

**YUNTIAN ZHANG**

---

Works Selection  
GSAPP 2023

Architecture is for experience. As a designer, a researcher, a thinker, and a futurist, I pursue the convergence of technology and architecture as the catalyst for producing provocative experiences. My design-thinking takes inspirations from filmmakers to bring moments into my design, picturing the past, present, and future of my design within a narrative storyline.

01

**Upon Water**

*A Data Center & Meanwhile An Aquatic Sports Center*

02

**AirCO -- A Cyborg Company**

*Self-Producing & Self-Digesting Energy Exchange Factory*

03

**TUBE -- Spectacle of Automation**

*Intelligent Container Transportation & Accommodation System*

# 01

**Dyson Ring Space City**

*VRay Render Works*





01

**UPON WATER**  
**A Data Center & Meanwhile An Aquatic Sports Center**

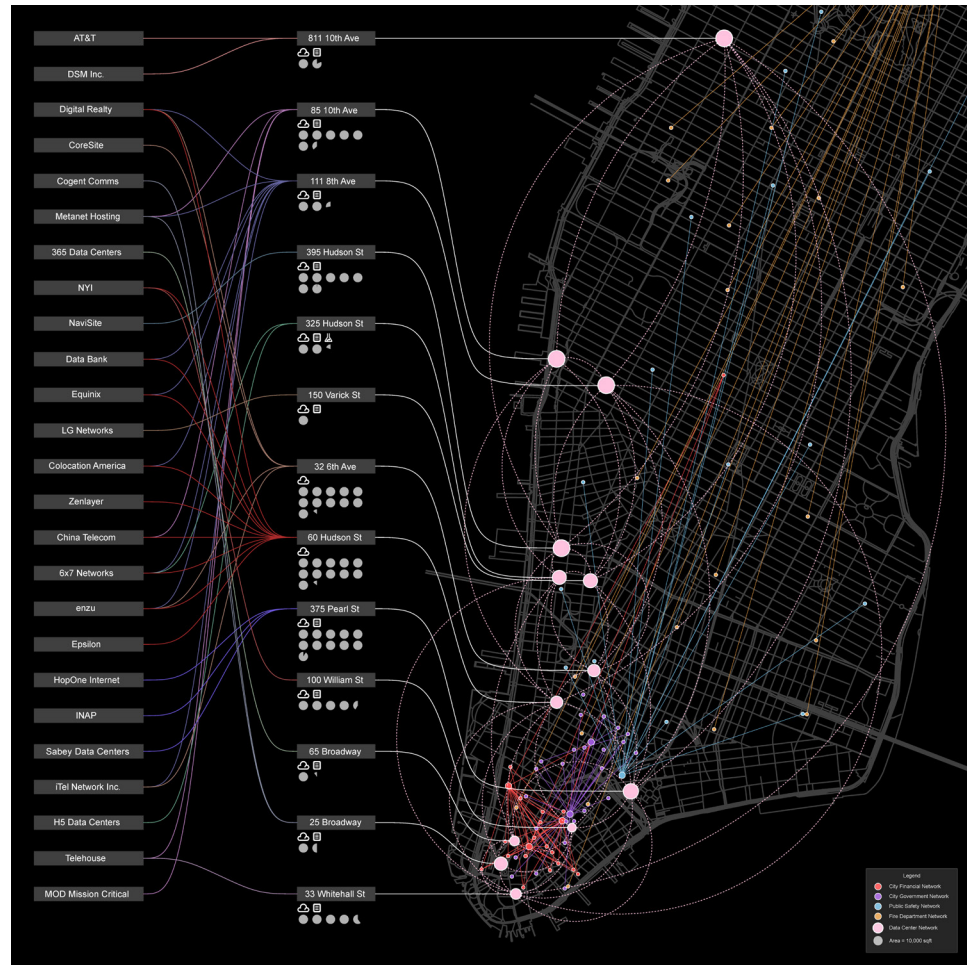
Collaborator: Nan Wei  
Advisor: Karla Rothstein  
Columbia GSAPP Summer 2022 Advanced Arch Design Studio

As the most important critical infrastructure in this century, data center has emerged as the new territory in architecture that focuses on designing for the machines. While it is a people-less space, this typology consumes massive amount of energy on preserving the machines, data storage, and server cooling. People remain physically distant from the data centers while producing massive amount of data stream on apps and websites, projecting their virtual presences into the servers far away.

Since the pandemic, in these spaces where human access is strictly limited, millions of New Yorkers gathered in a virtual and digital way, crowding those servers. During the pandemic, due to the restrictions on physical and social pursuits, data server demand spiked two to three times when people transitioned to online platforms. Data centers have become the most populated urban and architectural spaces in the post-digital time and pandemic era.

Upon Water rethinks the relationship between data centers and human activities. Situated at the riverside of the south-east corner of Manhattan, the data center draws water from the Hudson River to cool the data servers configured in numerous structural pillars and, by utilizing the gravitational momentum of the water and the heat of the water, the building generates power of its own to reduce the urban energy burden, while processing the water for diverse municipal programs, public pools, deep diving, indoor skiing, hot springs, and water therapy.

