A Hypothetical Society of the Future

Luís Felipe Saraiva Baptista

2022

CONTENTS

A HYPOTHETICAL SOCIETY OF THE FUTURE

Preface

As of the time of this writing, I, the author, am a 21 year-old Brazilian computer science student, with no working experience, and many unformed opinions. By expatiating my current beliefs and ideas, I hope to form a more concrete and justified worldview, and expose others to some of my ideas for the future.

I firmly believe our technologies should not adapt to our old systems of governance, bureaucracies and infrastructures, but be used as tools to create technically well designed systems that address the roots of the limiting issues of societies. Meaningful change is achieved by making new technologies widespread, not through collective epiphanies or resistance to the status quo.

This document opens with my interpretation of a few implementation-independent, axiomatic objectives. These objectives were partially inspired by the UN's list of Sustainable Development Goals.

I then expound my ideas for systems that hopefully, in unison, translate to a complete vision of a hypothetical society of the future, founded by technology, maintained by strong, diverse, and sustainable cultures, that achieve the described underlying goals. Every idea introduced was inspired in some form by current developments in our collective endeavor towards a more scalable and sustainable future. The chapters and sections are interesting in isolation, but introduce ideas that work together in profound ways, so only by reading the full document would one be able to piece together the full picture.

This document concludes with a brief look into my interpretation of what fundamental challenges stand in our way towards the described future - the systemic flaws that cause most problems common people face today, impeding progress.

Having defined my goals and these systems, in time, I will hopefully set a course for work in the directions I believe will most likely lead to real changes. I would like to one day help develop technologies with lasting positive impacts. With this being said, I understand that, in reality, meaningful progress happens slowly. This document is a creative project, nothing more. It is my way of mapping out our overwhelming, limiting modern problems. If I can make sense of them, I stand a better chance of dreaming up some solutions, and I might as well share my dreams.

Introduction - The Ideal Solutions

Overall Objectives

The

Overview of Ideas

In this section I summarize my ideas for the systems that achieve the described overall objectives. The collection of ideas are separated into four major groups: those related to the models of **governance**, the **infrastructures**, the **economy**, and **public services** of the hypothetical society. In exploring ideas I believe lead to ideal solutions, I have naturally come to describe a form of government known as a Technocracy, powered by advanced enabling systems and technologies. For this reason, and for the sake of simplicity of language, we will begin referring to this ideal society as **Technoland**. It is worth mentioning that Technoland can be more easily imagined as a society having been built from the ground up as described, rather than adapted from an existing one.

Governance:
The

Infrastructures:
The Infrastructures of Technoland are the material facilities that support the high-tech lifestyle of citizens, in their smart homes and cities. They are characterized by several enabling technologies that simplify most human activities and make important aspects of life sustainable at scale.

Technoland's information and communications technology (ICT) infrastructures enable secure and trustworthy information systems (IS), that in turn power smart cities, and several important public services running in decentralized environments. Some of these include the decentralized financial system, and the identity management system. The ID system provides a simple, standard, and secure authentication interface for public and private services. Citizens can easily manage how they are tracked across the web, having control over their data. A novel approach to information security at scale actively detects and prevents the spread of malware. There is a robust disaster recovery plan for the ISs.

Technoland's utility infrastructures provision energy, water, waste management at scale sustainably for civilian and industrial uses. All utilities approach management in a hybrid way, relying both on large centralized facilities at the periphery of cities, and on small and expandable utility nodes dispersed within them. Energy production is overwhelmingly green, and storage is integrated into the infrastructures of cities. Water is taken from many sources, including basins, rain, the atmosphere, and the sea, is used efficiently domestically and in industries, and is treated in a distributed way.

Waste produced by communities and by industries are mostly recycled, then sold back to companies, enabling a circular economy.

Technoland's residential infrastructures consist of varied and architecturally inspired green buildings, built for the masses, and bring diverse people together. The national residential strategy consists of investing in projects that adhere to a set of building quality standards, that guarantee they are safe, built in sustainable processes, house large numbers of residents, make use of sunlight and rainwater, include common grounds for residents, support hydroponic plant production, and many other things. The attributes of buildings are explored in much detail in the respective section.

Technoland's public spaces vary in many forms and functions, and are all within walking distance from most homes. They offer a nice reprieve from the habitual mass of buildings, offering open event areas, sports courts, playgrounds, and much more in green spaces blending local vegetation with a high-tech architectural style. They may be at ground floor or at the canopy of concrete jungles, and always catch sunlight. They play a key role in supporting utilities and transport infrastructure.

Technoland's transport system is autonomous, all-purpose, and fully electric. It is designed to transport people, mail, cargo, and city waste in a fully coordinated way, relying on a fleet of transport shuttles of varying sizes that can be combined to form larger vehicles dynamically, leveraging shared paths between different vehicles, minimizing energy use and traffic congestion. Widespread light transport units for the public complement the main transport solution. Emergency service transport is efficient thanks to the high-speed and secure communication of the transport infrastructure. Cities tend to be connected by vactrain lines.

Technoland's urban development approach is long, costly, and very controlled, but ensures that every city has national significance and significantly advances the development of the nation. Every city evolves in a controlled way, so as to ensure access to basic needs and services, and a good quality of living experience to citizens. The common stages of formation of a new city include its rationale, planning, initial investment, initial construction and are followed by continuous evolution. Technoland can best be described as a collection of highly coordinated collaborating cities.

Economics:

The

Public Services:

The

Governance

The Legislative Body

The

The Executive Body

The

The Judicial Body

The

Law Enforcement

The

Public Finance

The

Infrastructures

ICT Infrastructure

Technoland's information and communication technology infrastructure underpins the operation of many fundamental systems of Technoland, as explored in other sections, so it is fitting to begin our discussion about the infrastructures of the nation with a look into how its technology enables everything.

