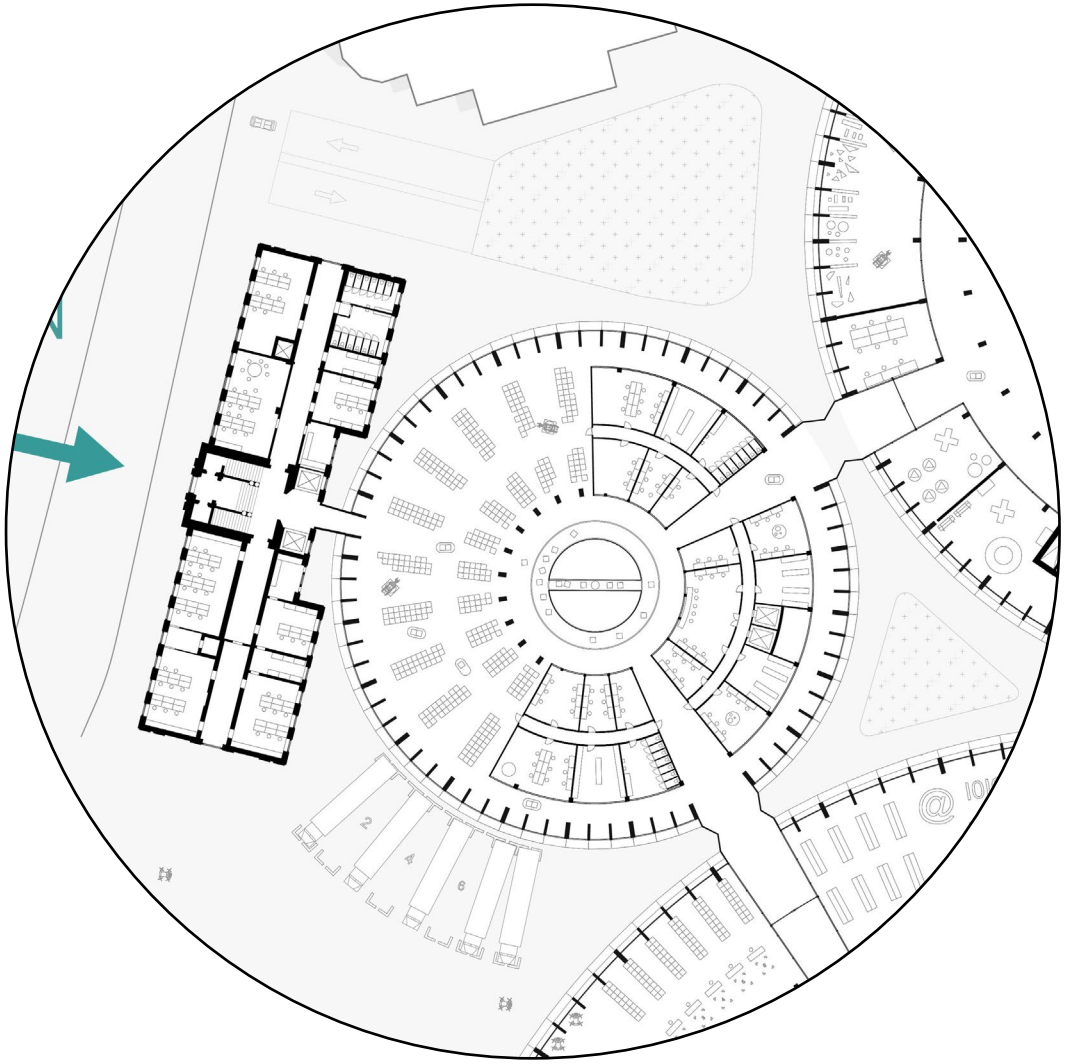
Design Implementation

MAKERSPACE & SIEMENSTADT



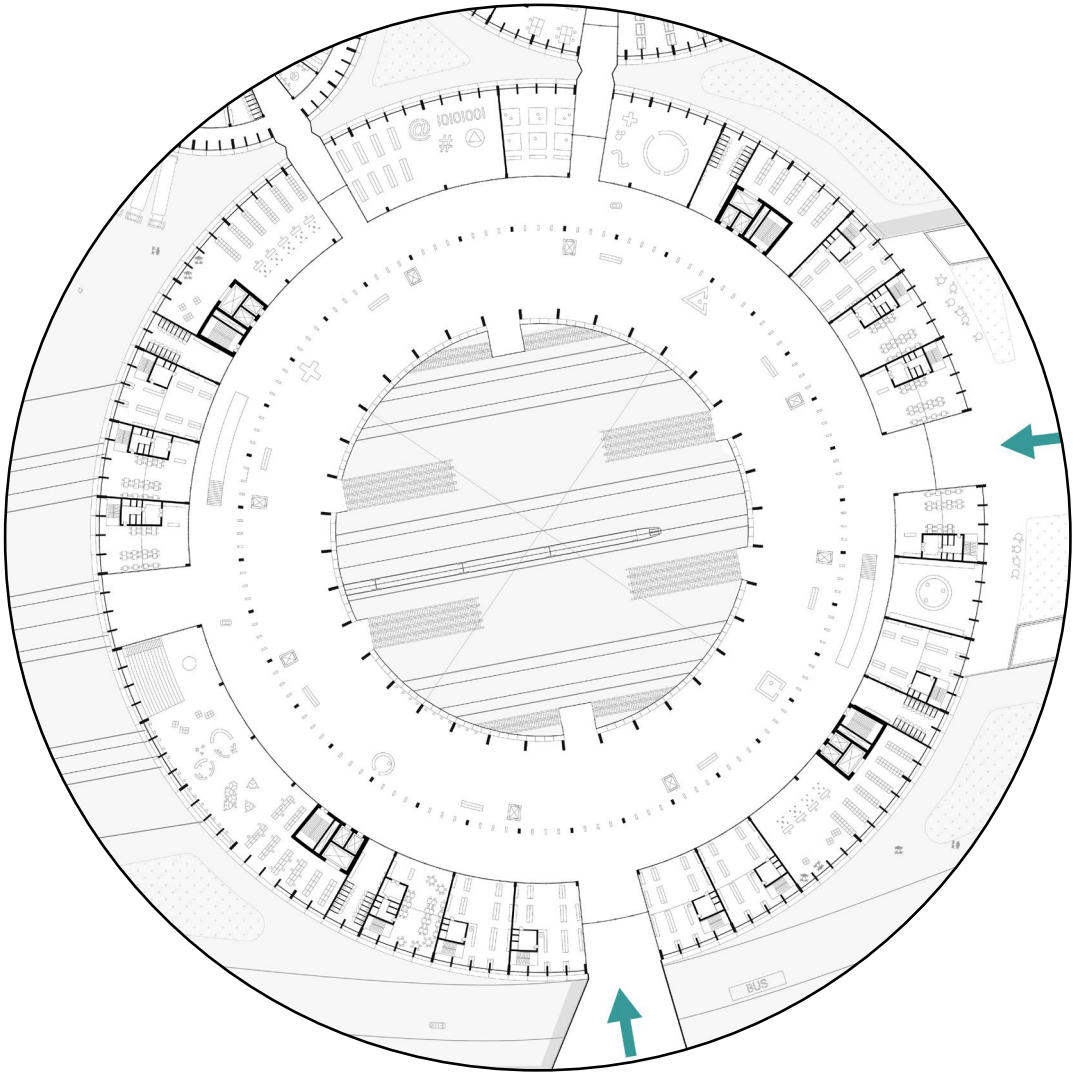
Design Implementation

LOGISTICS & PORT



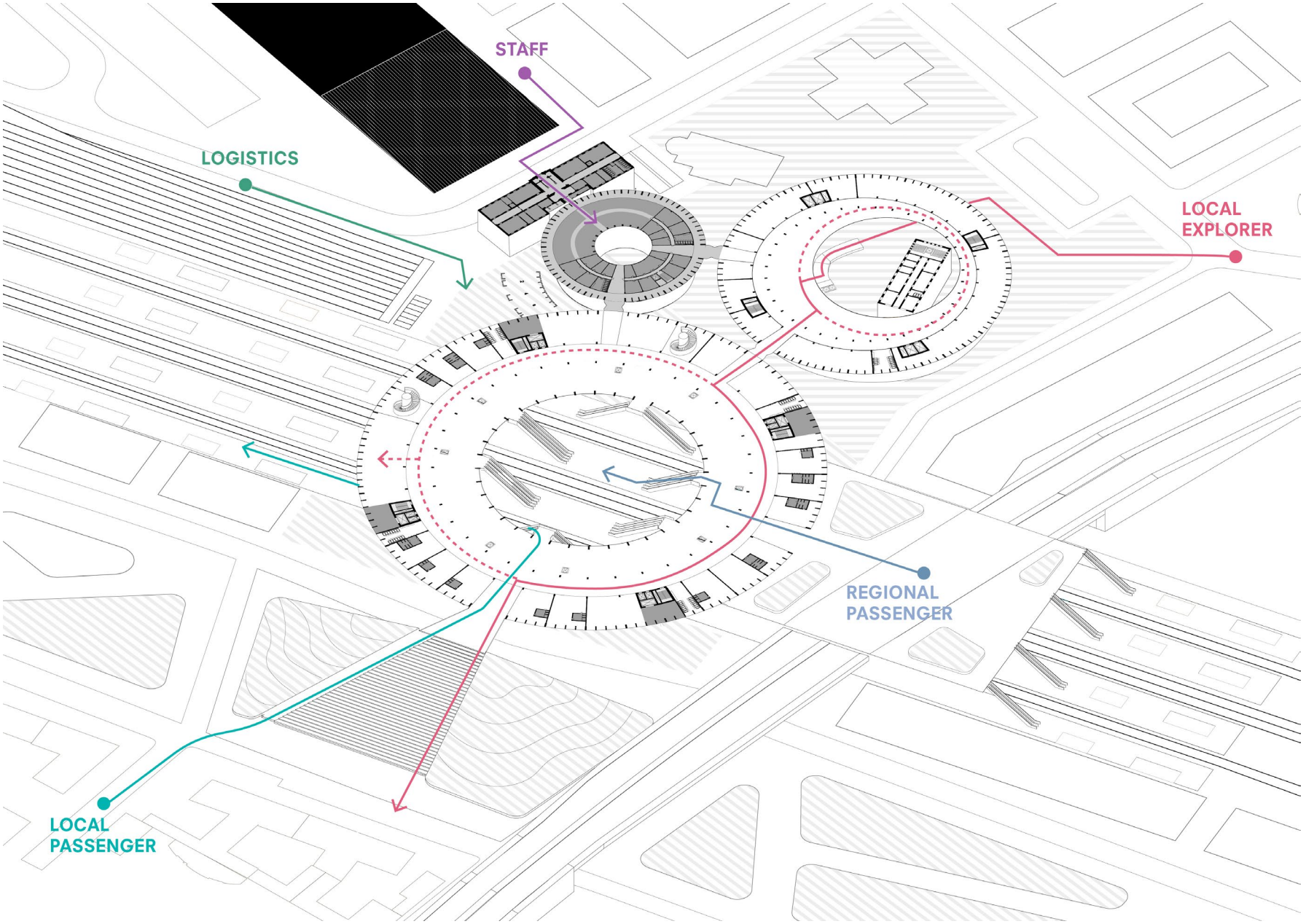
Design Implementation

TRAIN & CITY