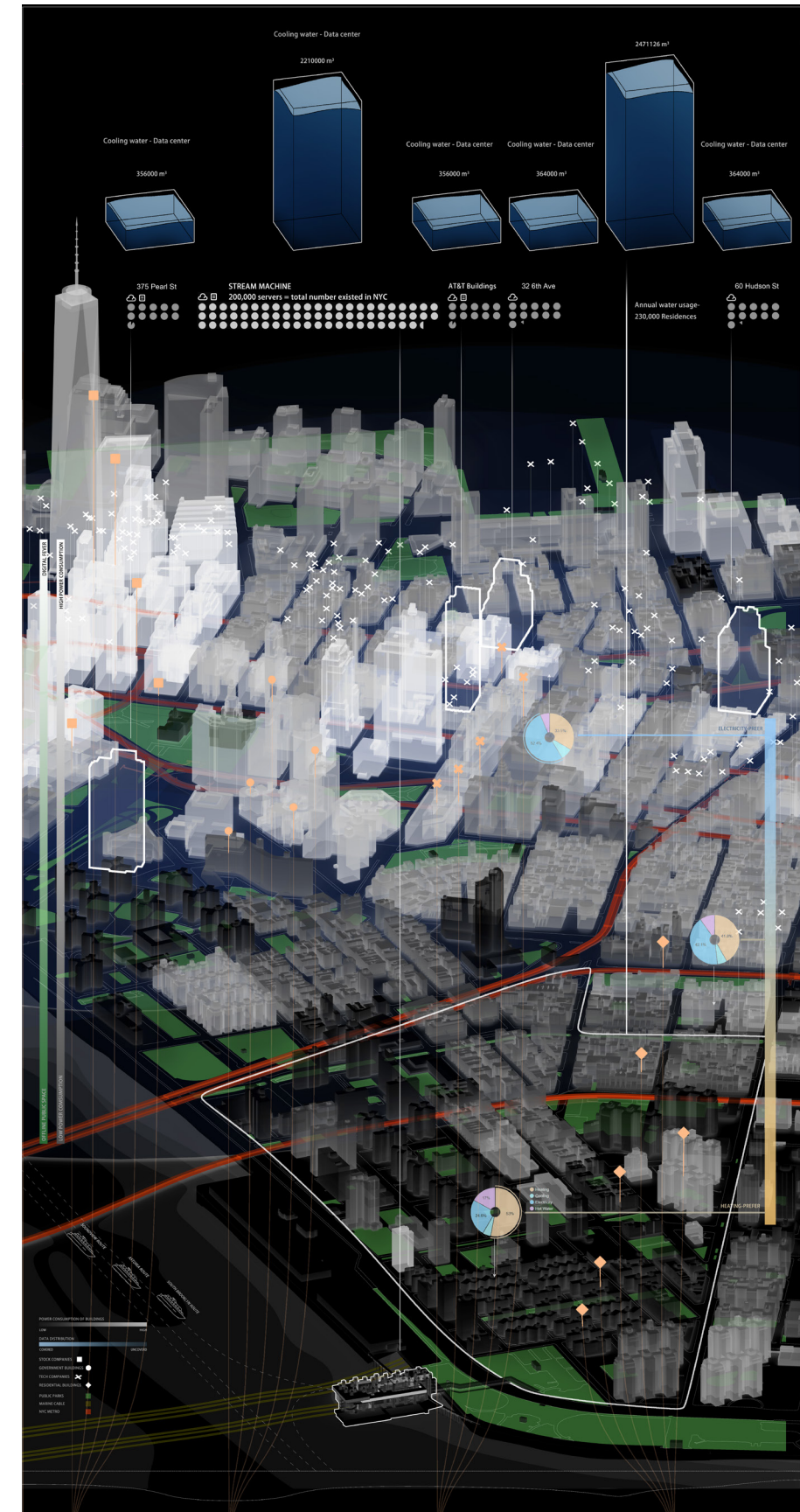




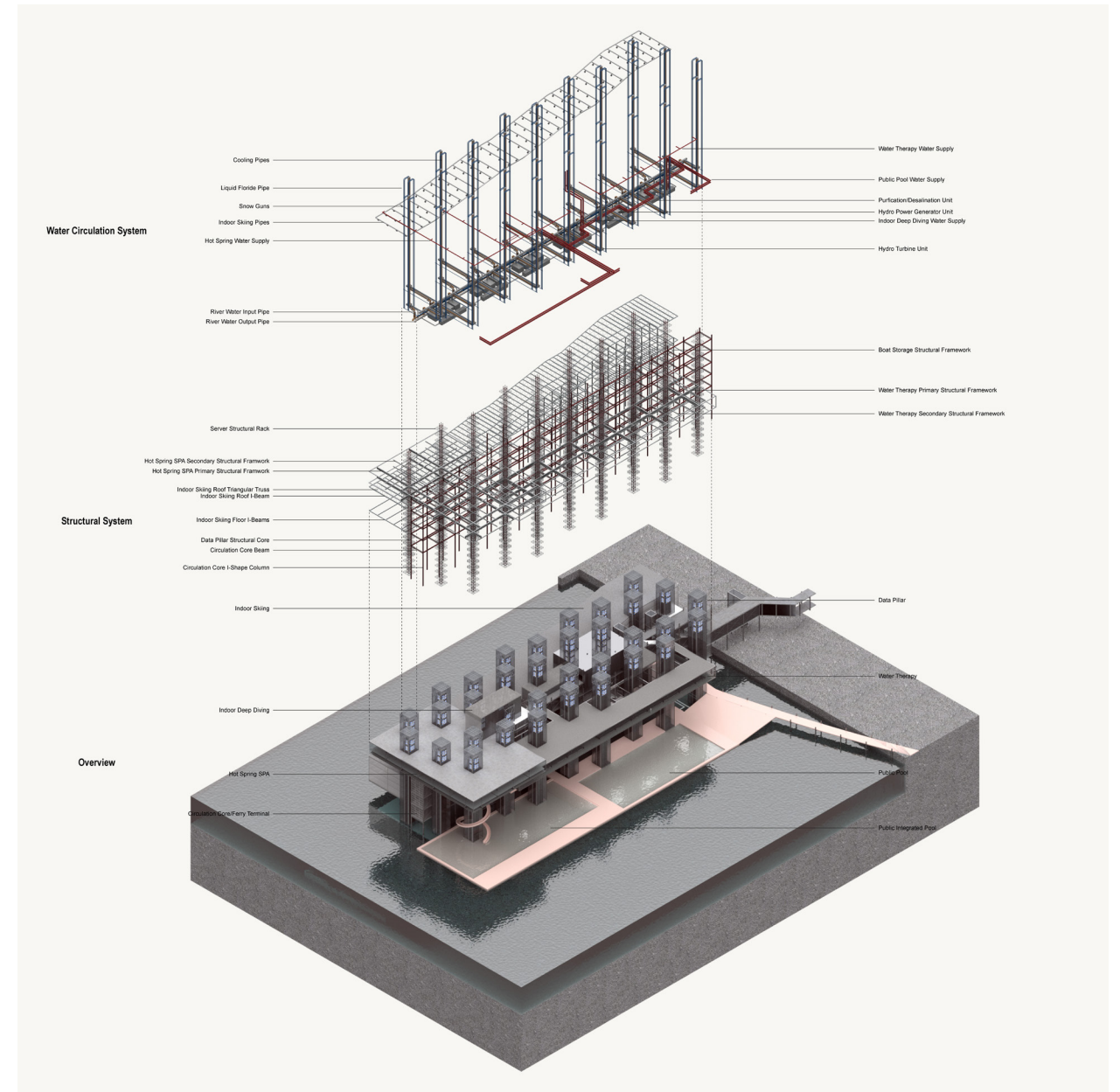
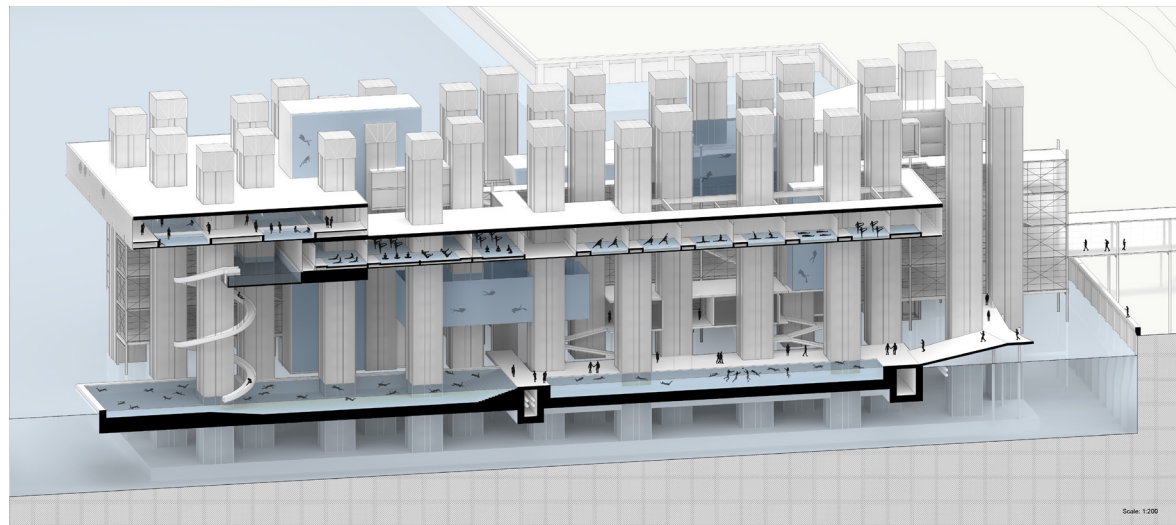
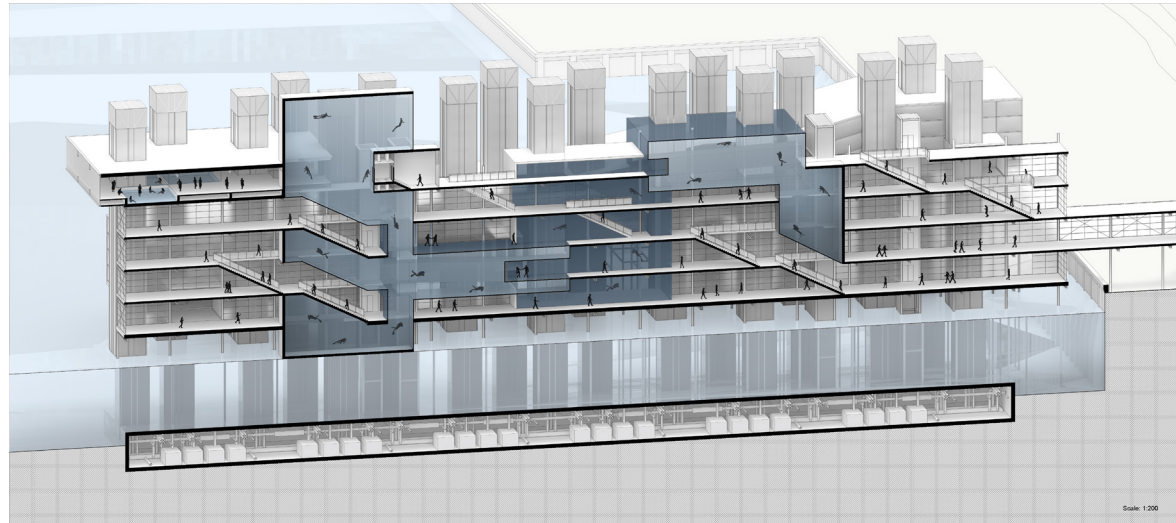
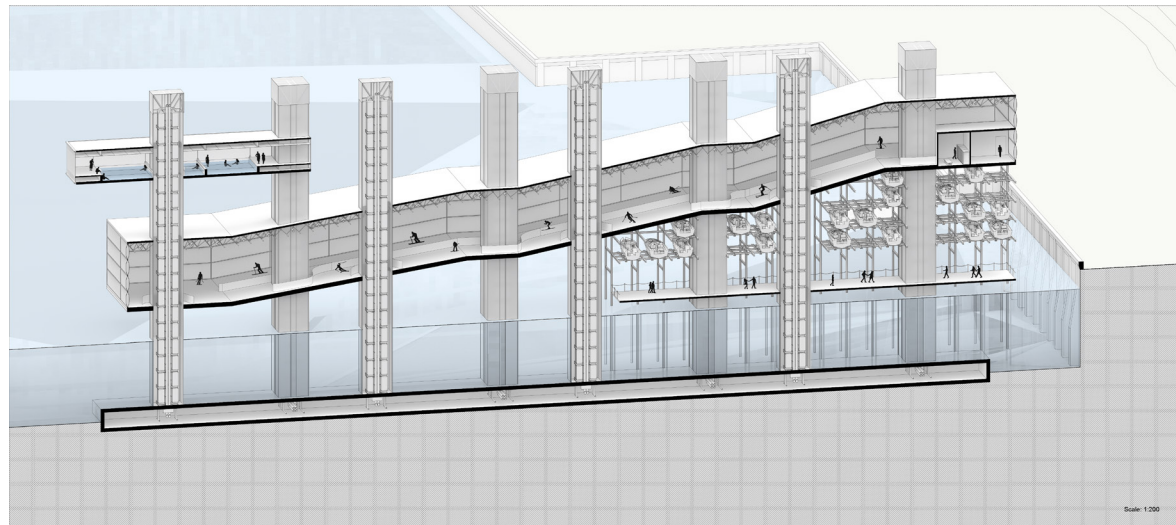
*Existing Landscape of Data Centers in New York City*

Different from new-born and growing towns bred by tech-giant's massive hyperscale data centers crawling on vast lands, New York City, especially Manhattan, has its data centers concealed in old buildings, either modern or classical unrecognizable from the outside, blending into the crowded urban environment as skyscrapers and high-rise.

These facilities, all colocation data centers with mixed-use programs such as offices for lease and labs, are sparsely occupied by people due to the unwelcoming environment of the data storage space.





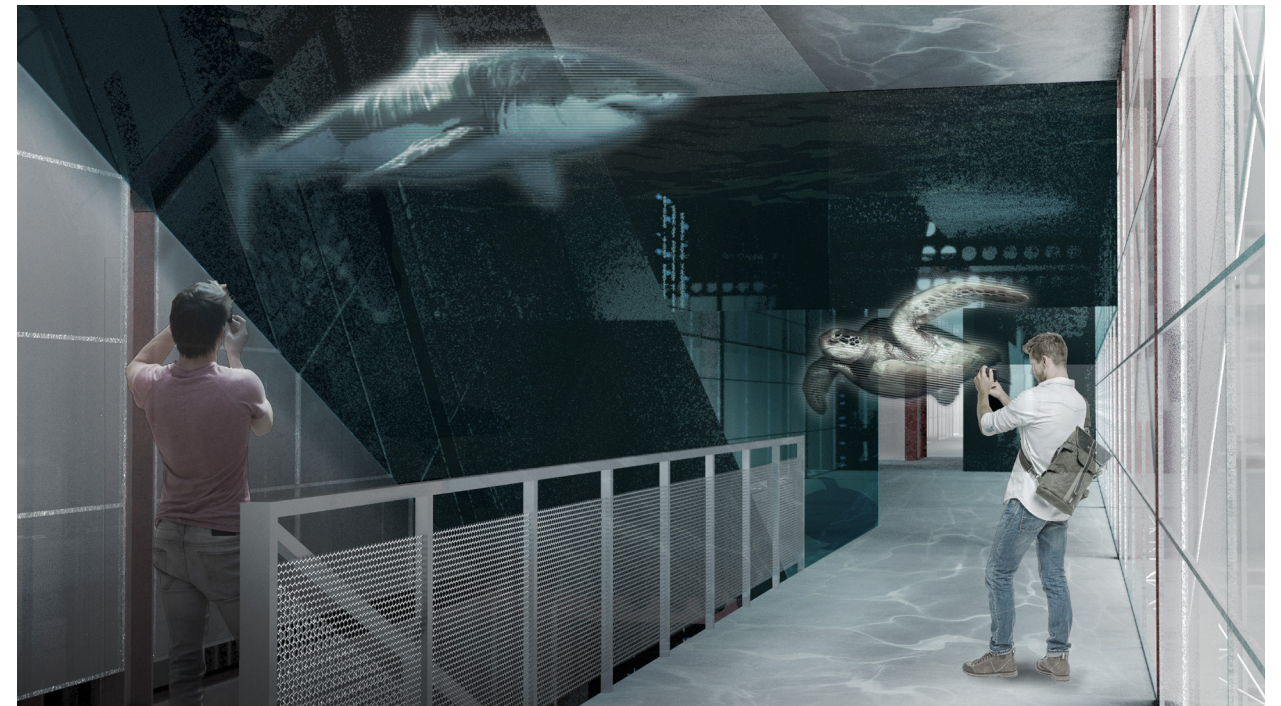
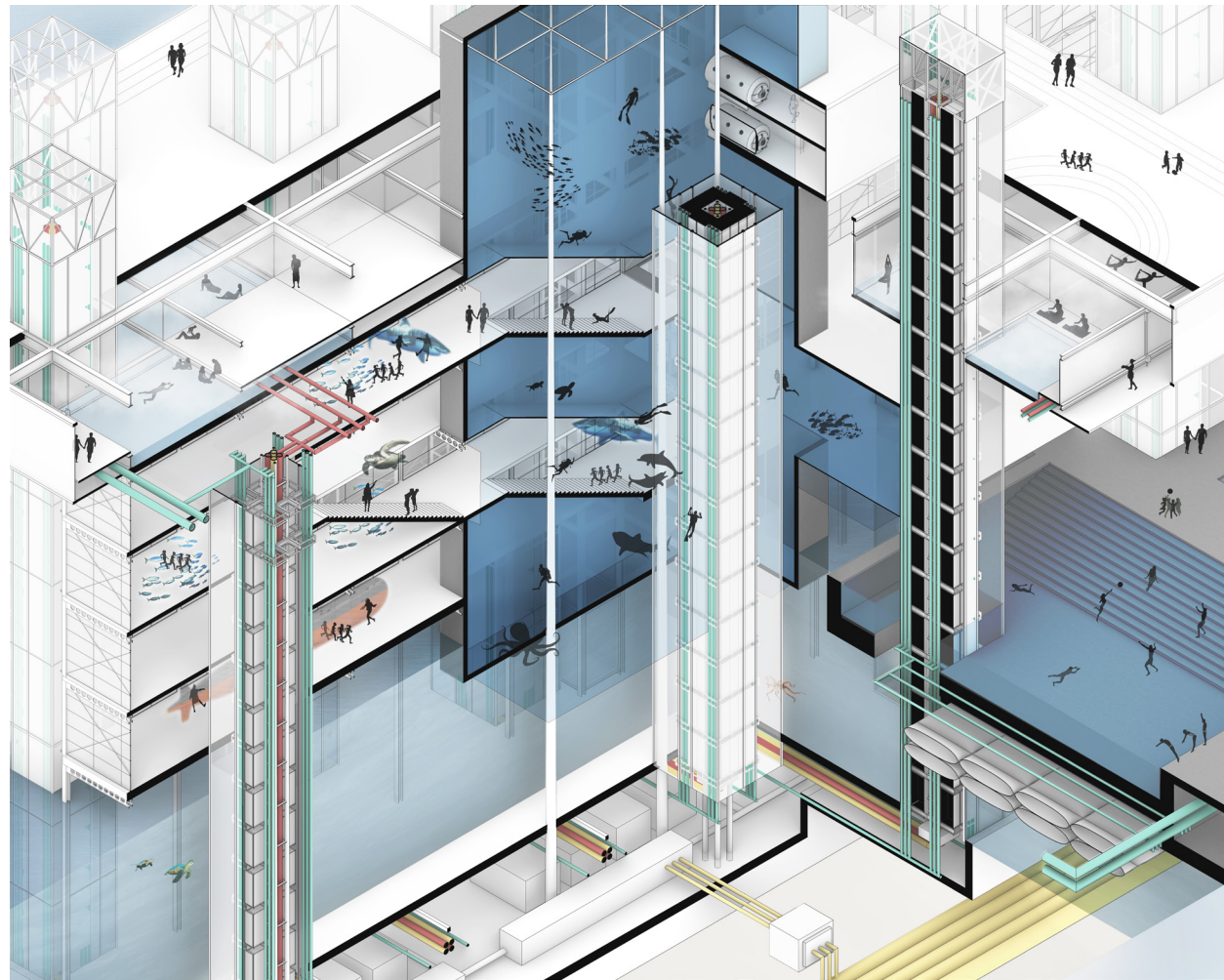


