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The City Re-Imagined

重新构想的城市

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Dr. Paul Friedli is both a PhD in Electrical Engineering and an MD. Twenty-five years ago he invented of the world's first practical destination control system for elevators and has continued to innovate in this field ever since. Ten years ago he realized that the total journey through the built environment was the important thing to optimize and developed a technology to do just that. This work led him to the realization that urban mobility holds the key for the topology of cities of the future and can enable radical urban lifestyle improvements.

保罗・弗里特利(Paul Friedli)博士获得了电气工程学博士学位，并拥有硕士学位。二十五年前，他发明了世界首套实用的电梯目的楼层控制系统，并继续在这一领域不断创新。十年前，他意识到乘客在整个建筑环境中的完整乘梯体验是需要优化的重要方面，并开发了一项技术对此进行优化。从中他意识到，城市移动是未来城市拓扑结构的关键所在，能够彻底改善城市生活方式。

Max Schwitalla
Founder | 创始人

Studio Schwitalla
Schwitalla工作室

Berlin, Germany | 柏林，德国

Max Schwitalla founded Studio Schwitalla, Berlin in 2012. The Studio has grown to a small team of international designers, researchers and scientists whose mission is to blur the boundaries between architecture and urban design. The experimental work between the two disciplines results in concepts for entire neighborhoods as three-dimensional structures and buildings as urban environments. Research partners include the multinational mobility expert Schindler Elevators as well as the car manufacturer Audi. The driving passion at Studio Schwitalla is the pursuit of future urban mobility and the team's ultimate goal is to re-negotiate spaces.

Max Schwitalla于2012年在柏林成立了Schwitalla工作室。该工作室成长为由国际设计师、研究者和科学家组成的团队，他们的任务是模糊建筑设计与城市设计之间的边界。在两种理念之间的实验性探讨产生了将整个社区当作三维结构和将建筑视为城市环境的概念。其研究伙伴包括跨国的移动专家迅达电梯公司和车辆制造商奥迪。Schwitalla工作室的主要动力来源是对未来移动城市的追求，团队的终极目标是重新组织空间。

Abstract | 摘要

Current urban models no longer meets the needs of the massive growth in urban populations which is predicted to continue for the foreseeable future. To prevent a catastrophic decline in the standards of living that current urban dwellers enjoy, it is necessary to make radical changes to the overall structure of the city. The City Re-Imagined will consist of an in-depth examination of the problem and a series of proposed solutions. Paul Friedli, a world-renowned expert in this field, will, with the aid of other relevant experts, give a historical perspective on the current situation and explain how to dramatically improve it. The paper will show how the subject of transit management holds the key to both what has gone wrong and how to fix it. A new development methodology based on renewed mobility concepts will be covered.

Keywords: Building Configuration, Transit Management, Urban Design, Urban Mobility, Vertical Transportation

当前的城市模型已无法满足城市人口大规模增长带来的需求，在可预见的未来，预计这一增长势头将会持续下去。为防止现有城市居住者所享有的生活标准急剧下降，很有必要对城市空间的总体结构进行彻底变更并获得立竿见影的效果。打造重新构想的城市，需对面临的问题进行深度审查，并提出一系列解决方案。历经连续4次会议，结合其他相关专家的协助，全球知名的电梯专家保罗・弗里特利(Paul Friedli)将就目前形势给出历史性展望，并解释应如何进行大幅改进。该团队将展示迅达PORT系统为何是发现问题、解决问题的关键所在。届时将介绍一种基于革新的移动理念的全新发展方法。

关键词：流量计算、电梯目的楼层控制系统、城市设计、城市机动性、垂直交通

The focus of the work by Schindler's Advanced Research group has been to undertake a high level of innovation that creates new values for customers. More recently, however, we have turned our attention to what we consider is the ultimate level, which is allowing our customers to innovate themselves thanks to our products and services. These are lofty goals, not least because the majority of innovation does not take place in this space at all but rather is focussed on cost reduction and minor improvements.

Elevator companies began their existence with an innovation that truly allowed their customers to generate values, specifically tall buildings, which without their product would not have been at all viable. Despite this, there was no further progress at this level of innovation and engineers lowered their sights to focus on making lower cost products with marginal improvements.