The computing hardware and networking equipment in Technoland are designed from the beginning for secure interconnection. The trustworthiness of many systems rely on the trustworthiness of the underlying fabric, so an enormous effort is made to ensure its security. Most computing devices, including personal devices, workstations, and embedded systems in cities have network interfaces paired with security modules. The hardware standards, network protocol stack, and communication protocols at every layer are designed to provide security (confidentiality, integrity, availability) of data for the distributed information systems that require the hardware over the internet. The internetwork of Technoland is managed by one large company with many branches, that implements the network architecture within and between cities following tried and tested principles that permit simple and seamless communication.

Smart cities, driven by hardened Internet-of-Things devices that continuously communicate with each other and gather useful data, enable a very high degree of automation of many city systems. Some of the noteworthy ones include the utility management systems, the transport system, the surveillance system, as well as maintenance systems for infrastructures or natural environments. The collection of IoT devices that support the public infrastructures of these systems provide data sources that are gathered and processed in a distributed system, to construct a continuously accurate digital representation of each city. Effectively, information from the collection of sources collectively contribute to the states of the digital cities, that can in turn be used to guide decisions and direct the attention of city administrators.

The collective computational power of citizen's personal devices in Technoland is used in distributed, fault-tolerant public systems to support several important applications. Some of these include the decentralized financial system, the identity management system, and computationally intensive scientific applications. Effectively, devices allowed to participate constitute a distributed supercomputer and mainframe so that important applications can be run in a decentralized environment, ensuring consensus about the state of these systems, eliminating points of failure, and putting (otherwise idle) compute infrastructure to good use.

The distributed identity management system plays a key role in providing a unified and secure authentication interface for public and private services. Participating nodes maintain a record of all members of society in a sharded decentralized list with global consensus. The underlying fabric is designed to handle the consensus protocol extremely efficiently. Identities are composed of inherent human attributes such as name, sex, parentage and biometrics. Financial, legal, medical, academic and other public sector data is linked to identities, and private organizations can link data as well, but authorization capabilities ensure any one group can only access relevant information from an identity. An individual can at any moment access all their linked data. Identity data is distributed and stored redundantly, as well as centrally and securely backed up at interior and foreign sites; the chances of any data being lost or corrupted is astronomically low. Authentication to services always consists of multiple factors, with public services requiring three (biometric scan, e-id card, password) or more factors. There is a standard identity registration and reverification process. Deaths cause identities to be archived securely outside the active distributed system, so the system remains efficient for the living.

Web activity tracking can be fully turned on or off, or can be customized. Tracked data is only accessible by the user or by parties given explicit permission. Tracked data can be easily seen and deleted, and how it is used is always made clear. Importantly, laws ensure civilian data cannot be used for mass surveillance, to deliver targeted propaganda, or for political campaigns.

The Network Immune System of Technoland's ICT infrastructure actively seeks out and fights spreading malware. This system, running in some capacity on most computing hardware and networking equipment, detects anomalous network activity patterns in real time, notifies hosts involved in the activity, who then start executing received code or script in an isolated virtualized environment, and upon detecting malware, broadcast its findings to the rest of the network so other hosts can prepare to defend against it and contain its spread.

In the event of an absolute natural or human-induced disaster, all of Technoland will invoke a robust disaster recovery plan to keep all essential functionalities of the infrastructure available and operational.

Utilities Infrastructure

Technoland's utility infrastructure covers energy, water, and waste management. Generally, across these three utilities, for every city, the management solutions rely on a hybrid approach of distributed and centralized processing facilities, so efficiency is maintained while keeping the system fault-tolerant. For this, there are infrastructures like energy stations, batteries, water treatment stations, and waste recycling stations, all of varying sizes, connected to electrical, water, and sewage networks. The utility stations may be large centralized facilities at the edge of cities, or small expandable utility nodes providing their capabilities inside cities. The utility networks can monitor flow (of energy, water, sewage) through links and raise alerts when faults occur.

Technoland's energy supply infrastructures produce, transport, and store electrical energy for civilian and industrial uses. Energy production is overwhelmingly green, relying primarily on nuclear energy (fusion and fission), and is complemented by renewable sources (solar, wind, wave), and green hydrogen fuel. Solar panels covering the rooftops of most cities effectively serve as virtual power plants, offsetting the electrical network demands substantially. Energy storage relies on chemical and gravity-based batteries that are integrated directly into the infrastructure of cities (building materials, elevators, electric transport units, dedicated facilities, etc.) and are complemented by energy-dense supercapacitors. The collection of light storage solutions effectively serve as a virtual superbatteries, offsetting energy production demands substantially. Thus, energy production and storage is distributed throughout homes, buildings, cities, and dedicated stations, and cities are partially self-sustaining.

Technoland's water supply infrastructures purify and transport water for all kinds of civilian and industrial uses. Water is sourced from nearby drainage basins, or from rain or atmosphere. The former source can be collected above or below ground in lakes, rivers, or aquifers and treated in centralized purification facilities. In coastal cities, sea water can be desalinated, used, then introduced into basins after being treated again. The latter source is generally collected in cities - in streets, or building rooftops - then treated in water purification nodes spread throughout the city or in buildings before being released into the clean water supply network, or to a particular building's tank, helping it offset some demand from the network. Water is used incredibly efficiently in cities and in industry, so there is always supply. Some solutions that help minimize water use include large-scale hydroponic and aeroponic plant farms in residential buildings, spraying showerheads and taps in homes, and highly controlled water usage, treatment, and reuse in chemical and manufacturing industry processes. Water fountains that can be used for free are spread throughout cities.