*Structural Display*

The Streaming Machine hosts in total 201460 data server units in 34 identical pillars, or spines. By calculated estimation, the total number of servers in data centers in Manhattan is around 200 thousand. The Streaming Machine would be a perfect replacement for these data centers coming to the end of their lifespans.

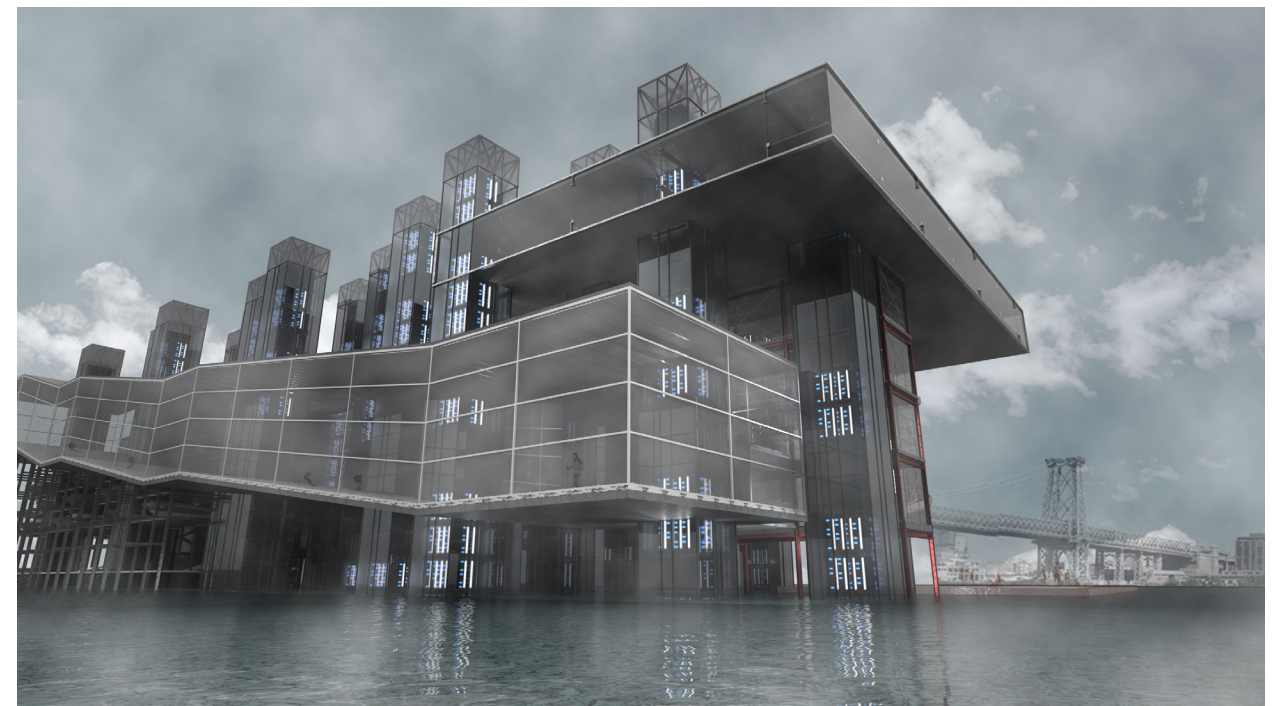
Cooling pipes run through data cores connect the data center with aquatic sports, using the same water from Hudson River to heat the SPA, cool the indoor diving, keep the snow from melting.





*Winding Through Water*

The main circulation core penetrates multiple aquatic activities, becomes the space of exhibition. People travel through the core while divers swim above them, underneath them, and besides them, constantly directing visitors' attention to the complex space and uneven environment around them.







**AirCO**  
a cyborg company

02

**AIRCO -- A CYBORG COMPANY**  
**Self-Producing & Self-Digesting Energy Exchange Factory**

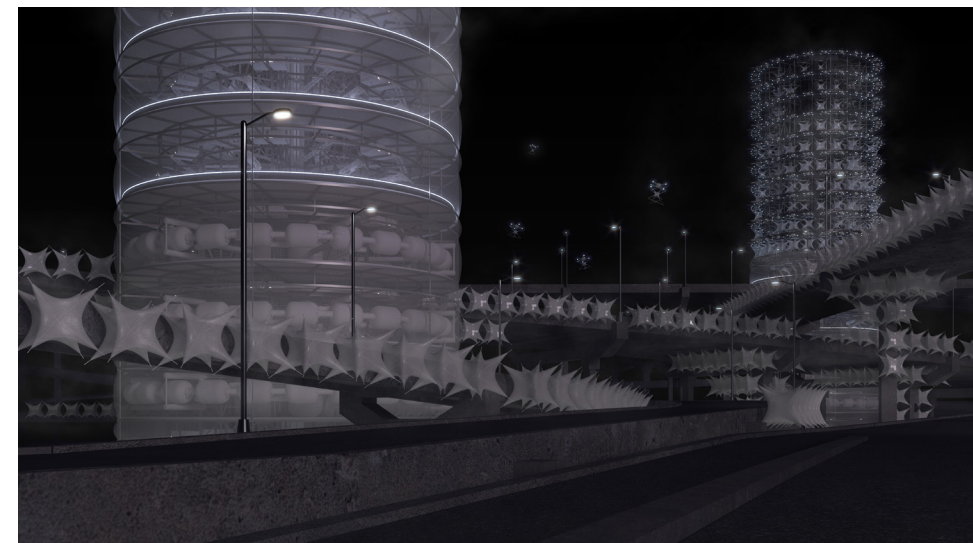
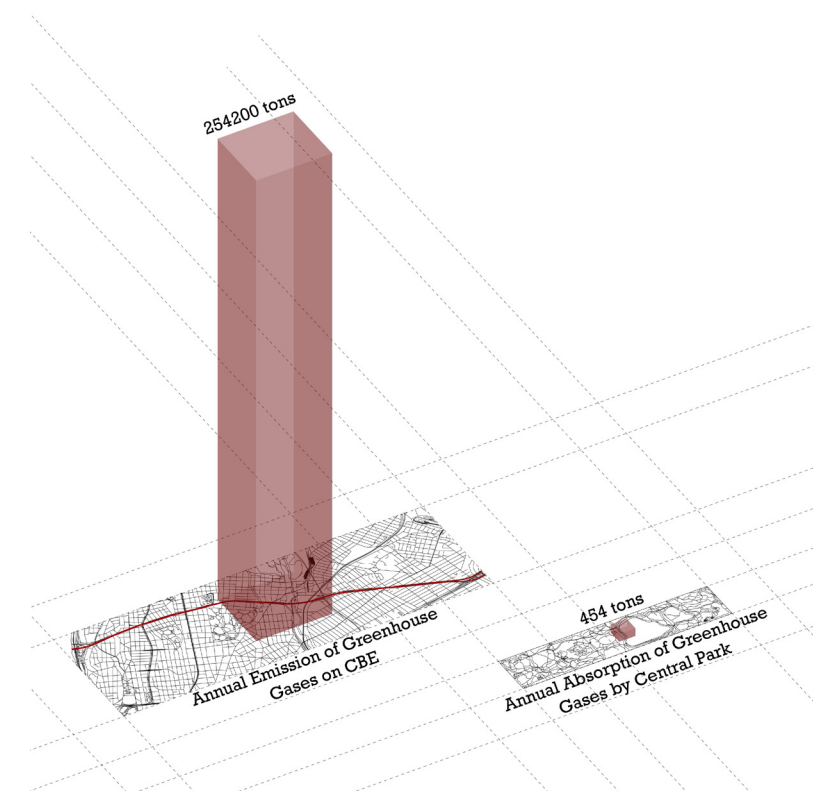
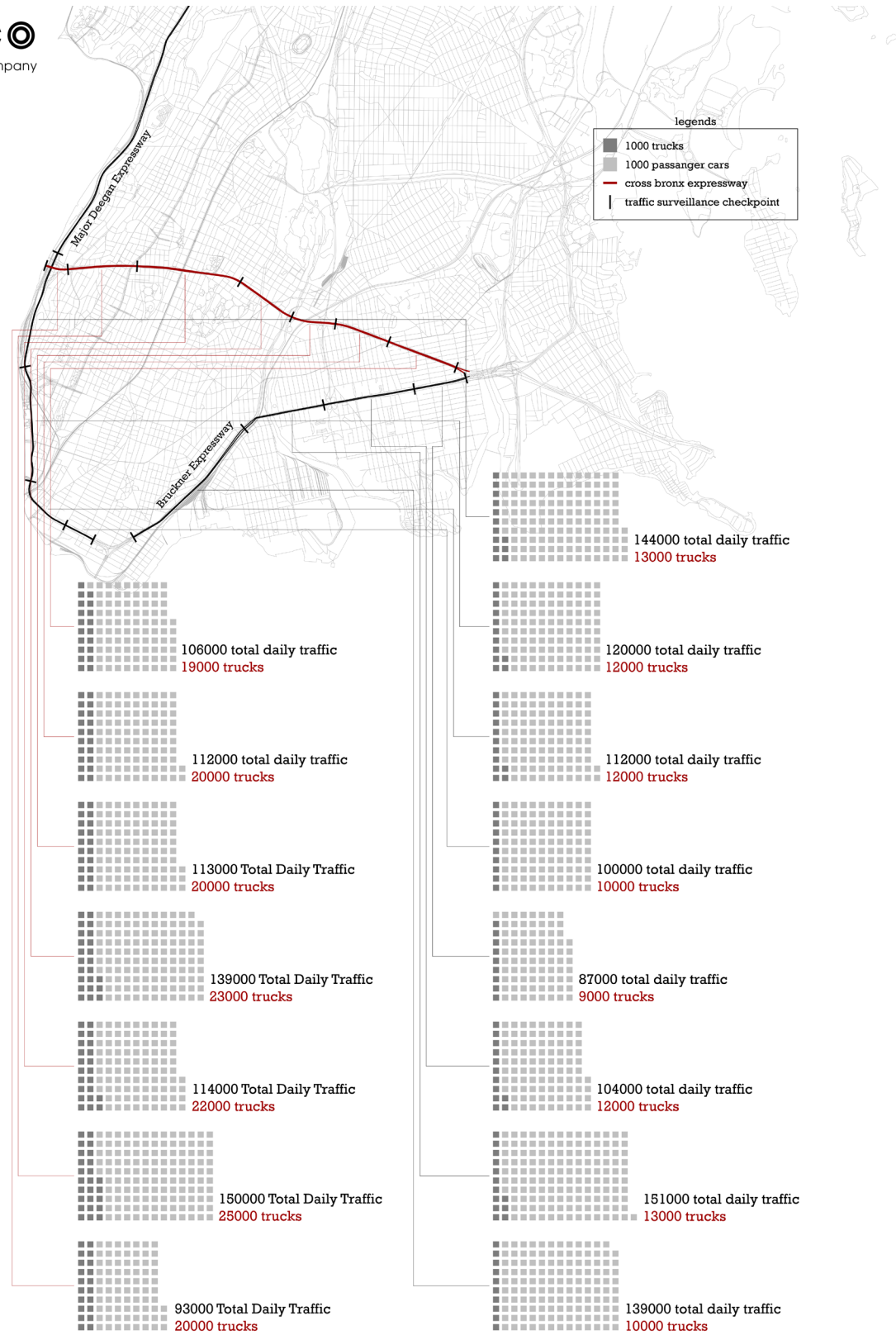
Collaborator: Lingfan Jiang

