

加速“智慧城轨”建设 助力城市轨道交通高质量发展

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自 1863 年伦敦地铁开通至今,世界城市轨道交通发展已有 160 年的历史。160 年来,世界城市轨道交通已经历了蒸汽机、内燃机、电气化时代,进入了高度自动化与信息化时代,新一轮科技革命和产业革命蓬勃发展,正推动着城市轨道交通向数字化、智能化的新时代迈进。在此背景下,城市轨道交通正面临着一次复杂而前所未有的变革。一方面,随着科技的进步,人民对美好生活的向往愈发强烈,而作为城市大动脉的城市轨道交通,也从过去单一的交通工具,演变成一个鲜活的都市生命体,这就要求城市轨道交通必须不断地响应需求、迭代与进化;另一方面,在过去百年的大发展中,我国乃至世界城市轨道交通基本上都采用一线一批、一批一建的方式推进,导致城市轨道交通业务系统都是按专业划分独立建设的“烟囱式”系统,各个系统各自为政,形成信息孤岛,严重制约行业的可持续发展。基于此,发展智能系统,建设“智慧城轨”,已成为行业共识,并见诸行动。

作为粤港澳大湾区最大的城市轨道交通运营载体,广州地铁始终秉承“全程为你”的服务理念,顺应新时代的发展要求,积极拥抱新技术、新模式,全面投入到“智慧城轨”的建设与应用中。早在 2019 年,广州地铁就发布了,联合腾讯公司组建穗腾联合实验室,携手研发可迭代升级的城市轨道交通智慧操作系统-穗腾 OS,并基于平台赋能开展 6 项智慧场景技术及应用的研究,努力打造“安全、可靠、便捷、精准、融合、协同、绿色、持续”的新型城市轨道交通体系。截至目前,已取得一定的《新时代城市轨道交通创新与发展白皮书》成效。

在平台研发方面,先后于 2019 年 9 月和 2021 年 9 月发布并应用了穗腾 OS1.0 和穗腾 OS2.0。作为新一代基于工业互联网与物联网的城市轨道交通操作系统,穗腾 OS 基于生态开放、功能解耦的理念,采用工业互联网和物联网等新兴技术,构建了一种全新的城市轨道交通工业控制架构体系,形成了设备物联、流程编排、算法推演、数据共享、组件开放的核心能力,提供了一个可持续迭代、灵活扩展的数字底座。这个数字底座不仅打破了传统工业控制系统“单一定制功能”的设计理念,还推动工业控制系统从单一定制化的产品设计,向灵活易扩展的平台设计转变。未来它将犹如智能手机的操作系统一样,可以不断升级,不断响应用户的需求,并不断迭代和进化。

在智慧应用方面,依托穗腾 OS 赋能,联合中车株洲电力机车有限公司、广州铁科智控有限公司等 22 家生态合作伙伴,已在广州地铁 3 号线、18 号线和 22 号线及线网指挥中心分别实现了车站级、线路级和线网级的工程应用,全面覆盖乘客服务、行车组织、智能运维、智慧安防、节能管控、调度指挥等智慧场景应用。以上应用的落地,不仅增强了安全保障能力,也提升了运营管理效益,在保证广州地铁列车服务可靠度位居行业前列的同时,实现了车辆等核心专业的生产检修配员降低 16%、车站常态化任务耗时降低 80%。更为关键的是,依托穗腾 OS 这一数字底座能力,可激发由用户主导的创新活力,快速响应运营业务需求,通过应用产生价值。

始于城市轨道交通,并不止于城市轨道交通,未来广州地铁将持续推动穗腾 OS 的迭代研发,不仅服务广州地铁乃至粤港澳大湾区的“智慧城轨”发展,还将为工业自动化乃至智慧城市的发展赋能。与此同时,我们还将联合生态合作伙伴,努力建设“智慧城轨”的标准体系,形成业内指南或引导性标准,为我国城市轨道交通的高质量发展贡献一份力量。

Accelerating the Construction of 'Smart Urban Rail Transit' and Promoting the High-Quality Development of Urban Rail Transit