Technoland's sewage system, which is separate from its water supply system, treats wastewater produced by communities before reintroducing it to drainage basins. The chosen approach is, like other utilities, hybrid, using large centralized facilities, and dispersed sewage treatment nodes, that can either treat it or transform it into biofuel.

Technoland's waste management system recycles most waste produced by communities, then sells the recycled raw resources back to companies. Residential buildings are designed to support a set of garbage chutes in every home apartment leading straight down to autonomous container vehicles that transport the waste (assumed to be partially sorted) to recycling facilities. An effective educational and cultural effort, combined with clear product labeling, have ensured that in practice, citizens are aware of the waste they produce, and send most of their discards towards the correct chutes. Garbage collecting autonomous vehicles may not belong to any one particular building, but roam the city and select buildings needing them at that time. There are usually a few garbage collectors waiting idle at each building so they may be promptly swapped in once others fill up. Recycling facilities may be large and centralized at the periphery of cities, or distributed within cities as waste recycling nodes. Recycled resources are transported from facilities to large warehouses, then sold wholesale to companies, and companies have fiscal incentives to participate in the circular economy.

Residences

In Technoland, residential construction projects are focused on tall, high-tech green buildings, dense with people per unit area. Through collaboration efforts of standardization organizations, and architects and engineers of many companies, the construction of urban residential projects have matured to a consistent level of quality across the industry. The result of these efforts was the establishment of a set of properties all residential buildings share, ensuring they are safe, roughly equally comfortable, sustainable for a long time, and incentivize community involvement. The residential buildings of Technoland are true architectural and engineering marvels.

On the one hand, the high baseline standards make it difficult for all but large construction companies to participate in the development of residences, funneling a lot of public funds into few companies, also leading to a high concentration of workforce. On the other hand, the standards help drive continuous innovation in the field, and facilitate the sharing of knowledge and experience across the industry. Projects of varying scales are undertaken depending on demand and what's economically viable for the construction company, but when (especially larger) projects present design or production innovations, these may then become standardized for future projects.

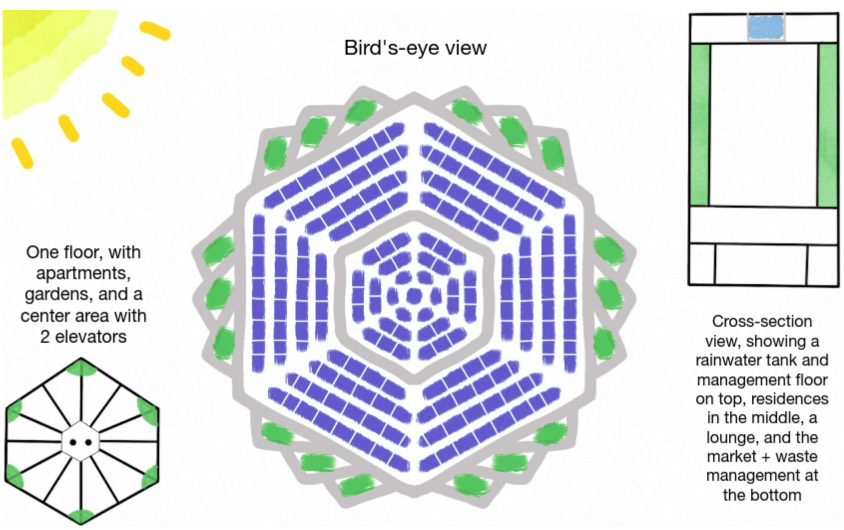
Because cities are planned and evolve such that residential buildings are roughly equally near to all major functional urban areas (schools, hospitals, malls, offices, etc.), the price of an apartment is roughly the same independently of where it is bought. There are no richer or poorer zones. This, combined with assurance of roughly equal living quality standards, cost-efficiency (in housing many people per unit area), and concententration of participating companies facilitates the regulation of apartment prices, in turn making them economically accessible to most people. Furthermore, projects are partly subsidized, and due to their close involvement with the public sector, companies are forced to be especially transparent with their spending.

Construction is continuously done for as long as there are people and families in need, and statistics on this are accurate. Buildings tend to range in capacity by several hundreds, and some are designed to be vertically expandable. Generally, this approach has led to highly scalable cities that actively prevent urban sprawl. It is important to note that this chosen housing strategy works for Technoland because its population growth rate tends to be relatively stable, its economy allows it, its workforce is competent, and infectious disease outbreaks are exceedingly infrequent events. This approach would absolutely not have worked if not for these, and other subtler reasons.

Some of the properties of residential buildings are the following:

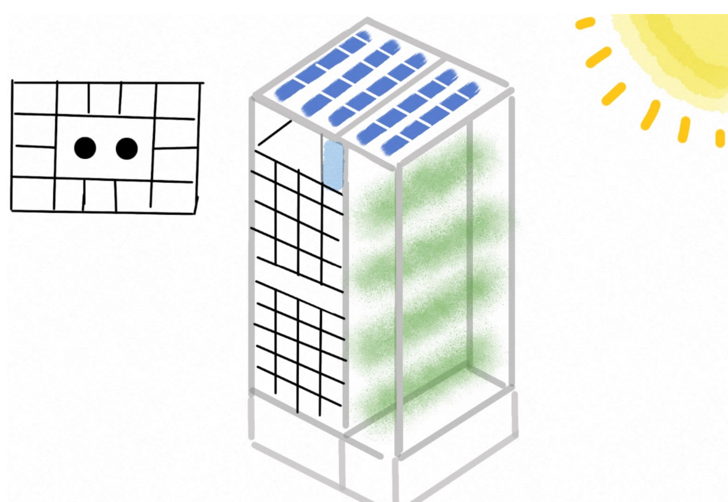
1. Comply with strict safety regulations and be resistant to relevant weather events.
2. Be constructed in a low emissions process, using sustainable materials.
3. Be dense with apartments, but have them be big enough to support 3-7 people.
4. Catch sunlight for energy generation and efficient natural illumination.
5. Catch and treat rainwater for plantation or domestic use.
6. Have efficient elevators that can store and release energy and predict calls.
7. Have garbage chutes in apartments to simplify selective garbage collection.
8. Support hydroponic gardens, either in apartments, or in dedicated sections of the building with automated harvesting.
9. Have a small market for essential items and foods.
10. Have a common area for community involvement.

