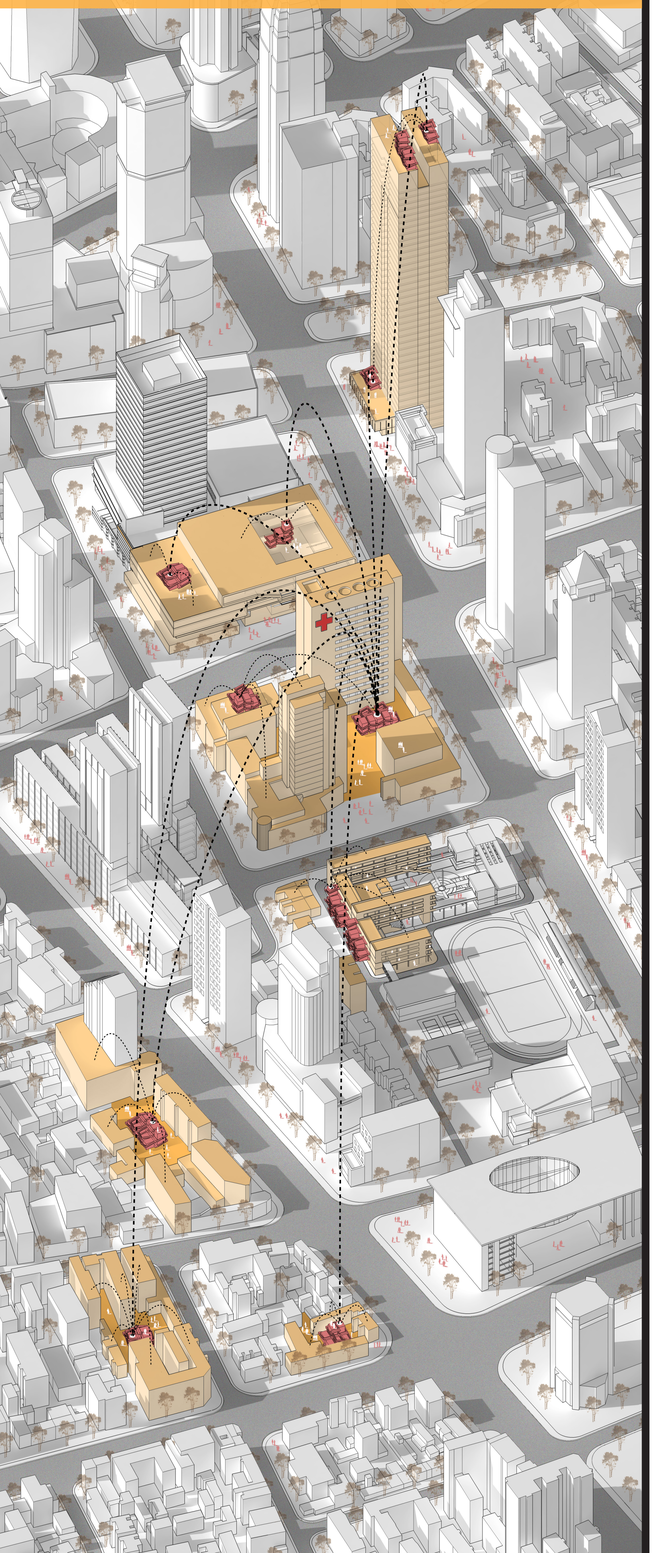
A190

NET OF CARE

Care Continuum in Chinese Major Cities

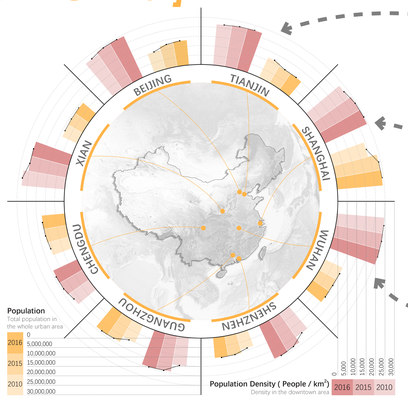
In 2040, Based on Modular Healthcare Unit



[Major Cities in China]

Chinese population are extremely unevenly distributed. Major cities accomodate too many people with limited resource, making the situation worse.

Patients queuing in and out of outpatient department of Huashan Hospital, one of the best hospitals in China.



Interesting fact in Tianjin

While its total population declining, dowtown population density of Tianjin has been going up in the last 16 years. This obviously indicates that in some areas in China, people are crowding into the center of major cities from suburb area, which is going to result in a more crowded future for cities like Tianjin.

