科技之魅
CHARM OF SCIENCE AND TECHNOLOGY

世界互联网
领先科技成果发布活动
RELEASE CEREMONY FOR
WORLD LEADING INTERNET SCIENTIFIC AND
TECHNOLOGICAL ACHIEVEMENTS

2022.11.9

2022 WORLD
INTERNET CONFERENCE
世界互联网大会
世界互联网大会
世界互联网大会
Preace to The Charm of Science and Technology

The waves of technology are surging forward, and the digital age is fast approaching. From an era of considerable difficulty in connection and communication to an era of the "Internet of Everything," information technology represented by the Internet is evolving with each passing day, leading the world to digital civilization in great strides, helping human society reach a new level in history, and demonstrating the unparalleled charm of science and technology.

At present, digital technologies are empowering various fields of economic and social development at an unprecedented speed. A digital world of ubiquitous intelligence and co-existence of virtuality and reality is approaching us. Standing at the forefront of digital evolution, foreseeing new trends of development in cyberspace, exploring new directions for digital transformation, and discovering new achievements in scientific and technological demonstration will benefit people all over the world. The World Internet Leading Scientific and Technological Achievements Release Event 2022 collects the latest scientific and technological achievements in the Internet field around the world, highlights the creative contribution of Internet practitioners, guides the future development direction of Internet technology, and creates greater space for international exchanges and mutual learning and the transformation of scientific and technological achievements. Let us raise the sail of cooperation, ride along the wind of the World Internet Conference, and steer the ship of scientific and technological innovation toward a bright future.

This year’s World Internet Leaders’ Annual Forum is held under the presidency of the China Internet Society and the China Internet Network Information Center (CNNIC), with the theme of "Innovations in Digital Society: New Opportunities, New Development." The forum will bring together leaders, experts, and scholars from various fields to share insights, explore new trends, and promote cooperation in the digital world. The conference will focus on the development of the Internet and digital society, exploring new opportunities and development directions, and fostering a collaborative and innovative environment for global digital development.

This year’s World Internet Leaders’ Annual Forum is held under the presidency of the China Internet Society and the China Internet Network Information Center (CNNIC), with the theme of "Innovations in Digital Society: New Opportunities, New Development." The forum will bring together leaders, experts, and scholars from various fields to share insights, explore new trends, and promote cooperation in the digital world. The conference will focus on the development of the Internet and digital society, exploring new opportunities and development directions, and fostering a collaborative and innovative environment for global digital development.
This year marks the seventh consecutive year that the event has been held and the seventh year that I have served as the Chinese director of the Recommendation Committee for World Leading Internet Scientific and Technological Achievements. Thanks to the care and guidance of Mr. Wan Gang, Vice-Chairman of the 13th National Committee of the Chinese People's Political Consultative Conference, Chairman of the China Zhi Gong Party, and President of the China Association for Science and Technology, as well as the support of foreign experts including Mr. Malcolm Johnson, Deputy Secretary-General of the International Telecommunication Union, Mr. Nil Quaynor, father of the African Internet, Professor Chon Kilnam, father of the Korean Internet, and Professor Jun Murali, father of the Japanese Internet. 257 leading items of scientific and technological achievements were collected from China, the United States, Russia, the United Kingdom, Sweden and other countries, covering a wide range of cutting-edge fields such as 5G and 6G, IPv6, artificial intelligence, big data, cybersecurity, supercomputing, high-performance chips, and digital twins, and multiple categories such as the fundamental theory, technology, products, and business models. Following the recommendation of experts, 57 outstanding achievements were finally selected and compiled. As these achievements continue to be transformed and implemented, they will be converted into new driving forces for economic and social development, facilitating the global community to embrace a new period of prosperity and development.

Time passes day by day. Thanks to the World Internet Conference, and The Charm of Science and Technology, both in their seventh year, extraordinary achievements of Internet technology’s innovation have been continuously recorded, witnessing the historical evolutions in the development of Internet technology and showing the unlimited charm of cutting-edge technology empowering social advancement. We hope that The Charm of Science and Technology will continue to play its leading role in innovation, encourage more scientific and technological talents and enterprises around the world to actively engage in scientific and technological innovation and unremitting exploration, and contribute its wisdom and strength to a better life for people across the globe.
<table>
<thead>
<tr>
<th>世界互联网领先科技成果</th>
<th>CONTENTS 目录</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAGLE 6G: 面向 6G 无线高速接入原型系统及测试环境</td>
<td>中国电科骨干全光网创新与应用</td>
</tr>
<tr>
<td>“IPv6+” 标准制定、设备研制、组网设计及规模应用</td>
<td>5G 时间关键型通信使能远程操控</td>
</tr>
<tr>
<td>欧拉开源操作系统</td>
<td>ODPS：数据驱动而生的超大规模多场景融合的大数据计算平台</td>
</tr>
<tr>
<td>OpenEuler Open Source OS</td>
<td>Open Data Processing Service (ODPS): A Hyper-scale Big Data Computing Platform Designed for Multiple Scenarios</td>
</tr>
<tr>
<td>基于数字对象架构的物联网及大数据互操作技术</td>
<td>大规模图神经网络模型云端协同计算平台和应用示范</td>
</tr>
<tr>
<td>Internet of Data Based on Digital Object Architecture and Big Data Interoperability Technology</td>
<td>The Computing Architecture of Device-Cloud Collaborative Graph Neural Network Learning over Distributed Environments as well as Its Applications</td>
</tr>
<tr>
<td>卡巴斯基安全远程工作空间（基于卡巴斯基操作系统）</td>
<td>龙芯 3A5000</td>
</tr>
<tr>
<td>Kaspersky Secure Remote Workspace (Based on KasperskyOS)</td>
<td>LS3A5000</td>
</tr>
<tr>
<td>数字内容防伪伪造检测系统和设备</td>
<td>微软下一代数字孪生平台—— Azure Digital Twins</td>
</tr>
<tr>
<td>Digital Content Forgery Detection System and Equipment</td>
<td>Microsoft Azure Digital Twins Platform</td>
</tr>
<tr>
<td>OceanBase 原生分布式关系数据库</td>
<td>全球首个集成 5G AI 处理器的调制解调器及射频系统</td>
</tr>
<tr>
<td>OceanBase Native Distributed Relational Database</td>
<td>The World’s First Modem-RF System with Integrated 5G AI Processor</td>
</tr>
<tr>
<td>大规模知识图表示学习的体系化基础算法及开源工具</td>
<td></td>
</tr>
</tbody>
</table>
World Leading Internet Scientific and Technological Achievements Nominated Projects

02

百度文心大模型
Baidu Wenxin Industry-Level Knowledge-Enhanced Models 054

TDSQL——推进数据库基础技术突破与产业分布式技术升级
TDSQL——Promoting the Breakthrough of Basic Database Technologies and the Upgrade of Industry Distributed Technologies 056

智能汽车行业创新：大算力、高性能融合计算芯片 IP 平台
Innovation in the Smart Vehicle Industry: the First Integrated Computing Chip IP Platform with High Computing Power and High Performance in China 060

奇安信大禹平台及重大网络安全防护应用
Dayu Platform and Its Applications on Major Cybersecurity Protection Projects 062

基于高性能人工智能训练芯片的算力集群
Intelligent Computing Cluster Based on High-Performance AI Training Chip 064

03

《科技之魅》收录成果
Charm of Science and Technology Collection

大规模图数据平台 AtlasGraph
AtlasGraph: A Large-Scale Graph Data Analytics Platform 070

360 全网数字安全大脑
360 Cyber-Wide Digital Security Brain 074

高性能大算力车载智能芯片——地平线征程®5
Energy-Efficient Automotive-Grade Processor——Horizon Journey®5 078

低轨 Q/V 和 Ka 频段宽带通信试验星座及 5G 星地组网应用演示
Application Demonstration of Low-Orbit Q/V and Ka Frequency-Band Wideband Communication Test Constellation and 5G Satellite-Ground Networking 082

河图：高效可扩展的分布式深度学习系统
Hetu: An Efficient and Scalable Distributed Deep Learning System 086
03
《科技之魅》收录成果
Charm of Science and Technology Collection

腾讯天籁行动——AI 让听障人士“听得清”
Tencent Ethereal Audio Campaign——AI Makes Hearing Impaired People “Hear Clearly”

2022 年领英全球数字技能框架研究成果
LinkedIn Global Digital Skills Framework Research 2022

AI 能动讯飞输入法，广泛无障碍改造弥合“数字鸿沟”
AI Enabling iFLYTEK Input Methods: Extensive Barrier-Free Transformation to Bridge the "Digital Divide"

多模态信息融合精准引导微创手术新技术与系统
New Technologies and Systems for Accurate Guides of Minimally Invasive Surgery Based on Multimodal Information Fusion

量子计算全球开发者平台
Quantum Computing Global Developer Platform

个性化语音增强技术
Personalized Speech Enhancement

中国移动 5G+ 空天地一体化应急通信系统
China Mobile 5G and Space-Air-Ground Integrated Emergency Communication System

超高清沉浸式视频制播技术创新及应用
Innovation and Application of UHD Immersive Video Production and Broadcasting Technology

鹏城云脑·E 级 AI 算力平台
Peng Cheng CloudBrain: E-Scale AI Super-Computing Platform

4G/5G 协同智能节能技术研究与应用
Research and Application of 4G/5G Collaborative Intelligent Energy Saving Technology

城市空间信息全域物联感知与三维建模关键技术及应用
Key Technologies and Applications of Global IoT Perception and 3D Modeling of Urban Spatial Information

木兰开源社区
Mulan Open Source Community

高能效计算系统
High Performance Graph Processing System

磐久服务器 M 系列
Alibaba Cloud Server M Series

智能司法公开关键技术及系统
Intelligent Public Judicial Information Services

高谱效高能效的大规模天线通信系统空时维度传输理论与方法
<table>
<thead>
<tr>
<th>端边云协同的分布式物联网操作系统“CTWing OS”</th>
<th>移动互联网 IPv6/SRV6 技术创新及超大规模部署</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTWing OS, a Distributed IoT Operating System with End-Edge-Cloud Coordination</td>
<td>IPv6/SRV6 Technical Innovation and Hyperscale Deployment for Mobile Internet</td>
</tr>
<tr>
<td>工业 5G Advanced 的网络系统</td>
<td>“RPA+AI” —— 基于认知智能的人工智能组件融合应用成果</td>
</tr>
<tr>
<td>Industrial 5G-Advanced Network System</td>
<td>&quot;RPA+AI&quot; —— An Fusion Application of Multiple AI Technologies Based on Cognitive Intelligence</td>
</tr>
<tr>
<td>一种基于 LCoS 技术的光调制芯片</td>
<td>复杂通信环境下的稀疏信号处理理论与方法</td>
</tr>
<tr>
<td>A Light-Modulating Chip Based on LCoS Technology</td>
<td>Theory and Method on Sparse Signal Processing Under Complex Communication Environments</td>
</tr>
<tr>
<td>多模态智慧网络</td>
<td>新一代高性能云端人工智能推理芯片</td>
</tr>
<tr>
<td>Polymorphic Intelligent Network</td>
<td>A New Generation of High-Performance Cloud AI Inference Chip</td>
</tr>
<tr>
<td>5G 增强器</td>
<td>HPLC 架起能源互联网通信高速路</td>
</tr>
<tr>
<td>5G Booster</td>
<td>HPLC Sets up the Energy Internet Communication Highway</td>
</tr>
<tr>
<td>TDOS 天元大数据操作系统</td>
<td>面向量产的智能重卡自动驾驶系统</td>
</tr>
<tr>
<td>Operation System of TDOS Tianyuan Big Data</td>
<td>Heavy-Duty Truck Autonomous Driving System for Mass Production</td>
</tr>
<tr>
<td>面向泛在时空大数据的实时地理信息服务平台</td>
<td>新型冠状病毒信息库 RCoV19</td>
</tr>
<tr>
<td>Real-Time Geographic Information Service Platform for Ubiquitous Spatiotemporal Big Data</td>
<td>Resource for Coronavirus 2019 (RCoV19)</td>
</tr>
<tr>
<td>全维可定义网络 5.0 新型网络架构</td>
<td>银河麒麟高级服务器操作系统</td>
</tr>
<tr>
<td>Network 5.0: A Novel Full-Dimension Definable Network Architecture</td>
<td>Kylin Advanced Server OS V10</td>
</tr>
</tbody>
</table>
世界互联网领先科技成果
EAGLE 6G: 
面向6G无线高速接入原型系统及测试环境


引言

图像实验室

Peng Cheng Laboratory

北京邮电大学

Beijing University of Posts and Telecommunications

华中科技大学

Huazhong University of Science and Technology

电子科技大学

University of Electronic Science and Technology of China

EAGLE 6G: 面向6G无线高速接入原型系统及测试环境

面向6G无线高速接入原型系统及测试环境，该系统通过在6G系统中引入多种技术，包括但不限于采用更高频段的毫米波通信、太赫兹通信等，以实现更快的数据传输速度和更高的网络容量。该系统旨在支持400 Gbps的潜在网络带宽，满足未来高速业务的需求。


EAGLE 6G has provided tests for potential key technologies of 6G, such as millimeter-wave and terahertz links, and will keep facilitating the evaluation and standardization for 6G promising technologies, as well as empowering the 6G innovation ecosystem.

The System Architecture of EAGLE 6G

EAGLE 6G: 面向6G无线高速接入原型系统及测试环境
“IPv6+”标准制定、设备研制、组网设计及规模应用
“IPv6+” International Standards Formulation, Device Development, Networking Design and Scale Deployment

引言
中国联合网络通信有限公司
China United Network Communication Co., Ltd.
华视技术有限公司
Huawei Technologies Co., Ltd.

建设“IPv6+”技术体系，升级网络联接能力
Building-up of IPv6+ technology system, Upgradation of network connectivity

"IPv6+"技术体系是以分层路由、网络片切、睡眠检测、应用感知等为代表的网络技术创新。

中国联合通讯和华为公司共同围绕业务需求，开展"IPv6+"技术研究，制定"IPv6+"系列国际标准，提交中国专利100多项，推动"IPv6+"技术体系逐步发展。
China Unicom and Huawei have jointly carried out "IPv6+" technology research, formulated series of "IPv6+" international standards, submitted more than 100 Chinese patents, and promoted the evolution and development of "IPv6+" technology system.

开展网络片切技术研究，打造出差异化SLA服务
Innovate the SLA service by carrying out network slicing technology research.

构建"IPv6+"技术能力，推动IP网络服务创新发展
Build IPv6+ technology capability, drive the innovation of IP network services.

基于上述研究，华为公司率先研制了支持"IPv6+"技术能力的新型路由器设备；中国联通率先实现了基于SRv6的可编程网络方案设计；目前，IPv6+技术已在部分省网及多地网络部署，有效提升了网络服务能力与产品创新能力。
Based on the above research, Huawei has developed the new router device that supports IPv6+ technical capability; China Unicom has realized the programmable networking scheme based on SRv6. At present, IPv6+ technology has been deployed in some provinces and cities of China; it has effectively improved the network service ability and product innovation ability.
推广 "IPv6+" 应用示范，提升产品质量

Promotion of "IPv6+" Application Demonstration, Improvement of Industrial Service Quality

中国联通为公司开展了系列研究和测试工作，为 "IPv6+" 技术的成熟和示范应用起到了先行先试的作用。

China Unicom and Huawei have carried out a series of research and testing work, which has played a pioneering role in the maturity of "IPv6+" technology and service demonstration.

中国联通率先进入 IPv6+ 规模部署阶段，已在河北全省、湖南部署了 IPv6+1.0 能力。

China Unicom has taken the lead in promoting the large-scale deployment of IPv6+ and has realized provincial-scale deployment of IPv6+1.0 capability in Hebei.

基于 "IPv6+" 技术中国联通打造了智慧冬奥数据专网，依托应用 SRv6 技术，对视频会议等多媒体数据传输进行优化，为各类业务提供优质的低时延、高带宽服务。

Based on the "IPv6+" technology, China Unicom has created a smart private data network for the Winter Olympics. With the application of SRv6 technology, it optimizes the transmission of multimedia data such as pictures and videos, and provides various services with low latency, high bandwidth, and the ability to deploy optimally.

中国联通 SRv6 + 网络切片应用创新已得到良好经济效益。基于 SRv6 业务资源、应用/算力感知的切片产品已实现试商用。中国联通与华为通过产品创新、服务创新，有效推动了 IPv6+ 产业技术升级，提升了电信网络服务质量。

China Unicom and Huawei co-sponsoring the research of IPv6 + international standards, "SRv6" network slice innovation to create new advantages of IPv6 scale deployment, network evolution and upgrade, and help improve the quality and efficiency of the economy. China Unicom’s SRv6 + network slice application innovation has brought good economic benefits, and pilot validation of series products based on SRv6 business chain and application computing power awareness has been completed. China Unicom and Huawei have effectively promoted industrial technological upgrading of IPv6 and service quality of telecommunication network.
引言

欧拉是面向数字基础设施的全栈开源操作系统。欧拉在开发过程中，创造性地实现一套OS架构，支持多样性设备，应用一次开发、覆盖服务器、云、边缘、嵌入式等多场景，满足计算架构100%支持。

Introduction

The OpenEuler platform is positioned as an enterprise-class, reliable, and secure digital infrastructure operating system that unites diverse computing power. Open source contributes to the creation of a sustainable future. With the goal of building an open, diversified, and architecture-agnostic software ecosystem, the OpenEuler open source community is available to global developers. As a superior operating system for all scenarios, it supports multi architecture computing, including server, cloud, edge, and embedded applications.

全面支持数字基础设施多样性设备，服务数字全场景

Full Support for All Scenario Digital Infrastructure Devices

技术突破构建全景操作系统。欧拉通过虚拟化、全栈原子化等解耦，支持数字灵活构建、服务自动组合，通过一套操作系统架构，突破性实现对服务器、云、边缘和嵌入式等场景的支持。

All-scenario OS: OpenEuler proposes full-stack atomic decoupling in order to support flexible construction and service combination. This OS supports server, cloud, edge, and embedded scenarios using a unified OS architecture.

支持多样性算力操作系统。支持Intel, AMD, 飞腾, 龙芯, 海光, 中星微等主流芯片，同时支持NPU, GPU和DPU等多种异构算力，构建了完整的硬件、软件兼容性测试环境，满足数字时代用户对多样性算力的灵活选择。

Diversified computing power: OpenEuler supports mainstream chips such as Intel, AMD, Kunpeng, Phytium, Zhixin, Loongson, Hygon, and ShenWei chips, and multiple processing units such as NPU, GPU, and DPU. It also has complete test specifications for hardware and software compatibility. It meets requirements for diversified computing capabilities in the digital era.
持续推动技术创新和标准化建设，累计申请专利 328 件，已授权 248 件。牵头和联合起草标准 8 项，已获 15 个奖项。

Promoted technological innovation and standardization. Submitted 328 patent applications, of which 248 were accepted, and co-initiated 8 standards, and won 15 awards.

生态繁荣，高速增长，规模应用

Vibrant Ecosystem with Rapid Growth and Large-scale Application

主要企业推出商业发行版，16 家主流操作系统厂商发布基于欧拉社区版的商业发行版，包括麒麟软件、统信软件、麒麟信安、SUSE、普华基础软件、拓尔思、超聚变、H3C、中科仙网、科东、中科创达软件、深信服、中兴红旗、中科方德、烽巢软件、润普软件等伙伴。

Commercial releases launched by major partners. The 16 major OS vendors have launched their commercial releases based on the OpenEuler community releases, including KylinSoft, Uniucntech, Kylinsec, SUSE, Soft, Tornado, x fusion, H3C, Thundersoft, Kyland, Institute of Software, Chinese Academy of Sciences (ICAS), Hohedun, Red Flag Linux, NFS China, Linx, and Tongyuian.