Design Implementation

COMBINING RUSH & SLOW

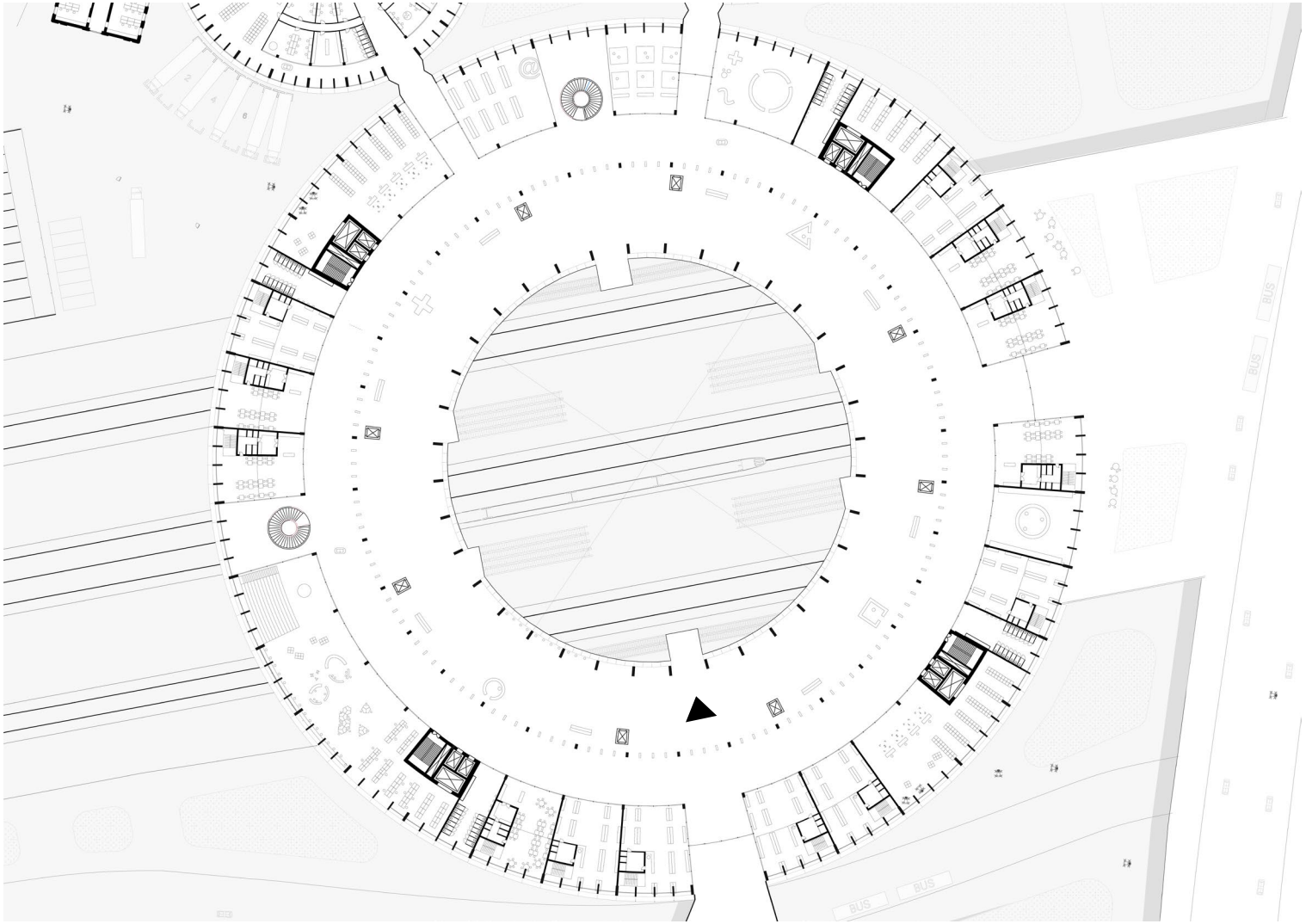


Design Implementation

CITY ENTRANCE

Design Implementation

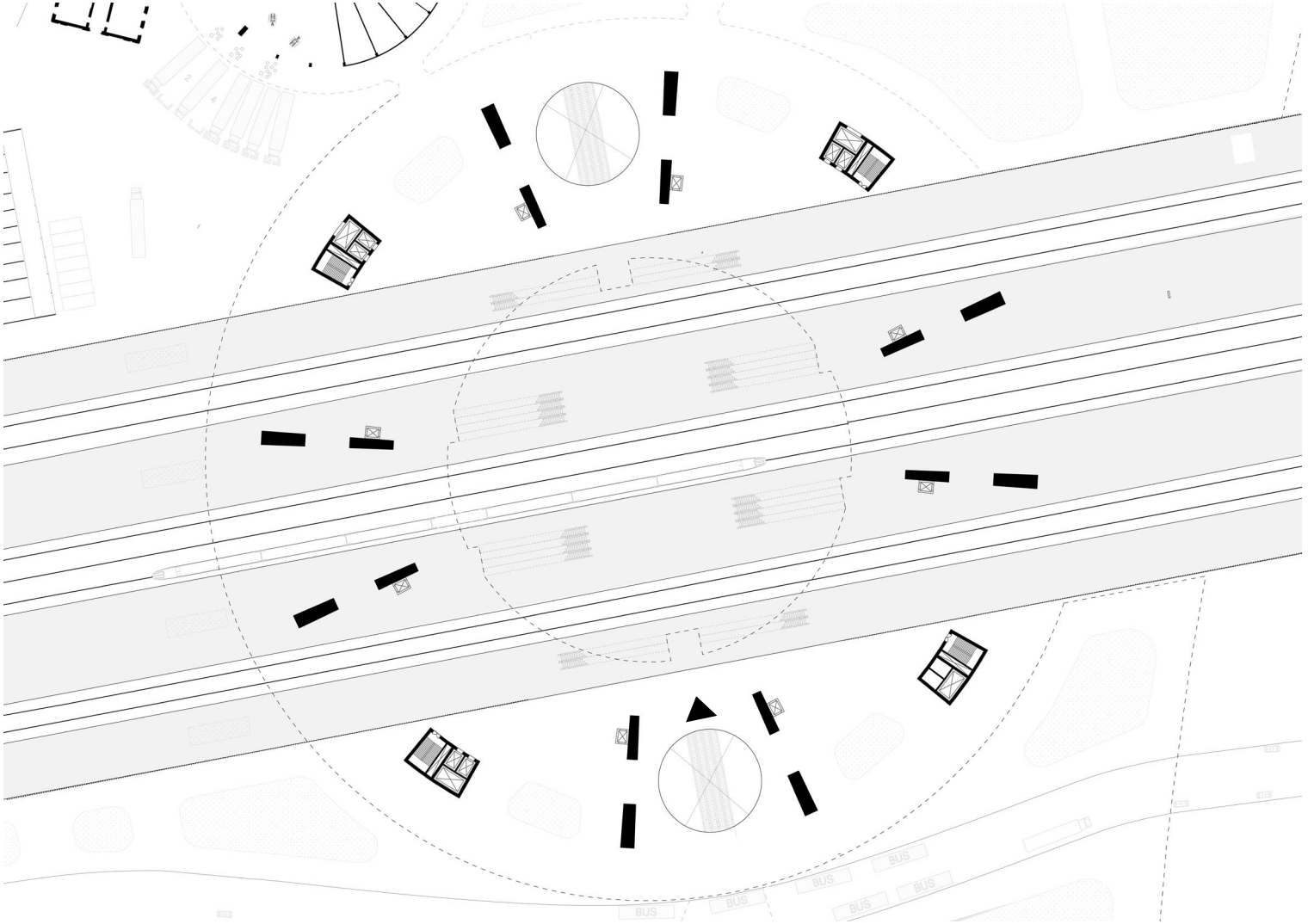
LEVEL 1: COMMERCIAL

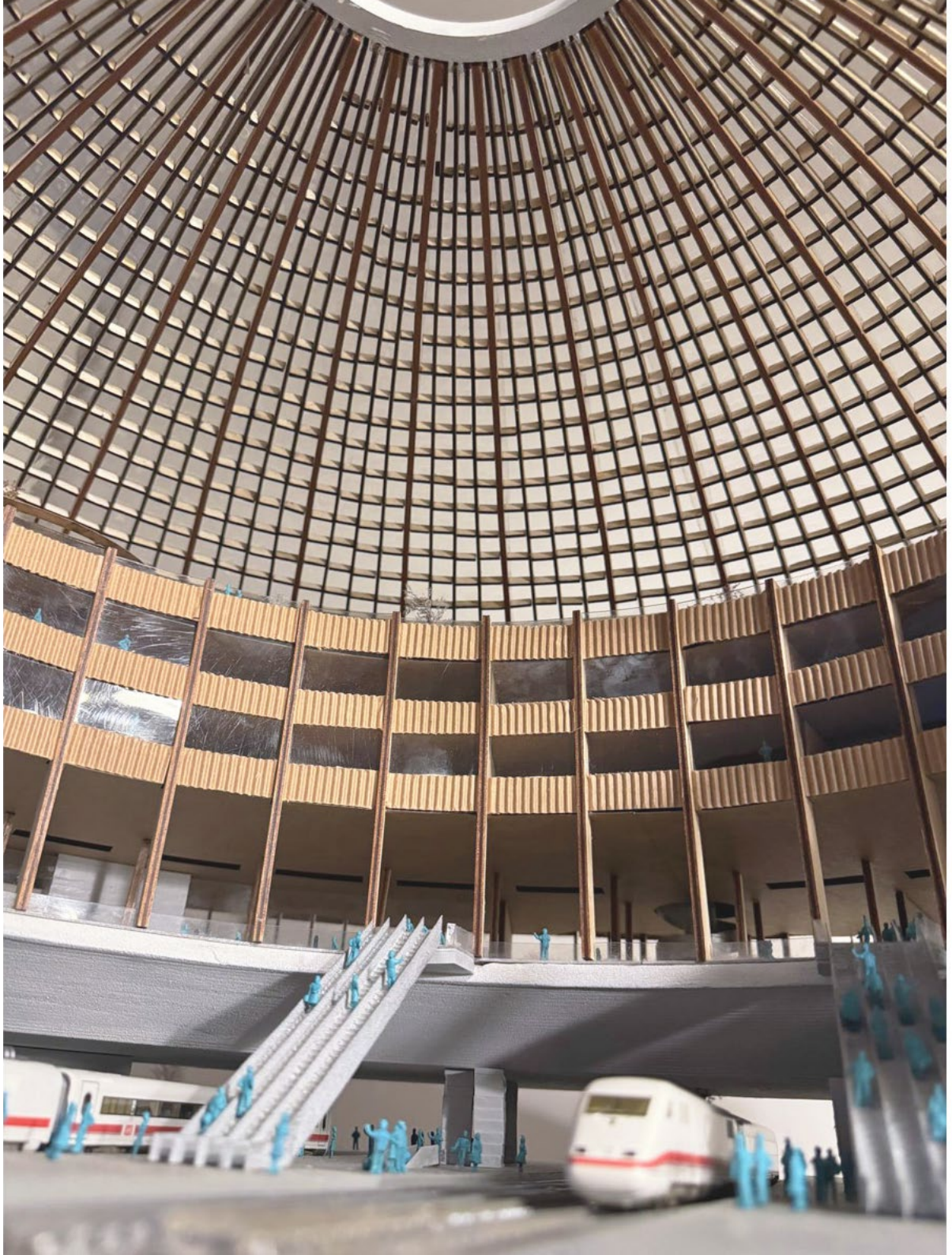