A few example compliant architectures are given below.



This building is a vertical stack of hexagonal floors slightly out of phase with each other, with twelve apartments per floor, and the dedicated sections - lounge, market, and waste management. Solar panels decorate the roof, and its slight inclination funnels rainwater to the tank. The management staff regulate energy & water collection, the market, and more.

This building splits its sides into a residential, and a plantation side, since it reliably catches sunlight on one of its faces every day. There are two sets of elevators and fourteen apartments on residential floors. The lounge takes up an entire floor in the middle. The solar panels, water tank, management, market, and garbage collection sections are also incorporated here.



There are many variations on such organizations, and many other fundamentally different and unique ones. There may be more or fewer of a section type, and different ones too, like sports courts, pools, collective gardens, kitchens, and several more. The possibilities of residential buildings are endless, and every design feels inspired.

Beyond giving most urban citizens comfortable and dignified lives, the housing strategy of Technoland also makes a real attempt at reducing hate and prejudice towards differing groups of people, by diversifying residents and incentivizing the formation of small communities - by getting different people to coexist. Available apartments are offered at a discount to customers depending on the distribution of ethnicities and other characteristics of residents throughout the buildings, in addition to other variables like the customer's distance to work. The recommendation system attempts to optimize the mixing and any customer-specific constraints. Residents can opt-in to be a part of a virtual social group with their neighbors, and they can easily see who lives in the community and contact them. People can easily chat, see what interests or activities they may have in common, schedule events on common grounds, form clubs, and make other plans.

Apartments are of roughly equal quality across all standard-compliant buildings but vary structurally. The most common apartment type is one with three rooms (one being larger), a bathroom, a kitchen, a living room, and a small veranda. Other options vary in size and number of compartments, and in the types of additional compartments there may be, like work or dining rooms. At most, the largest apartment may be, say, ten times larger than the smallest one, to limit disparity, and for those, customers living in large groups are prioritized, so a high cost-efficiency is maintained.

Buyers have the option to furnish the apartments themselves, or request that they be furnished as per some specification if they are the first buyers. Upon building completion, a coordinated furnishing service furnishes the requested apartments, following the selected templates, or the fully user-customized interior designs. The furnishing service may include appliances and networking equipment. Most furniture and appliances are smart and can communicate with each other.

The applications of their communication are varied and they profoundly impact the living experience by assisting in or automating many tasks. A few examples include automated cleaning, temperature regulation, garden maintenance, grocery list generation (based on current fridge contents, recommended dishes), remote utilities management, and best of all, hot bath preparation. Clothes are cleaned and dried, and dishes are washed automatically. Importantly, these IoT devices, and the building network, are hardened against potential malware or malicious tampering.

Apartments are designed to leverage natural illumination and airflow. In some buildings, solar tubes may bring sunlight from the roof all the way down, dispersing sunlight on residences, or on internal hydroponic gardens that would otherwise not catch a lot of sunlight. On buildings that catch a disproportionate amount of sunlight on one of its faces, solar panels may be installed on that face, or it may be leveraged for the gardens, or transfer heat throughout the building, or be used in other ways.

The common grounds of a building are usually a floor dedicated to promoting community involvement. They are usually a nice, open lounge. They might include some tables, chairs, recliners, sofas and poofs, TVs with media streaming services, a kitchen with dining tables, bookshelves, a bar, table games (ping-pong, pool, etc.), and a lot more. There, people may also find common useful items for borrowing (e.g, tools), or leave unwanted items for donation (e.g, clothes, toys).

The high number of residents per floor on an average building could have had a catastrophic impact on the elevator usage if they were not designed to support it, but it manages to avoid cramming and endless waiting. The number of elevators depends on the capacity of the building, so there may be, say, one for every three/four apartments. Elevators can be configured to give preference to calls from different floor intervals, increasing response time. Schools, universities, and businesses tend to operate between standard start and end times, so the elevators can be configured to pass from top to bottom or bottom to top stopping at every floor at definite times, catching or dropping people like a bus at its stops. More generally, the residents may securely share their schedules with the system so it can plan these stopped rides, and inform residents of when it will pass by their floor. Elevators tend to be physically large to support this. Beyond elevators and stairs, if there is room for it, indoor slides, poles, lines (that automatically suspend or lower people), and other means for vertical transport can be installed if deemed necessary to handle the traffic. The first few floors are usually accessed by stairs, and the prevalence of remote work lessens the demand for vertical transport, so waiting times are fine on most days.

Every home apartment comes with a small set of garbage chutes leading down to containers in large autonomous vehicles that automatically transport the waste (assumed to be partially sorted) to recycling facilities. In practice, thanks to education and clear labeling, residents tend to correctly sort trash items. Garbage collectors may not belong to any one particular building, but roam the city and select buildings needing them at that time. The garbage collection and market sections of each building tend to share the base floor, and the market can also leverage the garbage collectors to dispose of their waste. There are usually a few garbage collectors waiting idle at each building so they may be promptly swapped in once others fill up.