从头部企业发行商用版，中国移动、中国电信、中国联通、百度、华为云等行业头部企业基于欧拉社区版发布企业商用版本，并运行于核心系统。

In house releases developed by top enterprises. Companies in various industries, including China Mobile, China Telecom, China Unicom, Baidu, and Huawei Cloud, have developed their own operating systems based on OpenEuler community releases.

规模应用于各个行业的核心场景：截止目前，整个欧拉系的装机量累计超过 170 万台，规模应用在数字政府、运营商、金融、能源、交通、互联网等行业的核心场景。

Large-scale application in various industries. Over 1.7 million OpenEuler-based operating systems have been installed in various industries, including the public sector, carriers, finance, energy, transportation, and the Internet. In 2022, there are expected to be more than 3 million installations.

助力行业数字化转型，引领操作系统技术创新，贡献开源体系建设

Empowering Digital Transformation, Leading OS Technology Innovation, and Contributing to Open Source Construction

欧拉聚焦内核创新，华为作为欧拉开源社区成员，在 Linux Kernel 社区持续贡献，在 5.10、5.14 版本贡献全球领先。

The OpenEuler team is committed to the development of innovative kernels. Taking the lead in Linux kernel versions 5.10 and 5.14, Huawei is a member of the OpenEuler open source community.

欧拉系操作系统广泛使用在商业和政企在各行各业的头部用户的核心系统，累计装机量已经超过 170 万台。

The OpenEuler-based operating system is more than 1.7 million sets have been installed in various industries and are currently running in the core systems of major corporations.

欧拉开源社区吸引了来自全球 30 多家产业伙伴加入。

The OpenEuler open source community consists of more than 30 partners across the industry.

欧拉在技术、社区、商务、生态和服务等各个方面的持续发展可以为整个开放式系统构建做出贡献。

Throughout the open source ecosystem in China, OpenEuler’s practices in technology, community, business, ecosystem, talent, and open source atmosphere serve as an example.

欧拉已经与多个开源组织，全球 120 个国家，1500 个城市的用户和开发者，共下载装机量 55 万次。

OpenEuler mirrors have been set up outside China. Up to 550,000 downloads have been completed by users and developers in more than 1,500 cities in 120 countries and regions.

华为在 Linux Kernel 5.10 项下贡献全球领先

Huawei Ranks No. 1 in Contribution to Linux Kernel 5.10
基于数字对象架构的数联网及大数据互操作技术

Introduction

With the Internet of Data (IoD) and Big Data Interoperability Technology based on Digital Object Architecture (DOA), the needs for the construction of digitalization infrastructure are met. With reliable, manageable and controllable data interconnection and interoperability, the key technology challenges relating to cross-domain data use in an open, dynamic, uncontrollable and complex Internet environment are overcome, resulting in reliable, manageable and controllable data interconnection and interoperability.
开放开源，共建共治的数联网协同创新生态
Open eco-system of Internet of Data with open standard and open source

与互联网发明人、图灵奖得主罗伯特·卡恩博士及其团队开展合作，制定了数字对等架构两大核心协议之一的数字对等操作协议的国际团体标准，实现了数字对等架构的两大核心协议、三大核心系统，并全部开源，至此，形成了以数字对等架构为核心、国际先进、全球适用的数联网中国方案。

In cooperation with Dr. Robert Kahn, the inventor of the TCP/IP and the winner of the Turing prize, and his team, the team established a working group to develop and implement the DDA standards, and the team published the new version of the DDOIF, one of the two core protocols of the DDA. This achievement implements and opens-source the two core protocols and three core systems of the DDA.

在此基础上，与中国数十家高校、科研机构和行业龙头企业共同开展多个关键领域的数联网基础设施和重大应用的建设与运营，初步形成覆盖中国的数联网示范领产学研用、协同创新格局。

Furthermore, the team have established collaborations with dozens of Chinese institutions of higher learning, research institutions, and enterprises to construct and operate key infrastructures and applications in a variety of domains, such as medicine, energy, and manufacturing.

数联网正在成为多个行业和区域的以数据为中心的新型基础设施
Internet of Data is becoming the data-centric infrastructure in many domains

政务、工业、能源、医疗、科研等多个关键领域的数联网建设正在稳步推进，并开始发挥重要领域应用。例如，基于数联网的中国工业互联网数据要素登记（确权）试点，构建了中国“省市”级的工业数联网数据(确权)平台，推动数据要素市场化配置的基础，为打造全国工业数据资源市场提供了条件。

In recent years, the Internet of Things (IoT) has made significant progress in the fields of government affairs, industry, energy, medicine, scientific research, and other domains, and it has begun to support applications in these areas. As an example, the team have conducted a data element registration platform with a three-level structure of state, province, and city based on the industrial IoT and the pilot construction of China’s industrial data element registration (and confirmation of rights). As a result, it provides conditions for the creation of a national industrial data asset market based on market-oriented configuration of industrial data elements.

开启数联网“天地一体”新征程
Unified space and ground Internet of Data

2021年12月，数联网卫星节点发射升空，实现了数联网跨越陆地、海洋的纵深性和天地数据交互操作的可行性，开启了数联网技术发展的新纪元。IoT satellite node has been launched in December 2021, verifying interconnection between satellites and ground nodes and interoperability of satellite-ground data, which marked a new chapter in the development of IoT and DDA technology.
“卡巴斯基网络安全免疫” 设计奠定产品强大性能

“Kaspersky Cyber Immunity” design lays the foundation for the strong performance of the product.

卡巴斯基的“网络安全免疫”（Cyber Immunity）概念将理念与方法、安全的架构和专有微内核操作系统卡巴斯基操作系统（微内核由卡巴斯基从零着手开发）集于一体，是该产品的“设计即安全”（secure-by-design）基础设施的核心。

Kaspersky Cyber Immunity - a unique combination of ideology, methodology, secure architecture, and Kaspersky OS (the microkernel was bootstrapped from scratch by Kaspersky), enables secure by design thin client infrastructure.

其对应的解决方案（卡巴斯基安全远程工作空间）结合了以下内容：

Kaspersky Secure Remote Workspace is a combination of the following features:

- 卡巴斯基安全客户端是一款软件产品，安装在 TONK TN1200 硬件平台上，可显著提高安全性。
The Kaspersky Thin Client (KTC) is an endpoint security solution that is installed on the TONK TN1200 hardware platform, which significantly enhances the security of endpoints.

卡巴斯基安全中心，是卡巴斯基产品的企业级管理控制台。
An enterprise-grade management console for Kaspersky products, Kaspersky Security Center (KSC).

卡巴斯基安全管理套件，是卡巴斯基安全中心的专用内嵌式模块，可集中管控客户端基础设施。
Furthermore, Kaspersky Security Management Suite (KSM) enables centralized management of thin client infrastructure as an add-on module for Kaspersky Security Center.

这两种工具从单个中心管理多达 100,000 个节点，为所有客户端进行监控、配置和安全更新。当连接到卡巴斯基远程工作空间基础设施时，客户端将进行自动软件部署、漏洞评估、修补和注册、配置。
More than 100 pilot projects proved a good basis for promotion

According to Kaspersky’s research, using Kaspersky Secure Remote Workspace can reduce an organization’s total cost of ownership by at least 25% as compared with using classical desktops, laptops, and netbooks based on other operating systems. Furthermore, the Kaspersky Thin Client is a device that is already secure by design with the same level of performance as other solutions.

By optimizing workplace costs, companies are able to improve their employees’ social environments.

Innovation technology enabled cost savings

Kaspersky Secure Remote Workspace has received five Chinese national patents to date. As a company, Kaspersky believes that Cyber Immunity is the future of IT and information security. Currently, Kaspersky is ahead of its competitors when it comes to developing immune solutions. Although Kaspersky holds the leading position in this field, other companies are also required to develop similar solutions. In order to innovate other companies, Kaspersky has released commercial Cyber Immune products, which are currently available on the market.
引言

近年来，虚假信息已经成为了全球互联网安全的共同难题，群体在社交媒体、系统建设、热点上全面布局，历经数年攻坚，形成两大里程碑成果；

The global Internet has been plagued by the issue of information forgery. In terms of algorithms, systems, and products, the team has developed a comprehensive platform of false information detection. Two milestone achievements have been achieved and have been applied in practice after nine years of collaborative work.

The research and development of these technologies are crucial for safeguarding the integrity of the Internet. The team's achievements have been widely recognized and have contributed significantly to the field of information security.

As part of its efforts to promote the global development of the detection of false and forged information, the team has organized a number of academic forums and competitions and as well as released the largest Chinese multimodal dataset for the detection of false news. During COVID-19 Pandemic competition, the team organized the 2020FakeNews Detection competition, which attracted the attention of global academia and industry peers. The competitions have been attended by 672 teams.
引言
成果由邮储集团自 2010 年开始完全自主研发，有效解决了原基础系统在可靠性、可用性、可扩展性等方面的问题，简化了业务流程，提高了业务处理速度，降低了运维成本。系统经过不断升级和优化，已在国内外多家金融机构中成功应用，得到了广泛赞誉和好评。成果已在邮储银行系统中广泛应用，受到了广大用户的高度评价和广泛认同。

OCEANBASE 原生分布式关系数据库
OceanBase Native Distributed Relational Database

蚂蚁科技集团股份有限公司
Ant Group Co., Ltd.

OceanBase 原生分布式关系数据库
OceanBase Native Distributed Relational Database

引言
成果由邮储集团自 2010 年开始完全自主研发，有效解决了原基础系统在可靠性、可用性、可扩展性等方面的问题，简化了业务流程，提高了业务处理速度，降低了运维成本。系统经过不断升级和优化，已在国内外多家金融机构中成功应用，得到了广泛赞誉和好评。成果已在邮储银行系统中广泛应用，受到了广大用户的高度评价和广泛认同。

OCEANBASE 原生分布式关系数据库
OceanBase Native Distributed Relational Database

蚂蚁科技集团股份有限公司
Ant Group Co., Ltd.

OceanBase 原生分布式关系数据库
OceanBase Native Distributed Relational Database

引言
成果由邮储集团自 2010 年开始完全自主研发，有效解决了原基础系统在可靠性、可用性、可扩展性等方面的问题，简化了业务流程，提高了业务处理速度，降低了运维成本。系统经过不断升级和优化，已在国内外多家金融机构中成功应用，得到了广泛赞誉和好评。成果已在邮储银行系统中广泛应用，受到了广大用户的高度评价和广泛认同。

OCEANBASE 原生分布式关系数据库
OceanBase Native Distributed Relational Database

蚂蚁科技集团股份有限公司
Ant Group Co., Ltd.

OceanBase 原生分布式关系数据库
OceanBase Native Distributed Relational Database

引言
成果由邮储集团自 2010 年开始完全自主研发，有效解决了原基础系统在可靠性、可用性、可扩展性等方面的问题，简化了业务流程，提高了业务处理速度，降低了运维成本。系统经过不断升级和优化，已在国内外多家金融机构中成功应用，得到了广泛赞誉和好评。成果已在邮储银行系统中广泛应用，受到了广大用户的高度评价和广泛认同。
服务全球400余家核心系统的稳定运行和长效发展

Stable Operation and Sustainable Development: Serving the Core Business Systems of More Than 400 Enterprises Worldwide

随着“数字中国”时代各行业数字化转型对基础设施架构的新需求，适合在松耦合和云服务下运行，它亦可以支撑分布式架构的短板。经过十余年的的发展，成果已在金融、政务、运营商、能源、交通、互联网等多个行业得到广泛应用。支撑了蚂蚁集团、网商银行的全部核心系统，以及工商银行、建设银行、红塔银行、招商证券、中国人民保险、中信保诚、阿里巴巴等400余家机构的核心系统的稳定运行。成果自2013年开始应用于蚂蚁集团内部业务，已覆盖支付宝100%的核心系统，支撑会员、交易、支付等全部核心业务，并连续确保了支付宝9年“双十一”交易的稳定运行。

In this era of the digital economy, the OceanBase Database meets the requirements of a number of industries for infrastructure during digital transformation. It can be deployed and run on bare metal or in the cloud, and it can compensate for the shortcomings of a centralized architecture. OceanBase Database has been widely adopted in several key industries, including finance, government affairs, telecommunications, energy, transportation, and online services. All core business systems of Ant Group, and Mybank, as well as those of KBDO, Changhui, Rural Commercial Bank, Longba Shangshi, China Merchants Securities, PICC, CIC, Sinopec, and Alibaba Group, are supported by this system. In 2013, OceanBase Database was first deployed within Ant Group’s internal business systems. Currently, it supports all core lines of Alipay as well as all core business systems such as membership, transactions, payments, and accounting. During the massive Double Eleven Shopping Festival, it was able to ensure the stable operation of Alipay for nine consecutive years.

2018年双十一活动中的OceanBase团队

The OceanBase Team in the Double Eleven Shopping Festival 2018

有效解决数据库卡脖子难题，并在降本增效、节能减排方面成效显著

Achieving remarkable results in cost reduction, efficiency improvement, energy conservation, and emission reduction by breaking the stranglehold of database technologies

成果在保障使用机构业务稳定运行的前提下，在提升其业务效率、节省存储空间、降低采购和运维成本方面成效显著。

Currently, OceanBase Database provides stable business operations, improves business efficiency, reduces storage space requirements, and reduces procurement and operation and maintenance costs.

成果的成功研发和规模化应用，为数据库领域的国际竞争提供了新的赛道与空间，为各行业分布式架构转型提供了坚实的基础。

OceanBase Database has been successfully developed and commercialized, enabling it to compete internationally in the field of database management. For enterprises in various industries, it provides a solid foundation for transforming their systems into distributed architectures.

国内首个全面开源的分布式关系数据库

The First Fully In-house Developed and Open-source Distributed Relational Database in China

成果300万行核心代码的全面开源，是数据库领域全面开源的创新实践，对构建中国自主可控的数据底座技术路线和生态体系具有重要意义。未来一年来，已有近3.39万社区用户和129位核心代码贡献者，设有4.5万次Ziplf，成果开源版已应用于快手、滴滴、美团、腾讯云、中钞电银、58、360、京东等200余家机构。

In the open-source community, OceanBase has released three million lines of core code. A technology roadmap is being developed that will lead to a Chinese company owning a database ecosystem. The open-source community has attracted approximately 33,900 users and 129 core code contributors over the past year. Over 4,500 stars have been awarded to the project. More than 200 companies have deployed OceanBase Community Edition, including Kuaishou, Trip.com, KE Holdings, UnionPay, Sunshine Insurance, China Telecom, 58.com, Qihoo 360, and JD.com. OceanBase has trained more than 10,000 database professionals through its open-source community and talent incubation partnerships with more than 20 universities in China.

中商联合认证中心（CEC）测评结果

Statistics by China Environmental United Certification Center (CEC)
大规模知识图表示学习的体系化算法及开源工具

Systematized Basic Algorithms and Open-Source Tools for Representation Learning of Large Scale Knowledge Graph
In 2017, THU-OpenSK was successfully applied to two of the famous large-scale general knowledge graphs in the world, Freebase and Wikidata, establishing two knowledge graph representation models based on 10 million entities and 1.5 billion relations. In terms of artificial intelligence, these two relatively earlier published large-scale, open-source knowledge graph representation models in the world, contributing key resources to the development of knowledge computing. It has been used by researchers at hundreds of institutions both at home and abroad, resulting in a positive social impact. Ten national invention patents have been obtained as a result of this project. Tencent WeChat has successfully applied some of the techniques of this project, resulting in an improved user experience, thus promoting the intelligent level of the digital industry.

THU-OpenSK is one of the world’s most influential open-source platforms, forming THU-OpenSK, a large-scale knowledge graph representation learning system developed by Tsinghua University. OpenKE, OpennRE, and OpenNRE are three open-source toolkits included in THU-OpenSK, which has been rated 10,729 stars and has been forked 3,192 times. The system surpasses those of international and Chinese research institutions and enterprises. The influence of THU-OpenSK on open-source in the field of knowledge graph representation learning is among the leading positions in the world today, becoming one of the mainstream systems for knowledge graph representation learning worldwide. On GitHub, Tsinghua University’s THU-OpenSK project, with THU-OpenSK as its core content, attracts huge amounts of attention. Besides THU-OpenSK, OpenKE is a new open-source platform of artificial intelligence, which supports the ecological construction of open-source applications.

The major achievements include the development of knowledge graph representation learning and the creation of an artificial intelligence platform. The project has also contributed to the development of knowledge computing by applying the techniques to Tencent WeChat.

The project has been financially supported by the Ministry of Science and Technology of the People’s Republic of China, and the Shanghai Municipal Government. The project has established a platform for the development of knowledge graph representation learning, contributing to the development of artificial intelligence.

In conclusion, the THU-OpenSK project has made significant contributions to the field of artificial intelligence and has been widely recognized. The project not only provides valuable resources for researchers but also promotes the development of smart services and intelligent applications.

THU-OpenSK is open-source and welcomes contributions from the global community. The project encourages collaboration and partnerships with other institutions to drive innovation and advance the field of artificial intelligence.
中国国家骨干全光网创新与应用

Innovations and Applications of China Telecom Backbone All-Optical Network

中国电信骨干全光网创新采用一干二支架构，率先部署基于ROADM的全光交换网络和基于OTN的高级高质量传输网络，网络覆盖、带宽、质量和价格优势明显，大幅提高中低端互联网的带宽和质量，促进了互联网应用的高质量发展。

Introduction

It is China Telecom’s first all optical backbone network (AON) that is innovatively designed to integrate interprovincial and intraprovincial backbone networks via a single and optimized approach. With ROADM (Resconfigurable Optical Add-Drop Multiplexer) technology and high-quality OTN (Optical Transport Network) bearer networks, this is the world’s first deployed all optical switching network. As a result of the high optical backbone network, China Telecom offers a wide network coverage, a large bandwidth, high quality, and low latency, which greatly enhances the bandwidth and quality of the basic Internet, as well as facilitating the development of high quality Internet applications.

四大技术创新建成超大规模骨干全光交换和传输网络

The four major technological innovations have been applied to achieve the large-scale backbone all-optical switching and transmission network.

中国国家骨干全光网的研究和建设过程中，从网络架构、延长传输、波长交换、智慧运营等环节出现，实现了多项技术创新，首次提出一干二支的网络架构，全面覆盖全国各区域。中国国家骨干全光网的成功建立，将对整个中国的互联网网络架构和传输网络带来深远影响，大幅提高中低端互联网的带宽和质量，促进了互联网应用的高质量发展。

Dedicated to improving the development of China Telecom’s backbone all-optical network, a number of technological innovations have been achieved as a result of the difficulties with network architecture, ultra-long transmission, wavelength switching, as well as intelligent operation and maintenance.

A nationwide, integrated interprovincial and intraprovincial AON is built first by proposing an innovative architecture for the integration of inter-provincial and intraprovincial backbone networks. By eliminating bottlenecks in key technologies and optimizing the core parameters of all optical transmission system design such as transmission medium, code pattern, and spectrum, the all-optical transmission system has achieved world-leading performance indicators.