Within the lower cost category such items as production processes, new materials, and electronics all played a role. Specifically, each impacted the industry as follows:

Production Processes:
The elevator of the early 1970s was a bespoke

迅达前沿开发团队的工作重点便是进行持续不断的创新，其中包括为客户创造新的价值。然而，团队最近将目光转向了我们的终极目标——让客户可以依靠我们的产品与服务对他们自己的项目进行创新。这些目标很高远，尤其是因为此阶段任务并不在于发起大部分创新，而在于降低成本以及小幅改进。

电梯公司出现之初便是一项创新，真真切切地使客户能够创造价值，尤其是高层建筑，这一产物没有电梯就不可能存在。除此之外，此层级的创新并无进一步发展，工程师们降低了标准，侧重小幅改进、打造成本更低的产品。

在成本较低的类别中，生产工艺、新材料及电子产品均发挥了作用，分别对行业产生了以下影响：

生产工艺：
二十世纪七十年代早期的电梯是一种定制设备，在一家专业工厂完成制造，毫不夸张地说，它完全是由木材与金属制成的。然而，大家意识到，如果某些环节能够通过标准设计批量生产以更低的成本进行交易，那么将可以大幅降低成本。此外，通过从“每台电梯由一个国家的电梯工厂制造”转变至将每一重要部件放在全球专业工厂进行制造，进一步节约了成本。

device made in a specialist factory where it is not an exaggeration to say that wood and metal went in at one end and a fully manufactured elevator came out at the other. A very large amount of customisation was available for each unit. It was realised, however, that if some of this flexibility could be traded for lower cost generated by volume production of standard designs this could bring about very significant cost reductions. In addition further savings were achieved by moving from a "per country elevator factory" approach to one where each significant component was made on a global basis in specialist factories.

New Materials:
The use of light materials for the construction of an elevator cabin can have a radical effect on its cost. A lighter cab means a lighter counterweight, resulting in less overall weight for the winding machine bearing to support, and less system inertia for the drive to move. So two major components, the machine and the drive, can be specified to be smaller at lower cost. The replacement of ropes by belt-like lifting media in the last few years has also allowed for more compact arrangements and lower torque requirements.

Electronics:
Both manually driven and automatic elevators had relay controllers at the heart of their control systems until the mid-70s, when microprocessor-based controllers started to replace them. Initially, costs were equivalent or even higher but, as the product matured and higher volumes were used, savings started to be realized. Once elements such as diagnostics and ease of commissioning were taken into account, the microprocessor was established as the low-cost solution. In addition, the rise of powered electronics in the 80s meant that expensive solutions such as motor-generator sets could be replaced by transistor-based variable frequency drives to power the system.

The stepwise jump in computing power, which the use of the microprocessor gave to the elevator, meant that control algorithms, which could potentially enhance the performance of a group of elevators, could be attempted. This was important in the 80s since there was a great drive in the construction industry to build higher and to ensure good elevator service all the way up the building. Thus, more units were needed. This led to a reduction in rentable area, greatly increasing the pressure on elevator companies to produce more efficient elevators that could provide adequate service with less units. Unfortunately this did not prove easy since most of the "low hanging fruit" with respect to elevator group control had already been implemented with relays.

It became clear that if progress was to be made, elevator companies would have to use the increased computing power available to enable a radically new approach to the way in which passengers used elevators. It had been known since the 1940s that a theoretically more efficient way to use a group of elevators was by means of what was termed "destination control." The idea here was to adopt the methodology used by virtually all other mass transportation systems of pre-sorting people by their destination before they entered the transportation medium. The conventional means of using an elevator, whereby it was called on the basis of its direction (via the landing up/down buttons) and then the destination required was communicated in the cabin by means of another set of buttons, was a function of the evolution of automatic control. Here an attendant, to whom the destination required was verbally communicated by the passenger, was replaced by a set of buttons with no accompanying examination of the total system efficiency. Thus, the conventional control methodology was established without any attempt to take a systems approach to the overall problem. By the 1980's the whole industry was aware via simulation that "destination control" not only represented the logical way in which to control an automated group of elevators, but also that it could offer the major gains in efficiency. The problem was that nobody had come up with a passenger interface that enabled the system to be deployed by allowing users to operate it with the same level of ease and understanding that the conventional approach allowed (although when passengers are observed pushing both the up and down landing button to call an elevator this point may be considered debatable!). In the late 80s this challenge was taken up by Schindler's Advanced Technology group under my leadership and the result was Miconic 10, which we released in 1992 and which represented the first practical "destination control" system on the market. This system took some years before it was accepted by the overall industry (which perhaps explains why no rival products emerged for nearly ten years) but early adoption by buildings, which literally could not have been built without the efficiency gains it delivered, meant that eventually it was accepted as the main stream methodology for tall buildings. More importantly Miconic 10 also represented a move from the "make it cheaper" level of innovation to the "make it

新材料：
使用轻质材料制造电梯轿厢可对制造成本产生重大影响。更轻的轿厢意味着更轻的对重，就意味着绕线机所承受的总重更轻，曳引机移动时的系统惯性也就更小。所以，可以用更低的成本制造两大主要部件——控制柜及曳引机，并且可以做得更小。过去几年，带状提升媒介取代了绳索，这也使得布局更加紧凑，扭矩要求更低。