Advisor: Michael Bell

Columbia GSAPP Fall 2022 Advanced Studio V

Since the industrialization, history of production has been intervened by machine subjects. The invention of assembly line by Henry Ford in the early 1910s caused a huge increase in human productivity. The space of manufacturing became a long, endless horizontal strip, with workers operating by the line, repeating one single task repeatedly. But human labor is destined to be surpassed by machine labor, at least in the repetitive manufacturing industry. A post-work society is in near future as the human labors are overtaken by machine labor and automation.

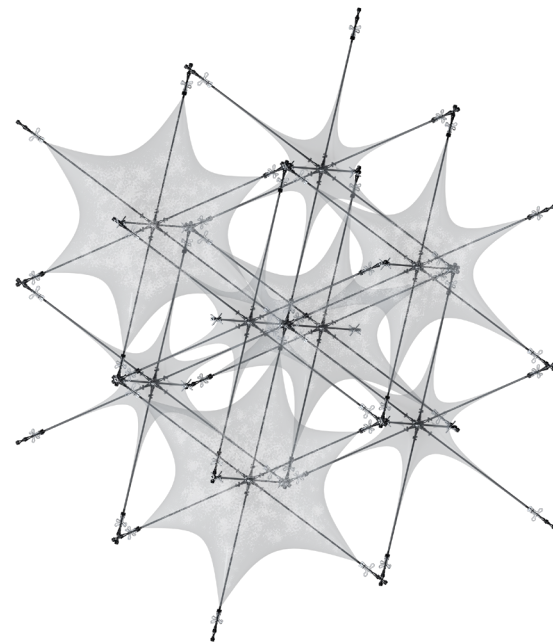
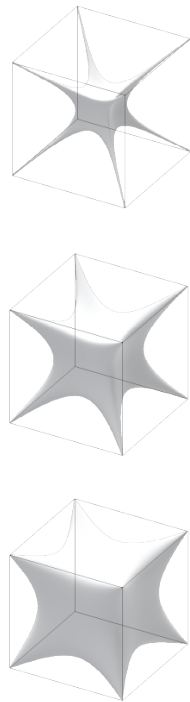
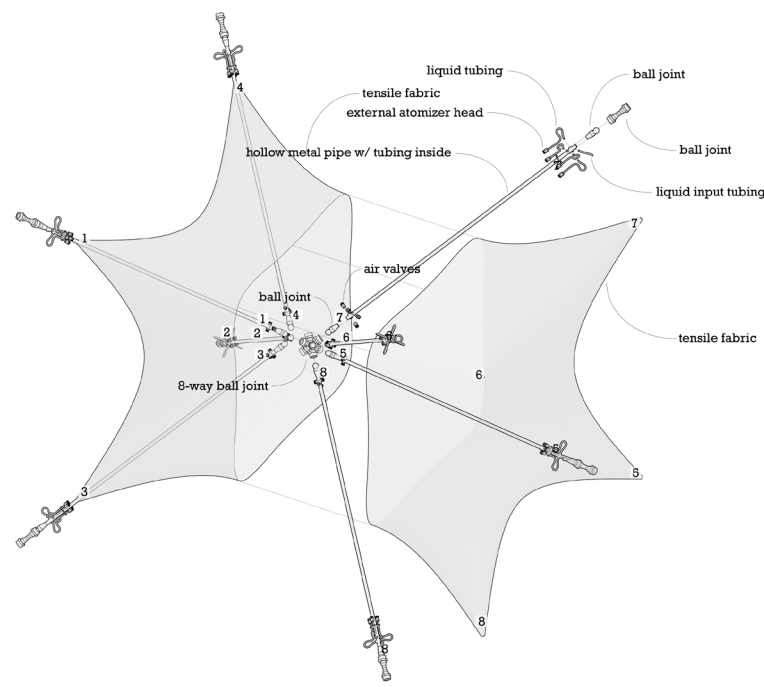
In AirCO, we are taking advantage of this automation to build good machines, machines that are not aiming for optimization solely, turning the heavily emissive factory line into a self-cleaning, self-digesting cyborg by using crystallization process of the guanidine liquid to capture CO<sub>2</sub> from ambient air into a solidified crystal structure. Since modernization, the idea of optimization is embedded in every modern and contemporary machines like air conditioners, computers, microwaves, and so on, aiming for production rate and quality as high as possible for maximized human comfort. A good machine like AirCO cyborg, on the other hand, is constantly negotiating with itself, contesting its own birth and creation, eating up its footprint along the process of its completion and is a machine without results.



Field Test Alpha -- Cross Bronx Expressway

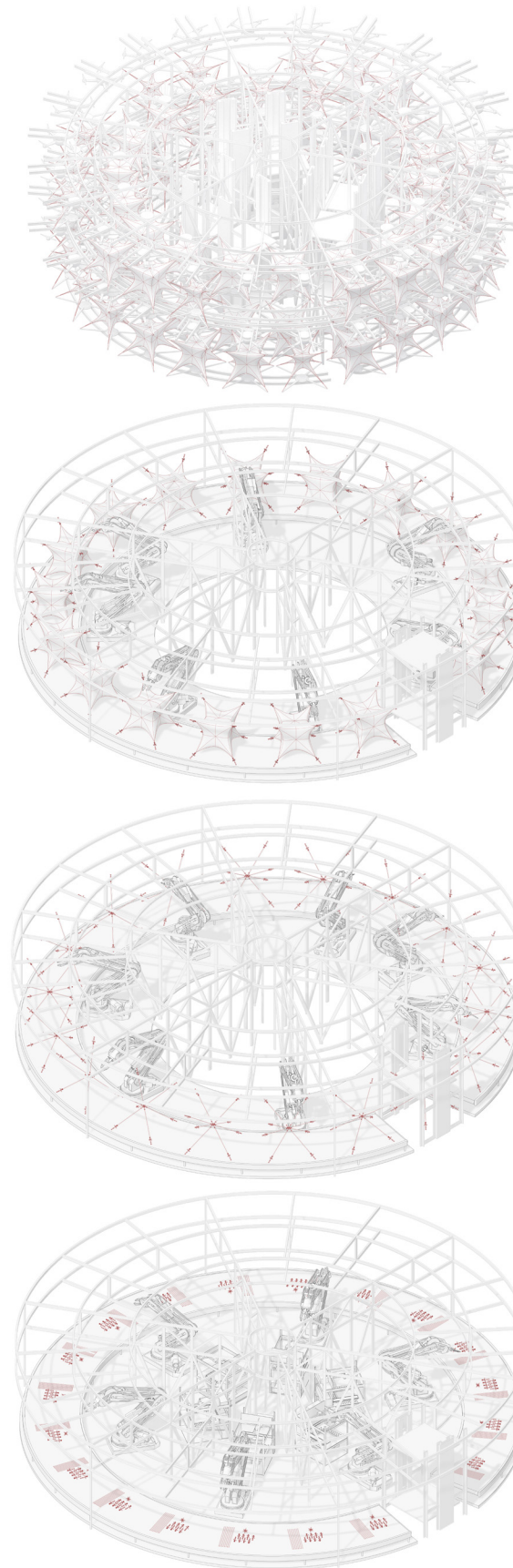
Earlier this fall, AirCO carried out the first field test on the Cross Bronx Expressway, NY. Piercing through the city of Bronx, this intervention of Robert Moses has caused heavy impairment to the city development, community welfare and environmental conditions. As one of the busiest and most congested traffic venues in New York City, the daily truck traffic on the CBE is twice the amount on the neighbor highways, major Deegan, and Bruckner expressway. By applying the average number of emissions per mile by each passenger car and truck, the estimated annual emission on CBE would take 560 central parks, absorbing emissions non-stop, for an entire year. This makes the CBE the perfect and "fertile" ground for AirCO interventions.