为公众和政企客户提供高可靠低时延大带宽连接

To provide high reliability, low latency and large bandwidth connections for the public and government and enterprise customers.

中国国家骨干全光网作为国家网络，可以为企业和政府提供高可靠、低时延、带宽保证的端到端专用数据传输通道，为覆盖网络的高可靠发展提供了重要引擎，通过各个底层之间高度协同，产业数字化发展模式的深度融合，为政企用户提供综合服务，建设行业信息化领域的头部服务能力，公共网络已经成为显性、互联网、能源、金融、医疗、教育、旅游等各行业以及提供数字化咨询服务的基础设施的连接纽带。全光ROADM网络的建设，使得中国国家骨干全光网——ChinaNet网络运行质量的大幅提高，为互联网用户提高速度、稳定的通信基础，使得基于视界的网络教育、网络直播等应用得以普及。

Through its all optical backbone network, China Telecom has established an end-to-end dedicated data transmission channel with high reliability, low latency, and guaranteed bandwidth that is essential to the development of high-quality computing networks across enterprises and the cloud. As a result of the strong cooperation of each service link and the deep convergence of industrial and digital development models, it has provided comprehensive services for the vertical industry and accelerated the development of the head service capability in the information industry.

To date, the all-optical network (AON) has provided tens of thousands of high-quality connections for government entities, the Internet, energy, finance, education, tourism, medical treatment, education, finance, agriculture, and many other sectors. A high-speed and stable communication infrastructure has been provided to internet users by the construction of an all optical ROADM network, which has greatly improved the operation quality of ChinaNet, a public Internet backbone network. Online education, webcasts, and other applications based on video have also become popular in China.
实现经济效益和社会效益双丰收

Achieve double abundant harvest for economic and social benefits

中国电信骨干全光网投入运营以来，经济和社会效益显著。骨干全光网开发的专线产品产生直接经济效益19.7亿，全光网减少大量建网成本，预估节省成本8亿元；低时延、高稳定网络为金融和OTT客户带来可观的间接经济效益。骨干全光网在推动国民经济增长方面取得显著的社会效益。

Since the launch of China Telecom’s all-optical backbone network, the company has achieved significant economic and social benefits. It has been estimated that the revenue from private line services based on the backbone all-optical network has reached approximately 19.7 billion yuan. As a result, AON can reduce a significant amount of network construction costs, which is expected to result in savings of up to 800 million yuan. The low latency, high stability and low latency of the backbone all-optical network creates an appreciable indirect economic value for financial customers and OTT users. As a result of China Telecom’s all-optical network, the national economy has achieved significant social benefits, such as the promotion of the digital transformation of the national economy and the facilitation of the rapid development of Internet applications and services.
5G 时间关键型通信使能远程操控
5G Time Critical Communication Enabled Remote Controlling

交叉层优化，克服无线环境波动，消除延迟，随时随地提供流畅视频
Cross-layer optimization to overcome wireless environment fluctuations, no delays for videos and smooth video anytime, anywhere

当前，大多数 5G 系统都为增强型移动宽带（eMBB）业务设计的，能够最大程度提高数据速率，但没有任何延迟的保证。XR、实时视频会议、远程驾驶和远程操控等新兴应用在真实 5G 环境中，受到无线网络和基站性能等因素波动的影响，会在网络中形成拥塞，进而引发 “脉冲式” 延迟，造成卡顿。为了解决这个问题，爱立信开发了时间关键型通信工具箱，L4S 是其中的重要技术之一。爱立信和中国移动在国际标准化组织（3GPP）及 3GPP 领域推动“L4S”（Low Latency, Low Loss, Scalable Throughput）技术标准。将 L4S 融合到 5G 网络，并与腾讯云开发出了全球首个 5G 时间关键型通信系统级解决方案。通过无线网络和应用的资源优化调度，远程驾驶在广域的多变的 5G 无线环境下移动，操作者仍然可以看到清晰的实时数据，保障了驾驶的安全性。解决了远程驾驶在 5G 脉冲中突发卡顿的问题，降低了风险，有力地推进了远程驾驶从概念走向生产落地，无线网络和应用的资源优化调度，也是向 6G 演进的方向之一。

引言

5G 时间关键型通信使远程操控不仅开创性地为需要高速传输数据的视频流等 eMBB 业务提供了延迟保障，而且 XR、远程驾驶和远程操控等 5G 新兴应用在真实无线环境中提供流畅的用户体验。

Introduction
Enhanced Mobile Broadband (eMBB) services, such as video streaming, that require high-speed data transmission, can be accessed using a 5G time-critical communication-enabled remote control. Furthermore, it provides a smooth user experience in real fluctuating wireless environments by enabling new 5G applications such as XR, remote driving, and remote control.

Ericsson and China Mobile are leading the standardization process for Low Latency, Low Loss – Scalable Throughput (L4S) technology. Tencent Cloud has developed, jointly with Ericsson Cloud, the world’s first 5G TCC-enabled remote control system, pioneering the introduction of the L4S mechanism into a 5G network. Using cross-layer optimization between wireless networks and applications, when remote driving vehicles operate in a wide-area and variable 5G radio environment, the operator is able to view real-time video in a smooth manner, ensuring the safety of the driver. As a result, remote driving is no longer frozen suddenly in the existing 5G network, risks are reduced, and remote driving is effectively promoted from concept to production. Another direction for the evolution to 6G is cross-layer optimization.
与国际主流协议兼容，得到众多国际厂商支持

Compatible with international mainstream protocols, supported by many international manufacturers.

现在网络主流协议 RTP/RTCP、TCP Prague、DCTCP、QUIC 均支持 L4S。L4S 在全球著名的开源网站 GitHub 发布部分的开源代码，使用了多核化时钟同步自适应 (Self Clock Rate Adaption for Multimedia, SCReAM) 算法，适用于主流的 RTP/RTCP 协议。众多国际厂商都表示了对 L4S 技术的支持；从全球来看，德国电信通过白皮书和云游戏的方式，宣布达在其 2022 GPU 技术大会上推出 XR。L4S 在全球开发的项目中展示 L4S 如图所示的改进。在中国，三一集团内某集团 X 无人驾驶项目中，实现 L4S 实时反应辅助驾驶功能落地商用；在全球港口厂中，地电推远程操控、港口无人集卡的远程驾驶，起重机的远程操作项目，乘用的远程操控等项目都得到了落地实施。L4S 技术已被全球主要的 L4S 开发者所接受，并在安卓系统中实现了部署。Nvidia 公司在 XR 苹果技术大会上展示了 L4S 技术在 XR 设备中的优势。

Potential to leverage the trillion-dollar market

5G 时代关键型通信在 XR，远程控制、工业控制和自动驾驶等各个垂直领域都有广阔的应用，市场咨询公司 Market Research Future (MRFR) 在其报告中指出，“工业控制系统以 10% 的复合年增长率增长，市场规模到 2030 年将达到 1800 亿美元”，根据预测，到 2030 年全球将有 9 - 10 亿 XR 用户，市场规模达到 1 - 2 万亿美元。5G 时间关键型通信和其延迟的远程操控对这些市场有巨大的作用，帮助这些应用在真实的 5G 网络中拥有更优的用户体验，加快市场进化。

The use of 5G transport critical communication is expected to be widespread in a wide range of vertical fields, including augmented reality, remote control, industrial control, and mobile automation. According to Market Research Future (MRFR), a market research firm, industrial control systems will grow at a compound annual rate of 10% by 2030 and reach a market size of $180 billion. Citibank forecasts that there will be 900 - 1000 million XR end users worldwide by 2030, with a market value of between $1 trillion and $2 trillion. These markets will be impacted by 5G time-critical communications and the remote control they enable. As a result of the 5G TCC enabled remote controlling, these applications will be able to maintain a good user experience at any time within the real 5G network, thereby speeding up the marketing process.
ODPS: 数据驱动而生的超大规模多场景融合的大数据计算平台

Open Data Processing Service (ODPS):
A Hyper-scale Big Data Computing Platform Designed for Multiple Scenarios

Alibaba Cloud Computing Co., Ltd.

ODPS is an open-source, distributed, and scalable computing platform that enables users to process and analyze large datasets. It is designed to handle massive data volumes and provide scalable computing power. ODPS is built on a distributed computing framework that is designed to handle large-scale data processing tasks. It provides a range of services that enable users to perform complex data analytics and machine learning tasks.

Introduction
Alibaba Cloud offers an integrated big data computing platform and data warehouse product called ODPS, providing key technology innovations such as the multi-model unified computing engine, hyper-scale unified resource scheduling engine (Fuxi), and multi-tenant security isolation technology.

From the aspect of storage technology, ODPS has built-in Pangu and OTS engines, which solve the bottlenecks of metadata hotspots, allowing it to scale to more than 10,000 physical servers and 30,000 nodes in a single cluster.

ODPS’s SQL engine, called Hive, is a decentralized data warehouse service that enables users to perform complex data analysis tasks. ODPS also provides a range of other services, including data integration, data governance, and data security.

ODPS is designed to be highly scalable and can handle large-scale data processing tasks. It is built on a distributed architecture that enables it to scale horizontally and handle large volumes of data. ODPS also provides a range of tools and services that enable users to perform complex data analytics and machine learning tasks.
Introduction

The team conducts a systematic research for device-cloud collaborative learning over large scale of graph data (which in general consists of billions of nodes and millions of edges). Specifically, the team is the first to set up the collaborative learning mechanism for cloud and edge modeling with a thorough technology of the architectures that enable such mechanism. The research can boost the co-evolution of learning models between cloud and edge, providing efficient utilization of computing resources over edge and cloud.

大规模图神经网络端云协同计算平台

The device-cloud collaborative computing platform of graph neural network over large scale data

项目在大规模图神经网络端云协同学习、一体化的端云协同技术模型中，设计了多层次的协作学习和端云协同算法，取得了显著的协同模型学习性能提升，实现了模型在表征学习能力、模型性能等方面的提升。项目在大规模图神经网络端云协同计算平台中，实现了端云协同模型算法的协同计算，推动了端云协同计算模式的发展。
端云协同架构支撑技术赋能、产业增效、场景变革

The empowered scenarios over device-cloud collaborative computing

项目通过技术赋能、产业增效、场景变革推动数字经济

The device-cloud collaborative computing platform empowers many of scenarios such as digital economy.

通过阿里云提供的数据计算服务、服务小微企业、中型企业、大型企业和国家开放平台等，项目通过端云协同架构支撑技术赋能、产业增效、场景变革，推动数字经济。

The device-cloud collaborative computing platform empowers many of scenarios such as digital economy.

GNN over Aiyian serves more than 100 enterprises and institutions, and the data flow reaches more than 100 million times a day, on average, promoting the intelligent upgrading of the digital economy through the combination of cloud services and edge intelligence.

The research has built the first industrial end-to-end general-purpose device-cloud collaborative computing platform learning infrastructure, establishing the computing framework and algorithm code open-source, leading the technology field of enabling device-cloud collaborative applications, being applied to more than 100 enterprises and institutions in the fields of government affairs, public security, finance and insurance, the internet and industry, and enabling core scenarios such as vision, recommendation, touch and voice. It supports more than 300 million active users’ real-time online demand for end-to-end inference 100 billion times a day (up to 223.5 billion times), and reshapes business models such as online economy and intelligent justice by technical means. The sales revenue increased by 6.867 billion yuan and the profit increased by 2.111 billion yuan in three years.

The research has built the first industrial end-to-end general-purpose device-cloud collaborative computing platform learning infrastructure, establishing the computing framework and algorithm code open-source, leading the technology field of enabling device-cloud collaborative applications, being applied to more than 100 enterprises and institutions in the fields of government affairs, public security, finance and insurance, the internet and industry, and enabling core scenarios such as vision, recommendation, touch and voice. It supports more than 300 million active users’ real-time online demand for end-to-end inference 100 billion times a day (up to 223.5 billion times), and reshapes business models such as online economy and intelligent justice by technical means. The sales revenue increased by 6.867 billion yuan and the profit increased by 2.111 billion yuan in three years.

科学融合培育人工智能创新性人才

Integrating science and education to cultivate artificial intelligence innovative talents

科联在WiseOcean上的项目

科联在WiseOcean上的项目

项目成果赋能智能司法

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.

The project focuses on "the first generation of artificial intelligence" in the application of legal assistance, and the national "internet + " strategy, and the "internet + " strategy, creating a new "internet + " service model that integrates online economy and intelligent justice.
龙芯 3A5000
LS3A5000

引言
龙芯 3A5000 是龙芯科技采用 LoongArch™ 指令系统的处理器芯片，四核 64 位，主频 2.5GHz，其键入 IP 与所用均为自主设计，芯片内置安全模块，性能指标达到主流产品水平，封装自主架构，性能较好，兼容性强，安全可靠等特点。

Introduction
LS3A5000 is the first general-purpose processor chip supporting a self-developed instruction set architecture named LoongArch™. All sources codes of its key IPs are written independently, including built-in security engine modules. The majority frequency of the 64-bit quad-core chip is 2.5GHz, and its performance is comparable to other mainstream CPU products. The LS3A5000 has an autonomous architecture, superior performance, ecological compatibility, and security integration features.

LoongArch™ 基于多年来的 CPU 研制和生态建设积累，从顶层设计到指令集和 ABI 基准等，全部自主创新。LoongArch™ 吸取了现代指令集演进的最新成果，运行效率更高。LoongArch™ 充分考虑兼容性生态的需求、融合 X86、ARM 等国际主流指令集的主要功能特性，并依托龙芯团队在二进制翻译方面十几年的技术积累与创新，实现跨指令集的高效应用。

LoongArch™ is based on years of CPU development and ecosystem building. It is designed independently, from the instruction set to the API base. LoongArch™ integrates major functions of other instruction systems, such as x86 and ARM, for ecological compatibility. Based on LoongArch™, LoongArch binaries across mainstream instruction systems have been achieved through the technical accumulation and innovation of the LoongArch binary translation team over the past ten years.

LoongArch™ 已得到国际开发软件界广泛认可与支持，成为与 X86/ARM 并列的主流开源生态系统。已向 GNU 编译器等多款 GPL/Linux Machine 环境 (L528 等)，并获得 Linux, Binutils, GDB, NET, GCC, LLVM, Ga, Chromium/ V8, Mozilla/SpiderMonkey, Javascript, FFmpeg, libyuv, libopen/klaim, Yices 等开源软件社区, UEFI(UEFI 标准), ACPI(标准) 以及中国开源社区支持。龙芯自主生态系统的构建，离不开 LoongArch™，其技术体现在 LoongArch™，种子开源生态系统的支持。

LoongArch™ has already received wide recognition and support from the international development software community. It has become one of the mainstream open-source ecosystems alongside x86 and ARM. It has been integrated into the Linux, Binutils, GDB, NET, GCC, LLVM, Ga, Chromium/V8, Mozilla/SpiderMonkey, Javascript, FFmpeg, libyuv, libopen/klaim, Yices, etc. It is well supported by the open-source community, including the UEFI standard, ACPI, and the Chinese open-source community. The development of the LoongArch™自主生态系统的构建，离不开 LoongArch™，其技术体现在 LoongArch™，种子开源生态系统的支持。

龙芯 3A5000 性能优异，用户广泛
The LS3A5000 offers excellent performance and is popular with a wide range of users.

龙芯 3A5000 在 GCC 编译环境下支持 SPECT CPU2006 的定点、浮点单精度 Base 分布均达到 26 分以上，四核心峰值达到 30 分以上。

Among international open-source software communities, LoongArch™ is widely accepted and supported and is becoming a top-level open-source instruction set ecosystem alongside X86/ARM. The GNU organization has approved a unique ELF Machine number (598), and has been recognized by many software communities, including Linux, Binutils, GDB, NET, GCC, LLVM, Go, Chromium/V8, Mozilla/SpiderMonkey, Javascript, FFmpeg, libyuv, libopen/klaim, Yices, etc. It is widely used and supported by various open-source communities.

龙芯 3A5000 的出现实现了一个安全性和开放性的重要突破，龙芯 3A5000 包括 CPU 核心、存储控制及相关 PHY、高速 IO 接口控制及相关 PHY，都有核心、片内及端口缓冲存储器等在内的所有所有级别自主设计。龙芯 3A5000 在处理器内核实现了对架构“隔离（Spectre）”与“屏蔽（Meltdown）”的攻击，并在处理器内核支持硬件级微码级密钥访问等访问控制机制。

数十个中国知名整机企业、行业性软件开发等基于龙芯 3A5000 研制了上百款基于解决方案产品，包括台式机、笔记本、一体机、金融设备、行业终端，服务器，移动设备，交通信息化领域得到广泛应用。

LS3A5000 integrates autonomously and securely deeply. LS3A5000 contains a number of self-designed modules, including a CPU core, a memory controller, a high-speed IO interface controller, a PLL, a multiprotocol register file, etc. A mechanism for preventing Spectre and Meltdown attacks, as well as access control policies, such as a novel stack protection for operating systems, are implemented in the processor core. Over the past several years, hundreds of open-source software solutions have been developed based on LS3A5000 by domestic well-known machine manufacturers and industrial terminal developers, including desktop computers, laptops, al-fone computers, financial machines, industrial terminals, security equipment, network equipment, industrial control modules, etc. It is widely used in the fields of e-government, finance, communication, education, and transportation in the information technology industry.

龙芯 3A5000 应用广泛，中国 LoongArch™ 生态建设已取得初步成果
The LS3A5000 processor has been widely used, and China’s LoongArch™ ecosystem has shown some promising results.

龙芯 3A5000 基于 2.5GHz，包含 4 个 L4644 处理核，性能接近主流桌面 CPU 水平。龙芯在系统设计，操作系统，3D 显示加速，4K 高清解码，以及各类业务软件处理等方面，龙芯 3A5000 资源用户评价很高，目前，龙芯生态建设已形成一定规模正在快速发展，不仅为中国的信创生态建设提供了自主可控的安全之路，也成功建立了基于 Win10 (Windows + Intel) 和 AA 体系的信息技术体系和产业生态。

With a L4644 processor core and a frequency of up to 2.5GHz, the LS3A5000 is the first processor chip to support LoongArch™. Its performance is comparable to that of other mainstream processor products in the CPU market, and its user experience is greatly improved in most daily tasks, such as the processing of complex documents, the opening of web browsers, the acceleration of 3D engines, the decoding of 4K, HD, and various business transactions. The LoongArch™ ecosystem has evolved rapidly over the past few years. In addition to providing a secure and autonomous base for the construction of China’s critical information infrastructure, the ultimate goal is also to actively promote the development of information technology systems and industrial ecosystems independent of Windows (Windows + Intel) and AA (Arm Andaro)
微软下一代数字孪生平台——Azure Digital Twins

Microsoft Azure Digital Twins Platform

微软（中国）有限公司
Microsoft (China) Co., Ltd.