Shanghai

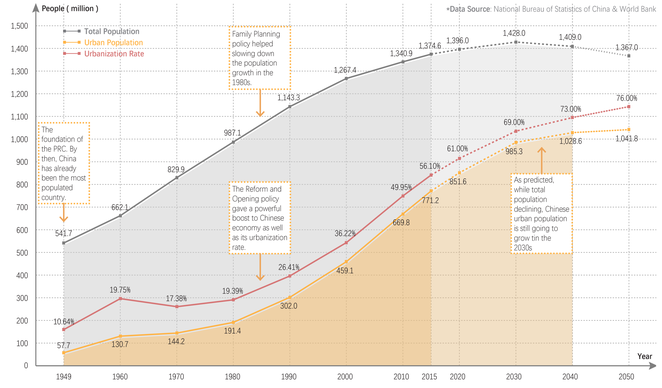
Shanghai is one of the most populated cities in China, and without doubt the most developed one.
In terms of healthcare, Shanghai has rich medical resources. Even though, hospitals in Shanghai are also crowded with patients and their families from all over the country.

Wuhan

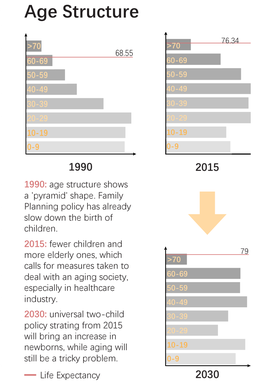
Wuhan may not be the most populated city in China, but it's no doubt one of the most crowded cities, with the downtown (namely Jianghan District) population density even higher than Shanghai.
Wuhan has a few top-level hospitals, but considering such high population density, they are far from not enough.

! Population density in major cities will keep going up, a few tertiary hospitals will not be enough. → Healthcare stations everywhere vs people everywhere

[Chinese Population]



Age Structure



1990: age structure shows a 'pyramid' shape. Family Planning policy has already slow down the birth of children.

2015: fewer children and more elderly ones, which calls for measures taken to deal with an aging society, especially in healthcare industry.

2030: universal two-child policy strating from 2015 will bring an increase in newborns, while aging will still be a tricky problem.

— Life Expectancy

! Urban Population will continue growing in the future with increasing newborns and aging problem. → Design for urban people of all ages

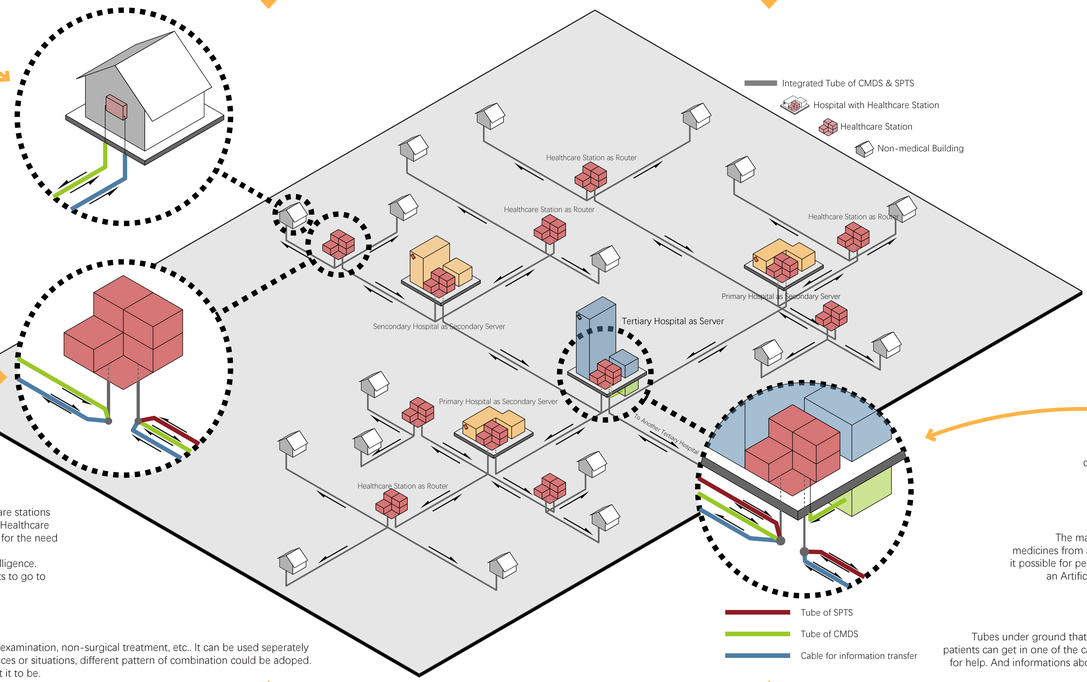
[Net of Care]

Non-medical Buildings as Terminals

We argue that, to distribute medical resources all over the city, non-medical buildings should also function as medical terminals in the future.