*AirCO Cyborg-01*

AirCO cyborg-01 is designed to be both mechanical and chemical, an embodiment of machine and nature. It is designed with the capacity for different stacking formations to deal with different surface conditions. Flexible ball joint and soft pneumatic membranes allow it to conform its shape and appearance to the complex human environment and building surfaces.



*Cyborg Storage & Deployment Deck*

Finished cyborgs are ready for deploying, being stored on the track, and spraying mist of guanidine liquid to capture CO<sub>2</sub> produced by its own maker, forming a dynamic temporary facade for the automated factory.

*Pneumatic Assembly Department*

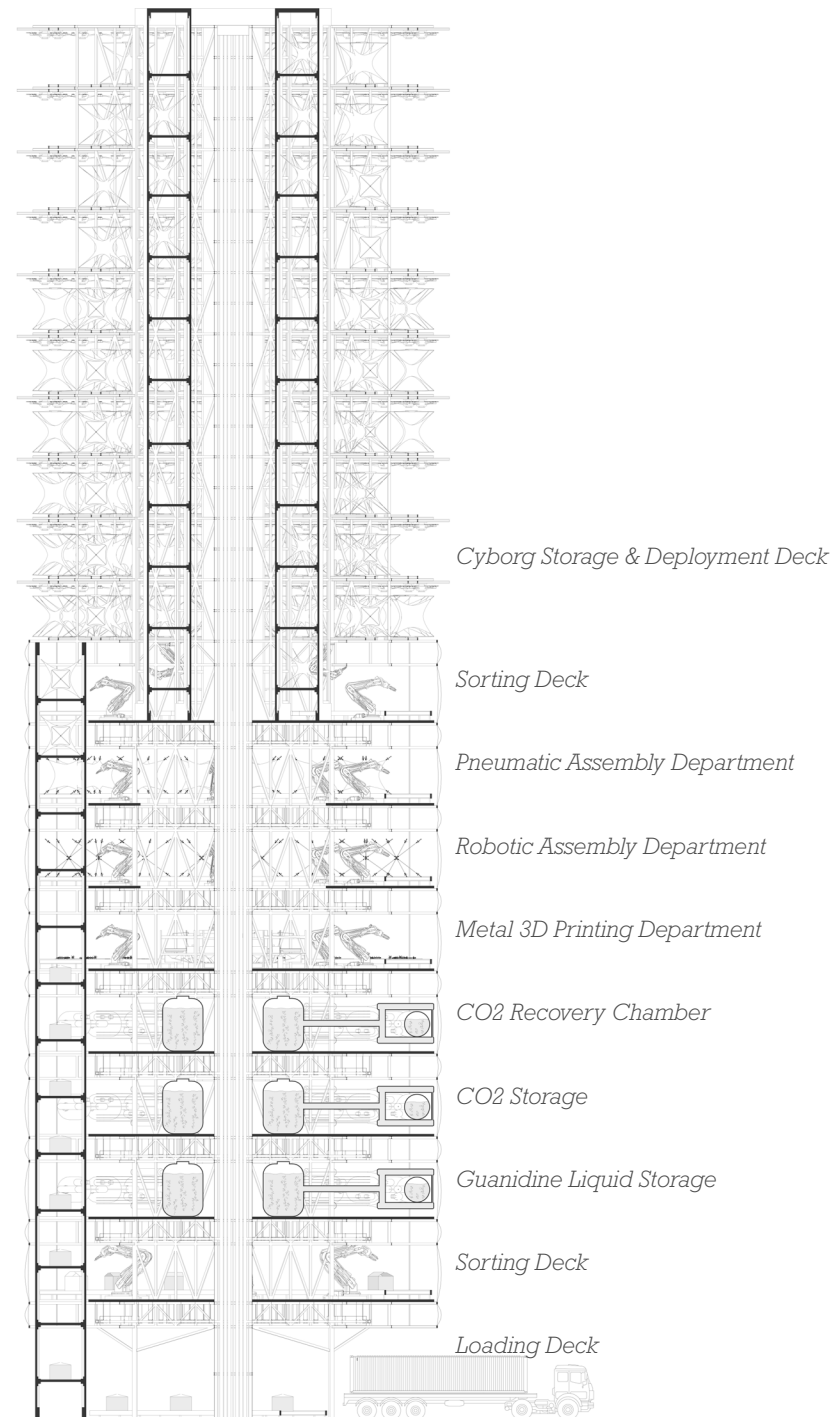
Pneumatic ETFE membranes are being installed onto the metal frame. Once installed, the CO<sub>2</sub> sensors are turned on to monitor CO<sub>2</sub> concentration level in the air and the cyborgs start operating.

*Robotic Assembly Department*

Metal components from the previous department and CO<sub>2</sub> sensors are being assembled by robotic arms and guanidine liquid is injected into the hollow tubing system ready for mistification.

*Metal 3D Printing Department*

Metal components of AirCO Cyborg-01 are 3D printed in the metal 3D printers and transported on the horizontal conveyor for further assembly.

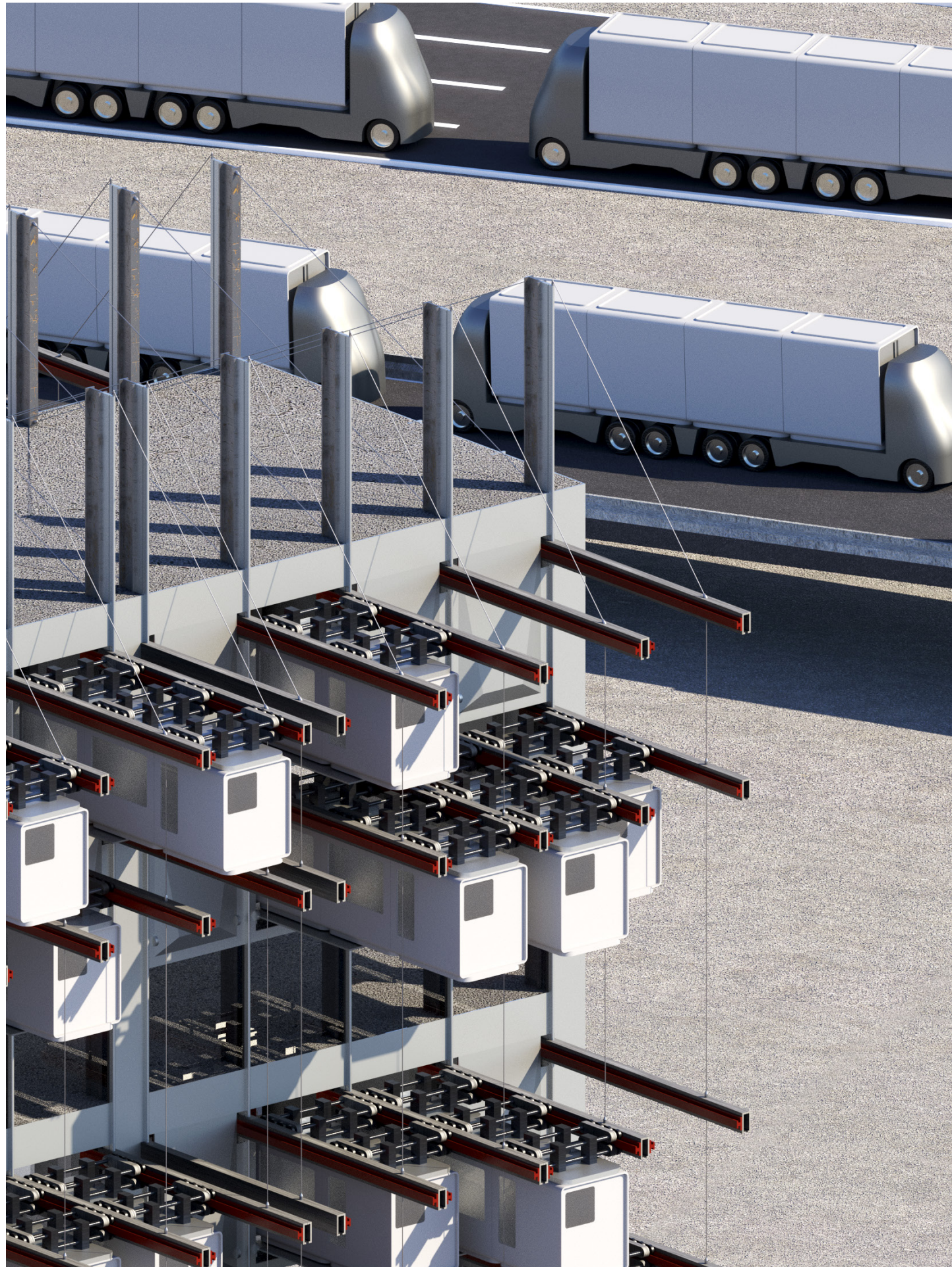


*Alternative Deployment Scenario*

As a newly envisioned technology to cope with CO<sub>2</sub> excess in human environment, AirCO tower can be deployed to versatile contexts, such as dense urban areas, heavy industrial zones, and anywhere exerts a heavy amount of greenhouse gases.







03

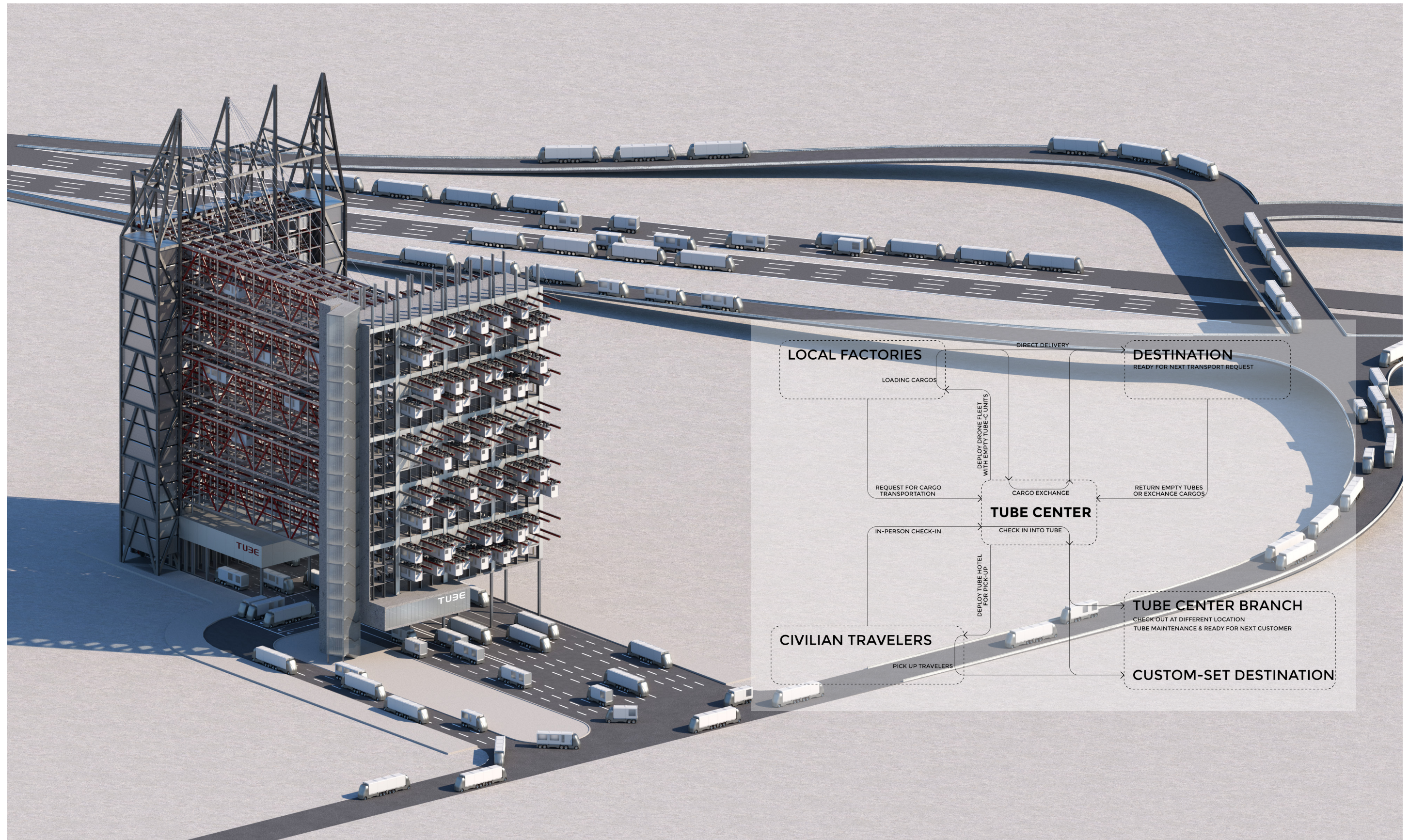
**TUBE -- SPECTACLE OF AUTOMATION**  
**Intelligent Container Transportation & Accommodation System**