电子产品：
曾经，不论人力驱动型电梯还是自动电梯，其控制系统的核心都是继电控制器，七十年代中期起开始被基于微处理器的控制器所取代。刚开始时，微处理器控制器的成本与使用继电控制器相当甚至更高，但随着产品不断成熟以及进行更大批量生产，节约效果便开始显现。若将诊断及易于调试等要素考虑进来，微处理器堪称低成本解决方案。此外，八十年代电力电子学的崛起意味着基于晶体管的电压、变频曳引机可替代诸如电动发电机组等成本高昂的解决方案来为系统供电。

电梯使用微处理器后，实现了运算能力的阶梯式进步，意味着可以尝试编写有望提升电梯群组性能的控制算法。这在八十年代非常重要，因为那时建筑行业掀起了建造高楼的热潮，需要使用更多台电梯来实现贯通整幢大楼的优质电梯服务。这导致可租用面积减少，极大地增加了电梯公司的压力——需制造更加高效的电梯以期在提供充足服务的同时减少电梯台数。不幸的是，这并非易事，因为大部分与电梯群控相关的“可轻松实现的目标”均已安装了继电器。

显而易见，如果要取得进步，电梯公司必须使用现有的强大运算能力，从根本上改变乘客使用电梯的方式。从二十世纪四十年代起，人们便知道，依靠“目的楼层控制”在理论上是更为高效的电梯群组使用方式。此处的理念是采用几乎所有其他公共交通运输系统都在使用的方法——在乘客进入交通系统前，根据其目的地对其进行预分类。电梯的传统使用方式——基于行驶方向呼梯（通过层站的上/下按钮），然后在轿厢内通过另一组按钮传达所要前往的目的楼层，这是自动控制的一项进步功能。在这里，由一组按钮取代了电梯侍者（乘客向其口述所要前往的目的楼层）的工作，但并未对整个系统的效率进行检查。因此，传统的控制方法并没有试图就整体问题采取任何系统做法。到二十世纪八十年代，通过模拟，整个行业意识到，“目的楼层控制”不仅代表了自动化电梯群控的逻辑方式，而且可以大幅提高效率。问题在于，尚未有人开发出一种让用户可以与运用传统方法一样简单易懂地进行操作的乘客界面（即使发现乘客同时按下了上行与下行层站按钮进行呼梯时，这一点可能是有争议的！）在八十年代后期，我带领迅达前沿技术团队应对这一挑

better" level which was clearly a move in the right direction.

The next step in our innovation path was to find a way of adding value to our customers. This came in the next iteration of "destination control," which we called Schindler ID. For the first time, we added a card reader to the input keypad of the system that enabled us to understand better the needs of each passenger via their use of an RFID card. In concert with this feature, the customer was able to take advantage of a full access control system which worked in conjunction with the elevators to bring a new level of security to their building. This was a real added value for customers and meant that the ultimate goal of being the catalyst that allowed them to innovate was within reach.

The final step on our path to allow customers to innovate was reached with the launching of the PORT Technology and, a few years later, with its smartphone-based addition, myPORT. Now, instead of trying to optimise each individual vertical transaction through an elevator system, the focus was on the total journey through the building from initial entry to final destination. The Schindler Advanced Research team coined the term Transit Management to define this discipline and it soon became apparent that, in the same way that early elevators enabled our customers to build tall buildings, Transit Management had the potential to enable entirely different forms of architecture to be realised. This was indeed a return to the highest level of innovation since for the first time customers could innovate themselves by using a Transit Management approach.

Within PORT Technology there are 4 elements, namely:

> Transport: the control of the elevator system itself
>
> Access: the authorisation of users to enter the building coupled with their assignment to an elevator and seamless further entries and elevator rides as required and allowed.
>
> Guidance: the information required for users to make a successful transit through the building to their final destination.
>
> Care: In the future a role will be played by PORT Technology in the welfare of building occupants.

At this point in the development of the Schindler Advanced Research team wanted to adopt a vision that would drive further research and, in particular, inform the engagement with the architectural community that we knew would have to take place if the promise that Transit Management offered was to be fulfilled. The phrase which we adopted is as simple as it is far reaching. Make people happy! This guiding principle is the basis for everything we work on. If it has the potential to improve people's lives then we do it, if not we don't. It is the only "business case" we consider and it has enabled us to produce elements of PORT Technology that have been financially successful without the stifling effect of an up-front monetary assessment of their value.

Armed with PORT Technology and our vision it was now time to engage with the architectural community. This was initially accomplished via a highly beneficial collaboration with the ETH Chair of Architecture and Urban Design whereby Schindler sponsored ground breaking research into the informal vertical community that had grown up in Torre David, an abandoned high-rise development in Caracas. The book produced by the collaboration (Brillembourg et al, 2012) was named by the Financial Times as their Architectural Book of the Year in 2012 and the work was awarded a Golden Lion at that year's Venice Bienale. Important conclusions were reached by this study that would impact further work undertaken by our group in the years ahead.