08:00

Design Implementation

LEVEL 0: TRAIN

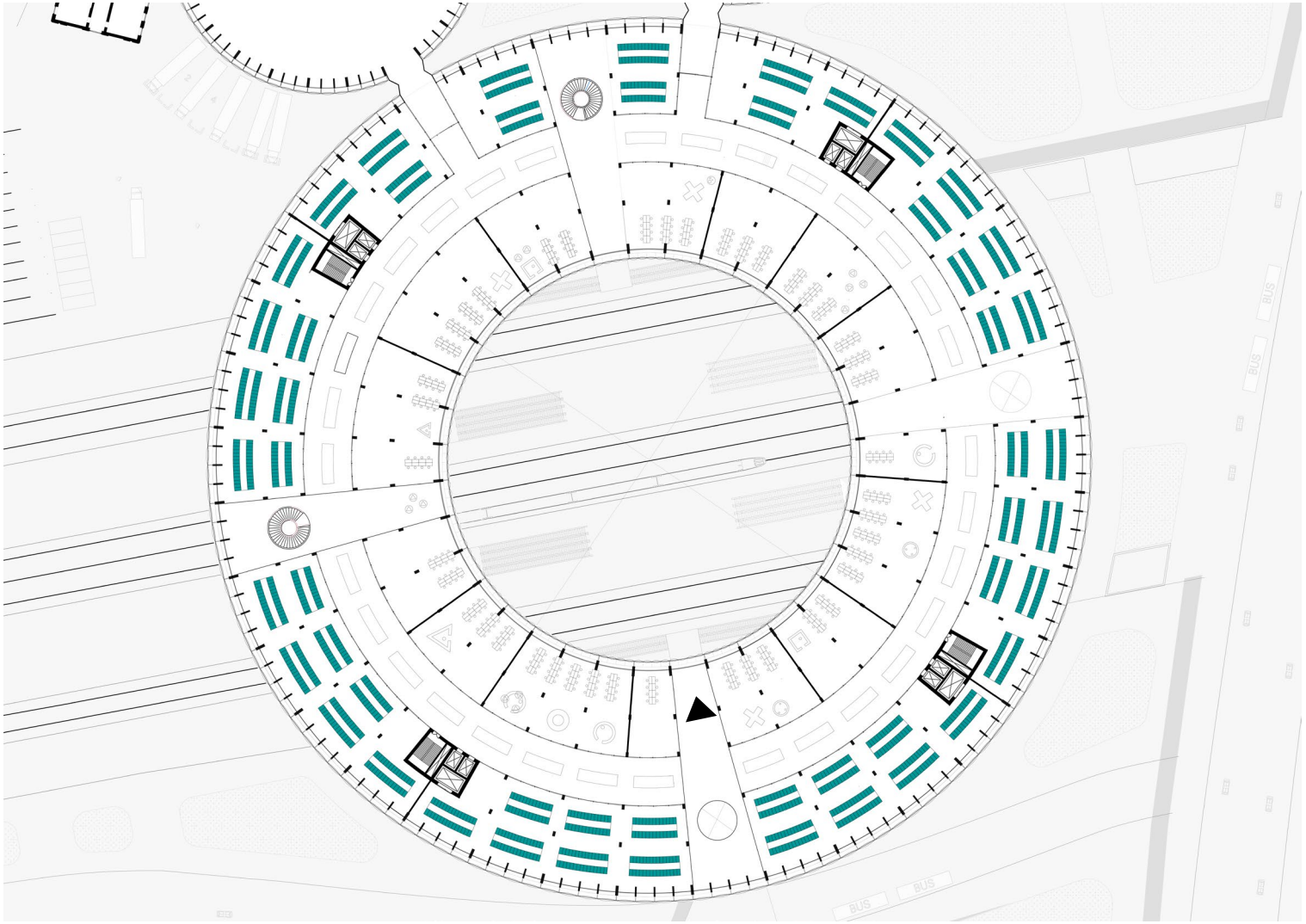


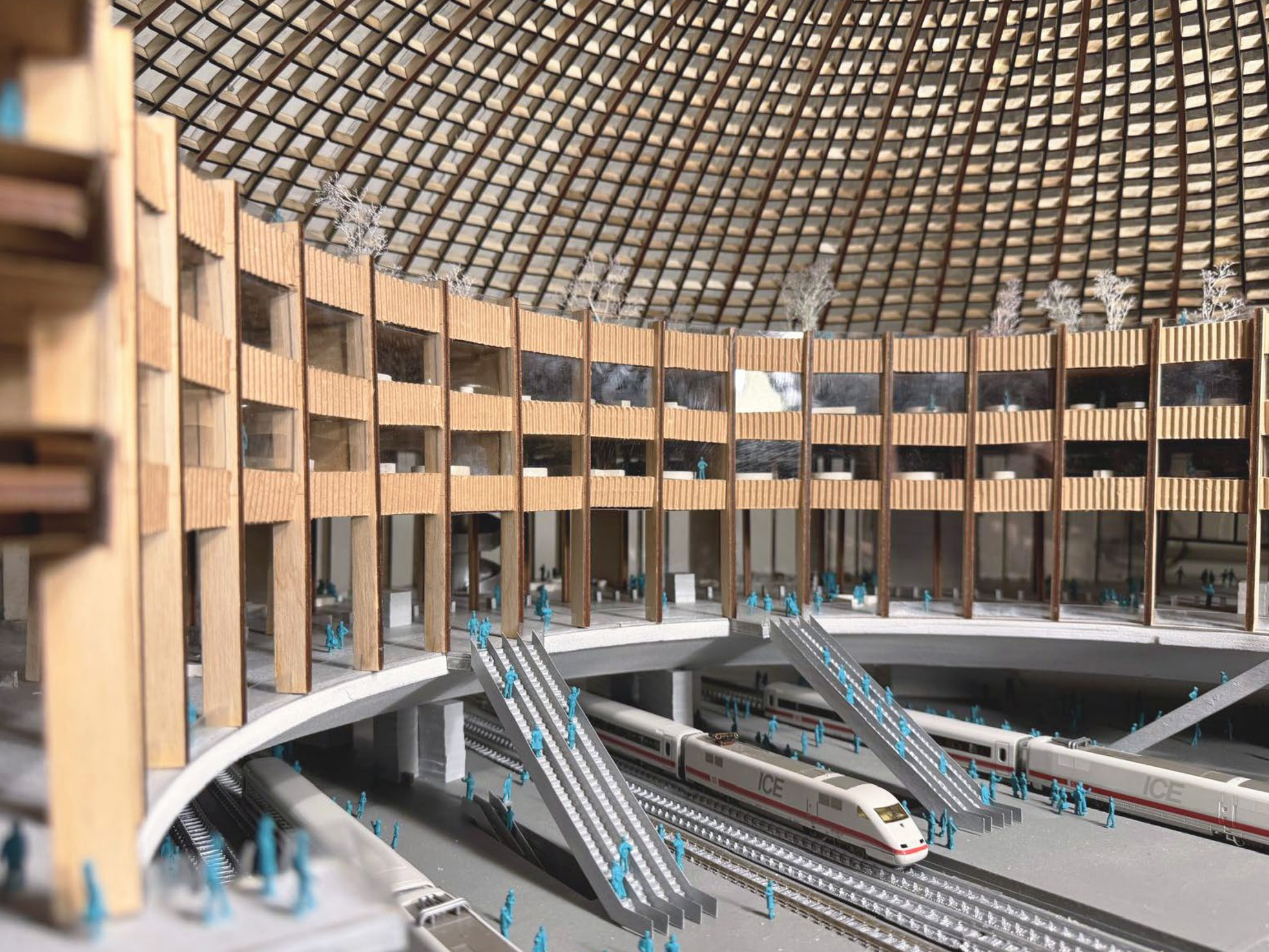


Berlin Studio

Design Implementation

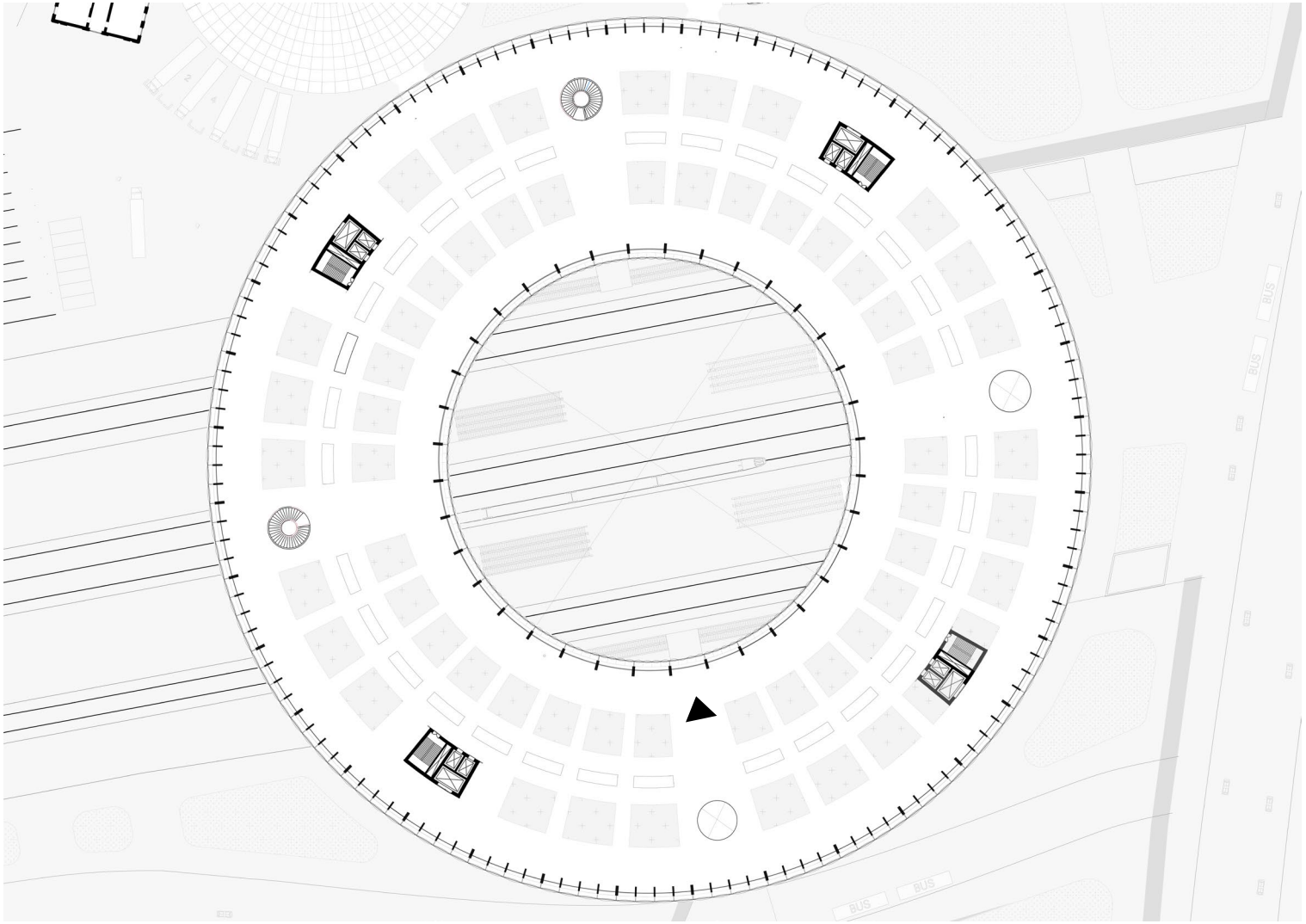
LEVEL 2+3: DATA

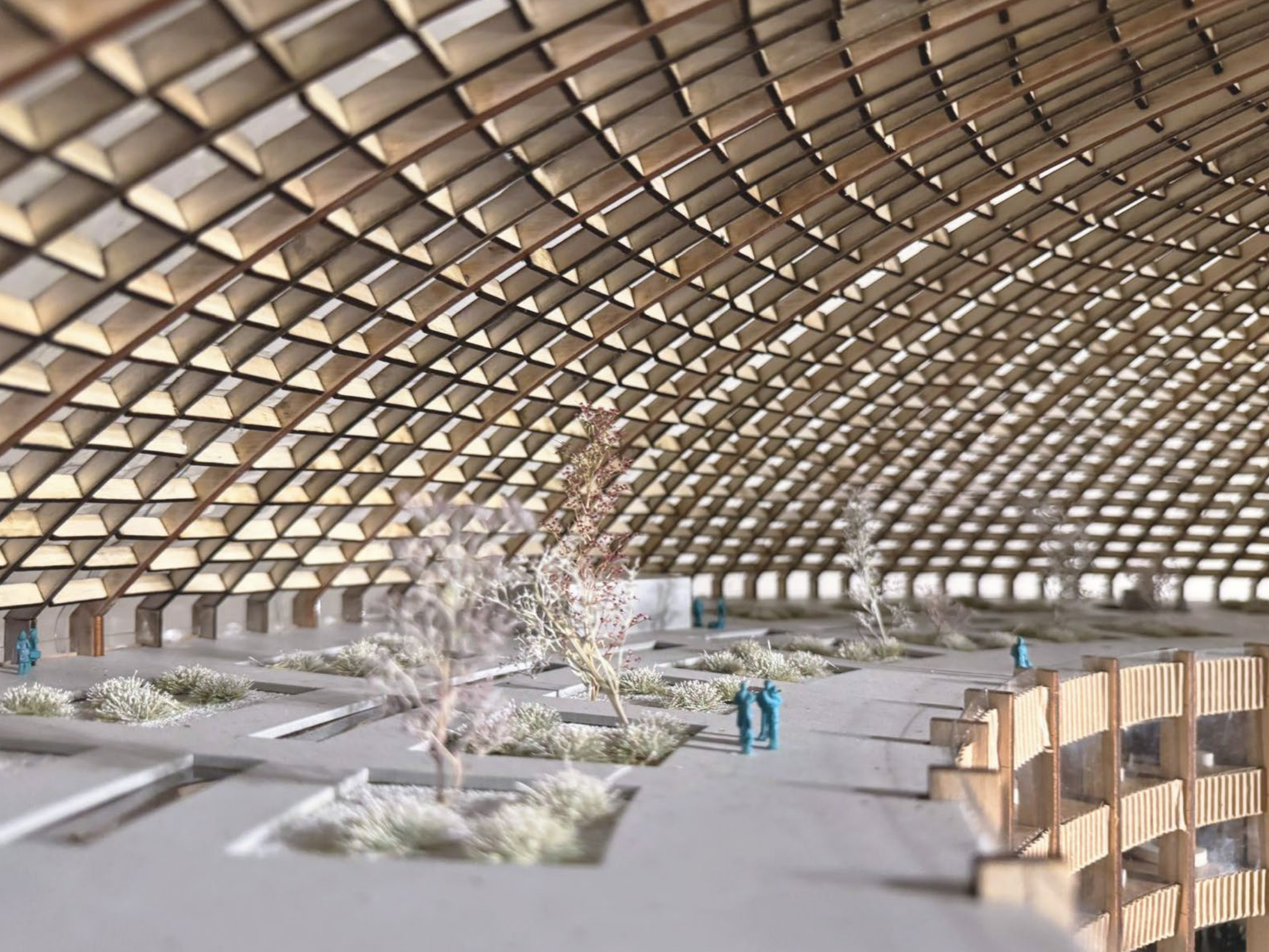