Artifical Inteligent Healthcare Machine (AIHM)

To achieve the goal of non-medical buildings funtioning as medical terminals, non-medical buildings, Including residence houses, schools, shopping malls, office buildings, etc., will be embeded with an Artifical Inteligent Healthcare Machine, or AIHM as we proposed, will be given the function of basic physical examinations (heart rate, blood pressure, electrocardiogram, etc.). And with the help of Centralized Medicine Distribution System (CMDS) we proposed, basic non-surgical treatment (injection, bandaging, etc.) can be done at home or office or when people are shopping.

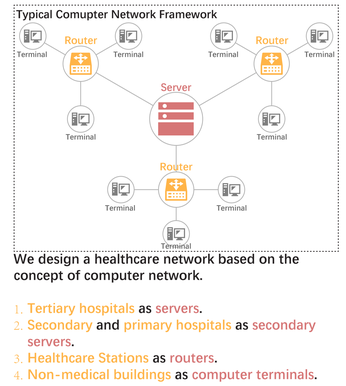


Healthcare Stations as Routers

Healthcare stations consist of Modular Healthcare Units, or MHUs. The function of healthcare stations will be like routers in a computer network, or transfer stations in a transportation network. Healthcare stations can be anywhere, in a community, a shopping mall, an office building or a school, for the need of different people.
People go to the stations to get physical examinations and basic diagnosis by artificial intelligence. Then, according to the severity of the illness, the artifical intelligence will advice the patients to go to the hospitals through the SPTS, or take non-surgical treatment or some medicine.

Modular Heathcare Unit (MHU)

MHUs are categorized into 6 types. Each type has its own single function, such as physical examination, non-surgical treatment, etc.. It can be used seperately or as a combination of several units assembled together. To meet the need of different places or situations, different pattern of combination could be adoped. All MHUs are modular and standarized, so that they can be assembled however users want it to be.



We design a healthcare network based on the concept of computer network.

1. Tertiary hospitals as servers.
2. Secondary and primary hospitals as secondary servers.
3. Healthcare Stations as routers.
4. Non-medical buildings as computer terminals.

Hospitals as Servers

Theres no need to build a new hospital. Simply embed an appropriate combination of our heathcare units, and it will get upgraded from a traditional hospital to a medical server in the Net of Care.

Centralized Medicine Distribution System (CMDS)

The main function of Central Medicine Distribution System, or CMDS, is to distribute medicines from a centralized medicine storage underneath the tertiary hospital. Which makes it possible for people to get there prescripted medicine at home, at office or wherever there is an Artifical Inteligent Healthcare Machine (AIHM) without having to go to a pharmacy.

Station to Station Passenger Tube System (SPTS)

Tubes under ground that contains capsules moving along them. In case of heavy illness or emergency, patients can get in one of the capsules at one of the healthcare stations and go to a hospital to ask a doctor for help. And informations about the patient will be send to the doctor in the same time, so that there is no need for unnecessary questions or examinations.

! Several steps can be distributed from hospitals. And there must be a better way for medicine distribution. → Artificial intelligence and automation

! Tertiary hospitals are taking too much responsibility. Concentrated medical resource needs to be distributed. → Distribute resources through lower-level hospitals

[Medical System in China]

Designed System

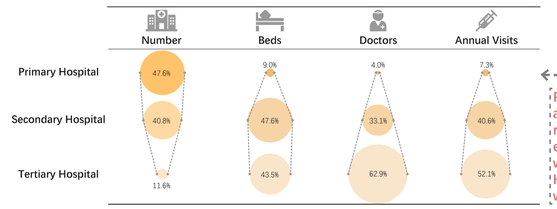
Hospitals in China are organized according to a 3-tier system.

Based on this, hospitals are designated as Primary, Secondary or Tertiary institutions.