The verticality of the building provided a level of security which was much higher than that available in the favelas which its occupants had previously called home. In addition, despite the fact that the final walls delineating apartments were not build under the auspices of an architect, the main structure was of a high quality and would withstand all prevailing weather conditions. Freed of the need to constantly protect the security of themselves and their structure, the residents of Torre David could focus on more creative pursuits and an entire community consisting of shops, services and even a currency emerged. In his introduction to the Torre David book, Andres Lepik summarises the situation as follows:

> "The current residents of Torre David seized the opportunity of appropriating an existing structure, originally intended for a different purpose, and are using it to meet their urgent housing needs, gradually adapting it to meet certain standards of habitation. In the course of this experiment, the community of residents has become

战，后于1992年推出了Miconic 10——市面上首套实用的“目的楼层控制”系统。这一系统几年后才被整个行业所接受（这可能解释了为何将近十年内都没有出现竞争性产品），但是，早期在建筑中得到采用（没有这一系统提供的效率增益，可能无法建成）意味着它最终成为了公认的高层建筑主流技术。更重要的是，Miconic 10也代表着创新从“降低成本”层面向“提高质量”层面转移，这无疑是在向着正确的方向前进。

我们创新之路的下一步是找到为客户增值的方法。此时出现了下一代“目的楼层控制”，我们称之为迅达ID。我们第一次在系统的输入键盘上安装了读卡器，这使我们能够通过各乘客的无线射频识别卡的使用情况来更好地了解其需求。与此特征相呼应，客户能够利用一套完整的门禁控制系统，此系统与电梯共同工作，提高建筑的安保水平。这对客户来说是一项实实在在的附加值，意味着由我们充当催化剂让客户自己进行创新的终极目标已触手可及。

我们发布PORT技术，完成了让客户可以自主创新的最后一步，几年后，又推出了智能手机应用myPORT。现在，我们不再试图通过一套电梯系统来优化各项垂直任务，而是聚焦乘客从进入大楼到抵达最终目的楼层的完整乘梯体验。迅达前沿开发团队创造了“交通动线管理（迅达PORT系统）”这一术语来定义这一原则，很快我们便意识到，就像早期电梯出现后客户能够建造高层建筑一样，迅达PORT系统也有望协助打造出完全不同形式的建筑。这其实正是回归到了创新的最高层面，因为凭借迅达PORT系统，客户第一次能够对他们自己的项目进行创新。

PORT技术包含4大要素，即：

交通：电梯系统的控制

权限：用户进入大楼的授权，以及为其选派一台电梯、随即进入轿厢、电梯按照要求及许可运行

指导：用户为在大楼内成功抵达其最终目的楼层所需的信息。

关怀：今后，PORT技术将对大楼住户的福祉做出贡献。

此时此刻，迅达前沿开发团队想要立足于可促进进一步研究的愿景，尤其是，迅达PORT系统的承诺得以实现后必定会兑现的建筑社区诺言。我们采用的措词简洁而影响深远。让人们快乐！这一指导原则是我们一切工作的基础。如果一件事有望改善人们的生活，那么我们就会去做，若不是，我们就不做。这是我们唯一考虑的“商业模式”，这也使得我们能够打造出PORT技术的各要素，这项技术最终取得成

Figure 1. Spiral Town (Source: Schindler Ltd)
图1. 螺旋镇（来源：迅达电梯）

increasingly stable, creating autonomous organizational forms that reinforce their sense of identity and solidarity."

Andres Lepik – Torre David

As the work of re-engaging with the architectural community continued, it became apparent that the driving force behind the topology of current urban environments is the prevailing mobility method in use. In their book "The Urban Shelf" (Friedli et al, 2015), the authors identify the two extremes of city development as being the CORE City wherein the elevator predominates and the CAR city where the automobile plays the largest role. While the CORE City grew from the need to rein in the horizontal expansion of the CAR city to a point where normal social and business functions became untenable, both topologies are at the limit of expansion and will not be able to meet the challenges posed by the rapid expansion of urban population predicted for the next decades.