ICE
ICE

Design Implementation

LEVEL 4: BOTANICAL





Design Implementation

STRUCTURAL SEGMENT

Data-driven
Rectractable Oculus

Data-driven
ETFE facade +
Integrated PV
cells & LED

Lightweight
Glulam Timber
Skeleton + Gridshell Roof

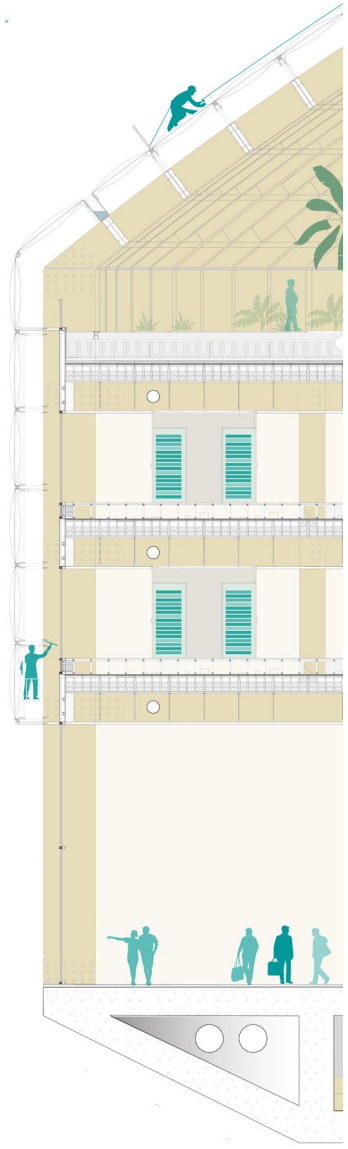
Botanical
Wintergarten

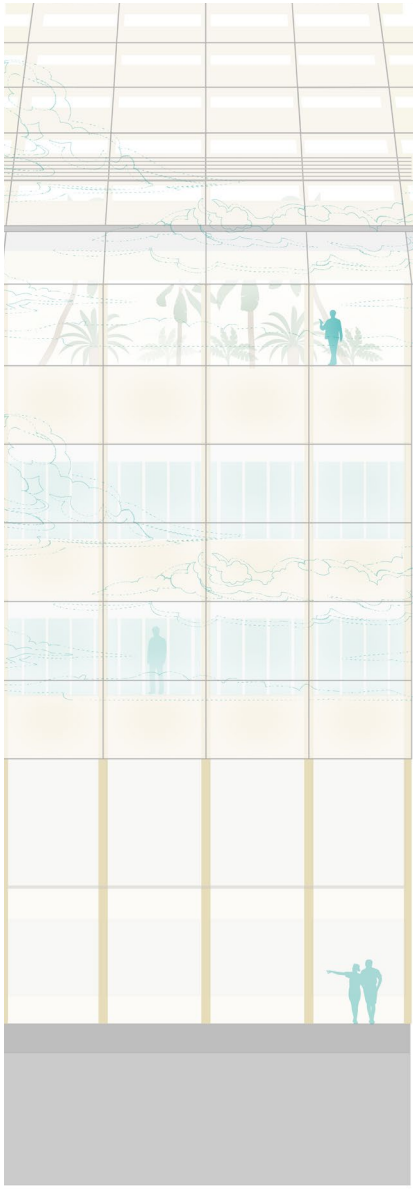
Data Centre
Heat Re-use

Futureproof
Concrete Girder

Design Implementation

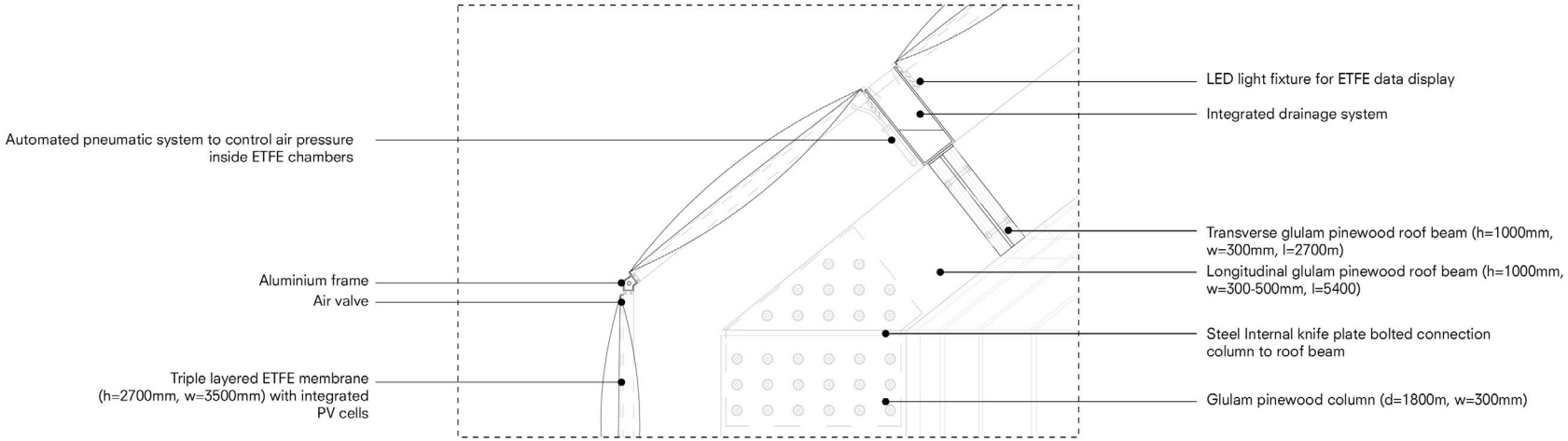
FACADE SEGMENT