The market of some residential buildings provides frequently needed items and groceries to its residents and outsiders, to simplify access to these items, and reduce traffic load in cities. Markets also help reduce the cost of apartments, offsetting some of it into the price of groceries for residents, helping construction companies profit from the investment. Markets are cashier-less, and partially automated. They are limited in size, offering a limited set of items and groceries without much diversity. They merely complement supermarkets. Residents can stay informed on the availability of items at their markets.

Buildings with many segments like these tend to have a management floor and associated staff that oversee everything: solar energy production/storage/usage, water collection/treatment/usage, garden crop production/consumption, elevator usage, market purchases/inventory, building security (physical & cyber), and more things. Residential content distribution servers that cache frequently accessed content (top movies, music, games, etc.) and serve it to hosts within or near the building can also be maintained at the management floor.

Housing for the Homeless:

The final component of the residential strategy of technoland are the homeless shelters. Their purpose is not only to keep people in dire situations off the streets, but to help reintroduce them to society as productive members, and into residential apartments. There may be one shelter per city. They are dense with beds, and mostly self-sustaining. Their maintenance cost is minimal. Inhabitants are promptly presented with opportunities for work (in simple jobs like construction or maintenance) and education on entry. If they take it, and agree to live in groups, and participate in therapy or rehabilitation programmes if necessary, then they may move to a proper apartment and slowly pay off their debt.

Public Spaces

Experienced and creative urban planners are involved with the inception of any new city that is to be established on Technoland. All cities are meaningfully distinct, and leverage their natural environment to assert their identities. Cities are people-centric, providing high walkability and interesting urban spaces and pockets of nature.

Urban parks are roughly uniformly distributed, and vary in form and function. Each one is handcrafted by urban planners and their designs are inspired. Some are lush, others more open. Some are tall, or wide, or both. Some are flat, others have hills or go underground. Some are at ground level, others at the canopy of the concrete jungle. Some are square, round, or linear, cutting through an entire city. Most of them blend a high-tech architectural style with pretty vegetation. They all necessarily catch sunlight. Some include ponds, kid's playgrounds, sports courts, open-ended indoor spaces used for exhibitions/events, space for kiosks, and other functional (and less functional) areas. Monuments can hardly be found, as citizens tend to agree there are usually better ways of spending taxpayer money, but outdoor art and public sculptures are commonplace. Still, if the people agree that one distinguished individual should be immortalized, they can easily make that wish come true with popular initiatives. Some of the cities' utility nodes - that store energy, treat rainwater, recycle garbage, etc. - may also be situated in parks, playing a role in Technoland's distributed utility management. The cities' public transport shuttles may also lie at the parks while idle, alongside other light transport units like bikes and scooters. Many parks have water fountains, bathrooms and charging stations for devices. While smaller parks may offer little more than a nice place for a picnic, larger ones may have open automated vertical gardens that catch solar and wind energy, store rainwater, and treat waste. Larger parks are also used as locations for popular events, like concerts or fairs.

Some of Technoland's urban planners' inspirations:

Rolling Green Ribbons (proposal), Los Angeles

Supertree Grove, Singapore

The Transport System

Technoland's transport system is autonomous, all-purpose, fully electric. It is designed for people, mail, cargo, and city waste. For public transport, the system is designed to leverage shared segments of trips among users; a fleet of automated shuttles are available to the population, and any time a user needs to travel through the city, they must simply specify their pickup and dropoff locations, and one of the shuttles will take them to their destination, through a path determined by where other users of the network need to go. If a shuttle is not in use, the system sends it to a region where it expects future rides may begin and recharges itself; the distribution of shuttles adapts to global transportation needs. They also collectively serve as a virtual superbattery for the city, releasing energy back into the grid when needed. All vehicles are real-time systems, so they are continuously aware of their surroundings and communicate with other vehicles, roads, and pedestrians securely and at extremely low-latency.

Shuttles support varying capacities of people. The most used capacities are for one, two, or four people, in Solo, Duo, and Quartet transport units respectively. These can be physically joined together by a 8-linker unit, that can link shuttles with a combined total capacity of eight people. For groups of up to eight or sixteen people, the less common Octet and Hextet shuttles can be used, and linked by 32-linkers.

Citizens can call a shuttle from anywhere to any destination (in the city) using an app for mobile/wearable devices. They can quickly call it for themselves or for a nearby group of contacts. In the latter case, once called, the contacts must confirm they will join, and after confirmation, the call will be broadcasted. Upon the shuttle's arrival, passengers are given some time to get in before it starts moving again. They may share the shuttle with other passengers already inside. Passengers are authenticated so if someone who didn't call the shuttle gets in, they will be kindly asked to step out (before the ejector seat springboards them 5 meters into the air, that is).

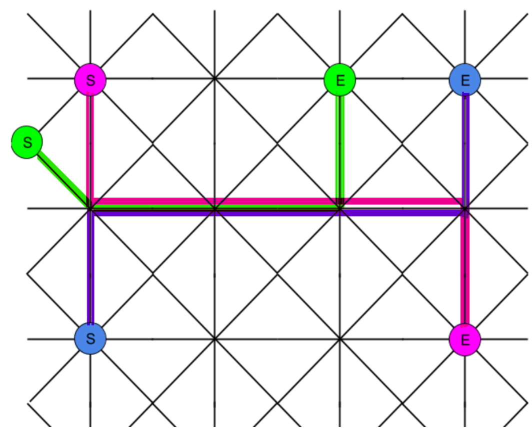
If multiple user paths are similar, they are combined for the duration of some shared segment; their vehicles will attach to each other via a linker, and each engine's operation will be rebalanced to more efficiently move the larger combined vehicle. Once the shared segments have been traversed, the transport modules are separated to complete each users' trips separately. The combination and separation improves energy efficiency, especially for larger groups, and prevents congestion.