A number of methods have been considered as pathways to a more sustainable urban future, each driven by a new or modified mobility system. Spiral Town (Figure 1) is

功，且并没有仅从商业盈利的角度作为单一的出发点。

有了PORT技术以及我们的愿景，是时候着手打造建筑社区了。大卫塔是加拉加斯一幢遭遗弃的烂尾摩天大楼，该大楼逐渐发展成为一个非正式垂直社区，迅达发起了对这一社区的开创性研究。建筑和城市设计协会主席提供的协作对我们大有裨益，这就是打造建筑社区取得的最初成果。Brillembourg等人撰写的关于上述协作的书（2012年）被《金融时报》评为2012年年度建筑书籍，大卫塔荣获当年的威尼斯建筑双年展金狮奖。此次研究得出了重要的结论，这些结论可能会对我们集团未来的进一步工作产生影响。

相比居民们之前居住的贫民窟，该大楼的垂直性所提供的安全等级要高得多。此外，尽管勾画一间间公寓的最终墙体并未在建筑师的主持下建成，但大楼的主体结构质量很高，能够防御所有盛行的天气状况。没有了担心自身安全及容身之所的长期后顾之忧，大卫塔的居民们能够专注于更具创造性的追求，建成了一个包含商店与各项服务的完整社区，甚至发展了一种货币。Andres Lepik在大卫塔之书的简介中总结道：

“大卫塔的现有居民抓住机会，占有了一幢现有建筑（原先打算建成新的金融中心），利用这幢建筑满足了他们的住房需求，并逐渐对其进行改造，使其满足特定的居住标准。在此项实验过程中，这一居民社区日益稳定，形成了自治的组织形式，加强了其身份认同感与团结性。”

Andres Lepik——大卫塔

随着重新接入建筑社区工作的继续，显而易见的是，当前城市环境拓扑结构背后的驱动力正是当前在用的移动方法。在Friedli等人2015年撰写的《城市层架》（The Urban Shelf）一书中，作者提出了城市发展的两个极端——电梯占据主导地位的核心城市以及汽车发挥最重要作用的汽车城市。为控制汽车城市的横向扩张以免正常的社会及业务功能无法维持，核心城市应运而生，尽管如此，两种拓扑结构均已达到扩张极限，并将无法应对未来几十年城市人口急剧增长所构成的挑战。

对于通向更加可持续的未来城市的途径，业内考虑过若干由全新或经改良的移动系统驱动的方法。螺旋镇（螺旋大厦）（图1）这项理论性实验促发我们对未来城市设计方法的全新思考，这一概念从根