引言

微软Azure数字孪生是一个全新的平台即服务（PaaS）产品，基于该产品可创建用于描述现实世界的数字孪生图谱。同时可整合物联网的数据，应用高级数据分析和人工智能技术，获取有关企业业务的洞察结果，并与三维可视化结合，实现高度逼真的可视化效果，从而提供更灵活的用户体验并帮助企业带来更多的业务价值。

Introduction

Azure Digital Twins is a platform as a service (PaaS) offering that enables the creation of twin graphs based on digital models of entire environments. It creates a digital representation of real-world things, places, business processes, and people. These digital twin models can be used to gain visualization and insights that drive better products, optimized operations, reduced costs, and breakthrough customer experiences.
Azure 数字孪生加速数字孪生解决方案落地

Azure Digital Twins accelerates the implementation of digital twins solution

基于 Azure 数字孪生平台的全链功能，企业可结合自身的行业领域知识构建定制化的数字孪生解决方案，典型的应用场景包括：

With the comprehensive capabilities of Azure Digital Twins, enterprises can take advantage of your domain expertise on top of Azure Digital Twins to build customized digital twin solutions, typical scenarios including:

- 实现任意物理环境的数字孪生模型，并以可扩展且安全的方式注入实时数据使数字孪生模型如实反映真实环境状态变化。
  Model any environment, and bring digital twins to life in a scalable and secure manner.

- 连接物联网设备和现有业务系统等的数据资产，使用强大的事件系统构建动态业务逻辑和数据处理。
  Connect assets such as IoT devices and existing business systems, using a robust event system to build dynamic business logic and data processing.

- 建立完备的三维可视化，并在上下文中展示业务逻辑和孪生数据。
  Build connected 3D visualizations of your environment that display business logic and twin data in context.

Azure 数字孪生的价值实现

Azure Digital Twins simplify and accelerate the development of digital twin solutions

通过 Azure 数字孪生，企业可以简化和加速数字孪生方案的构建，应用 Azure 数字孪生提供的开放性数字孪生模型语言，企业可以快速实现模型，以反映真实环境的数据表示，该表示可以是楼宇、工厂、能源网络，甚至整个城市模拟环境的模型，从而加速企业的数字孪生方案构建，为企业业务、城市公共管理的等应用场景带来实实在在的经济价值。

此外通过 Azure 数字孪生服务的端到端的数据资源，可轻松打散企业的数据孤岛，为整个现实环境提供商业洞见，加速企业的数字转型，从而提升企业运营效率同时也节省企业的运营成本，为用户提供高质量的产品服务同时营造大量的社会经济效益。

Track the past and help predict the future of any connected environment: Easily model and create digital representations of connected environments with an open modeling language. Model buildings, factories, farms, energy networks, railways, stadiums—even entire cities. Bring these digital twins to life with a live execution environment that translates twin changes over time. Unlock actionable insights into the behavior of modeled environments via powerful query APIs, and integrate with Azure analytics.

Break down silos within connected environments: Model any physical environment that’s important to enterprises’ business. Then connect inputs from IoT devices that are using Azure IoT Hub or from any business system to establish a single live integration layer that delivers insights from across the entire environment.

Azure 数字孪生在企业的应用

Digital Twins Application in Enterprises
全球首个集成 5G AI 处理器的调制解调器及射频系统

The World’s First Modem-RF System with Integrated 5G AI Processor

高通无线通信技术（中国）有限公司
Qualcomm Wireless Communication Technologies (China) Co., Ltd.

引言

高通公司于2022年2月推出全球首个集成5G AI处理器的调制解调器及射频系统——骁龙X70，其利用强大的AI能力，实现突破性的5G性能，包括高达100Gbps的5G传输速度，超低时延、卓越的网络覆盖和能耗，开启5G智能连接新时代。

介绍

Qualcomm推出了Snapdragon X70，这是世界上第一款集成5G AI处理器的射频系统，能够提供强大的AI能力，实现突破性的5G性能，包括高达100Gbps的5G传输速度，超低时延、卓越的网络覆盖和能耗，开启5G智能连接新时代。

骁龙X70利用全球首个5G AI处理器，实现突破性的5G性能

Snapdragon X70 harnesses the world’s first 5G AI processor for breakthrough 5G performance.

骁龙X70引入高通5G AI套件，优化Sub-6GHz和毫米波5G链路，其独特优势包括：AI辅助信道状态反馈和动态优化，全球首个AI辅助毫米波实时管理，AI辅助网络选择，AI辅助后链路优化。通过Qualcomm的5G PowerSaver 3.0技术，集成先进的射频管理技术，并提供智能电源管理，在智能手机和移动场景下，通过软硬件协同优化技术降低功耗，实现更长的电池续航时间。

骁龙X70面向5G垂直行业，以平台化方式赋能行业变革

Snapdragon X70 supports a wide array of devices and enables industrial transformation with innovation-driven hardware.

骁龙X70是全球首款支持从600MHz到41GHz全5G频段的调制解调器及射频系统，为终端厂商设计追求全面覆盖要求的终端提供极大的灵活性，支持业界最全的链路聚合功能，包括全球首个单载波聚合、FDD频段的下行聚合、以及毫米波和Sub-6GHz聚合，支持出色的上行链路性能和时延。通过结合5G和AI技术的实时优化和资源分配，骁龙X70还支持毫米波独立组网和Sub-6GHz毫米波独立组网，面向全球市场的5G多SIM卡和多部署双模功能。

Qualcomm的Snapdragon X70是全球首款集成5G AI处理器的调制解调器及射频系统，支持全球多个运营商，从600MHz到41GHz的频段，允许OEMs设计设备，支持全球运营商的网络，从而满足全球运营商的需求。

With peak speeds exceeding 8 Gbps, Snapdragon X70 enables the world’s first standalone mmWave connection. With Snapdragon X70, 5G mmWave networks and devices can be deployed without using an anchor in the Sub-6GHz band. By doing so, operators will have greater flexibility in providing multi-gigabit broadband access to residential and commercial customers with ultra-low latency and multi-gigabit speeds. It is also possible to achieve a peak download speed of 6 Gbps via 5G Sub-6GHz carrier aggregation across three TDD channels with the Snapdragon X70.

awaiting your response...
World Leading Internet Scientific and Technological Achievements Nominated Projects
**Baidu Wenxin Industry-Level Knowledge-Enhanced Models**

**Introduction**

Wenxin is a series of industry-level knowledge-enhanced large models independently developed by Baidu. The full layout of Wenxin includes models, tools, and platforms, and a community of large model innovation and exploration. As a result, AI development and applications have been lowered to a substantial degree, its large-scale industrialization has been accelerated, and its boundaries have been greatly expanded.

**Industry-level knowledge-enhanced large models**

Wenxin integrates large-scale knowledge into pre-training by utilizing the distributed training technology of paddle. Baidu's deep learning platform. In order to overcome the bottleneck of unified representation and learning of multiple sources of heterogeneous data, the parallel pre-training on massive unsupervised text and knowledge graphs is used.

By seamlessly deploying nuclear power plants, Wenxin can extract large amounts of knowledge from unstructured and structured data. These extracted knowledge and models are then used to analyze and interpret a variety of tasks, ranging from natural language processing to computer vision.

**World-leading scientific and technological achievements**

- **Applications in natural language processing:** Wenxin has achieved significant breakthroughs in areas such as language translation, question answering, and dialogue systems.
- **Influence in academic circles:** Wenxin has been widely cited and used in academic research, contributing to the advancement of AI in China.
- **Innovation in industry:** Wenxin's models are deployed in various industries, improving efficiency and productivity.

**Constantly creating economic and social value**

Wenxin models are used in many applications, contributing to economic and social value. They are applied in various industries to improve efficiency and productivity, and they are also used in research to advance the field of AI.

**Concluding remarks**

In conclusion, Wenxin represents Baidu's commitment to driving the development of AI. By integrating knowledge into large models, Wenxin provides a powerful tool for various applications, driving innovation and progress in the field of AI.
腾讯云企业级
分布式数据库 TDSQL
国际领先的服务式数据库

TDSQL具有高可用、全球部署架构、分布式水平扩展、高性能、企业级安全等特点，同时使用自研DSAM、自动化运维等配套设施，为用户提供完整的分布式数据库解决方案。

TDSQL——推进数据库基础技术突破与产业
分布式技术升级

TDSQL——Promoting the Breakthrough of
Basic Database Technologies and
the Upgrade of Industry Distributed Technologies

腾讯科技（深圳）有限公司
Tencent Technology (Shenzhen) Co., Ltd.

中国人民大学
Renmin University of China

腾讯云计算（北京）有限责任公司
Tencent Cloud Computing (Beijing) Co., Ltd.

引言
腾讯对分布式数据库技术进行了多年的持续研究创新，在数据一致性与高性能、系统弹性伸缩与高可用、HTAP 融合引擎等方面进行持续创新，研发了具有国际领先水平的，面向未来数字经济的金融级分布式数据库 TDSQL。

不断优化企业级分布式数据库

Constant optimization of enterprise-level distributed database

TDSQL 立足于国际产业对数字化转型的需求，对企业级事务处理、系统可用性、安全性和分布式处理等功能性进行创新突破，为解决传统数据库在扩展性、成本与性能等根本性问题，打造出国际领先的分布式数据库，具备金融级分布式、实时分析、云原生等云计算时代先进特性，推进数据库基础技术突破与产业分布式升级。

TDSQL 已推出多个版本，并在多个行业领域取得成功。在金融、能源、交通等行业，TDSQL 已经实现了大规模应用，证明了其在业务场景中的强大性能和稳定性。同时，TDSQL 也为企业提供了高可用、高性能的分布式计算能力，支持企业业务的快速扩展和升级。

通过使用 TDSQL，企业可以实现数据库的分布式部署，提高数据处理能力，满足业务扩展的需求。TDSQL 支持高可用性、高性能和弹性扩展，为企业提供了一种有效的数据管理方案。
大规模投产金融核心系统，服务50万家金融政企客户
Large scale production of financial core systems, serving 500,000 financial government and enterprise customers

突破金融级可用，才能走向企业级通用。TDSQL已应用于近50万家用户，包括主流金融、政府、运营商、工业制造企业。目前，TDSQL已广泛服务于金融行业，助力20余项金融机构进行核心系统上云，处于行业领先地位，帮助包括平安银行、交通银行、昆山农商行、邮储银行、印尼Bank NeoCommerce等实现核心系统分布式与数字化转型。

通过其能力来构建金融行业应用，TDSQL自2016年以来，不仅在金融领域取得卓越的成果，还被广泛应用到互联网、电信、电力、交通等行业，提供高效的数据处理能力。目前，TDSQL已拥有超过200家的金融行业用户，其中包括了国有大行、股份制银行、城市商业银行等各类银行机构。

此外，TDSQL还支撑社会实现数字化转型，推动企业与社会共同成长。TDSQL的可靠性与安全性得到广泛认可，其在智慧城市、交通、医疗、教育等多个领域的应用，证明了其在支撑社会数字化转型中的重要作用。同时，TDSQL还为企事业单位提供高效的数据处理能力，助力企业的数字化转型，推动社会的进步。

在企业的数字化转型过程中，TDSQL作为关键支撑技术，提供了高效的数据处理能力，帮助企业实现业务的高效运行。TDSQL的广泛应用，不仅在金融行业，还包括了互联网、电信、电力、交通等行业，证明了其在支撑社会数字化转型中的重要作用。同时，TDSQL还为企事业单位提供高效的数据处理能力，助力企业的数字化转型，推动社会的进步。

以先进技术服务经济发展、支撑社会实现数字化转型
Leveraging technologies to serve economic development and support digital transformation

TDSQL自应用以来，不仅在金融领域取得卓越的成果，还被广泛应用到互联网、电信、电力、交通等行业，提供高效的数据处理能力。目前，TDSQL已拥有超过200家的金融行业用户，其中包括了国有大行、股份制银行、城市商业银行等各类银行机构。

通过其能力来构建金融行业应用，TDSQL自2016年以来，不仅在金融领域取得卓越的成果，还被广泛应用到互联网、电信、电力、交通等行业，提供高效的数据处理能力。目前，TDSQL已拥有超过200家的金融行业用户，其中包括了国有大行、股份制银行、城市商业银行等各类银行机构。

TDSQL的可靠性与安全性得到广泛认可，其在智慧城市、交通、医疗、教育等多个领域的应用，证明了其在支撑社会数字化转型中的重要作用。同时，TDSQL还为企事业单位提供高效的数据处理能力，助力企业的数字化转型，推动社会的进步。

在企业的数字化转型过程中，TDSQL作为关键支撑技术，提供了高效的数据处理能力，帮助企业实现业务的高效运行。TDSQL的广泛应用，不仅在金融行业，还包括了互联网、电信、电力、交通等行业，证明了其在支撑社会数字化转型中的重要作用。同时，TDSQL还为企事业单位提供高效的数据处理能力，助力企业的数字化转型，推动社会的进步。
智能汽车行业创新：
大算力、高性能融合计算芯片 IP 平台

Innovation in the Smart Vehicle Industry: The First Integrated Computing Chip IP Platform with High Computing Power and High Performance in China

引言

作为面向智能汽车的大算力，高性能融合计算芯片 IP 平台，将全面赋能智能汽车全场景芯片产品快速落地，支持中国智能网联汽车产业链自主、构建开放协同的智能汽车产业生态，为未来全球汽车市场奠定良好基石。

Introduction

As the first integrated computing chip IP platform designed with high computing power and high performance, it will comprehensively accelerate the launch of high-end chip products for domestic smart cars, enhancing the establishment of a strong vehicle system that conforms to Chinese standards, creating an open and collaborative smart car industry ecosystem, and laying the foundation for the global expansion of domestic smart cars.

大算力 + 高性能智能汽车芯片新规范

An innovation to the definition of smart cars, with high computing power and performance

安谋科技重大突破性地将自研 NPU、虎贲 CPU、山海 CPU、灵曜 ISP 和灵曜 VPU 等计算单元构成的 K1 架构创新地应用在智能汽车芯片上，结合全球领先的 Arm Cortex CPU、 Mali GPU 技术，打造面向智能汽车的大算力、高性能融合计算芯片 IP 平台。

Flawless innovation of new standards to smart cars with high computing power and performance

作为将创新性的计算单元创新地融入的单芯片 NPU，Mali GPU，山海 CPU，灵曜 ISP 和灵曜 VPU 等计算单元构成的高端化芯片 IP 平台，提供强大算力及高性能特性，为智能汽车产品提供强大功能支持，为智能汽车的开发提供强大算力及高性能特性。为了推动智能汽车的创新，提供强大算力及性能支持，此平台的知识产权优势使得智能汽车产品具有强大的竞争力。

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

智能汽车行业分为智能汽车有两大特性，即高性能计算和高算力。高性能计算是智能汽车的重要支撑，高算力是智能汽车的核心能力。此平台的高性能计算和高算力特性使得智能汽车产品具有强大的竞争力。

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

大算力 + 高性能智能汽车芯片新规范

An innovation to the definition of smart cars, with high computing power and performance

安谋科技重大突破性地将自研 NPU、虎贲 CPU、山海 CPU、灵曜 ISP 和灵曜 VPU 等计算单元构成的 K1 架构创新地应用在智能汽车芯片上，结合全球领先的 Arm Cortex CPU、 Mali GPU 技术，打造面向智能汽车的大算力、高性能融合计算芯片 IP 平台。

Flawless innovation of new standards to smart cars with high computing power and performance

作为将创新性的计算单元创新地融入的单芯片 NPU，Mali GPU，山海 CPU，灵曜 ISP 和灵曜 VPU 等计算单元构成的高端化芯片 IP 平台，提供强大算力及高性能特性，为智能汽车产品提供强大功能支持，为智能汽车的开发提供强大算力及高性能特性。为了推动智能汽车的创新，提供强大算力及性能支持，此平台的知识产权优势使得智能汽车产品具有强大的竞争力。

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

大算力 + 高性能智能汽车芯片新规范

An innovation to the definition of smart cars, with high computing power and performance

安谋科技重大突破性地将自研 NPU、虎贲 CPU、山海 CPU、灵曜 ISP 和灵曜 VPU 等计算单元构成的 K1 架构创新地应用在智能汽车芯片上，结合全球领先的 Arm Cortex CPU、 Mali GPU 技术，打造面向智能汽车的大算力、高性能融合计算芯片 IP 平台。

Flawless innovation of new standards to smart cars with high computing power and performance

作为将创新性的计算单元创新地融入的单芯片 NPU，Mali GPU，山海 CPU，灵曜 ISP 和灵曜 VPU 等计算单元构成的高端化芯片 IP 平台，提供强大算力及高性能特性，为智能汽车产品提供强大功能支持，为智能汽车的开发提供强大算力及高性能特性。为了推动智能汽车的创新，提供强大算力及性能支持，此平台的知识产权优势使得智能汽车产品具有强大的竞争力。

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.

The platform is in the forefront of the design of the underlying architecture and the cooperation with the world’s leading Arm Cortex CPUs and Mali GPUs.
奇安信大禹平台
及重大网络安全防护应用

Dayu Platform and its Applications on Major Cybersecurity Protection Projects

奇安信科技集团股份有限公司
QI–ANXIN Technology Group Co., Ltd.

引言

奇安信基于人工智能和大数据技术，研制了具有自主知识产权的大数据安全平台——大禹平台，作为新一代网络安全防护体系的核心引擎，实现了安全检测、分析与处置能力的有效集成。

Introduction

Qi–Anxin has developed the Dayu platform, a big data security center, based on AI and big data technologies. Providing security detection, analysis, and response capabilities, the platform serves as the core engine of a new generation of cybersecurity protection systems.

突破四重难题，提升网络安全防护整体能力

Four breakthroughs to elevate the overall cybersecurity protection capability

大禹平台重点突破四大难题与挑战：威胁情报深度分析，态势评估与应急响应等关键技术，系统化提升重要信息系统安全防护能力。

Q: How has it significance?
A: It has significant advancements in the detection of vulnerabilities and threats, the aggregation of threat intelligence, the assessment of situations and the response to emergencies, with the aim of systematically improving the security protection capabilities of critical information systems.

一是突破多层级覆盖漏洞检测预警，平台支持源代码与文件代码漏洞检测，具备2798条供应链安全漏洞的自动检测能力，相关结果发布于CVE，获得全球约1万厂商的3000多次使用。

Firstly, the breakthrough in multi-level and wide-vulnerability detection, the platform supports source code and binary code vulnerability detection and is capable of automatically detecting vulnerabilities in 2798 types of source code. The results of the research were published at CVE and praised more than 400 times by renowned IT manufacturers from both home and abroad.

二是突破高级威胁检测预警，平台实现对无文件攻击、脚本攻击、内存攻击等高级攻击检测，有力支撑网络和移动安全检测分析。

Secondly, the platform has achieved breakthroughs in advanced threat detection and detection of memory attacks, the platform also supports real-time analysis of fine-grained behavior data for fileless attacks, script attacks, and memory attacks. Therefore, it is a high-performance and real-time analysis engine capable of applying thousands of rules to actual combat scenarios.

完成规模应用，护航千行百业数字转型安全

Scale application to escort security of digital transformation of thousands of industries

大禹平台入选国家级数字化转型伙伴行动和中小企业数字化提升专项行动，在能源、金融、航空、大型制造等百个世界500强企业落地应用，已覆盖20多个行业。

Q: What is the scale of application?
A: The Dayu platform has been selected for the national digital transformation partner action and the small and medium-sized enterprise digital transformation action. It has been applied in the energy, finance, aviation, large manufacturing, etc., covering more than 20 industries.

该平台累计检测30多万个可疑样本，超过10亿次行为，发现2000多个安全漏洞，参与执行中国规模最大、开放软件框架安全检测计划，为国内500多家公司及单位提供了安全检测服务。

Q: What is the scale of detection?
A: The platform has detected over 300,000 suspicious samples, more than 1 billion behaviors, and discovered over 2,000 security vulnerabilities. It has participated in China’s largest open software framework security testing plan, providing security testing services for over 500 companies and organizations.