Citizens are charged for every ride they complete, but the cost is very accessible. The autonomous transport infrastructure replaces conventional cars, vans, and buses, and the industry has scaled to the point of handling the demand for transport units in every city throughout the nation.

Synchronization, signaling between vehicles and pedestrians is fully dynamic. There are no traffic lights for vehicles, as their communication ensures they accelerate, decelerate, and halt to ensure no crashes, while maximizing flow. Pedestrian signaling depends on the number of pedestrians waiting and vehicles passing by a crosswalk. Generally, a 'halt' signal is asserted when approaching vehicles are transporting more people than there are waiting, and a 'proceed' is signaled otherwise. Timers can also switch the signaling so no group is ever waiting for too long.

Light transport units are a secondary component of Technoland's public transport strategy. Bikes and scooters are widespread, and can be rented easily through the official transport app. Users are charged monthly for using bikes, and in real-time as they make their trips with electric bikes or scooters. Users must always start and finish their trips with electric light transport on one of the many charging stations distributed throughout the city, or risk paying a nasty fine. The location of light transport is constantly monitored so city maintenance workers can deliver outstanding units to a station if there are any.

Hyundai 'Mobility of Things' Illustration for CES 2022



Example of combined shuttle paths

Ambulances, police cars, fire trucks, and other emergency service vehicles are given utmost transport priority. Once deployed, their paths are broadcasted to vehicles and roads along it so vehicles clear the way in a coordinated manner, and halts are signaled at crosswalks as the emergency vehicle approaches.

As mentioned in other sections, Technoland’s garbage collecting service is also integrated into the autonomous transport system, using specialized container shuttles that dock into the base of buildings and accumulate a specific type of trash, that are then transported to one of many recycling centers once they fill up.

Technoland’s postal service also uses specialized shuttles for transporting varied mail items. Some variety exists among mail shuttles, enabling the delivery of small, medium, and large items on a variety of standardized packages. Endpoint delivery is also automated, as packages are inserted into specific slots in buildings, or otherwise left on the floor or delivered to a person. All packages come with a secure geolocation tag enabling real-time tracing. Once they are delivered, a receipt confirmation may be required, but not always, as the system may consider a delivery as complete when the geotag confirms it has reached its destination. The delivery service is costly but a good part of the money is returned when the package is returned to the postal service, either to a shuttle or a local post office; packages are reused. Small, high-priority packages can be delivered via drones for a higher price.

Cargo transport in cities is also done on large, specialized container shuttles, but are sold, rather than leased to companies. They are autonomous and are managed via a standard interface that can be integrated into different companies' logistic systems. They can be sold between companies, and their ownership is shown on their exteriors.

Neighboring cities are connected by vactrains that are mostly used for cargo transport, but have limited passenger capacity. The vacuum lines are pretty much always in use; cities are always sending each other resources, so inter-city transport is fast and accessible. More conventional, less efficient means of inter-city connection through ground, water, and air vehicles are also available.

Urban Development

Technoland is a collection of collaborating cities, where every city has some national significance and significantly advances the development of the nation as a whole. Furthermore, every city is developed in a controlled way, so as to ensure access to basic needs and services, and a quality living experience to all. This in turn orientates most citizens toward productive life paths, and enables a true meritocracy. To show how all this is achieved, we will go through the common steps in the establishment of a new city, pointing out important considerations that need to be made at each one. Technoland's urban development process is long, but reasonably well structured - enough to be explained in general terms. We will assume there already exists at least one city in Technoland, and that city establishment is always a calculated expansion effort of existing cities. Thus, cities do not form naturally from dispersed peoples.

Rationale:
First of all, who decides when a new city should be established? The executive body of the federation of Technoland has a say in this, but ultimately, ordinary citizens should approve such costly expansion efforts.

Why should a new city be established - what good reasons could motivate its existence? First, it may be necessary to create a new city to accommodate a growing population in the collection of existing cities, if these cannot be scaled further. Second, there may be some abundant natural resource in national territory with potential for stimulating the national economy, that could also benefit the economy of a city near to it. Third, there may be some coast with great potential to serve as a checkpoint for maritime trade routes, or in other words, that could exploit a commercial opportunity with ports. Fourth, for a certain distribution of cities over national territory, it may be sometimes desirable to establish a city to serve as an intermediary link between other distant cities that would otherwise not be connected. There are many more reasons why a city should be built, and each one has strong economic motives.

Where should a new city be established? This is partially determined by the reasons behind it, but other more specific considerations can be made. If a new city can be established near existing ones, it could initially share some existing utilities infrastructure - it could be much cheaper to build. Otherwise, if that city's purpose is to exploit far away resources or commercial opportunities, then it would have to be built and survive more independently of the rest of the nation, that would lead to a greater cost, but that would be, in principle, offset by the cash flow it creates. Cities created in higher isolation will naturally evolve in ways meaningfully distinct from the rest.

How should a new city connect to existing ones? The first implemented infrastructure in all expansion efforts is a direct, preferably high-speed connection for physical and data transport from an existing city to where the new one should be built. This is done to enable coordination and an accelerated transfer of resources and people for subsequent development efforts. All cities are eventually well-connected together by various paths over land, water, and air, and these connections should be established as early in its development as possible. If the next city to be established is more isolated from existing ones, and a long direct high-speed connection is infeasible, then a simpler connection should be created, and the high-speed path will need to be built slowly as the need for establishing intermediary cities emerges.