Individual Work  
Advisor: Michael Bell  
Columbia GSAPP Spring 2023 Advanced Studio VI

With the increasing development of autopiloting and AI application in transportation system, the existing infrastructure of highway network, including truck stops, travel centers, motels and such are rapidly becoming obsolete. It is anticipated that by the year of 2050, auto-piloting will be widely applied and replacing human drivers in ground transport, entering the Level 5 with fully autonomous vehicles. By then the current transportation and accommodation systems, including modes of transport, cargo delivery, energy consumption, the metaverse, and most importantly, automation, will completely overturn the consensus of daily life experiences and urban expansion and development.

TUBE is established to take advantage of this spectacle of automation, transforming the traditional highway experiences by implementing automation into the process of cargo delivery, efficiency maximization, accommodation of human travelers, and autonomous nomadic lifestyle.





**LOCAL FACTORIES**

LOADING CARGOS

**DESTINATION**

READY FOR NEXT TRANSPORT REQUEST

REQUEST FOR CARGO TRANSPORTATION

DEPLOY DRONE FLEET WITH EMPTY TUBE-C UNITS

DIRECT DELIVERY

CARGO EXCHANGE

RETURN EMPTY TUBES OR EXCHANGE CARGOS

**TUBE CENTER**

IN-PERSON CHECK-IN

CHECK IN INTO TUBE

**CIVILIAN TRAVELERS**

PICK UP TRAVELERS

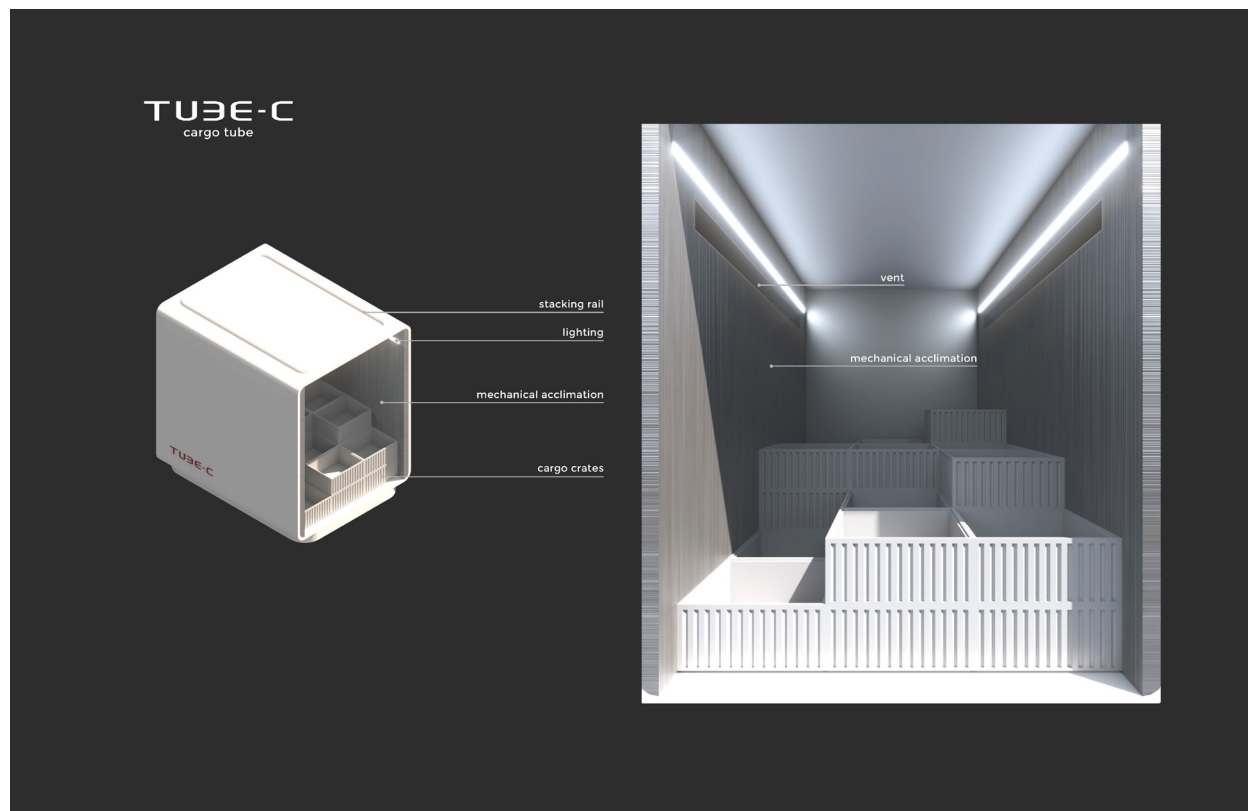
DEPLOY TUBE HOTEL FOR PICK-UP

**TUBE CENTER BRANCH**

CHECK OUT AT DIFFERENT LOCATION  
TUBE MAINTENANCE & READY FOR NEXT CUSTOMER

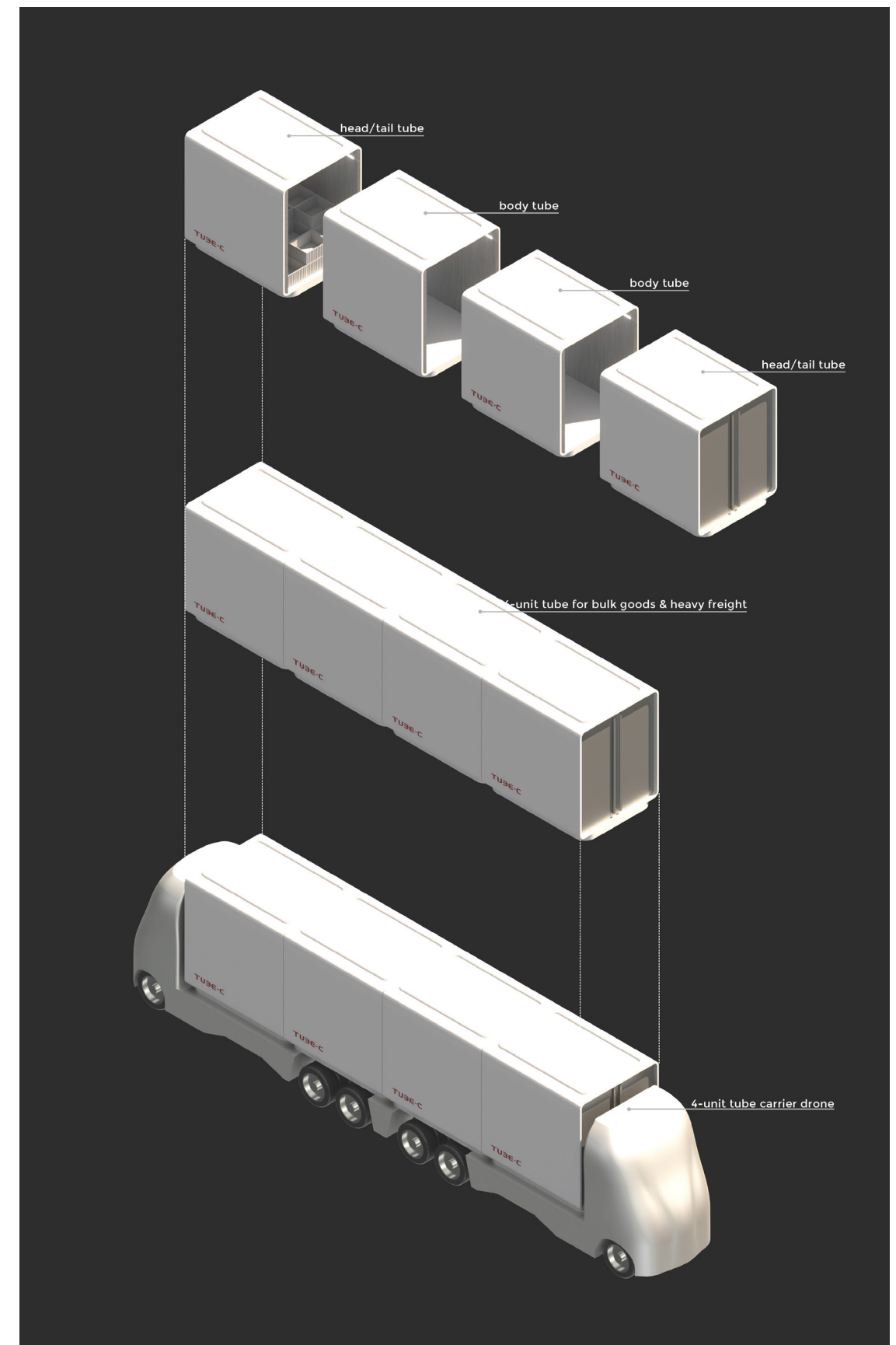
**CUSTOM-SET DESTINATION**

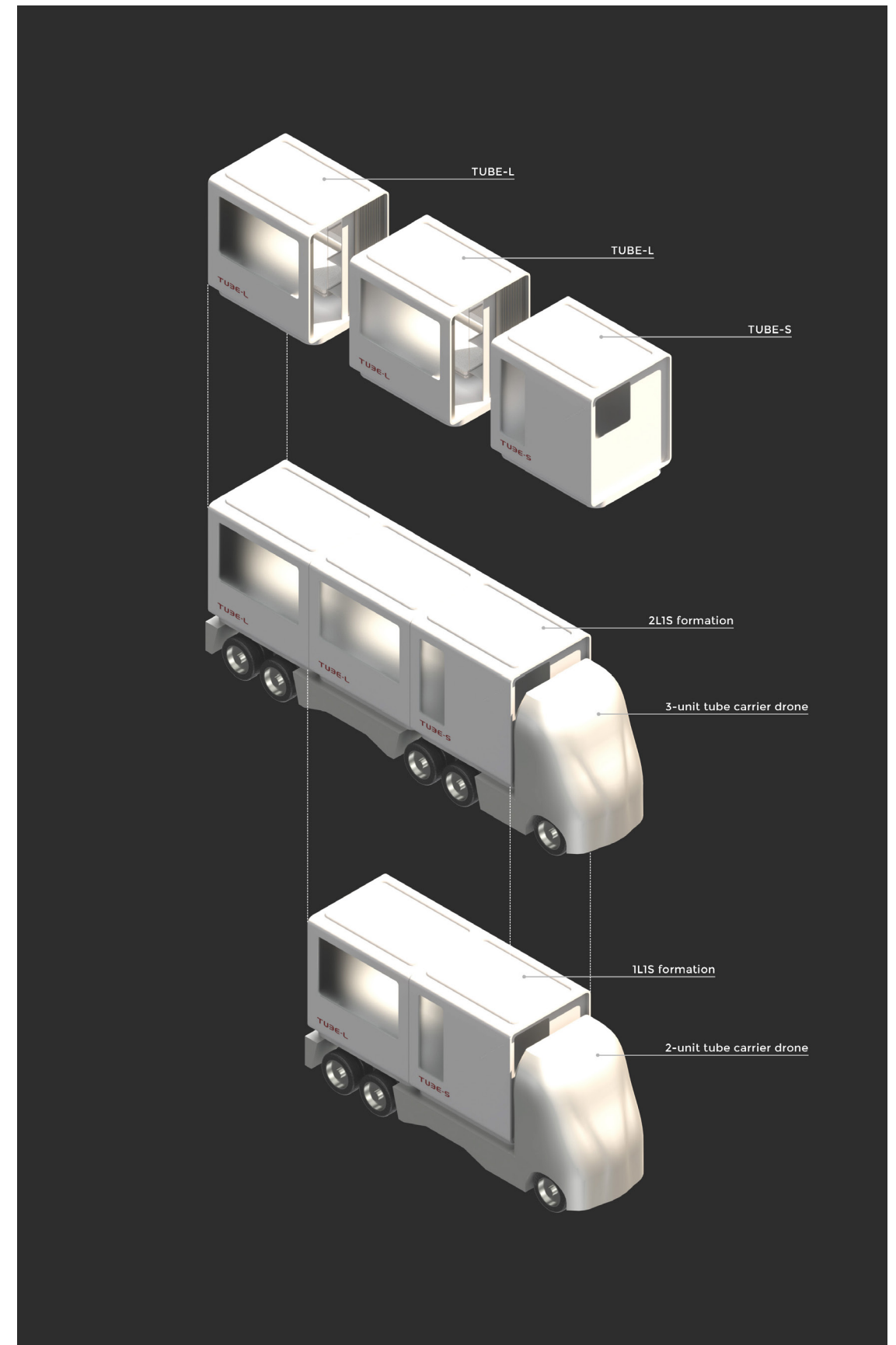
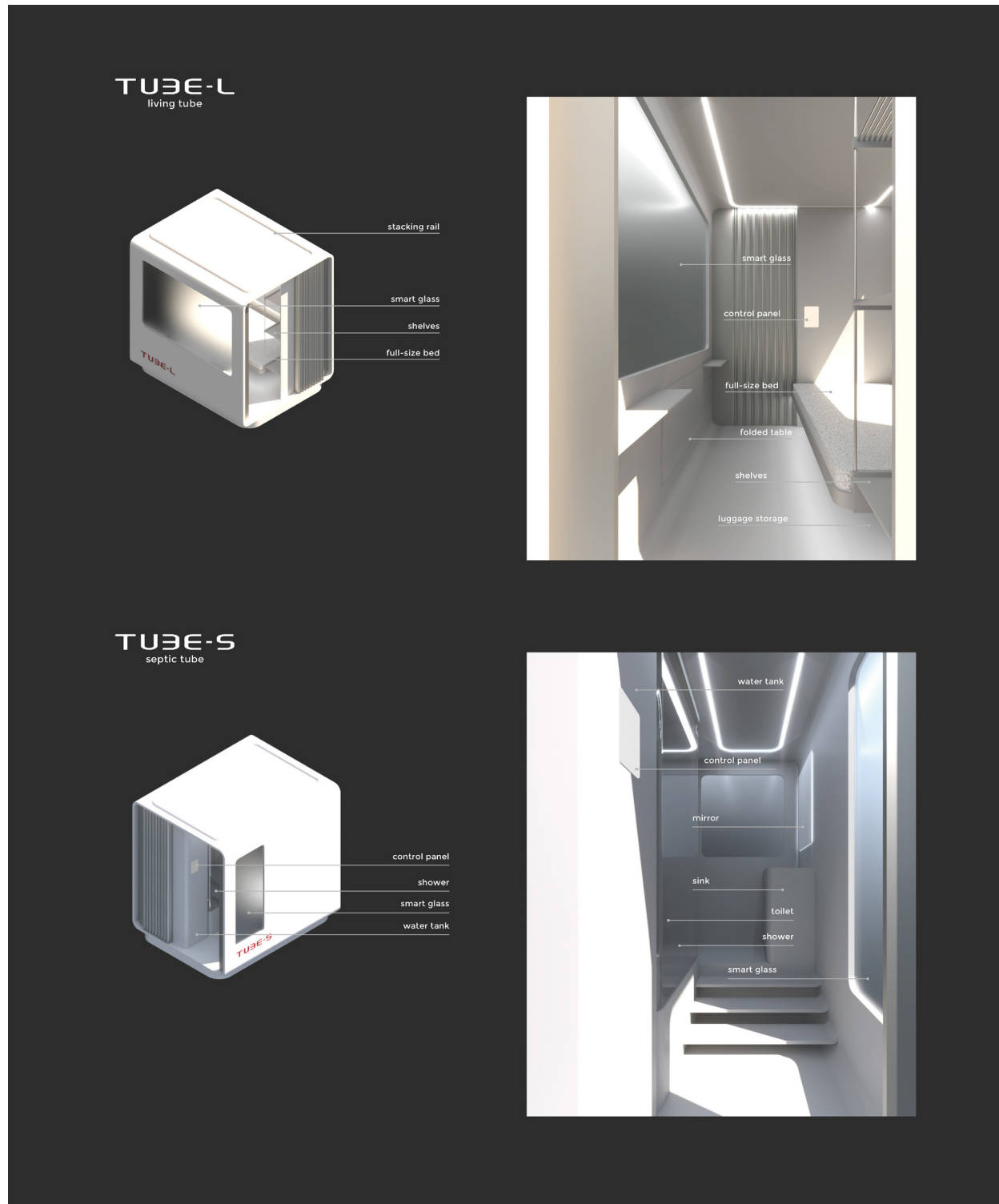




*TUBE-C For Cargo Accommodation*

Each TUBE-C module is a 10 ft long container equipped with mechanical accommodation system on two sides to adjust interior environment properties for different cargo types. Head/tail module is open to one end and with sealed doors on the other end. Body module is open to both end. Thus, it is flexible to accommodate 20 ft standard container requirement while provide 30 ft & 40 ft options.





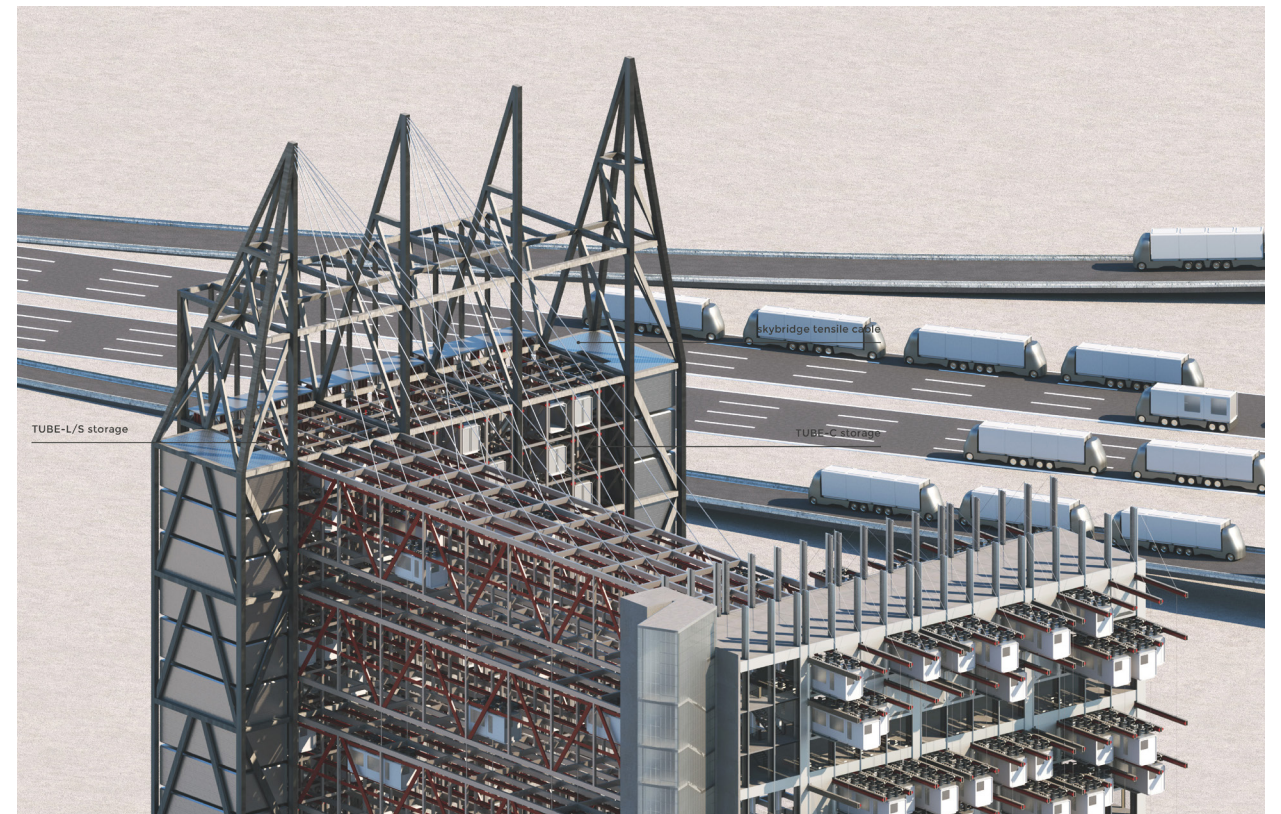
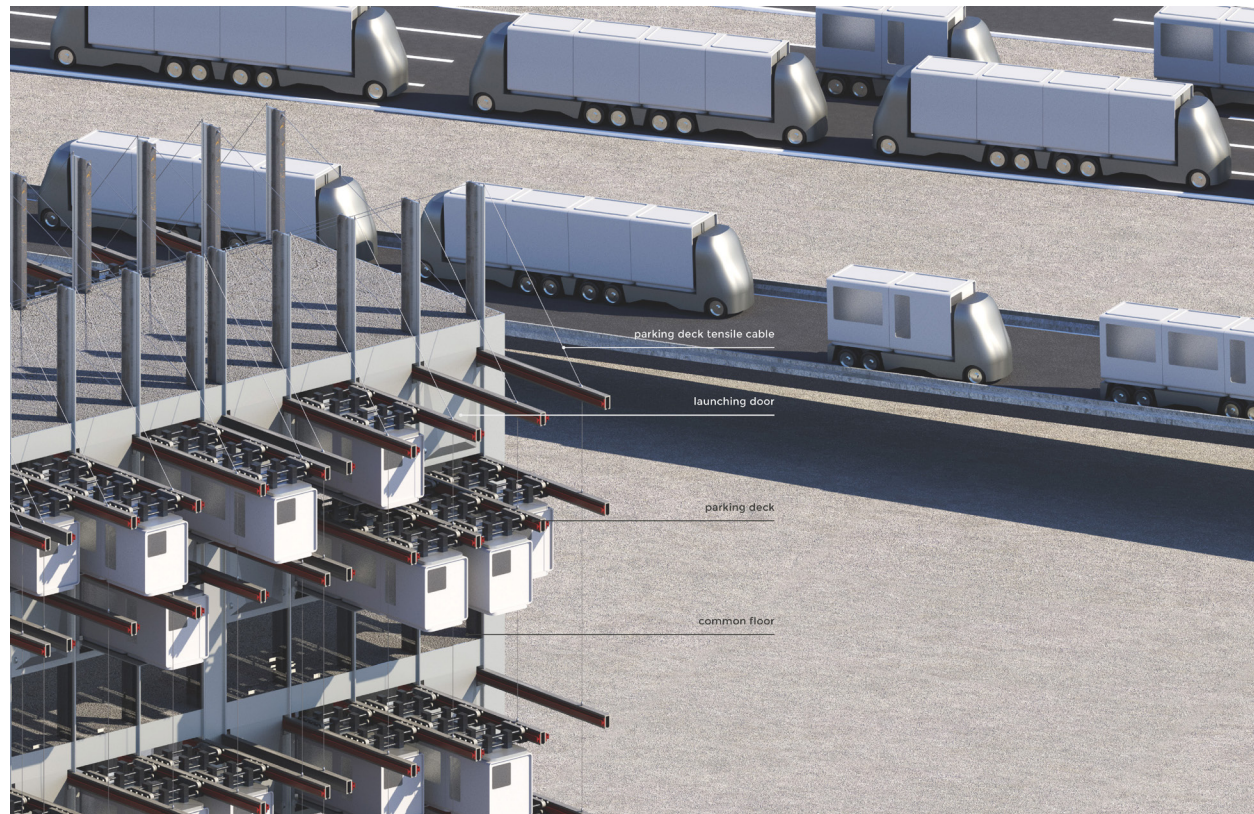
*TUBE-L & TUBE-S For Human Accommodation*