完成规模应用，护航千行百业数字转型安全

Scale application to escort security of digital transformation of thousands of industries

大禹平台入选国家级数字化转型伙伴行动和中小企业数字化提升专项行动，在能源、金融、航空、大型制造等百个世界500强企业落地应用，已覆盖20多个行业。

Q: What is the scale of application?
A: The Dayu platform has been selected for the national digital transformation partner action and the small and medium-sized enterprise digital transformation action. It has been applied in the energy, finance, aviation, large manufacturing, etc., covering more than 20 industries.

该平台累计检测30多万个可疑样本，超过10亿次行为，发现2000多个安全漏洞，参与执行中国规模最大、开放软件框架安全检测计划，为国内500多家公司及单位提供了安全检测服务。

Q: What is the scale of detection?
A: The platform has detected over 300,000 suspicious samples, more than 1 billion behaviors, and discovered over 2,000 security vulnerabilities. It has participated in China’s largest open software framework security testing plan, providing security testing services for over 500 companies and organizations.

完成规模应用，护航千行百业数字转型安全

Scale application to escort security of digital transformation of thousands of industries

大禹平台入选国家级数字化转型伙伴行动和中小企业数字化提升专项行动，在能源、金融、航空、大型制造等百个世界500强企业落地应用，已覆盖20多个行业。

Q: What is the scale of application?
A: The Dayu platform has been selected for the national digital transformation partner action and the small and medium-sized enterprise digital transformation action. It has been applied in the energy, finance, aviation, large manufacturing, etc., covering more than 20 industries.

该平台累计检测30多万个可疑样本，超过10亿次行为，发现2000多个安全漏洞，参与执行中国规模最大、开放软件框架安全检测计划，为国内500多家公司及单位提供了安全检测服务。

Q: What is the scale of detection?
A: The platform has detected over 300,000 suspicious samples, more than 1 billion behaviors, and discovered over 2,000 security vulnerabilities. It has participated in China’s largest open software framework security testing plan, providing security testing services for over 500 companies and organizations.

完成规模应用，护航千行百业数字转型安全

Scale application to escort security of digital transformation of thousands of industries

大禹平台入选国家级数字化转型伙伴行动和中小企业数字化提升专项行动，在能源、金融、航空、大型制造等百个世界500强企业落地应用，已覆盖20多个行业。

Q: What is the scale of application?
A: The Dayu platform has been selected for the national digital transformation partner action and the small and medium-sized enterprise digital transformation action. It has been applied in the energy, finance, aviation, large manufacturing, etc., covering more than 20 industries.

该平台累计检测30多万个可疑样本，超过10亿次行为，发现2000多个安全漏洞，参与执行中国规模最大、开放软件框架安全检测计划，为国内500多家公司及单位提供了安全检测服务。

Q: What is the scale of detection?
A: The platform has detected over 300,000 suspicious samples, more than 1 billion behaviors, and discovered over 2,000 security vulnerabilities. It has participated in China’s largest open software framework security testing plan, providing security testing services for over 500 companies and organizations.
A new paradigm for scientific research can be formed by scalable heterogeneous computing clusters built on high-performance artificial intelligence training chips.

The heterogeneity at the architecture level is represented by the chips utilized in the AI training cluster. The chips can be intelligently configured to adapt to different types of AI models and applications, allowing for more efficient and effective AI training. This heterogeneity is achieved through the use of a modular architecture that allows for the selection of appropriate chips based on the specific needs of the AI model being trained.

The benefits of this approach include improved performance, lower cost, and increased flexibility. By utilizing a heterogeneous architecture, the AI training cluster can be optimized for a wide range of models and applications, leading to improved efficiency and cost savings.

Furthermore, the use of a modular architecture allows for easier maintenance and updates. As the needs of AI models evolve, new chips can be added to the cluster to enhance its capabilities. This ability to adapt and evolve is critical for the ongoing development of AI technology and the advancement of scientific research.
There is an AI chip of enflaming technology at the centre of this heterogeneous intelligent computing cluster system, which is packaged in 2.5D stereo and supports high-precision measurements containing FFIA, TF16, and RF16. The result is a high degree of heterogeneous computing power, a high degree of customization, and a high degree of energy efficiency. The intelligent computing cluster, which integrates scientific computing, artificial intelligence technology, and big data processing, not only accelerates the implementation of AI applications but also speeds up the process of scientific research and discovery. The system has been used at Zhejiang Lab for scientific research as well as major applications in intelligent sensing, artificial intelligence, intelligent computing, intelligent systems, and intelligent networks.

之江天目智能计算集群间应用系统加速上层应用开发平台

The industry ecosystem is established and improved, and application development is accelerated

人工智能算力基础设施是整个行业与应用加速发展的核心支撑，是数字化转型和智能化转型的关键推动力。要为优化经济发作出贡献，之江天目的试验和系统，有利于加速技术与应用创新，促进产业快速发展，打造高质。会发挥出的AI算力，有力推动和加速人工智能技术及上层应用的迭代创新。

As a key driving force for digital construction and intelligent transformation, artificial intelligence computing infrastructure will play a significant role in the rapid development of the entire industry and applications. It will also contribute significantly to the development of China’s digital economy. With the successful deployment of this intelligent computing cluster system, innovation in technology and applications will be accelerated, rapid industrial development will be promoted, AI computing power will be created that is efficient and high-density, and China’s artificial intelligence technology and applications will be powerfully advanced and accelerated.

高效及可扩展智能计算集群网络架构

Energy-efficient and Scalable Heterogeneous Intelligent Computing Cluster Network Architecture

智能计算及“之江”前沿科学研究与应用

Intelligent Computing Cluster Improving *Computing* Interdisciplinary Frontier Research and Application
世界互联网
领先科技成果发布活动

03

《科技之魅》
收录成果

Charm of Science and Technology Collection
大规模图数据分析平台 AtlasGraph

AtlasGraph: A Large-Scale Graph Data Analytics Platform

北京海致星图科技有限公司
Beijing Hazi Stargraph Technology Co., Ltd.

清华大学
Tsinghua University

北京海致星图科技有限公司
Beijing Hazi Technology Group Co., Ltd.

引言

本项目产学研相结合，通过存算 - 计算的协同设计，实现了以分布式图数据库为基础的大型规模数据
分析平台。平台已在银行、证券、保险、公安等诸多领域成功应用，为抗击疫情做出了重大贡献。经济和
社会效益显著。

Introduction

The objective of this project is to integrate storage and computing in a collaborative manner between industry, academia and
research, and to build AtlasGraph, a large-scale graph data analytics platform built on a self-designed distributed graph
datastore. It is a key project with both scientific and applied significance, including important impacts such as improving
insurance, public safety, etc. The platform has made a significant contribution to the successful fight against COVID-19 and has
increased significant economic and social benefits.

运用图的三维划分计算等高性能图计算技术，
突破了图原生的大规模数据存储备份，实现了
基于 Rust 语言的分布式混合事务分析处理图
database

In this project, the distributed hybrid transaction and
analytical processing graph database in Rust is realized by
bridging key technologies in high-performance
graph computing (e.g., the method for partitioning
and computing graphs in three dimensions) and graph-
native large-scale data storage.

创新 1：基于 Rust 语言的分布式混合事务分析处理图数据库

Innovation 1: A distributed HTAP (Hybrid Transaction Analytical Processing) graph database in Rust.

创新 2：高并行图计算技术

Innovation 2: High-performance computing techniques for large-scale graph data.

1) Developed the 3D graph partitioning and computing method, which reduced inter-node communication by 90% by optimizing
the system stack in accordance with data semantics; 2) developed the first global-purpose, distributed graph random
walk engine capable of processing large graphs efficiently.

相关论文发表于 SOSP 2019, 2021。
and 2021, respectively. And Plato, a high-performance graph computing framework open-sourced by Tencent, has adopted the technology. 3) Developed GraphDB, one of the first software-hardwired co-designed graph processing systems for the PIM (Processing in Memory) architecture. Within just four years of the publication of the related paper in HPDC 2018, 130 related papers have been published in top venues such as IFIP HPDA, USENIX FAST, IEEACOM MICRO, among others.

项目技术已广泛应用于疫情防控、银行、证券、保险、能源电力、城市运营、公共安全等领域

Several important fields have been benefited by the technologies developed as a result of the project, including epidemic prevention and control, banking, securities, insurance, energy and power, city operations, public safety, etc.

项目积极投身开源活动，支持包括采样的通用分布式数据库引擎，支持以片内存速度运行的数据库系统等重要技术均实现开源共享，总分开发数达到了25，项目数超过100个，图数据库在银行、证券、保险、能源电力、城市运营、公共安全等重要领域，技术知识靠我在平台上，服务了中国40余家金融机构以及40个行业3000余家企业客户，在服务大数据挖掘方面，服务中国19个省级的60多个地级公安机关。

The project actively participates in open-source activities. Both the general-case distributed graph random walk engine with recombined sampling and the random walk system capable of running at cache efficiency have been open-sourced, being forked 25 times and gaining 100+ stars in total. AtlasGraph and the related technologies are widely used in many important fields, including epidemic prevention and control, banking, securities, insurance, energy and power, city operations, and public safety. In particular, the platform has served over 40 state-owned and private financial institutions in China, along with more than 3,000 corporate clients from 14 industries in the field of financial knowledge graphs. Over 60 Municipal Public Security Bureaus have used the platform for big data applications in 19 provinces across China.

项目成果的应用提升了公共服务水平，促进了社会发展。最近四年，项目已实现新增销售额13.96亿元，累计创造利润6亿元。

The application of the project outcome has enhanced public service capacity, promoted social development, and gained new sales of 13.96 billion yuan and accumulated profits of 600 million yuan in the past 4 years.

平台助力疫情防控，保障了人民身体健康。2020年新冠肺炎疫情期间，防疫人员多次“逆行”在前线，依据图数据库的分布式平台和录入数据推送体系，迄今已累计超过240个地区提供疫情防控、智能物流等大数据服务，为成功抗击疫情做出了重大贡献。

Platforms such as this have played an important role in preventing and controlling epidemics and, therefore, ensuring people's health. For example, Hashr Group repeatedly assigned technical staff to Wuhan for building the epidemic prevention and control data analysis platform and establishing the distribution system during the COVID-19 pandemic in 2020. Currently, the platform provides such epidemic-related big data services as epidemic modeling, analysis, and screening of contact information for more than 240 counties and cities in China, contributing to the successful fight against COVID-19.

经济效益方面，项目四年已新增销售额13.96亿元，累计创造利润6亿元，带动相关计算配置需求超过100亿元。

In terms of economic benefits, the project has increased sales by 13.96 billion yuan in the past four years, creating a profit of 600 million yuan cumulatively, and driving the demand for cloud computing capacity of more than 10 billion yuan.

国民经济统计显示，我国2022年企业互联网行为指数第一

Hashr Graph Ranked First in the 2022 China Internet Week (CIWEEK) Knowledge Graph Enterprise List

网络连接在《互联网周刊》2022知识图谱企业行为指数第一

Hashr Graph Ranked First in the 2022 China Internet Week (CIWEEK) Knowledge Graph Enterprise List

图数据库平台中数据集的分布式架构

The Distributed Architecture of the Graph Database in Atlasgraph

通用分布式数据流引擎KriktKing 的开源页面

Homepage for KriktKing, a Generative-purpose Distributed Graph Random Walk Engine Open-sourced by the Project
引言

数字化面临的安全挑战，内部双层安全挑战，风险遍布所有场景，感知网络安全态势是基础，最基本的工作，“看见”是处量和应对的前提是安全体系建立的核心。360通过17年的积累和沉淀，凝聚为360全网数字安全大脑，不断攻克数字安全行业“看不见”工程的难题。

Introduction

Digitalization is faced with dual security challenges, both internal and external, and risks are pervasive in all scenarios. Perceiving the network security situation is the most basic and fundamental work. "Seeing" as the core of the security system construction, is the premise of disposal and response. Through 17 years of accumulation and precipitation, 360 has condensed into the 360 Cyber-Wide Digital Security Brain, and constantly overcome the problem of "invisible" risks in the digital security industry.

3 大核心汇聚 360 全网数字安全大脑

Three cores gather 360 cyber-wide digital security brain

360耗时近20年，投入200亿，凝聚超2000名安全专家，积累了2000PB安全大数据，构建360全网数字安全大脑，建立了一套以“看见”为核心的智能安全运营服务体系，形成了“看见”智能的，“看见”高级威胁的高抗能力。

360 spent nearly 20 years, invested 2 billion dollars, gathered more than 2,000 security experts, accumulated 2,000PB of security big data, built a high-anti-attack service system centered on "seeing" and "managing" around 360 Cyber-Wide Digital Security Brain, and formed the ability to "see" the cyber-wide situation and resist advanced threats.

具体而言，360全网数字安全大脑总体核心分三个层次，第一层是安全大数据平台，第二层是智能分析和关联平台，第三层是智能运营平台，这样才能把全网大数据进行汇聚，分析、判断，形成对安全威胁的判断，最后通过对外的XaaS云服务为用户提供看见威胁的能力和针对性的防御指引。

Specifically, the core of 360 Cyber-Wide Digital Security Brain system is divided into three layers. The first layer is the security big data platform, the second layer is the intelligent analysis and correlation platform, and the third layer is the expert operation platform. In this way, the cyber-wide big data can be gathered, analyzed, and processed to form an insight into security threats. Finally, through external XaaS cloud services, users can see threats and provide targeted action guidance.

在数据层面，360在过去17年为亿万网民提供网络安全，平均每秒有数亿次数据查询，拦截4万条恶意网址，拥有超过300亿样本，数据规模超过2000PB，每天新增的数据达到1500TB，数据积累的今天，也建立了庞大的网址库、域名库、漏洞库、病毒行为库、资产库、国家级威胁组织信息库等，将他们关联起来，形成了安全大数据平台。

At the data layer, 360 has protected network security for hundreds of millions of Internet users in the past 17 years. On average, it has responded to 650 thousand file queries every second, intercepted 40 thousand malicious Web sites, had more than 30 million samples, had more than 2000PB of data, and added 1500TB of data every day. While accumulating data, it has also established a huge website database, domain name database, vulnerability database, virus behavior database, asset database, national threat organization information database, etc., and linked them together to form the security big data platform.

在智能分析和关联平台层面，360开发了采用人工基层技术和专家经验的智能分析引擎，并逐步发展成为全面的人工智能系统。智能分析研判了360 多款引擎，有专门的技术团队维护。核心的实时技术和策略，通过相关技术对用户和数据进行分析，对于任何一个智能引擎，平均可以在单机提取熟悉的所有特征并和攻击特征进行匹配，以确定它属于哪个攻击组织，以及采用哪种攻击手段。

At the layer of intelligent analysis and detection platform, 360 has developed the anti-virus and advanced threat
从国家到企业、个人的全面实践

**Comprehensive practices from country and city to enterprises and individuals**

在国家层面，截至目前，基于360全球安全大数据，360城域安全大脑建设已经部署了超过10万多个城市，覆盖全国2000多个城市和区县，为城市和区域提供全面的安全保障。

在企业层面，360企业安全大脑建设已经帮助超过10万家大中型企业实现了全面的安全防御。

在个人层面，360安全卫士等产品已经在全球范围内覆盖超过10亿用户，为用户提供全方位的安全防护。

**“看见”数字安全风险，护航数字经济健康发展**

Exposing digital security risks, securing the development of digital economy

在数字经济时代，数字安全风险已经成为影响数字经济发展的关键因素。360安全大脑通过构建全域数据安全大脑，为数字经济的发展提供了强有力的保障。

通过构建全域数据安全大脑，360安全大脑能够全面覆盖数字经济的各个领域，为数字经济的健康发展提供了坚实的基础。

医疗健康、教育、金融、交通、能源、工业等领域都已经实现了全面的数据安全防护。

360安全大脑通过构建全域数据安全大脑，为数字经济的健康发展提供了坚实的保障。
高性能大算力车载智能芯片
——地平线征程®5

Energy-Efficient Automotive-Grade Processor
——Horizon Journey®5

地平线
Horizon Robotics

引言
地平线征程®5是继征程2和征程3开创中国车载智能芯片量产先河之后，地平线发布的又一款高性能、大算力全场景智能驾驶中央计算芯片。征程5搭载地平线自研深度学习加速引擎BPUP®贝拉芯，算力高达128TOPS，可充分满足全场景自动驾驶和人机交互的量产应用需求。

Introduction
The Journey®5 is the new generation of energy-efficient automotive-grade processor that Horizon introduced after Journey®2 and Journey®3 to lead the mass production for smart vehicles in China. Journey®5 is equipped with Horizon’s deep learning acceleration engine BPUP® Bellacore, which provides up to 128TOPS of computing power, and is sufficient to meet the mass production application requirements for autonomous driving and human-computer interaction in full-scenario applications.

软硬协同优化，发挥极致性能
Soft and hard co-optimization, maximize performance

车载智能芯片作为智驾网联汽车的关键核心部件，也代表着智能驾驶的制高点。通过自主研发的高性能深度学习网络加速引擎Brain Processing Unit（简称 BPUP®），地平线结合自身高突性的核心算法加速打造的地平线 BPUP® 芯片架构、搭载双布料片结构的征程 5，算力高达 128TOPS，充分弥补中国 TOPS 级大算力自动驾驶芯片市场的空白。

Automotive-grade processor are the core components of intelligent connected vehicles, which represents that autonomous driving is the cutting-edge technology. As a result of Horizon’s independent development of the programmable acceleration engine Brain Processing Unit (BPUP), the new generation of BPUP® Bayesian computing architecture has been created. With its dual-core Bayes architecture and computing power of 128 TOPS, Journey®5’s successively filled the gap in China’s TOPS-class computing autonomous driving processor market.

得益于软硬协同优化，BPUP® 贝拉芯为征程 5 带来“可持续成长”的强劲计算性能。在保证高性能运算的同时实现低功耗效益，通过采用异构计算方案，征程 5 实际性能超过 1531 FPS，均明显优于征程 5 英伟达 Ampere 架构表现。

Achieving high-speed processing power while achieving the optimal ratio of energy efficiency due to co-optimization of hardware and software, BPUP® Bayes brings "sustainable growth" of robust computing performance to Journey®5. During the benchmarking process, it was determined that Journey®5’s real performance could exceed 1531 FPS.

征程 5 集成了对深度学习和自动驾驶场景的深度洞察，具备高性能、低功耗、低延迟的特点。依托业内领先的芯片架构设计，征程 5 集成了测景深度学习加速引擎 BPUP® 贝拉芯，算力高达 128TOPS，可充分满足全场景自动驾驶和人机交互的量产应用需求。

演示了对深度学习和自动驾驶场景的深度洞察，具备高性能、低功耗、低延迟的特点。依托业内领先的芯片架构设计，征程 5 集成了测景深度学习加速引擎 BPUP® 贝拉芯，算力高达 128TOPS，可充分满足全场景自动驾驶和人机交互的量产应用需求。

征程 5 集成了对深度学习和自动驾驶场景的深度洞察，具备高性能、低功耗、低延迟的特点。依托业内领先的芯片架构设计，征程 5 集成了测景深度学习加速引擎 BPUP® 贝拉芯，算力高达 128TOPS，可充分满足全场景自动驾驶和人机交互的量产应用需求。

征程 5 集成了对深度学习和自动驾驶场景的深度洞察，具备高性能、低功耗、低延迟的特点。依托业内领先的芯片架构设计，征程 5 集成了测景深度学习加速引擎 BPUP® 贝拉芯，算力高达 128TOPS，可充分满足全场景自动驾驶和人机交互的量产应用需求。
In September 2022, the official of Journey 5 announced. In September 2022, the official of Journey 5 announced that the world’s first mass production would be achieved and carried by Ideal Li, and it would officially become the first domestic TOPS class computing power intelligent driving processor to achieve mass production. Meanwhile, Journey 5 has obtained mass production cooperation projects with BYD, Li Auto, SAIC Motor, FAW Hongqi, Zappola Automobile and other automobile manufacturers. Several software or system partners have joined, including Jule Technology, Liguangzhou Zhihong, Jiandong Zhihong, Preetech, HongjiuxinAutoDriving, etc., which is accelerating the landing of advanced automatic driving applications by expanding the partner camp of building mass production solutions based on Horizon Journey 5.