These initial considerations are informed by the current stage of Technoland's expansion strategy, that is restrained by the amount invested, and seeks to minimize construction time, and maximize the expected gains from created economic activity. Thus, the expansion strategy adapts to Technoland's current political state of affairs (determined by thousands of variables), and the current state of the national economy. For example, establishing a distant city with the intention of creating commercial ports that enable the exchange of valuable resources, connected to other cities by long simple lines would be a bigger gamble than establishing one closer by, more tightly connected, but with a smaller economic impact. Whether the gamble is taken or not depends on how prepared and willing Technoland is for it.

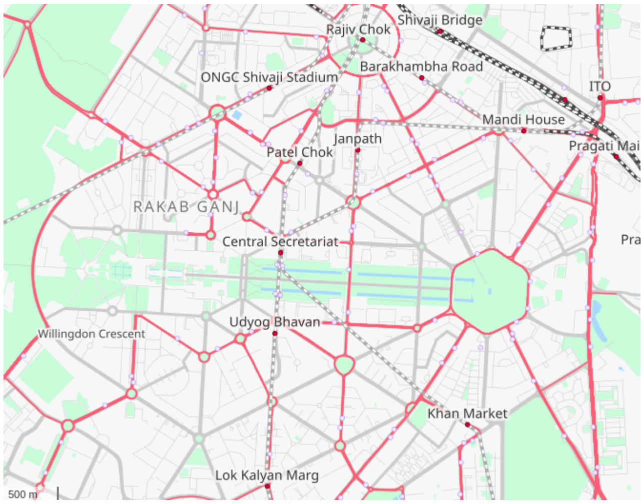
Planning:

The planning stage of a new city begins when its rationale has been well defined and approved. It begins with the initial specification of the project's scale, and appropriate call for investment and budget allocation. The initial size of a new city largely reflects the amount invested on it. At the urban planning stage, the initial layout of the city begins taking shape: the ICT and utilities infrastructure, placement of urban areas, and design of the transport network, for the natural environment they will be built upon.

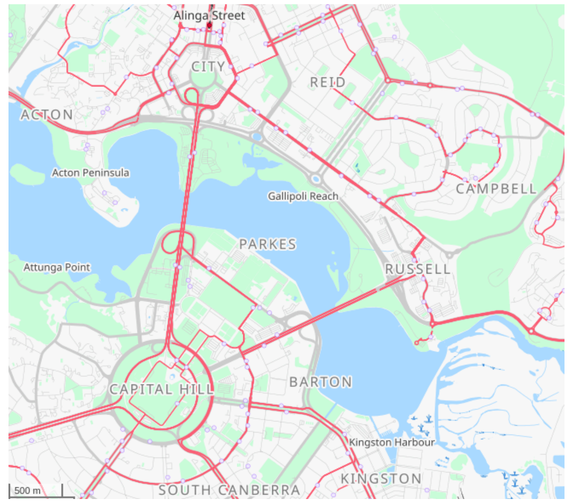
Cities are designed for efficient transport. The transport network design assures multiple efficient and safe paths exist between any two points in the city by using major lanes slicing the city, many minor diagonal lanes, tunnels and viaducts, roundabouts, diverging diamond interchanges, and many other structures. Pedestrian paths and light transport lanes are also included in the design.

An initial assignment of essential facilities to urban areas is then chosen - these are residences, urban parks, schools, hospitals, police and fire departments, utility nodes, administrative buildings, and other such infrastructures. Generally, these are all distributed over the geography of cities so no one area has a concentrated population and all have easy access to basic needs and public services.

Some of Technoland's urban planners' inspirations:



New Delhi



Canberra

<u>Initial Investment</u>:

Raising funds and public interest for a new city is a necessary step between planning and production. After the initial proposal and plan have been reviewed and approved, city establishment projects seek out construction companies that could build its parts. Then, the idea of the city takes on a more public form, as campaigns incentivizing participation and investment in the new city are launched. Specifically, many city administrations of technoland announce the project, promote fundraising events, sell apartments to initial residents, employ new public workers, and sell land to businesses. Over time, having accumulated enough interest for the project, plans for the urban infrastructure that will fill up the delimited urban areas start being drafted. Importantly, the project does not go forward if businesses don't commit to opening offices, job openings, and shops; the economic activity of the city must start strongly. If interest is big enough, then the initial connection from a fringe city to the new one can start being built. Gathering funds and (public and business) interest may take several years; it is the stage in urban development that makes or breaks projects.

<u>Initial Infrastructure</u>:

Having accumulated enough funds and interest to start building the city, a schedule for production is created, so it can be gradually populated as it is built. But before this, a path for physical and data connection is established, the workforce is transported to the site, and temporary living facilities made from prefabricated mobile homes are set along with mobile utility nodes. Then the ground is cleared, and the initial ICT and utilities networks start being implemented. After that, construction starts on the roads.

Meanwhile, scheduled construction companies involved with the building of facilities in urban areas start pre-production. As roads are built, the sites are prepared for production, then production begins. This takes a while and projects are almost always delayed and go over budget, but they eventually complete, and the next phase of scheduled construction efforts begins. This process repeats many times until the land is transformed into an initial and presentable version of the city it shall become. Only then does the city start being populated in rounds.

It can take a decade or more for a new city to materialize from its initial plans, but every time a new one emerges, they represent a major step in the nation's economic, social, cultural, and scientific development. The first few cities established by this process took quite a long time, but eventually the workforce (planners, architects, engineers, construction workers) became accustomed to the fast pace of development, and learned process optimizations have hastened the cycles. In every case the long-term investments have paid out for all involved. Despite Technoland's relatively stable and rising economy, due to the accelerating pace of technological evolution, only a few cities are ever in construction at any given moment; processes and infrastructures are always evolving, and work is also continuously done in established cities to help them approach their full potential.