TUBE-L and TUBE-S are standard human accommodation containers for individual travelers, couples, business travelers, and nomads. Equipped with central control panel, travelers can customize their trip, including destinations, temporary stops, trip durations, maintenance support and such.

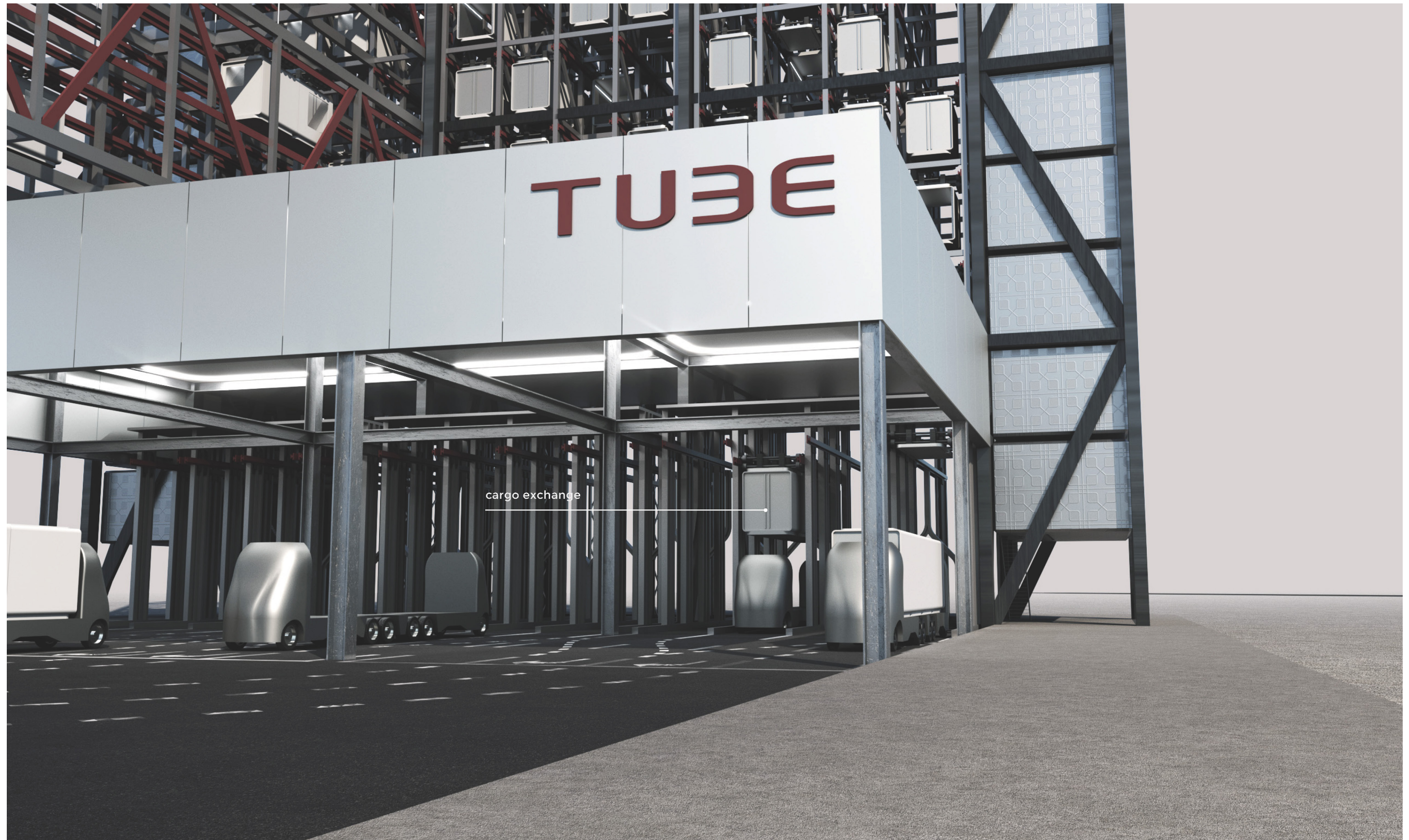












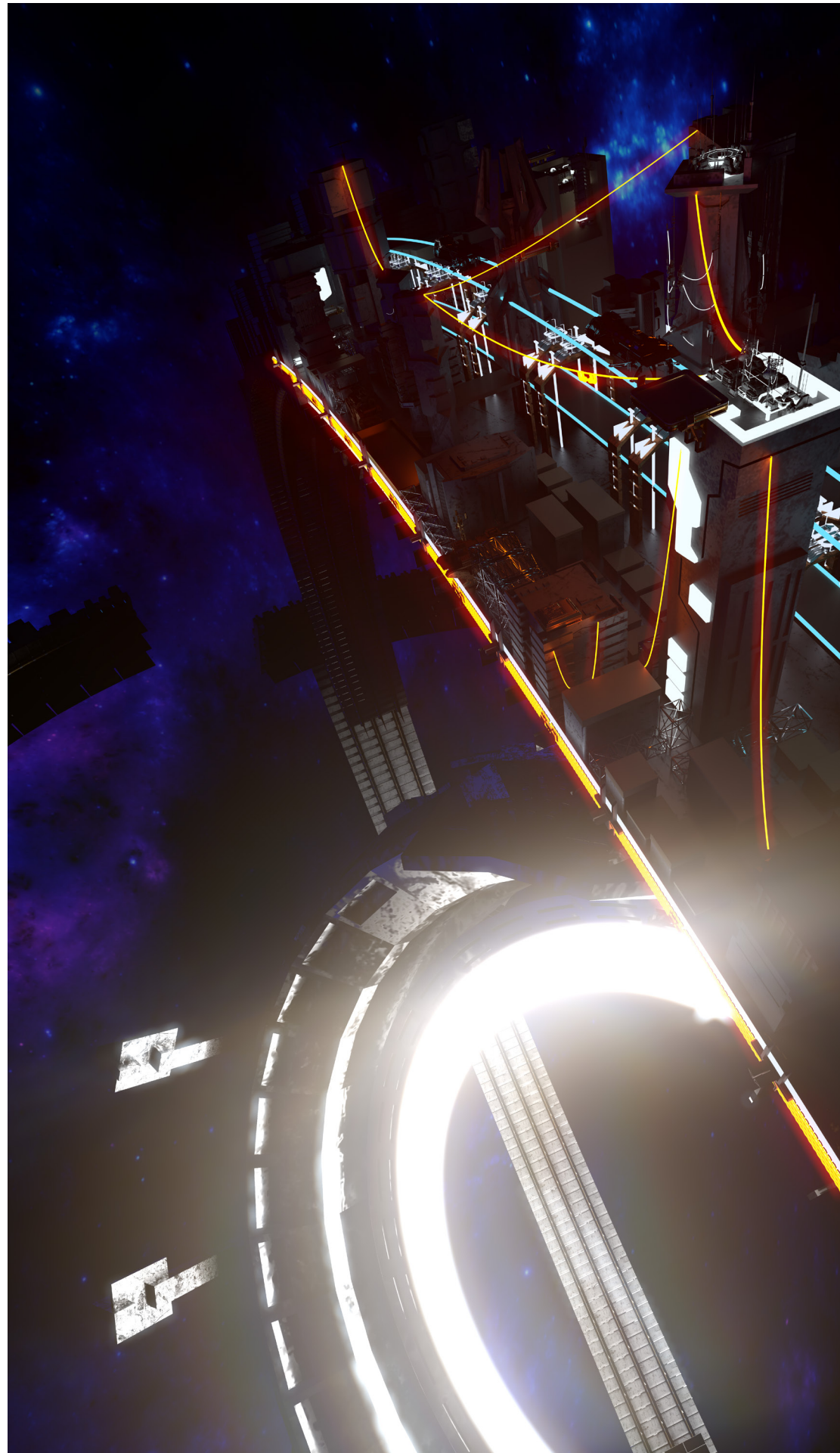
TU3E

cargo exchange









# 01

**DYSON RING SPACE CITY**  
**VRay Render Works**

Collaborator: Junzhi Deng, Huanpeng Li  
Advisor: Phillip Crupi  
GSAPP Fall 2022 Techniques of the Ultrareal

Dyson Ring Space City is an imagined project that focuses on the process of creating ultrareal cinematic rendering through VRay. The city is built around an artificial solar energy source that creates gravity towards the middle. Human clans built strip cities on the revolving halos powered by the solar panels.

The rendering process took several steps: conceptual sketches, Rhino and 3ds Max modeling, material customizations, VRay rendering, and post-processing. The landscape view is taken from an approaching spaceship's viewing deck, looking at the space city. The window has reflections of the interior of the viewing deck, exposing the mechanical equipments, ceiling light, weapon racks and such in the back.







**YUNTIAN ZHANG**

---

Works Selection  
GSAPP 2023