The efficiency of horizon journey series processors showcases the development of smart driving of China.

As of October 2022, the Horizon Journey series processors have exceeded 1.5 million, more than 70 models of precoding mass production project fixed points have been signed with more than 30 vehicle manufacturers, and Horizon Journey is working closely with cooperation partners to achieve visual perception from 1 to N. It is Horizon’s belief that the combination of paradigm-level intelligence driving algorithms and hardware systems that support such algorithms will be the key to driving the adoption of high-level automatic driving. Horizon’s other competitive advantage is that it provides visual perception algorithms designed specifically for Chinese driving scenarios, which in combination with its own autonomous driving processor, can fully meet the demands of intelligent driving environment perception, such as visual perception within and outside the vehicle, visual mapping positioning, etc. With Horizon’s large-scale production engineering experience and efficient technology iteration under soft and hard coordination, we will be able to popularize all-dimensional automotive intelligence and aid in the transformation of automobiles.
低轨 Q/V 和 Ka 频段宽带通信试验星座及 5G 星地组网应用演示

Application Demonstration of Low-Orbit Q/V and Ka Frequency-Band Wideband Communication Test Constellation and 5G Satellite-Ground Networking

银河航天
GALAXYSATE

银河航天自主研发、中国首次批量生产的低轨宽带通信卫星于 3 月 5 日成功发射，并在轨与首发星组网中国首个低轨 V/Ka 频段宽带通信试验星座“小蜘蛛网”，完成了 5G 信道验证、V 频段卫星通信、车载“动中通”等一系列 5G 星地组网应用演示。

引言

银河航天与云技术实验室研究、北京邮电大学和联创等组织开发了一系列通信体制验证，在卫星互联网与 5G 深度融合方面迈出重要一步。

GALAXYSATE has conducted a series of communications system verifications in collaboration with the China Academy of Information and Communications Technology, Beijing University of Posts and Telecommunications, China Unicom, and other organizations, paving the way for the deep integration of satellite Internet and 5G technology.

银河航天完成首次低轨宽带通信试验星座的车载动中通测试，突破车载载荷的地面实际应用条件下的低轨卫星的难题，实现了车载信标机的卫星通信，迈出低轨卫星互联网应用探索的重要一步。

GALAXYSATE has completed China’s first low-orbit wideband test constellation vehicle “on the move” testing. The test was able to accurately track low-orbit satellites in real time under actual driving conditions. As a result, vehicles have been able to communicate with the satellite continuously during driving, and an important step has been taken in exploring low-orbit satellite Internet applications.

银河航天在自主研制的多颗低轨宽带通信卫星中使用了技术难度较高的 Q/V 频段，并成功实现了中国首次 V/Ka 频段低轨卫星组网，对卫星互联网的产业发展具有积极意义。

GALAXYSATE has successfully developed low-orbit wideband communication satellites using frequency bands such as Q/V, which are technically challenging. In addition, China has achieved China’s first V/Ka frequency band satellite demonstration, which has a positive impact on the industrial development of satellite Internet.

丰富的垂直行业应用场景

Rich vertical industry application scenarios

该试验星座在互联网、应急通信、卫星互联网与 5G 综合应用的场景下，结合无人平台等平台，提供快速可依赖的高质量 5G 通信服务，支撑应急场景下 5G 应用。

5G communication support scenarios for emergency and disaster relief. With the integration of satellite Internet and 5G, as well as the use of unmanned aerial vehicles (UAVs) and other mobile platforms, high-quality 5G communication services with rapid response will be provided to support the comprehensive application of 5G in emergency situations, utilizing the ubiquitous connectivity advantages of the integration.
Internet has been developed. Through highly integrated and optimized design, it has developed a new type of intelligent satellite manufacturing production line utilizing modular and standardized products resulting in rapid development of low-cost and large-scale benefits, as well as the rapid development of satellite Internet services in low orbits.

In a new era of satellite Internet technology, it is expected to realize intelligent collaboration and intelligent decision-making. The construction of intelligent satellite Internet will provide effective solutions for the development of the industry by leveraging the benefits of satellite Internet technology.

This project will explore the development of a three-dimensional environmental and ecological monitoring system integrating space-ground technologies using low-orbit satellite Internet technology. It will enhance the timeliness of ecological monitoring data and the effectiveness and level of environmental and ecological governance, as well as provide new basic capabilities and technical support for innovation in global environmental governance and climate change adaptation.
河图:
高效可扩展的分布式深度学习系统
Hetu:
An Efficient and Scalable Distributed Deep Learning System

引言

在过去十年中，深度学习迅速发展，深刻改变了传统的大量数据计算模式，互联网公司等应用场景的出现了巨大价值。随着数据规模持续增长以及模型结构日益复杂，构建实用的大规模机器学习系统越来越具有挑战性。

Introduction

在过去十年中，深度学习迅速发展并得到了广泛开发。深度学习改变了传统的大量数据计算模式。在互联网公司等商业场景中，深度学习提供了巨大价值。随着数据规模持续增长以及模型结构日益复杂，构建实用的大规模机器学习系统越来越具有挑战性。

Hetu is a deep learning system developed by the Data and Intelligence Laboratory of Peking University for high-dimensional, large-scale deep learning scenarios to support various artificial intelligence applications and deployments. Hetu, as the first distributed deep learning system independently developed by the academic groups in Chinese universities, takes into account both the industrial high availability and the academic innovation.

推动数智化变革，服务AI+云计算

Promoting digital and intelligent transformation, serving AI + cloud computing

Hetu主要应用于在云计算、机器学习平台、智能数据中心以及人工智能应用广泛。从资源角度来看，云计算、机器学习平台、智能数据中心能够为AI提供强大的计算能力，而人工智能应用广泛则能够推动各行各业的变革。从技术角度来看，Hetu提供了一种新的计算模式，能够提高计算效率，降低计算成本。从应用角度来看，Hetu可以应用于各种领域，如医疗、金融、教育等。因此，Hetu的推出对于推动数智化变革具有重要意义。

Hetu is mainly applied in cloud computing, machine learning platform, intelligent data center and other fields. It provides a new computational mode to improve computational efficiency and reduce computational costs. It can be applied in various fields such as medical, financial, education, etc. Therefore, the launch of Hetu is of great significance to promote digital and intelligent transformation.
models, ultra-large-scale pre-training models, large-scale graph neural networks, 2) Automated machine learning (Tencent, Kuaishou, ZTE, ByteDance, and other companies): recommendation strategy optimization, cluster operation and maintenance, machine learning model design optimization, physical industry, assisting in the optimization of geological shale segmentation, aerospace material design, and other tasks; 3) Intelligent database (Alibaba Cloud): tuning parameters of database systems, e.g., RDS MySQL, RDS PostgreSQL, PolarDB MySQL, PDB-08-D, and other database systems.

### 助力人工智能应用，极致释放数据价值

**Helping Artificial Intelligence applications, maximizing the release of data value**

Hetu and its related technologies have achieved significant socioeconomic benefits, such as:

1. Large-scale distributed training technology helps Tencent to serve terabyte-scale advertising model training, bringing a cumulative 10% GMV improvement to advertisers. 2) Automated machine learning technology helps Kuaishou achieve automatic segmentation in shot segmentation tasks. The model replaces manual design and improves the AUC of the online user retention prediction business model by 1.2%. 3) The intelligent database technology is implemented on Alibaba Cloud DMS products to help users customize and optimize parameter configuration, among which the template parameter function helps to improve the offline TP by 13% to 50%.

### 坚持学术创新导向，引领前沿技术趋势

**Adhere to the orientation of academic innovation, leading the trend of cutting-edge technology**

In the past three years, the Hetu team has published more than 40 CCF-A papers in top international conferences or journals such as SIGMOD, VLDB, ICML, KDD, WWW, NeurIPS, ICDE, AAAI, ICLR, etc., including the Best Student Paper Award at The Web Conference (formerly known as International World Wide Web Conference). In addition, Hetu has also achieved good results in the selection of various world-class competitions, such as the 2021 Top Ten Open Source Events by Josselin, the champion of the open graph benchmark (OGB), the champion of the 2021 CIKM Analytic Cup Automatic Hyperparameter Optimization Track, the highest award of 2021 CCF BDCI, etc., has won wide attention from academia and media.
鹏城云脑：E 级 AI 算力平台
Peng Cheng CloudBrain: E-Scale AI Super-Computing Platform

引言

鹏城云脑是 E 级智能算力平台，拥有 1024 P ops AI 计算能力和 64 Pbps 高速开并行扩展能力，具有高计算效率、高可靠性、高可扩展性等技术优势，研发了全栈算力基础软件体系，打造了支撑干万亿级规模 AI 模型的并行训练平台。

引言

鹏城云脑是一款 E 级智能算力平台，拥有 1024 P ops AI 计算能力和 64 Pbps 高速开并行扩展能力，具有高计算效率、高可靠性、高可扩展性等技术优势，研发了全栈算力基础软件体系，打造了支撑干万亿级规模 AI 模型的并行训练平台。

鹏城云脑是 E 级智能算力平台，拥有 1024 P ops AI 计算能力和 64 Pbps 高速开并行扩展能力，具有高计算效率、高可靠性、高可扩展性等技术优势，研发了全栈算力基础软件体系，打造了支撑干万亿级规模 AI 模型的并行训练平台。

鹏城云脑是 E 级智能算力平台，拥有 1024 P ops AI 计算能力和 64 Pbps 高速开并行扩展能力，具有高计算效率、高可靠性、高可扩展性等技术优势，研发了全栈算力基础软件体系，打造了支撑干万亿级规模 AI 模型的并行训练平台。

鹏城云脑是 E 级智能算力平台，拥有 1024 P ops AI 计算能力和 64 Pbps 高速开并行扩展能力，具有高计算效率、高可靠性、高可扩展性等技术优势，研发了全栈算力基础软件体系，打造了支撑干万亿级规模 AI 模型的并行训练平台。
4G/5G 协同智能节能技术研究与应用

Research and Application of 4G/5G Collaborative Intelligent Energy Saving Technology

引言

该成果属于无线通信技术领域，旨在解决 5G 网络能耗大、频率使用效率低的难题，提出 5G 网络基础设施的智能化管理和节能方案。实现精细化、智能化、敏捷化、绿色低碳化的网络运营。

Introduction

This achievement belongs to the field of wireless communication technology, and aims to solve the problem of high energy consumption and inefficient frequency usage in 5G networks. It proposes intelligent management and energy-saving solutions for 5G infrastructure to achieve fine-grained, intelligent, agile, and green and low-carbon network operation.

建立 4G/5G 协同智能节能体系

建立 4G/5G 协同智能节能体系，实现网络、站点、设备多层级智能化节能

Establish 4G/5G collaborative intelligent energy saving system to realize multi-level intelligent energy saving of network, site, and equipment

5G 作为数字信息基础设施正处于快速发展的阶段。5G 网络基站能耗远高于 4G，传统的节能技术在业务负荷及频段变化时很难达到理想效果。不支持实时的网络参数、智能节能管理等手段，导致节能效果不佳。网络运维复杂，如何实现多系统协同的智能化节能、最大化节能效果，将为全球运营商面临的共同挑战。

As a digital information infrastructure, 5G is in a period of rapid development. Due to the technological evolution and the improvement of equipment capacity, the energy consumption of one base station of 5G network is two or three times of one 4G base station. The traditional energy-saving solution turns off the base station hardware according to the idle state of 5G service, which is not supportive of the real-time operation in the manner of intelligent energy-saving management across the whole network. And the traditional energy-saving solution will lead to the poor energy-saving performance and the complexity of network operation and maintenance. How to accomplish intelligent energy-saving and maximize the energy efficiency for a multi-RAT network will become a common challenge for global operators.

研究成果提出 4G/5G 协同智能节能体系，基于网络级、站点级、设备级分层架构，实现无线网络智能化节能管理和多基频智能节能管理，推动了网络基础设施智能化和绿色低碳化。

This achievement innovatively proposes the 4G/5G collaborative intelligent energy saving system. Based on the hierarchical architecture of network level, station level, and equipment level, it has achieved intelligent energy-saving management of wireless network, intelligent management and control of power supply and other communication infrastructure facilities, promoting the research and application of digital innovation technologies in network infrastructure.

首次提出“深度休眠”等基站设备级节能创新技术，最大化设备级节能效果。

The innovative energy-saving technologies of base station, such as "deep sleep" and other innovative solutions are proposed to maximize the energy efficiency at the equipment level.

研发 5G 电力智能控制系统，首创智能下电控制策略及基础设施唯一识别功能，降低站点级能耗。

The innovative 5G power intelligent control system is developed, supporting the strategy of intelligent power-off control mechanism and the unique identification code of infrastructure facilities, which greatly reduces energy consumption at the base station level.

技术引导与示范应用双轮驱动

Technology guidance, network trial and commercial deployment lead to the promotion of intelligent energy-saving technology in the whole industry
4G/5G collaborative intelligent energy-saving management platform has been provincewide deployed in the network of China Unicorn. The platform has been applied in a pilot scale of more than 30,000 base stations in Tianjin. The average daily energy-saving duration is 3 hours or more, the comprehensive energy-saving ratio is more than 10%, and the energy-saving effect is remarkable.

5G power intelligent control system in China Unicorn has been applied in multiple local networks of China Unicorn.

This achievement has promoted the development of wireless network energy-saving technology and industry, ensuring the green and intelligent evolution of network through technological innovation, providing global operators with examples of wireless network green and intelligent operation, to achieve the goal of "Carbon Peak and Carbon Neutral".
引言
项目组历经近十年的产学研联合攻关，突破了城市时空信息全域物联感知与三维建模关键技术，构建了城市时空信息数字化支撑平台，为上层城市全面感知中心提供底层服务。

Introduction
The team has spent nearly a decade focusing on the needs of China’s smart city strategy and social and economic transformation. In addition to breaking through key technologies related to global IOT perception and 3D modeling of urban spatial information, the digital twin support platform is intended to provide basic services for the city’s brain system by providing spatial-temporal information support.

突破全域物联感知与三维建模关键技术，构建城市时空信息数字化支撑平台

Breaking through the key technologies of global IOT perception and 3D modeling, and building a digital twin support platform for urban spatial-temporal information

首先，项目组突破了空间信息多维度精确感知与全域物联感知的关键技术，设计出空间信息的多层监测模型，与国际上已有最优方案相比，在同等空间覆盖率条件下，所需监控设备节点数量降低5%；发明了针对DEM数据生成的剥皮与保护方法，有效提升了处理大数据量采集的精度和实时性，其次，项目组解决了三维数据的异步通信与联合调度难题，发明了城市时空信息全感知体系中上行链路的协调调度方法，与基于业务的顺序状态下的调度算法，相比于国际上已有的典型方案，降低了10.5%的传输时延和开销。另外，项目组还提出了三维空间数据的大规模并行调度与多源异构数据的聚合并联调度方法。三维空间数据并行调度算法，设计了多源数据并行调度数据量集，针对不同外域数据并行调度的数据量集，实施了数据并行调度的动态性，提高了数据并行调度的动态性，加强数据融合与共享。作为城市数据支撑平台的上层应用，项目组研发了城市大脑指挥中心系统，利用大数据和人工智能技术，借助图数据库以及互联网数据、城市视频数据及政府数据，对各类场景模型进行自动/主动、快速、全面感知，加强数据融合与共享。
The city brain intelligent operation command center of the Haidian district in Beijing, designed and constructed by the team.
Mulan Open Source Community

In addition to providing intellectual property rules guarantee for China’s self-developed open source projects, the Mulan open source community has also promoted the important practice of China’s open source business model, promoting Chinese international licensing rules, which is available in both Chinese and English. Huawei, H펙ingroup, Rui with other ecological basic projects, and Art OceanaBase database community edition projects with other independent projects have been applied.

Meanwhile, it was responsible for systematically opening China’s open source standardization work, promoting research into China’s open source governance and operation rules using standards as its starting point, and successfully establishing China’s first national open-source standard. Establish an “Open Source Software Task Force” (OSSF) with other countries to promote China as a start-up country. International standardization of open source software is being promoted by countries such as the United Kingdom, Canada, and India under ISO/IEC JTC1.

In order to promote China’s independent open source software system, the Mulan open source community has been recognized as the “Mulan” licenses as a starting point. Developed independently, the Chinese Mulan series licenses have filled the void left by China’s international open source license and have attracted considerable attention and applications both at home and abroad. By utilizing the experience gained from license research and development, it was able to promote the successful approval and approval of the country’s first open source national standard, as well as established as a system of open source standards. Establish the OpenAtome Open Source Foundation as China’s first open-source foundation in order to support and guarantee the voice and competitive advantage of the open-source independent open-source community. A channel for industry-university-research exchange and cooperation in the open-source community has been established, in conjunction with Shanghai Magnola and Shanghai Jiayuan University, to promote the implementation of Mulan in the local community. As a result of open-source activities such as the China Software Conference, China Open Source Hackathon, and Mulan Technology Open Day, tens of thousands of developers have benefited from these events.

For the first time, contributed to the formulation of global open-source ecological rules and designed the domestic open-source standard system at the highest level.

Introduction

The Mulan Open Source Community was established in 2019, and Mulan PSL 2.0 open source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license is the community’s first effort. This open-source license is designed to promote open-source software projects and foster innovation and collaboration in the open-source community.

In addition to ensuring that the Mulan PSL 2.0 license is used in open-source projects, the Mulan Open Source Community also promotes the development of open-source software projects by providing funding and resources to support open-source development. The Mulan Open Source Community focuses on promoting open-source software projects and fostering collaboration in the open-source community.

The Mulan Open Source Community was established to address the growing need for open-source software projects, and the Mulan PSL 2.0 open-source license was released to provide a framework for promoting open-source software projects in China. The community is committed to promoting open-source software projects and fostering collaboration in the open-source community.

The Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.

Mulan Open Source Community is an open-source community that promotes open-source software projects, and the Mulan PSL 2.0 open-source license was released. It is a project initiated by the Linux Foundation. The company is based in China and operates worldwide. An open-source community showcasing technological innovation in the local area.
High Performance Graph Processing System

High-performance software/hardware codesign graph processing system

Architectural Innovation of High Performance Softwate/Hardware Codesign Graph Processing System

Software and hardware collaborative optimization enables industry innovation

The low-level accelerator architecture cannot be customized by high-level programming languages, reduce the accelerator programming threshold, and support the agile development requirements of typical business scenarios.

To break through the application scope of traditional graph processing, a unified computing architecture is proposed.

In this scenario, the team presents a single-architecture, breaking through the graph processing paradigm.