Reality

1. Medical resources are highly concentrated in tertiary hospitals.
2. Patients tend to crowd into tertiary hospitals, even when they only need basic diagnosis or non-surgical treatment.
3. Primary hospitals are not taking their resposibilities as ecpected, while tertiary hospitals are taking way too much.

Hospital Type	Location	Bed Capacity	Basic Healthare	Comprehensive Healthcare	Specialist Healthcare	Medical Education	Medical Research	Number of Patients (as Expected)
Primary Hospital	All cities	<100	√					High
Secondary Hospital	Medium cities and major cities	100~500	√	√		√	√	Medium
Tertiary Hospital	Major cities only	>500	√	√	√	√	√	Low



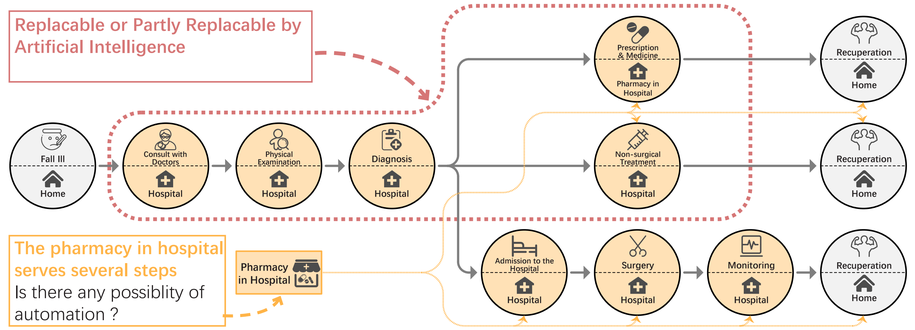
Just the Opposite

Primary Hospitals are not taking their resposibilities as expected, while Tertiary Hospitals are taking way too much.

*Data Source: National Health and Family Planning Commission of People's Republic of China

[Service Process in a Chinese Tertiary Hospital]

Replacable or Partly Replacable by Artificial Intelligence

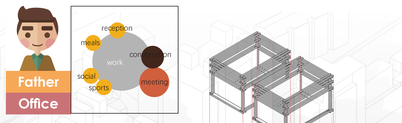


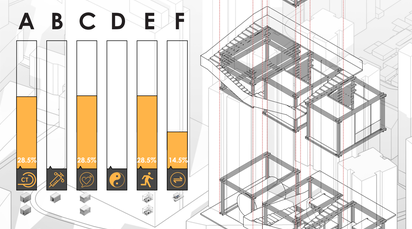
The pharmacy in hospital serves several steps
Is there any possiblity of automation ?

Pharmacy in Hospital

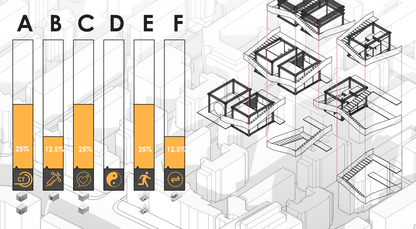
NET OF CARE

[Healthcare Stations for Different Members of Family]

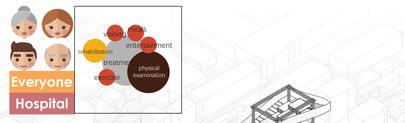




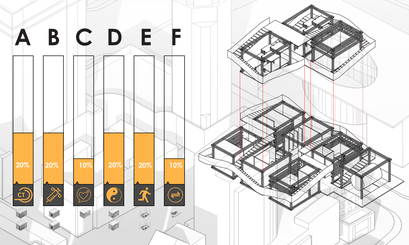
Father works in an office building. To provide adequate healthcare for Father, healthcare station in office building should focus on physical examination, psychotherapy and outdoor activities. Basic treatment and portal to SPTS are also necessary.



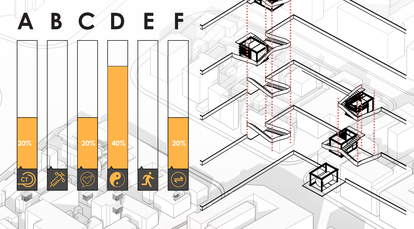
Son spends much of his time in school. Studying, sports, leisure activities and having meals are the main things he does in school. To meet the need of children, healthcare station in school should focus on physical examination, psycotherapy and outdoor activities.