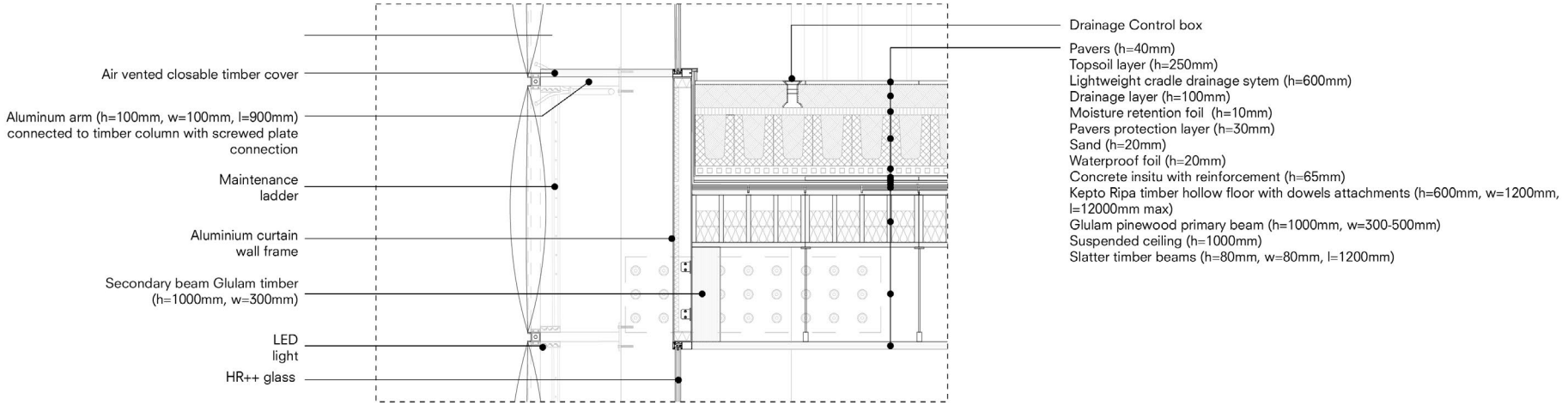




Design Implementation

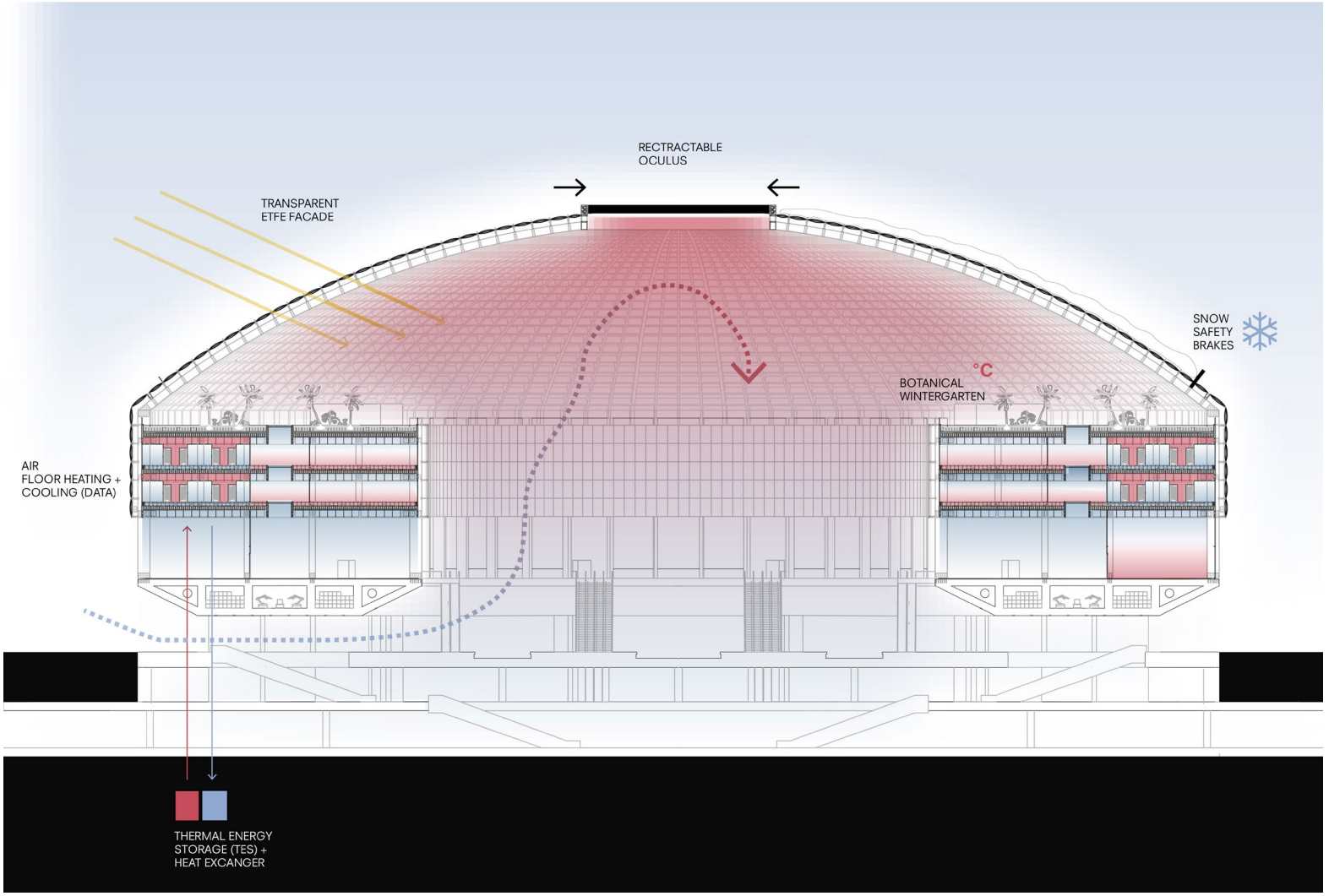
DATA DRIVEN ETFE SKIN





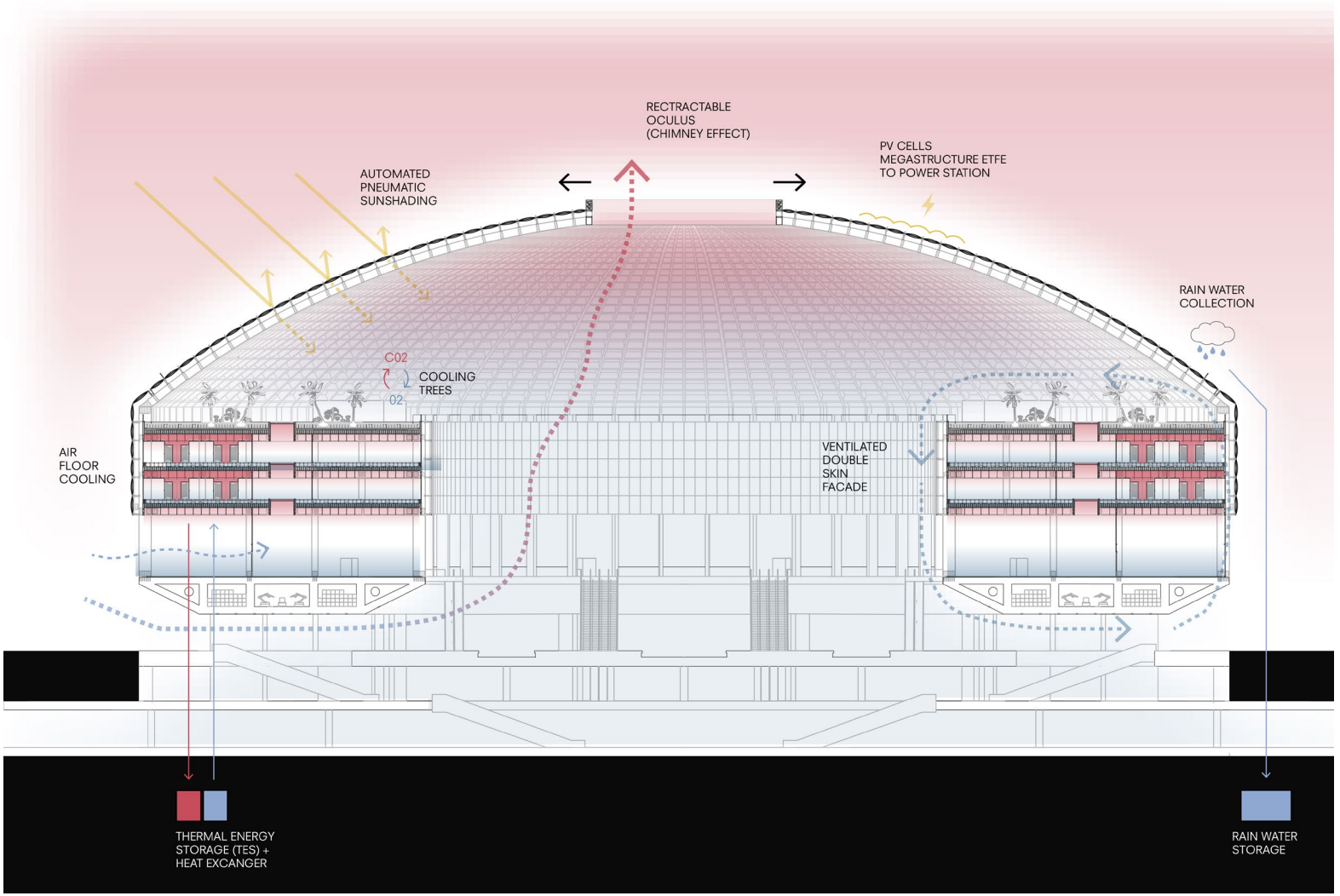
Design Implementation

WINTER CLIMATE



Design Implementation

SUMMER CLIMATE



INTRODUCTION