In the system software layer, the team presents a single-architecture, breaking through the graph processing paradigm.

In the system software layer, the team presents a single-architecture, breaking through the graph processing paradigm.

In the system software layer, the team presents a single-architecture, breaking through the graph processing paradigm.
The R&D team has developed key technologies for graph processing based on the graph processing accelerator, such as architecture, runtime, memory, programming interface, management and analysis system, and distributed software. Further, it constructs a technological system for graph processing. With the help of this technology, it is possible to provide the electric grid application of the State Grid Corporation of China with complex attributes and intensive computation, which reduces the time it takes to calculate the power flow and estimates the state from seconds to milliseconds. As part of this project, the team develops an accelerated graph processing system for graph analytics and financial and medical insurance graphs. The performance of this method is four times better than that of traditional detection methods. Furthermore, the project team has improved the performance of Huawei Kunpeng servers for concurrent graph processing.

获奖图计算领域多项“世界第一”

Wen several "World Firsts" in the field of graph processing

科研团队在 2021 年参加了图计算领域最具影响力的国际赛事之一 GraphChallenge，这是首次来自中国的队伍荣获图数据处理赛冠军。同时，在全球图计算性能权威榜单 Graph500 和 Green Graph500 多次登顶。在第 18 届 Green Graph500 排名中性能功耗比全球第一；在第 23 届 Graph500 排名中单机性能全球第一，并在 24 届 Graph500 排名中并行系统全球第一，以单机和并行分布式系统，相关成果形成了广泛的社会影响，与业界展开深度战略合作，助力相关产业的持续发展。

One of the most prestigious international events in graph analytics, GraphChallenge, recognized the R&D team's achievement as one of the 2021 Champions. As far as this event is concerned, this is the first time that a Chinese team has won the championship. The achievement also ranks first in terms of performance power consumption ratio in the 18th Green Graph500 and first in terms of single machine performance in the 23rd Graph500. This team's achievements also rank first in the world in the 24th Graph500, outperforming all distributed systems. Supercomputer graph processing performance is measured by the Graph500 and Green Graph500 lists of the Supercomputing Conference. A broad social impact has been achieved as a result of these achievements. To promote the development of related industries, it also establishes a close strategic cooperation with the industry.
磐久服务器 M 系列
Alibaba Cloud Server M Series

阿里云计算有限公司
Alibaba Cloud Computing Co., Ltd.

引言

科技快速发，技术不新世代，云上部署和应用，云上开发和运营，云原生业务呈爆发式增长。这给传统数据中心带来的极大挑战。2021 年 10 月杭州云栖大会，阿里云磐久服务器 M 系列首次亮相。在妥善的部署、应用开发的速度、性能和资源利用效率上实现从芯片、硬件到整机的软硬件创新。此外，通过可优化的架构和性能最新技术，磐久服务器 M 系列已经成为阿里云服务器硬件产品线的代表，为千行百业不断增长的算力需求提供强劲支撑。

Introduction

As the technology evolves rapidly and iterates continuously, cloud solutions are emerging for application deployment, development, and maintenance, and cloud-native business is growing exponentionally. This brings huge challenges to traditional data centers. At the Alibaba Cloud Computing Conference in October 2021, Alibaba Cloud officially launched its Cloud Server (Punjit M Series). This server achieves convergent innovation in technologies such as high-density container deployment, fast application startup, low resource consumption, and high energy efficiency ratios for both the hardware and software, from chips, components to the complete machine. In addition, adopting the advanced industry standards and the latest industrial techniques, Punjit M Series has become a representative of Alibaba Cloud’s next generation cloud-native server products, continuously satisfying the increasing demands for high-performance computing in multiple industries.
智能司法公开关键技术及系统

Intelligent Public Judicial Information Services

清华大学计算机系
Computer Science Department, Tsinghua University

引言

司法公开是全球司法体系面临的共同问题。中国已经建立了全球规模最大的司法审判信息资源库，司法公平公正得到了有力保障。但司法公开程度和效能仍需进一步提升。因此，智能司法公开关键技术及系统的研究成果对降低隐私泄露风险，满足复杂信息需求及提高信息主动利用方面提供了切实有效的解决方案。

Introduction

The lack of judicial openness in the legal system is a global problem. China has built one of the largest judicial information warehouses in the world, which ensures that justice is available to all. However, judicial openness still requires improvements in both degree and efficiency. The achievement of intelligent public judicial information services represents a practical and effective method for reducing the risk of privacy leakage, satisfying complex legal information needs, and enhancing proactive information management.

人工智能加持，用创新成果提升司法公开效能

Improve the effectiveness of judicial openness by AI-driven innovative achievements

该成果针对数据泄露风险的不足导致存在隐私泄露风险，司法公开服务不足导致难以满足复杂信息需求、司法公开程度和效能仍需进一步提高等司法公开体系建设中面临的挑战，为推动司法公开的内安全和隐私保护技术、提升司法公开效能的关键技术及系统研发提供了技术支撑，产生了如下创新成果：

During the construction of the judicial openness system, there are three key challenges, including: a) insufficient regulation and control pose a high risk of sensitive information leakage; b) a lack of semantic match capability results in poor retrieval and incomplete retrieval; c) inadequate proactive personalized information utilization due to a lack of understanding of heterogeneous user groups. In order to address these challenges, this achievement focuses on three aspects of content security and privacy protection to safeguard judicial openness. This achievement also includes the development of a multi-granular risk evaluation system for judicial openness, which results in an increase in recall rate from 45.0% to 57.9% and accuracy rate from 83.0% to 96.4%.

实现了不同类别、不同粒度数据的高效检索，构建了基于语义分析能力的风险评估体系，使裁判文书敏感信息的召回率提升14.1%，准确率提升16.1%。

First and foremost, the achievement enables efficient retrieval and association mining of sensitive information at a multi-granular level with different categories and constructs an automated risk evaluation system for judicial openness, which results in an increase in recall rate from 45.0% to 57.9% and accuracy rate from 83.0% to 96.4%.

实现了从关键字到语义的多尺度语义检索技术的构建，构建了融合语义识别和多粒度语义信息的裁判文书系统，使得检索性能提升18.6%。

Secondly, this achievement further enables the transformation from keyword retrieval to highly effective semantic retrieval for complex legal information requirements. By incorporating domain knowledge into a multi-granular semantic information retrieval system, a ranking performance improvement of 18.6% is achieved.

实现了具有异质化特征的异质数据语义理解能力的个性化精准司法公开服务引擎，有效填补了用户认知与海量司法公开信息之间的鸿沟，使主动推送信息的用户点击率提高32.9%。

Lastly, this achievement makes possible an accurate personalized judicial information recommendation engine, which is capable of being aware of heterogeneous roles and scenarios. This recommendation engine improved the clickthrough rate of recommended information by 50.9%, demonstrating its ability to bridge the gap between a limited degree of cognition on the part of users and a large amount of heterogeneous judicial information on the part of the court.
The comprehensive judicial openness management platform, developed by the achievement, has successfully served more than 100,000 online and 280 judges, handled more than 5,000 cases, and comprehensively involved more than one million judgment documents. The demonstration courts have provided user experience reports that demonstrate that the platform can greatly ease the burden on judicial personnel by allowing them to handle legal cases more efficiently and effectively.

This results from the advice and data resources developed in this achievement are made available freely to the public to ensure that the intelligent judicial openness community can develop sustainably. Firstly, this achievement pretrained and released legal reasoning language models, OpenClap and Lawformer, based on 100s of millions of Chinese legal documents for the first time. Since its release, Lawformer has been downloaded more than 15,000 times. Secondly, this achievement launched 14 datasets that contains millions of legal documents in total. The results, taken as benchmarks in the Challenge of AI in Law (CAIL), cover a wide variety of legal tasks, including judgment prediction, legal element extraction, and legal fact book prediction.

For all the efforts, the achievement has been awarded the best paper award at the ACM Web Search and Data Mining Conference in 2020. In the International AI in Law Competition, our team achieved first place twice by implementing the leading key technologies. Since 2018, we have also organized annually the Challenge of AI in Law (CAIL) on the global scale, which attracted a large number of international teams to participate. Such achievements provide intelligent technical solutions and interdisciplinary talents to support the development of smart courts.

为全球司法公开提供智能化解决方案，为持续培养高端复合型人才提供平台

Provide intelligent solutions for global judicial openness and expert continuous high-level interdisciplinary talent for legal problem solving

成果完成期间，整理的制度规则库内容，对抽象技术的推动。经过第三次评估，该解决方案和方法论的平台顺利进行，一致认为该成果达到了较高的技术状态，具有较强的创新性、前景和市场推广可行性，相关学术成果获得了国内和国际同行的认可。

During the achievement completion process, the development quality is strictly controlled by means of scientific output management and benchmarking with international technology frontiers. In the evaluation process conducted by an independent testing agency and authentication by several domain experts, it has been unanimously agreed that this achievement has reached high levels of technical excellence, is innovative, has a bright future application potential, and is feasible for demonstration and promotion. International peer-review experts also recognize the high quality of the academic outputs.

依托于该成果，共发表发明专利及软件著作权17项，高水平论文26篇，培养研究生41人，技术人员35人，获得国际网络检索与数据挖掘大会最佳论文，两次在国际著名司法学年会中获得第一名，成果团队连续举办多场国际性司法智能技术评测比赛，并吸引了4524支国际队伍参赛，为辅助智慧法院建设提供智能化解决方案和复合型人才保障。

The achievement results in a wide range of world-leading academic outputs, including 17 patents and software copyrights, 26 high-level papers, and the development of 41 graduate students and 35 technical experts. One of the outputs received the best paper award at the ACM Web Search and Data Mining conference in 2020. In the International AI in Law Competition, our team achieved first place twice by implementing the leading key technologies. Since 2018, we have also organized annually the Challenge of AI in Law (CAIL) on the global scale, which attracted a large number of international teams to participate. Such achievements provide intelligent technical solutions and interdisciplinary talents to support the development of smart courts.

创办互联网司法论坛，促进国际产学研交流合作

Found the Internet Judiciary Forum to promoting International Industry-University-Research
communication and cooperation

为促进的国际、跨领域、跨学科的互通与合作，探索国际司法公开及基础理论的智能化解决方案，成果团队成立了清华大学互联网司法研究院，创办了国际互联网司法论坛—“清华互联网司法研究院”。“清华互联网司法论坛”在国际上，通过举办国际性司法论坛，吸引了全球范围内的法律专家、学者和行业领袖，为国际司法问题的解决提供了新的思路和方法。在推动全球司法智能化发展的同时，也为我国司法改革提供了重要参考。

In this project, we examine the important scientific issue of the contradiction between 5G massive MIMO’s low overhead and low power consumption and the communication in high-dimensional channels. The paper presents a set of high-dimensional MIMO channel space-time dimension reduction transmission theory and method, which can reduce the system overhead and power consumption significantly. In order to improve the construction, operation, and service level of wireless infrastructure, the related achievements have been applied in the construction of 5G networks.
5G商用无线网络中的推广与应用

The application in 5G commercial wireless networks

中国移动通信研究院表明，本项目设计的覆盖范围可降低整体成本50%，构造的子空间矩阵可降低通信反馈开销40%。

根据中国移动的设备测试结果，覆盖范围的规定使得本项目可以有效降低通信反馈开销50%，并且构造的子空间矩阵可降低通信反馈开销40%。

基于本项目成果开发的大规模MIMO样机先后在2022年日内瓦国际发明展、美国硅谷国际发明展等国际发明展览会上展出，其优越性得到高度评价。

As a result of this project, the massive MIMO prototype developed has been awarded the Gold Award at the 2022 Geneva International Exhibition of Inventions, and the Outstanding Demonstration Award at the IEEE International Conference on Communications in 2022.

本项目近五年与华为开展合作项目8项，合同金额超1000万，其中一个项目获2021年华为十大优秀校企合作项目。本项目提出的新信道子空间矩阵通过与华为的产学研项目合作，成为华为主导的5G增强型Type II Massive MIMO的重要组成部分，已写入5G标准（3GPP TS 38.214，R16，Section 5.2.2）。In the past five years, this project has carried out eight cooperative projects with Huawei, with a contract value of more than 100 million. One of the projects has been selected as one of Huawei’s top ten outstanding school-enterprise cooperation projects for 2021. Through collaboration with Huawei’s industry-university-research project, the channel subspace codebook proposed in this project has become an important part of the 5G enhanced Type II codebook. As a result, it has been incorporated into the 5G standard (3GPP TS 38.214, R16, Section 5.2.2).

本项目提出的信道估计算法和编码方法是重要创新性成果，基于这些成果“研发的基站设备已经在我国5G商用网络建设中得到了规模应用”。The proposed channel estimation and prediction coding method in the project is an important innovative achievement. Based on these findings, “research and development of base station equipment already being used in the construction of the 5G commercial network in China on a large scale”.

推进和提升现代网络建设、运营和服务水平

Improve the modern wireless network construction, operation and service level

相关研究内容对学术发展以及经济社会产生了重大影响。相关的论文内容发表于IEEE Journal on Selected Areas in Communications, IEEE Transactions on Signal Processing等国际权威学术会议，并多次获得最佳论文奖，论文引用者包括美国、英国、加拿大等国外专家。In related research, the results have been published in prestigious international journals such as IEEE Journal on Selected Areas in Communications and IEEE Transactions on Signal Processing. The citations of relevant papers are made by 24 foreign academicians from the United States, the United Kingdom, Canada, etc., 35 current or former chief editors of IEEE journals, and 200 IEEE Fellows. The majority of them are scholars specializing in wireless communication, including microwave, antenna, chip, radar, and other related fields. With respect to the social economy, the academic actively promotes the implementation and application of relevant technologies through collaboration with companies such as Huawei, China Mobile, ZTE, and other enterprises and projects. Furthermore, by participating in major national special projects, the applicant contributes to the achievement of the goal of "5G leadership".
Tencent Ethereal Audio Campaign
——AI Makes Hearing Impaired People "Hear Clearly"

Tencent Ethereal Audio Lab

**Introduction**

On the International Day for the Deaf in 2020, Tencent presented a comprehensive solution for the hearing impaired, establishing a cooperative framework with major wireless technology companies and organizations. The company has invested in the development of wireless audio technology, promoting the accessibility of digital hearing aids.

**Case Study:** Tencent Tianxiang Action

Tencent Tianxiang, in collaboration with Tsinghua University, has developed a new AI-based hearing aid technology. This technology utilizes AI algorithms to analyze and improve the sound quality of hearing aids, making them more effective and comfortable for users.

**Key Features:**
- **AI-Enhanced Sound Quality:** The technology uses AI algorithms to enhance the sound quality of hearing aids.
- **Customizable Settings:** Users can customize the sound settings according to their personal needs.
- **Long Battery Life:** The device has a long battery life, allowing users to use it for extended periods.
- **High Compatibility:** The technology is compatible with various hearing aid devices, making it versatile for different users.

**Impact:**

The Tencent Tianxiang Action has not only improved the quality of life for the hearing impaired but has also raised public awareness about the importance of accessibility in technology development. The project is an excellent example of how technology can be used to address real-world problems and improve the lives of those in need.

**Conclusion:**

Tencent’s commitment to innovation and accessibility continues to set a new standard in the development of technology. By focusing on the needs of the hearing impaired, Tencent is making a significant contribution to the field of accessible technology.

**Further Reading:**

1. Tencent Ethereal Audio Campaign
2. Tsinghua University
3. International Day for the Deaf

---

**Tencent Ethereal Audio Campaign**

**Tencent Tianxiang Action**

**Tsinghua University**
广泛链接社会资源，打造听障人士帮困闭环
Extensively link social resources to create a closed loop for the hearing impaired

作为腾讯在技术公益领域的创新尝试与标杆，天籁行动以技术公益为基点，除“腾讯科技向善”团队外设立专项AI技术研究外，还联合“腾讯科技向善”、“腾讯公益慈善基金会”、“腾讯AI实验室”、“腾讯健康”等多个部门，共同推动天籁行动的实施。

The Tencent AI Lab and the China Academy of Science and Technology have established a strategic partnership to create an AI hearing assistance system, which is expected to help more than 500,000 hearing-impaired individuals within the next five years.

At the same time, in order to help more needy hearing-impaired elderly people, Tencent Charity Foundation, Tencent list Yifang Technology Laboratory, Tencent Meeting Eteral Audio Lab, and Smart Listening Technology also jointly launched the "Buy One Give One" public welfare relief activity for the hearing aids of Tencent Eternal Audio inside. During the pre-sale period, every time a hearing aid of Tencent Eternal Audio is sold, Tencent and Smart Listening Technology will donate a hearing aid of the same type for the deaf elderly in remote mountain areas for free. This is also an important public welfare measure in the field of hearing disability relief by Tencent Eternal Audio Care Foundation following the Shaoguan relief action.

呼吁全社会关注听障人士，共同助力信息无障碍建设
Call on the whole society to pay attention to the hearing-impaired and jointly help to build an information-accessible society.

腾讯联合多家合作伙伴，推出"天籁行动"，为听障人士提供免费的耳蜗植入手术，帮助他们更好地融入社会。

The Tencent AI Lab can also benefit the hearing-impaired by launching special relief funds in collaboration with a number of foundations.

同时，通过与多家基金会合作发起专项救助基金的方式，让天籁AI技术可以更好地惠及听障人士，真正实现技术为社会服务。其中，“天籁聋人救助基金”首期在腾讯基金会，为500位聋人免费提供腾讯天籁聋人耳蜗植入手术，“天籁行动"倡议在2022年已覆盖100家以上聋人耳蜗植入手术，帮助近万人受益。

天籁行动计划在平台的推动下，聋人耳蜗植入手术手术量累计超过2000例，帮助聋人更好地融入社会，享受到更高质量的生活。

技术突破与公益成果，受到多家权威机构单位认可

Technological breakthroughs and public welfare achievements have been recognized by many authoritative institutions and units.

天籁行动被中国残联及多家基金会予以高度评价，并获得了"中国公益慈善领域"、"中国社会影响力大会"、"感动中国年度公益人物"等称号。

"天籁行动"是中国公益慈善领域的又一重要里程碑，腾讯将继续在信息无障碍建设方面做出更多探索和努力，为更多听障人士创造更加美好的未来。
2022 年领英全球数字技能框架
研究成果

LinkedIn Global Digital Skills Framework Research 2022

引言

疫情当下，数字技术加速演进。全球劳动力市场
正站在一场全新的交叉路口。领英致力于通过经济
报道全球数字技能现状。从技能发展的角度为全
球经济政策的制定提供及时且客观的分析预测，帮助人
才与机会以全新的方式实现对接。

Introduction

Global labor markets are at the crossroads of change due to the
deep effects of the pandemic and the rapid evolution of the
digital economy. Through the Economic Graph, LinkedIn is committed
to creating a Global Digital Skills Framework. The company is
committed to leveraging exclusive technology and data to
provide real-time and effective tools to help formulate global
economic policies from the perspective of skills development and
assisting talents and opportunities to connect more.

2022 年领英全球数字技能框架

To embrace the future of skills, LinkedIn creates the
global digital skills framework.

为拥抱“技能为王”的未来职场，领英构建全
球数字技能框架

"为拥抱"技能为王"的未来职场，领英构建全
global digital skills framework.