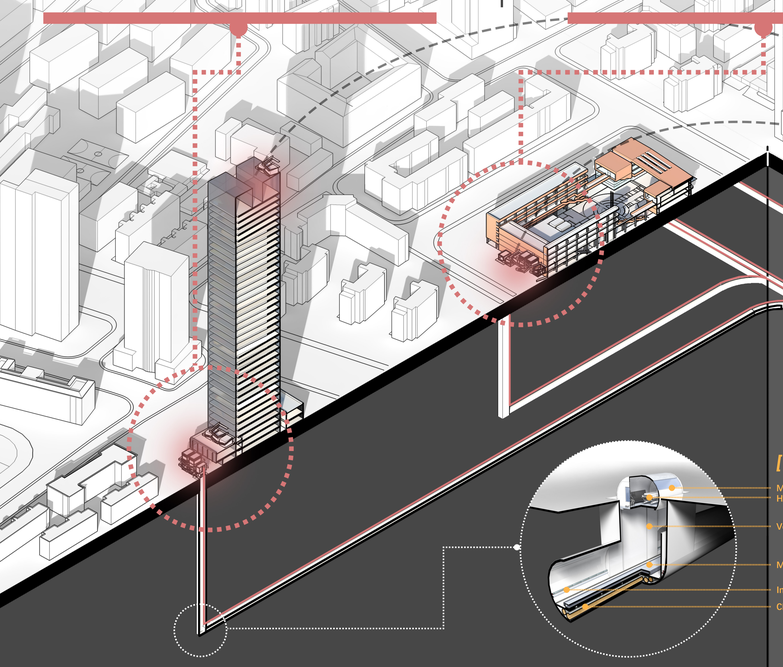
Hospital is a place where everyone would sometime go to. As the core of the proposed Net of Care, hospital function as a "server", so portals to SPTS are essential. Besides, Medical stantion in hospital should also be a supplement to the hospital, which makes psychotherapy and outdoor activities necessary.

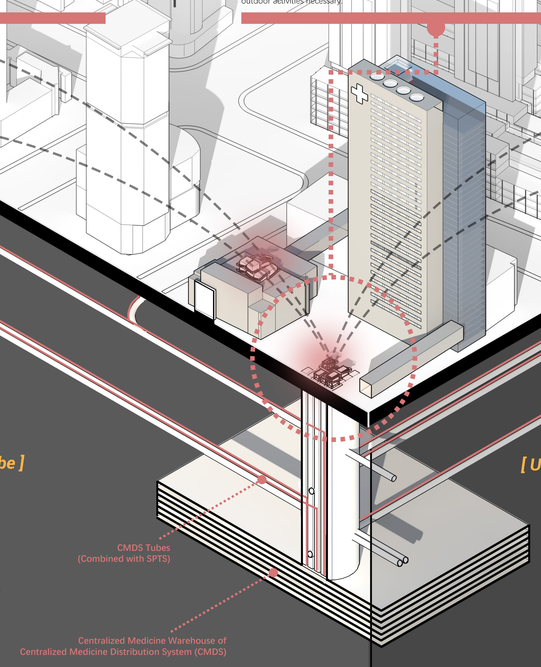


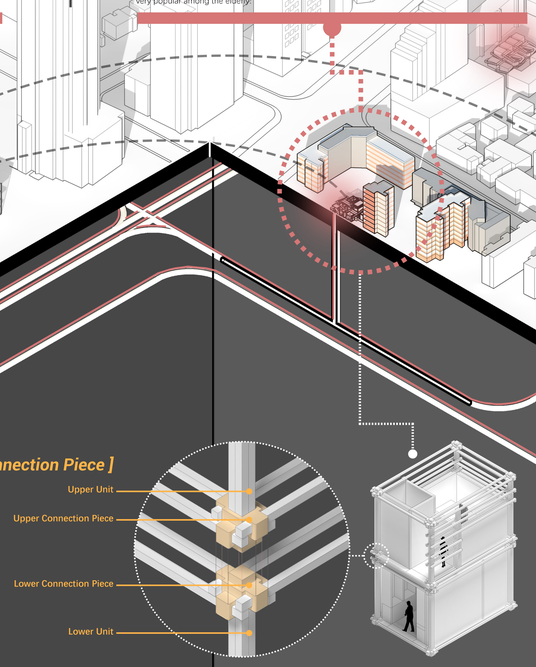
As an elderly, granma tends to stay in a limited range of places. She spends most of her time in the community. To provide adequate service for Grandma, medical stantion in community should have examination, treatment, outdoor activity units. Besides, tradition Chinese medicine is also very popular among the elderly.