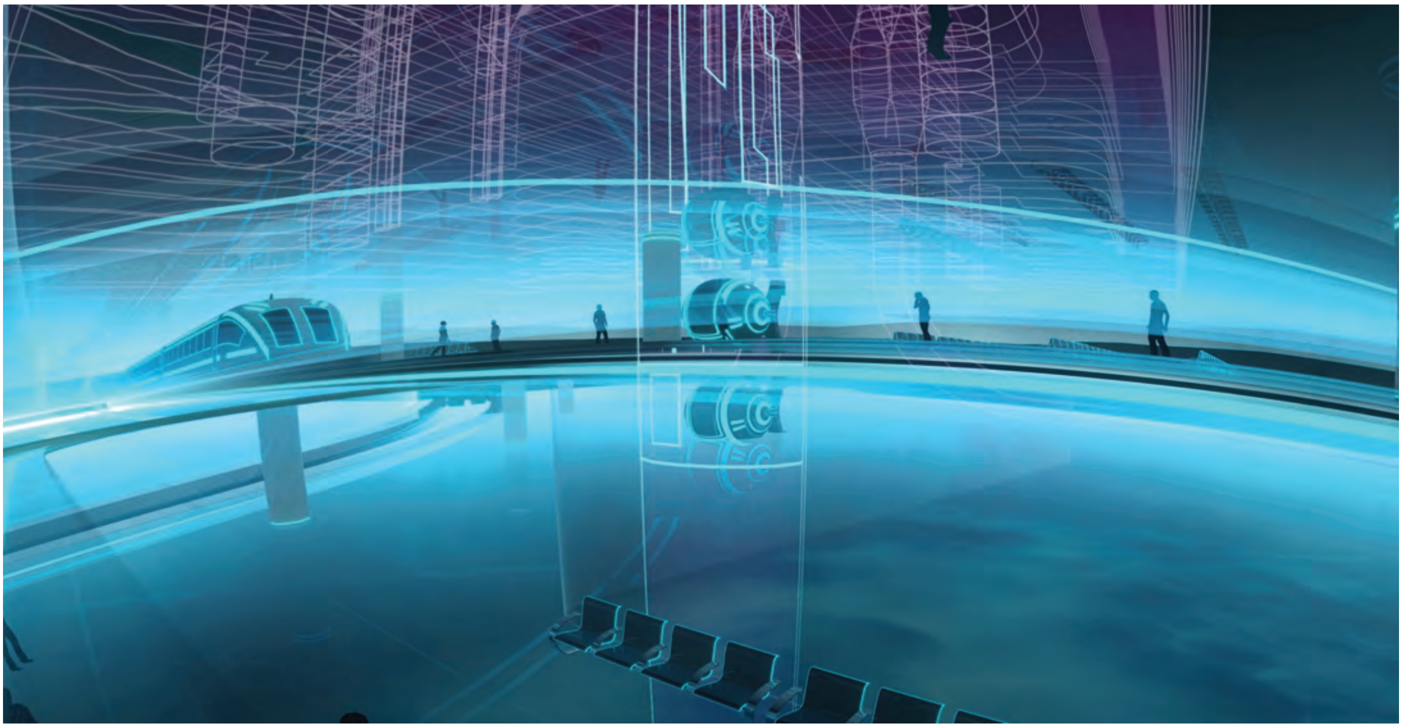

Figure 2. The UPWAY at a metro interchange point (Source: Schindler Ltd)
图2. 地铁联运交接点的UPWAY（来源：迅达电梯）

a theoretical experiment to provoke new thinking about the way we design our future cities, a concept that radically transforms the city as we know it. Contrary to a traditional, concrete filled city centre with suburbs and green space that surround it, Spiral Town is inverted, containing a green heart surrounded by its built environment. The structure is designed as a vertical spiral reaching around 300 metres in height, with a 5% grade to enable easy circulation around the structure. Linear horizontal distances are compressed and the hazard of urban sprawl is reduced by activating the z-axis. This results in the inversion of the traditional city section with buildings that used to be grounded, occupying valuable green space, now hanging beneath the structure. This allows the sloping green space to become a continuous belt uniting the town.

Another approach, requiring the development of a novel mobility infrastructure that we will term the UPWAY is illustrated here (Figures 2 and 3). The UPWAY is a three-dimensional transit system which can link an existing metro system to a series of vertical villages. The UPWAY station of each village leads to the main community area which we might term the village square (Figure 4) and further vertical transportation within the community is accomplished by elevators and escalators.

A more immediately implementable solution to radically improve existing cities by the provision of what we will call the "Urban Shelf" In its generalised form the novel building topology allows the urban planner an almost

本上转变了我们对城市的认知。传统城市的市中心充斥着混凝土建筑，周围是郊区与绿地，而螺旋镇恰恰与此相反，其中心绿意盎然，周围才是各种建筑环境。建筑设计成垂直的螺旋形状，高约300米，保留5%的倾斜角度，从而易于绕建筑循环。通过激活z–轴，线性水平距离得以压缩，城市扩张的危害得以降低。这颠覆了传统的城市格局——传统城市中的建筑往往将基础打入地面，现在则变为向下悬挂的结构。斜坡状绿地成为了连接镇子的环形纽带。

本文介绍了另一种方法（图2、图3），其中要求开发一种新的移动基础设施——我

Figure 3. A series of vertical villages enabled by the UPWAY (Source: Schindler Ltd)
图3. 由UPWAY实现的一系列垂直村落（来源：迅达电梯）