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Since the opening of the London Underground in 1863, the development of urban rail transit worldwide has a history of 160 years. Over the past 160 years, urban rail transit had undergone the eras of steam engines, internal combustion engines, and electrification, and has entered the era of high automation and informationization. The new round of technological and industrial revolution is flourishing, and it is driving urban rail transit towards a new era of digitalization and intelligence. In this context, urban rail transit is facing a complex and unprecedented revolution. On one hand, with the advancement of technology, people's longing for a better life is becoming stronger. As the city's major artery, urban rail transit has evolved from a single mode of transportation into a vibrant urban life form. This requires urban rail transit to continuously respond to demand, iteration, and evolution. On the other hand, in the past century of rapid development, both China and the world have been advancing urban rail transit with the approach of 'one line, one batch; one batch, one construction', resulting in the construction of 'silos' for each system in the urban rail transit business system, with each system operating independently and forming information islands, which seriously restricts the sustainable development of the industry. Based on this, developing intelligent systems and building 'smart urban rail' become a consensus in the industry and is being put into action.

As the largest urban rail transit operator in the Guangdong-Hong Kong-Macao Greater Bay Area, Guangzhou Metro has always adhered to the service slogan of 'All for your journey', conforming to the development requirements of the new era, actively embracing new technologies and new modes, and completely investing in the construction and application of the 'smart urban rail'. As early as 2019, Guangzhou Metro announced the establishment of a joint laboratory with Tencent, developing an iteratively upgraded urban rail transit smart operating system-SuiTeng OS, and carrying out six smart scenario technology and application researches based on the platform empowerment, striving to create a new type of urban rail transit system centered on 'Safety, Reliability, Convenience, Accuracy, Integration, Synergy, Green, Sustainability'. Up to now, goals determined in 'White Paper on Innovation and Development of Urban Rail Transit in the New Era' are partially achieved.

In terms of platform development, SuiTeng OS1.0 and SuiTeng OS2.0 were successively launched and applied in September 2019 and September 2021. As a new generation of urban rail transit operating system based on industrial internet and IoT (internet of things), SuiTeng OS adopts the concept of open ecological system and function decoupling, uses emerging technologies such as industrial internet and IoT, and constructs a new type of industrial control architecture system for urban rail transit. It establishes core capabilities of equipment IoT, procedure orchestration, algorithm deduction, data sharing, and component opening as well as providing a sustainable iteration and flexible expansion digital base platform. This digital base not only breaks the traditional design concept of 'single customized function' in industrial control systems, but also promotes the transformation of industrial control systems from single customized product design to flexible and expandable platform design. In the future, like the operating system of a smartphone, it will be constantly upgraded, continuously responding to user demands, and constantly iterating and evolving.

In terms of intelligent applications, relying on the empowerment of SuiTeng OS and in cooperation with CRRC Zhuzhou Locomotive Co., Ltd, Guangzhou Railway Sciences Intelligent Controls Co., Ltd and 22 other eco-partners, station-level, line-level and network-level engineering applications are implemented in the Guangzhou Metro Line 3, Line 18, Line 22 and network command center respectively, fully covering passenger services, operation organization, intelligent operation and maintenance, intelligent security, energy-saving control, dispatching command and other application scenarios. The implementation of these applications, not only enhances the ability of security guarantee, but also improves the efficiency of operation management. While ensuring that Guangzhou Metro is at the forefront of industry in reliable train service, a 16% reduction is achieved in the number of production and inspection operators for core disciplines such as vehicles and an 80% reduction in the time spent on routine tasks at stations. More significantly, by leveraging the SuiTeng OS's digital base capabilities, user-led innovation can be stimulated rapidly responding to the operational business needs and creating value through applications.

Starting from urban rail transit, Guangzhou Metro will develop beyond. In the future, Guangzhou Metro will continue to promote the iteration and research of the 'SuiTeng OS', not only serving the development of 'smart urban rail' in Guangzhou Metro and the Greater Bay Area, but also empowering industrial automation and the development of smart cities. At the same time, we will cooperate with eco-partners to build a standard system for 'smart urban rail' and form industry guidelines or guiding standards, contributing to the high-quality development of China's urban rail transit.

(Translated by WU Shang)