RESEARCH

DESIGN BRIEF

IMPLEMENTATION

REFLECTION

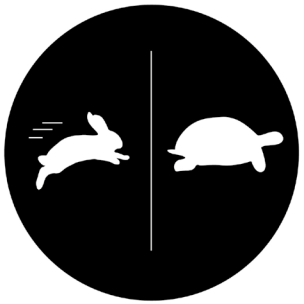
Reflection

RESEARCH QUESTION

HOW WILL DATA IMPACT THE DESIGN OF A TRAIN STATION FOR RUSH HOUR?

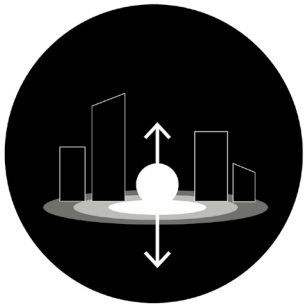
Reflection

THE TRAIN STATION AS THE FUTURE DATAPORT

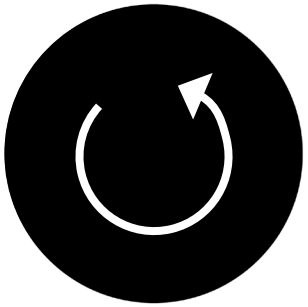


COMBINING RUSH AND SLOW

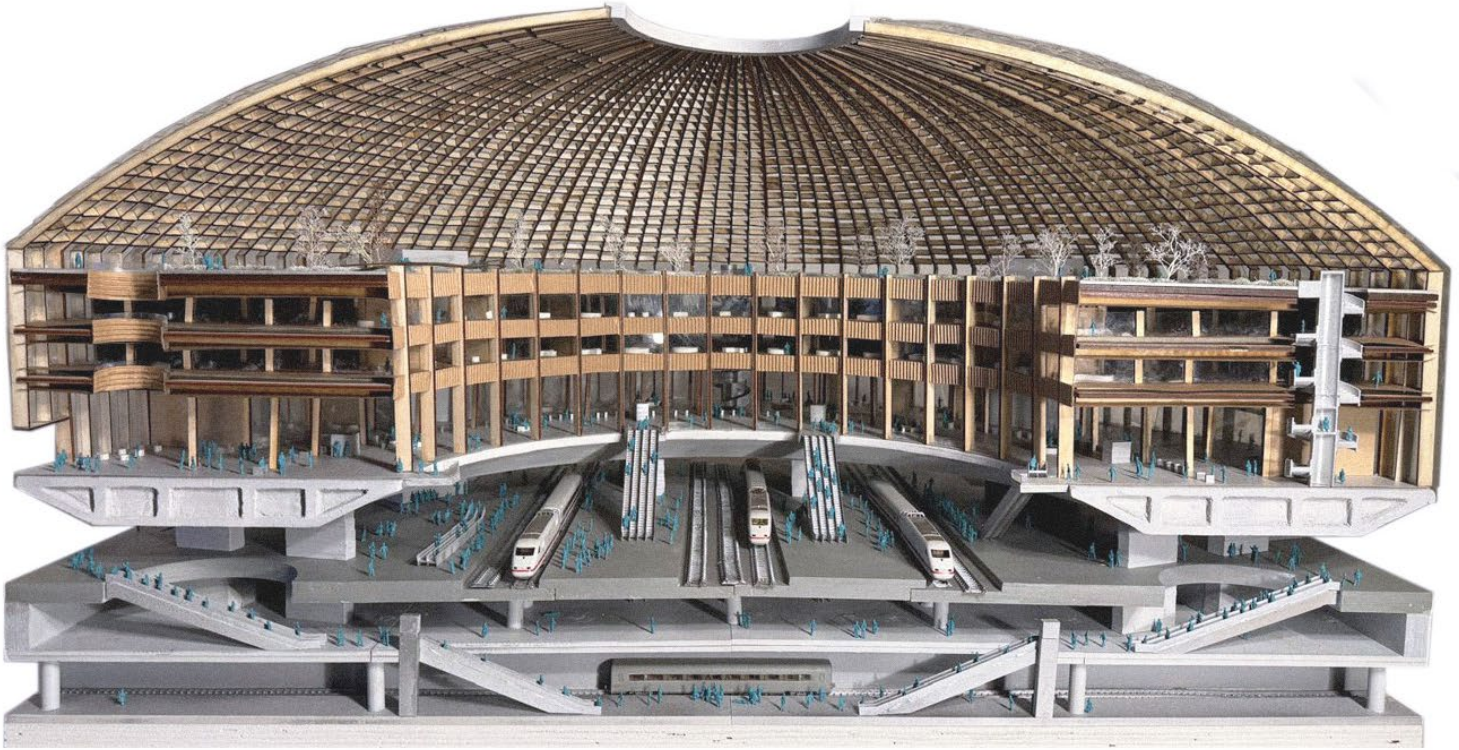
EXCHANGING FLOW OF PEOPLE, DATA AND GOODS



URBAN ANCHOR OF THE DATA SOCIETY



CIRCULAR MEGASTRUCTURE



THANK YOU!