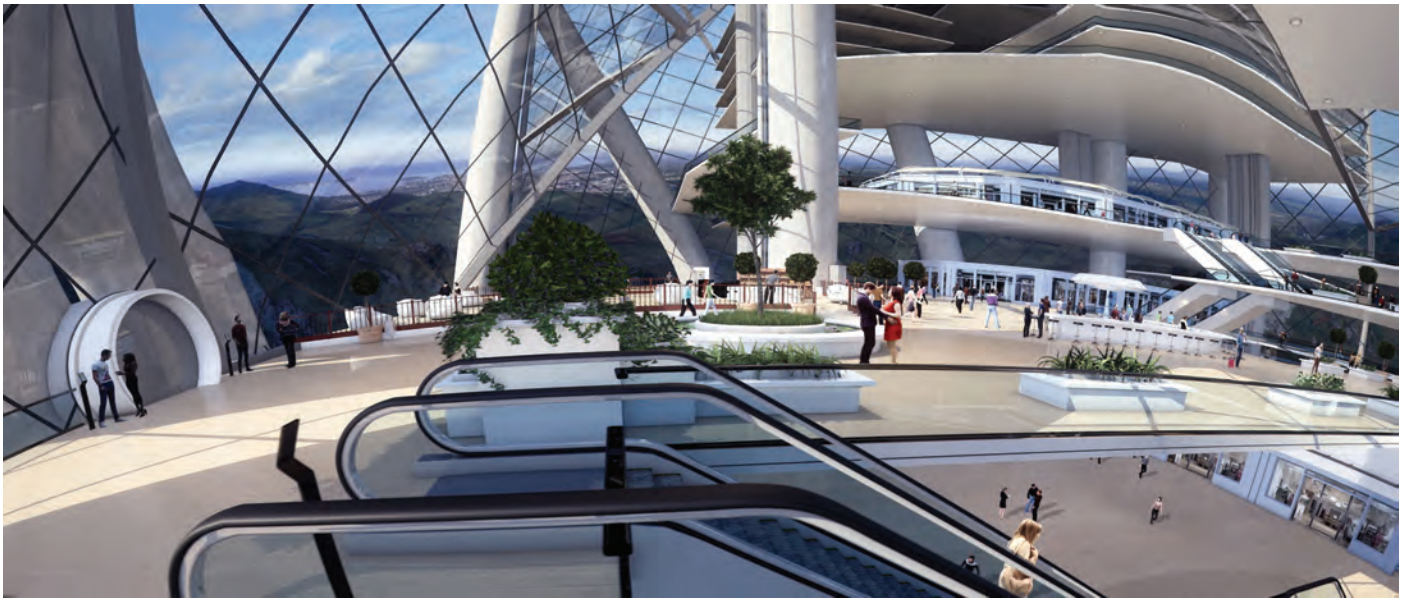

Figure 4. A vertical village square at an UPWAY station (Source: Schindler Ltd)
图4. 市内（来源：迅达）

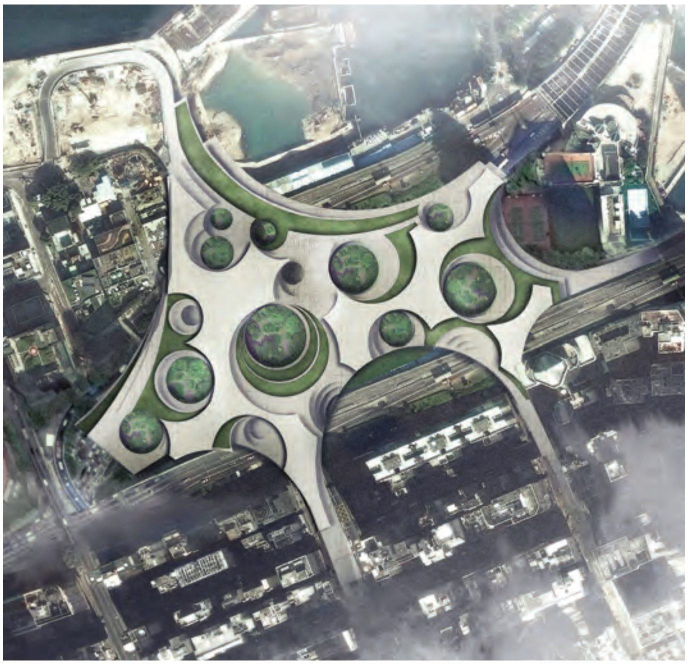

Figure 5. An example of how the Urban Shelf can enhance the existing landscape (Source: Schindler Ltd)
图5. "城市层架"加强现有景观的例子（来源：迅达电梯）

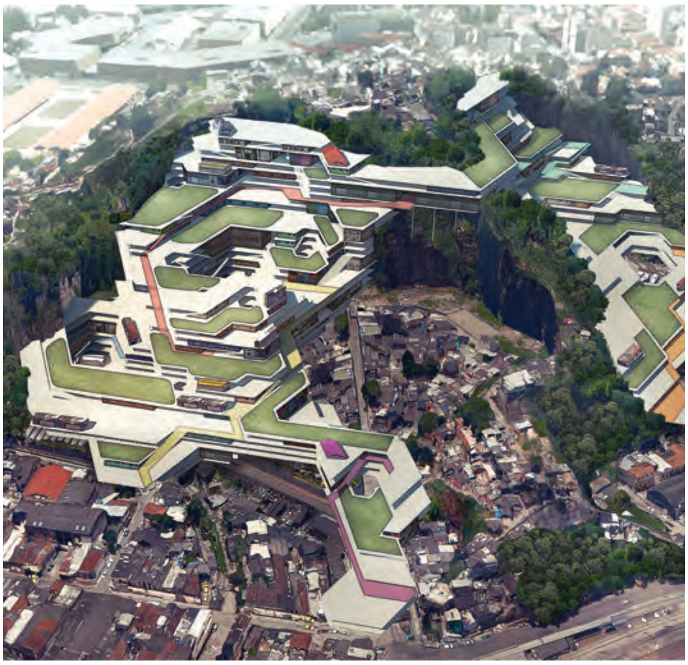

Figure 6. An example of how the Urban Shelf can enhance the existing landscape (Source: Schindler Ltd)
图6. "城市层架"加强现有景观的例子（来源：迅达电梯）

unlimited number of configurations (Figures 5 and 6).

The idea is to de-link the traditional role of the developer from that of the ultimate occupant by providing the ability to stack available land with secure and stable platforms that form flooring, roofing and basic infrastructure. This three-dimensional pre-plan allows habitats, shops and businesses to organically evolve, thus forming a new urban landscape. We have an open platform, which then allows various types of neighbourhoods to evolve.