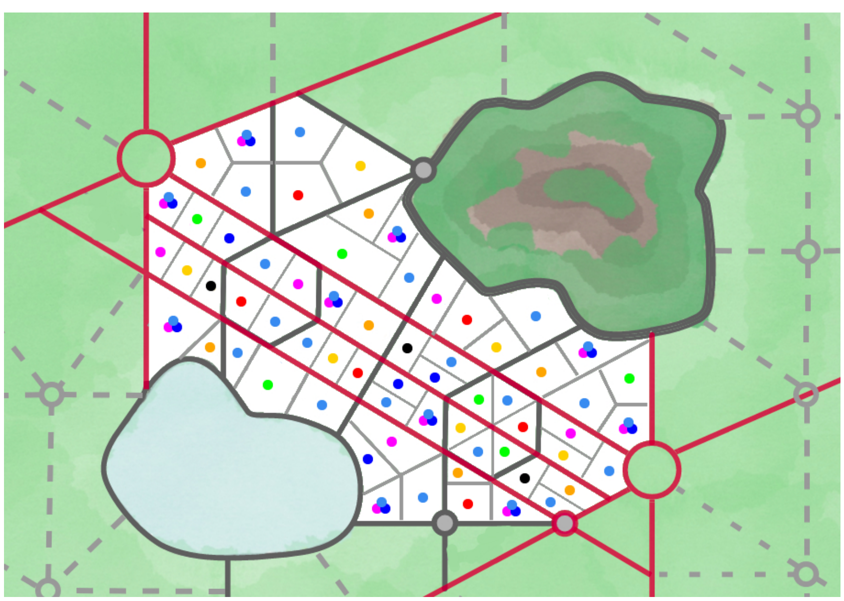
Evolution:

The guiding principle behind city evolution efforts is that by giving everyone good and roughly equal education and work opportunities, and base starting conditions, then people's merits can more directly be attributed to their efforts, and they can be rewarded more directly. In other words, Technoland can operate as more of a true meritocracy. Systemically minimizing economic and social disparities, and investing heavily in education have led to the formation of entire generations of incredibly capable workers, and the first part of this equation has everything to do with how the evolution of cities is controlled.

Concretely, residences, parks, schools, hospitals, emergency service stations, and diversified points of business and commerce are spread out and balanced over the geography of cities, such that the notion of city centers, suburbs, and low/high income neighborhoods fades away, and everyone has roughly equal access to facilities of these types. Another way of seeing this is as the different types of activities that tend to happen in cities being allocated regions such that most residences are covered by facilities of all activity types. This is ensured by initial designs, but maintained as cities expand. This is all done algorithmically, of course, in machine learning models that adapt as data is gathered on where people tend to go, and spend money.

This controlled evolution approach is not flawless, but it ensures that 1) the population is not concentrated on any specific set of locations; 2) access to basic facilities like schools, hospitals and markets is guaranteed; 3) every region is roughly equally economically invested in; and, as a result of the previous three, 4) the transport network avoids congestion. Controlling quality standards for residences (as described in other sections) and investing roughly evenly on business & commerce in every region tends to help limit economic and social disparity.

An Example of an Urban Plan:
To illustrate the approach to urban planning and evolution, consider the following simple example. The initial city plan, which includes a transport network, delimitation of urban areas, and an outline of regions of expansion, rests between a mountain and a lake. Different line colors and thicknesses indicate the traffic capacities of transport lanes, with red ones being major avenues. The colors of the dots represent the types of facilities that take over a certain urban area. Blue dots correspond to residences, red to healthcare centers, yellow to schools, orange to universities or research institutions, green to parks, pink to commercial centers (stores, markets, restaurants & bars, shopping malls, sports stadiums, etc.), purple to businesses (offices, factories, etc.), and black to emergency service stations. The frequency of occurrence of facilities vary by their type; residences are widespread, emergency service stations are rare, but strategically located, and everything else lies somewhere in between those two in terms of frequency per area. This example was hand drawn but in practice, plans are done algorithmically to suit a much larger variety of activities, larger cities, and any underlying environment.



Summary:

In summary, the urban development process is long and controlled so that certain challenges that emerge as a result of chaotic development are avoided. This process begins with a thorough consideration of the nation's strategic development plan to define what future expansion efforts should be, and what they should achieve. Next, a plan for the chosen expansion strategy is designed - a new city takes form. Then, to move the plan from paper to the real world, economic and social support needs to be gathered. Having successfully gotten people on board, the groundwork for the new city is established over a schedule of construction cycles. Finally, as people move into the new city and it grows and develops, a fair distribution of facilities that support basic needs, and evenly stimulate economies is maintained.

This tremendous effort allows cities to be fully developed in a matter of decades (rather than evolve chaotically over centuries), with every city being varied, having national importance, maintaining high life quality standards, being built to scale, and ultimately, enabling a true meritocracy.

Economics

The Financial System

The

Businesses & Labor

The

Industries

Supply Chains
The

Industrial Equipment & Machinery
The

Industrial Transportation
The

Packaging
The

Natural Resource Extraction
The

Chemical Industry
The

Durables Industry
The

Services Industry
The

Household & Personal Products Industry
The

Pharmaceutical Industry
The

Information Technology Sector
The

Media & Entertainment Sector
The

Commerce

International Trade
The

Wholesaling & Retailing
The

Illicit Trade
The

Financial Markets

The Stock Market
The

The Bond Market
The

The Derivatives Market
The

Public Services

Education

The

Healthcare

The

Welfare

The

Emergency Services

The

Online Public Services

The

Conclusion - The Limiting Problems

The