Mother works on weekdays, but malls will be the place she'd love to go on weekends. How should malls provide healthcare service? Portal to SPTS is necessary, and units like psychotherapy and TCM treatment will also be welcomed.

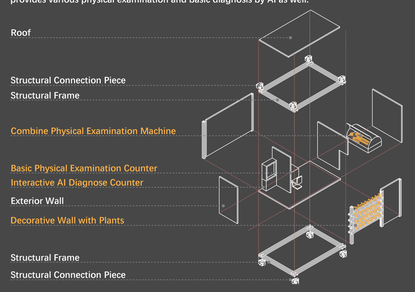


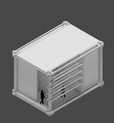




[Modular Healthcare Unit]

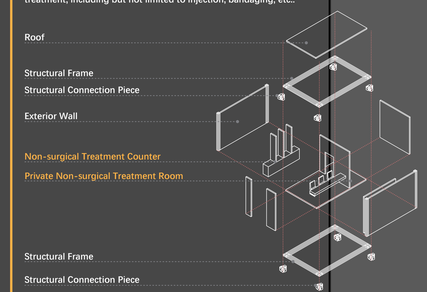
Unit Type A, or Examination Unit is equipped with a combine physical examination machine, a basic physical examination counter and a interactive AI diagnosis counter. Unit Type A provides various physical examination and basic diagnosis by AI as well.

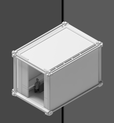




A CT
Examination

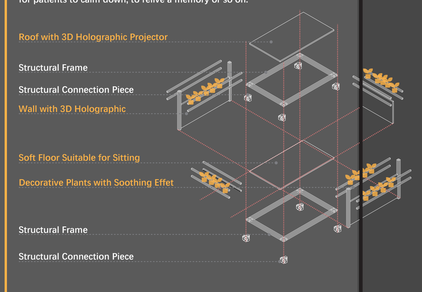
Unit Type B, is equipped with Non-surgical treatment counters and a private non-surgical treatment room, all treatment carried out by AI. Unit Type B provides various non-surgical treatment, including but not limited to injection, bandaging, etc..





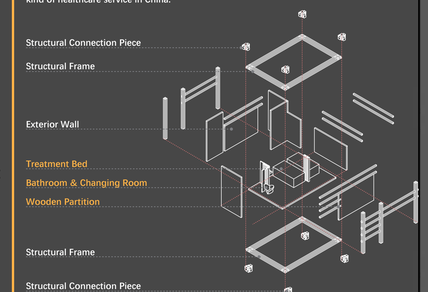
B
Treatment

Unit Type C, is a single room equipped with soft floor and 3D holographic projector. Therapist carry out their therapy with the help of 3D holography, which creats a virtual reality for patients to calm down, to relive a memory or so on.



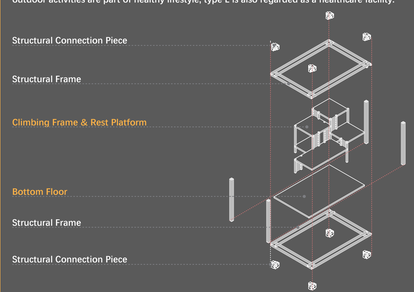
C
Psychotherapy

Unit Type D, is used for Traditional Chinese Medicine (TCM) Treatment, including Chinese massage, acupuncture, cupping and so on. TCM treatment is a very important and popular kind of healthcare service in China.



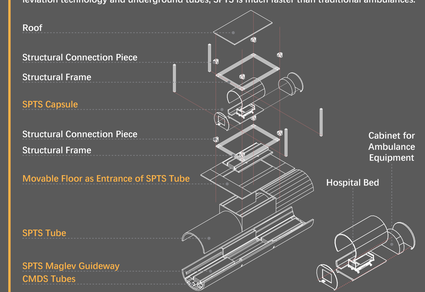
D
TCM Treatment

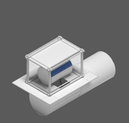
Unit Type E, is a playing ground for children, a dating place for young couples, a lesiure bench for the elderly. In a word, it is a place for all kinds of people to hanging out. Considering outdoor activities are part of healthy lifestyle, type E is also regarded as a healthcare facility.



E
Outdoor Activities

Unit Type F , is the portal of SPTS, which is designed for heavy illness and emergency. By getting into the capsule, patients can be sent through SPTS tube to hospitals. Using magnetic leviation technology and underground tubes, SPTS is much faster than traditional ambulances.





F
SPTS Portal