The pre-plan is accomplished by the stacking of available land with platforms that form both flooring and roofing and provide a basic infrastructure which is both secure and stable.

们将称之为UPWAY。UPWAY是一套三维交通系统，能够将现有地铁系统与一系列垂直村庄连接起来。每个村庄的UPWAY站点通向主要的社区范围，我们可能会将其称为村庄广场（图4）。电梯和自动扶梯实现了社区内的进一步垂直交通。

一个更加直接可执行的解决方案是通过建设"城市层架(Urban Shelf)"，从根本上改善城市状况。在其广义形式下，新型建筑拓扑结构使城市规划者几乎可以实现无限配置（图5、图6）。

此处的理念是把开发商的传统职责与最终住户的职责分开，让其有能力在可用土地上堆砌安全稳固的平台，最后成为地板、屋顶和基础设施。依托这一三维预先计划，住所、商店和商业可以有组织地不断发展，从而形成全新的城市景观。我们设有一个开放平台，之后，各种类型的近邻社区可基于此发展起来。

通过在可用土地上堆砌可成为地板、屋顶及基础设施的安全稳固的平台，便完成了上述预先计划。之后，这些要素由容易通行的斜坡连接在一起，城市景观逐步形成。

在这样的空间内，可以实现自然发展，打造逐步提高居民生活品质的活力社区。在这种"由下而上"的战略下，前瞻性居民能够成为真正创造周围环境的主人翁。在富裕社会，可能意味着与建筑预制商协作建造住房，而在较贫困的社会，则由居民身体力行，自建住房。在这两种情况下，由于建筑具有灵活性，因此都能不断改进，满足千变万化的需求，无需彻底置换。

These elements are then tied together by easily accessible ramps, and a landscape evolves.

Within this space, organic growth can then take place, creating vibrant communities that offer a stepwise improvement in the quality of life of their residents. This "bottom-up" strategy allows prospective citizens to become the true makers of the environment. In wealthy societies, this might mean collaboration with a building prefabricator or, in poorer ones, individuals physically building their dwellings. In both cases the flexibility of the structure allows it to evolve to meet changing needs without the disruption of total replacement.

We have here a human scale development (Figures 7 and 8) where residences and other public and commercial services can grow together in a way that breeds a sense of identity and pride in the community – a great help when it comes to security which the vertical nature of the structure also enhances. The structure can fit into many city spaces, including those occupied solely by streets. Currently a street provides connectivity for the automobile and separation for everyone else. Covering it with a platform allows its original purpose to continue while providing multiple new layers that form the "glue," allowing unfettered access across the city to all of its citizens regardless of their transportation method. A micro mobility concept can then exist between the multiple levels and this easy access between many small businesses will lead to the sort of densification of brain power, which drives innovation.

In conclusion, the realisation, initially via the development of elevator control systems, of the fundamental link between urban mobility and topologies has allowed a radical re-assessment of the possibilities of city of the future. Our hope and, indeed, challenge to the architectural community is that these ideas or something like them can be prototyped relatively soon in projects around the world. If this is done and the results are positive we can then go on to deploy them more widely after which we really will have achieved our goal of the City Re-Imagined!

在此，我们实现的是根据居住的人口数采用可伸缩的发展（图7、图8），居民与其他公共或商业服务能够共同成长，成长过程中不断在社区中培养身份认同感与自豪感——这对安全性而言大有裨益，建筑的垂直性质也增强了安全性。这样的建筑适合许多城市空间，包括那些街道交错的地方。目前，街道为汽车提供四通八达的行驶通路，并将其他人都隔离开。在街道上方加一个平台，既可以继续保持街道的原有功能，还能形成多个新的层次，形成“粘性”，所有市民能够采用各种交通方式在城市中无拘无碍地通行。如此，多层面之间微移动概念方得以立足，而且，许多小企业之间的这一便捷通道将导致脑力的致密化，从而驱动创新。

总之，最初通过开发电梯控制系统实现的城市移动与拓扑结构间的基础连接，使得我们能够对未来城市的可能性进行彻底的重新评估。我们的希望以及建筑社区面临的挑战在于这些理念或与之类似的东西能够很快在全球各地的项目中成为原型。如果做到这一点，并且取得积极成果，那么我们便可以继续更加广泛地将其展开，然后我们将真正实现我们的目标——重新构想的城市！

Figure 7. The Urban Shelf, a human scale development (Source: Schindler Ltd)
图7. “城市层架”——人类尺度的开发（来源：迅达电梯）

Figure 8. The Urban Shelf, a human scale development (Source: Schindler Ltd)
图8. “城市层架”——人类尺度的开发（来源：迅达电梯）

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