在全球数字技能框架下，领英所倡导的"以技能
为导航"的招聘打破固有的招聘思维，以更契合实际
需求的方式进行人才匹配，为全球经济发展提供更多就业
机会，帮助人才更快在职场取得成功。

Using the Global Digital Skills Framework, LinkedIn advocates
skills-based hiring as it transcends the traditional recruitment
model and allows for a more accurate and practical method of
matching candidates with employers. In this way, LinkedIn
contributes to the creation of more employment opportunities for
the global economy and allows more individuals to flourish in the
workplace more quickly.

同时，领英利用经济图谱产生了独家的数据研究
和创新工具：

With the Economic Graph, LinkedIn can deliver data-driven
tools and reports, accelerating the process of digital transformation and
workforce upskilling.

data research and innovative tools:

数据驱动能力转型工具

Exclusive research offers new perspectives on digital
transformation:

领英经济研究团队与清华大学经济管理学院互联
网发展与治理研究中心（CIDG）进行多年数字经
济研究，提出"数字人才"这一概念，为全球
经济的发展提供独到视角。

In collaboration with the Tsinghua University Center for
Internet Development and Governance (CIDG), LinkedIn Economic
Graph has developed the concept of "digital talent," which
provides us with a unique insight into the globalization of the
global economy through its digital transformation.

工具助力对接技能市场：

Keeping talent relevant in the marketplace requires innovative
upskilling tools:

 depending on the needs of the workforce, provides directions for upskilling
and industry development. The latest monthly labor data insights on
major countries and regions around the world are available to
individuals, governments, and businesses in real time, including
key information such as hiring rates and skills trends.

工具助力对接技能市场：

Keeping talent relevant in the marketplace requires innovative
upskilling tools:

数据平台（Hawkeye），实时获取全球主要国
家及地区的每月最新劳动力数据洞察，涵盖雇佣率、
技术趋势等关键信息。

The Hawkeye Insights report provides directions for upskilling
and industry development. The latest monthly labor data insights on
major countries and regions around the world are available to
individuals, governments, and businesses in real time, including
key information such as hiring rates and skills trends.

技能数据（Skills Data）：通过呈现全球行业技
能变化图景，成为复合型人才有迹可循。

Skills Interactive Data Dashboard helps the global workforce stay
competitive in the post-pandemic world. It is possible to stay
ahead of the future of work by showing how skills in a specific
field have evolved over time, which can provide traces to follow
to lead to becoming an interdisciplinary talent.

技能数据（Skills Data）：通过呈现全球行业技
能变化图景，成为复合型人才有迹可循。

Skills Interactive Data Dashboard helps the global workforce stay
competitive in the post-pandemic world. It is possible to stay
ahead of the future of work by showing how skills in a specific
field have evolved over time, which can provide traces to follow
to lead to becoming an interdisciplinary talent.
全球数字技能框架精准助力数字化转型，以技能培养实现人才理想

LinkedIn’s Global Digital Skills Framework Enables Precise Digital Transformation and Promotes Scientific Upskilling

LinkedIn与全球化智库合作研究【高校校友观察（2021）】

LinkedIn’s University Alumni Insights, 2021, collaborated with the Center for China and Globalization (CCG)

在全球化背景下，中国的人才发展正面临着新的挑战和机遇。随着数字经济的快速发展，对人才的需求也在不断变化。LinkedIn作为全球最大的职业社交平台，通过其全球数字技能框架（Global Digital Skills Framework），旨在精准地推动数字化转型，并促进科学的技能提升。

LinkedIn的全球数字技能框架能够帮助企业和个人更好地理解当前的技能需求，以及未来的发展趋势。通过该框架，LinkedIn提供了详细的数据和分析，帮助用户了解不同行业和职位的技能要求，从而做出更明智的职业选择。

LinkedIn的数字技能框架还包括了职业发展的指导和资源，帮助用户提升自己的技能，适应快速变化的市场需求。这对于在中国乃至全球的劳动者来说，都是一个重要的工具。

LinkedIn还通过与全球化智库的合作，发布了《高校校友观察（2021）》报告，该报告基于LinkedIn的大量数据，深入分析了中国高校校友的职业发展情况，为教育和人才政策的制定提供了有价值的参考。

LinkedIn的全球数字技能框架和《高校校友观察（2021）》报告，都是在全球化和数字经济背景下，推动人才发展和技能提升的重要尝试。随着数字经济的进一步发展，我们可以期待LinkedIn和类似平台将继续发挥重要作用，帮助全世界的劳动者和组织抓住机遇，迎接挑战。
引言

手机输入法作为全球互联网应用之一，随时代发展呈现智能化趋势，因此帮助特殊群体跨越“数字鸿沟”具有重要意义。讯飞输入法通过AI广泛赋能进行一系列适老化无障碍改造，突破广大中老年人和障碍人士障碍沟通。

Introduction

Mobile input is one of the global internet applications that has evolved with the development of the times to become an intelligent trend. The importance of assisting special groups to cross the ‘digital divide’ cannot be overstated. Using AI, FLYTEK input is capable of carrying out a series of aging and barrier-free transformations, facilitating communication between the elderly and the disabled.

从用户“痛点”出发，实现多模态无障碍信息输出和输入

Starting from the user’s "pain points", multi-modal barrier-free information output and input are realized.

在中国60岁及以上人口有2.6亿，占比达18.70%，老龄化成为较长时期的主基调，也随着互联网适老、助老、养老成为刚需。国际上输入法领域原生键盘（Qboard）、微软Swiftkey缺少为老年人使用的定制功能，讯飞输入法则能做到打字、手写、语音识别、适老化模式不支持的功能，研发出“长辈模式”，不仅简化交互层级，还调整界面布局，同时内嵌高识别率手写输入，独家支持25种方言语音输入，配备语音播报功能。

AI赋能讯飞输入法，广泛无障碍改造弥合“数字鸿沟”

AI Enabling FLYTEK Input Method, Extensive Barrier-Free Transformation to Bridge the "Digital Divide"

为了实现真正的无障碍交互，讯飞输入法联合科大讯飞手写识别、语音识别、OCR基础上，增加机器翻译、语音合成等AI核心技术和跨语言手写识别算法升级，提升基于“简繁群体”的特点进行广义的无障碍改造。

AI输入法
FLYTEK Input Method

语音功能采用科大讯飞自研的前后端一体化的语音识别框架TFMA（Temporal feedback end-end multi-channel ASR），使离线、多人说话、外语说话等复杂场景下仍可保持识别率。

TFMA (Temporal feedback end-end multi-channel ASR) is FLYTEK's proprietary integrated front-end and back-end speech recognition framework developed by FLYTEK for the speech function, which ensures the high recognition rate for complex scenarios with high background noise, multi-person speaking, and lower speaking volume.
In order to allow anyone to exchange information equally, conveniently and without barriers in any situation, FLYTEK input method actively establishes cooperation model, helping the blind to "touch" the wonderful Internet world through the development of barrier-free input products.

为更进一步推动无障碍输入生态建设，讯飞输入法与设备厂商达成合作，推动技术成果共享，联合头部手机厂商小米等推出无障碍输入，旨在让全球每个人都能享受科技带来的美好生活。2022年4月基于MIUI系统升级，迭代升级无障碍输入，增加更多软键盘，支持语音自动读屏，打造行业应用案例，让全社会共享成果。

助力“适老化及无障碍专项行动”，使互联网使用场景从“可用”变“通用”

Contributing to the "special action of adapting to aging and accessibility", so that the Internet application scenarios becomes "universal" from "available"

2010年，移动互联网发展初期，讯飞输入法率先推出中文语音输入，并成为主流输入方式，引领传统键盘输入方式的革新与发展。

FLYTEK Input method is the first to introduce Chinese voice input as a mainstream input method, transforming traditional Chinese character encoding onto intelligent speech. The "touch net" of special groups also urgently requires this type of efficient and convenient input. There are a significant number of smartphone users, and each individual spends 30 minutes typing a day. Voice input saves at least 20 minutes a day, which is 120 hours in one year. Each year, about 12 billion hours could be saved if 260 million elderly people and 17 million visually impaired people use voice input. It is possible for intelligent terminal manufacturers to build in FLYTEK Input to achieve a wide range of barrier-free human-computer interaction at a low cost.
引言

影像引导精准微创治疗是现代医学发展的新方向，项目旨在变融合技术、尖端手术机器人、精准微创操作的核心技术，推进了微创治疗技术的发展，提升了手术精确化与智能化水平。

Introduction

Modern medicine is moving in a significant direction toward image-guided minimally invasive diagnosis and treatment. This project has invented the core technologies of fusion of multi-modality images, precise surgical planning, and precise minimally invasive operation, improving the precision and intelligence of surgery by developing new equipment for minimally invasive diagnosis and treatment.

发明影像引导精准微创治疗新方法

The development of new procedures for the diagnosis and treatment of cancer using image-guided minimally invasive techniques

针对微创精准手术注册与配准过程依赖手工操作的难点问题，发明一系列医学影像建模计算与自动配准的新方法，通过影像计算机技术，实现快速的多模态影像自动配准。在靶向精准治疗与肿瘤消融等前沿领域，形成世界领先的医学影像和手术机器人，智慧城市中的ponge，精准医疗，实现安全手术步骤，已形成一系列发明专和研究论文，在国内外心手与新等智能机器人产品广泛应用，自动化程度高，安全性好，达到国际先进。

This project has developed new methodologies of image fusion and automatic positioning and active perception for the registration process of minimally invasive surgery. There have been several patents granted for core inventions. A new image computing technology has enabled the automatic registration of multi-modal images, the imaging and visualization of interventional blood vessels without contrast agents, and the automatic planning of surgery, creating a multimodal interventional medical planning system. As a result of the invention and development of digital tracking systems such as multi-view real-time surface reconstruction and structured light scanning for nephroscope robots, the world's leading face scanning and registration technology greatly simplifies the registration process for patients. Safe surgical planning is made possible by the exclusive technology that allows for the visualization of the cerebral cortex and blood vessels. With the application of the new technology to medical device products, such as catheter and surgical robots, high levels of automation and safety can be achieved, reaching advanced international standards.

多模态信息融合精准引导微创手术新技术与系统

New Technologies and Systems for Accurate Guides of Minimally Invasive Surgery Based on Multimodal Information Fusion

清华大学
Tsinghua University

华科精准（北京）医疗科技有限公司
Sinovation (Beijing) Medical Technology Co., Ltd.

深圳迈瑞生物医疗电子有限公司
Shenzhen Mindray Bio-Medical Electronics Co. Ltd.

迈瑞的影像融合和手术机器人系统

The Developed Cross-modal Image Fusion Technology and Application on Ultrasound Imaging System

技术发明在手术机器人系统、手术导航系统、超声融合影像产品中大规模应用，得到医生的好评并受到媒体的广泛关注。

The technological inventions have been used to develop robotic surgical systems, surgical navigation systems, and ultrasound imaging products. A number of doctors and media outlets have expressed concern about the innovative working procedures and products.

技术发明转化为多个国际领先的医疗级产品

Transforming technological inventions into internationally recognized medical devices

Research into the imaging fusion and surgical planning systems

清华大学
Tsinghua University

华科精准（北京）医疗科技有限公司
Sinovation (Beijing) Medical Technology Co., Ltd.

深圳迈瑞生物医疗电子有限公司
Shenzhen Mindray Bio-Medical Electronics Co. Ltd.

迈瑞的影像融合和手术机器人系统

The Developed Cross-modal Image Fusion Technology and Application on Ultrasound Imaging System

技术发明在手术机器人系统、手术导航系统、超声融合影像产品中大规模应用，得到医生的好评并受到媒体的广泛关注。

The technological inventions have been used to develop robotic surgical systems, surgical navigation systems, and ultrasound imaging products. A number of doctors and media outlets have expressed concern about the innovative working procedures and products.

技术发明转化为多个国际领先的医疗级产品

Transforming technological inventions into internationally recognized medical devices
项目的技术发明已在多个医疗领域新产品研发和新功能开发中得到应用，转化为多个医疗机械产品上，分别由华科精准（北京）科技有限公司、深圳迈瑞生物医学电子股份有限公司完成了产业化研发。医疗机械产品注册和推广应用，所研发的适用于儿童与成人的多功能手术机器人系统，通过中国自主创新医疗器械监管政策的实施，获得三类医疗器械注册证；所研发的超声融合导航系统具有在线实时导航和实时数据补偿，可实现秒级和人体移动矫正功能。达到国际先进水平，通过中国药监局、CE、美国FDA和多国医疗器械产品注册认证的同类产品，进入国际市场。

新研发的超声导航系统产品和新功能产品开发过程中，利用的创新技术，中国国家医疗器械产品管理局（NMPA）已批准了这些创新医疗器械。

Siwonite（北京）医疗技术有限公司，和深圳迈瑞Bio-Medical Electronics Co. Ltd.已合作完成了创新医疗器械研究开发，取得了创新医疗器械产品注册证书，具有创新医疗器械产品生产资质。

As of 2018, Siwonite has developed the brain surgery robot system for children and adults in China, which has been recognized by the NMPA of China as an innovative medical device product and has obtained a third-class medical device registration certificate.

The Mindray ultrasonic fusion imaging system has reached the advanced international level, with features such as online motion modeling, real-time deviation compensation, breathing correction, and human movement correction. The system has obtained the registration certificate of medical device products in many countries, such as China, NMPA, European CE, and American FDA, and has entered the international markets of Europe, America, and Asia.

提升产品数字化与智能化水平，
精准治疗带来明显社会效益

Digitalization of products and an increase in intelligence level with obvious benefits for precise treatment

项目研发的神经外科手术机器人已在中国二十余个城市130多家医院应用，累计完成手术3000例。神经外科手术导航系统在中国十多家医院广泛使用，累计完成手术超过1000例。研发的超声融合导航系统在全球市场销售。

Over 130 hospitals in more than 20 provinces in China have already implemented the neurosurgery robotic system developed by the project. There have been more than 3000 successful neurosurgery operations. Over 1000 brain surgeries have been performed using the developed neurosurgery navigation system in dozens of medical units throughout the country.

临床应用效果证明，本项目的
t术研发大幅度提高了手术导航技术中定位的精度，使治疗更为安全，
减少手术创伤和风险，能够治疗复杂的疾病。

A variety of models of the developed ultrasound fusion imaging system have been sold in the global market to meet the needs of the customers. The inventions developed in this project have been clinically proven to significantly improve surgical planning accuracy, convenience, and safety, and reduce surgical trauma and risk. Methods and products invented by the clinic have been fully recognized by clinicians, allowing them to provide minimally invasive and precise treatments with new and high-performance digital and intelligent equipment. This project has been recognized by both domestic and international counterparts for its innovative achievements and products.

The Clinical Application of the Developed Products
Quantum Computing Global Developer Platform

Introduction

The Quantum Computing Global Developer Platform is the first "classical-quantum" collaborative platform for quantum computing development and application demonstration in China, which has broken the access to both supercomputers and quantum computer services and contributes to the establishment of a quantum computing platform in China. This platform provides comprehensive services for quantum computing enthusiasts and developers worldwide.

A Combined Quantum Computer and Supercomputing Training Model

Quantum Computing Global Developer Platform has become an integrated platform for teaching and researching quantum computing in Chinese universities, which integrates systematic curriculum resources and practical training products to meet the needs of teaching, learning, and training of quantum computing. "Origin Quantum" has established partnerships with nearly 50 universities within China and is currently in contact with several universities in Central Asia, West Asia, Southeast Asia, and Eastern Europe to explore cooperation in the global arena.

Quantum Computing Global Developer Platform also provides real-time cloud services and cloud-based quantum computing services for developers. "Origin Quantum" realizes the sharing of powerful quantum computing resources, supports the development and testing of quantum computing software, and provides platforms for emerging quantum applications.

Quantum computing is an emerging technology that has profound implications for various fields, including mathematics, physics, computer science, and even social sciences. It has the potential to revolutionize the way we process information and solve complex problems.

Quantum Computing Global Developer Platform promotes the development of quantum computing technologies by providing a comprehensive ecosystem for developers. It aims to foster a community-driven approach to quantum computing, where developers can collaborate and share resources to advance the field.
As the first quantum computing development platform with open services for the world, the Quantum Computing Global Developer Platform is a pioneering service that provides learning, collaboration, and innovation for users at all levels, including individuals, enterprises, and research institutions.

The platform integrates enterprise resources and cooperates deeply with leading enterprises in finance, biology, chemistry, artificial intelligence, industrial design, and other industries. It has already transformed some research results into quantum computing-related applications and shared them on the platform.

量子计算人才培养

Conducting quantum science education and personnel training

As the demand for quantum computing talent increases, we are actively promoting the development of quantum education and training. By collaborating with various organizations, we aim to create a quantum ecosystem that benefits everyone.

量子计算教育

Quantum Computing Education

和企业共同开发量子计算相关行业应用，可供用户体验

Work with Companies to Develop Quantum Computing-related Industry Applications that are Available for User Experience
个人信息化声音增强技术

Personalized Speech Enhancement

引言

疫情以来远程办公兴起，去噪降噪是对通话质量至关重要的。为了用户在会议中能够清晰地听到他人声音，腾讯会议在XMOS芯片上搭载了腾讯自主研发的个性化声音增强技术，从而提高通话质量。该技术支持在通话过程中能够根据通话环境自动调整音量，使用户在不同场景下都能享受到清晰的通话体验。

Introduction

The COVID-19 pandemic has made remote meetings an essential part of our daily lives. The importance of speech enhancement for maintaining high speech quality during remote meetings cannot be overstated. Nevertheless, conventional speech enhancement algorithms do not work well when it comes to suppressing the voice of interferers. Towards addressing this issue, Tencent Ethereal Audio Lab, under Tencent Meeting, has proposed a new feature – Personalized Speech Enhancement – which aims to emphasize the target speaker’s voice from a complex multi-talker scenario and improve the overall speech experience for the user.

夺取DNS国际大赛第一名

First place in the international well-known DNS challenge

腾讯会议旗下腾讯实验室的个性化声音增强技术在Interspeech, ICASSP等国际会议上发表多篇论文，在ICASSP DNS 2022国际权威个性化语音增强比赛排名。

ICASSP DNS 2022个性化语音增强排名

使用腾讯会议App启用个性化语音增强功能

“Personalized Speech Enhancement” in Tencent Meeting App

成功落地到腾讯会议中

Successful Application to Tencent Meeting

个性化声音增强技术能在消除环境噪声的基础上，进一步提高通话中人声干扰抑制效果，从而提高会议参与者的声音体验，使参与者能够在嘈杂的环境中更清晰地听到对方的声音，提升会议的沟通效率。

Personalized speech enhancement eliminates not only the noise but also suppresses the voices of interference speakers to highlight the voice of the target speaker. It is the general understanding that Tencent Ethereal Audio Lab is the first company in China to launch this new technology on the RTX product and successfully implement it in the Tencent Meeting App. Besides web meetings, this technology can also be used for cloud gaming, custom services, etc. By incorporating this technology into the Tencent Ethereal Audio Lab and hearing aid devices, Tencent Ethereal Audio Lab will be able to create more social wealth for society as a whole.

该技术在会议中的应用流程如下图。根据Figure 2 and Figure 3, this is the instruction manual for personalized speech enhancement on the Tencent Meeting App.

Boost the telecommuting under COVID-19 pandemic

目前个性化声音增强技术已经在腾讯会议中为用户打造更加干净、纯粹的沟通体验。目前腾讯会议用户已突破3亿，服务范围覆盖全球220多个国家和地域，已广泛服务于企、政、军、教育、医疗等各行业和中小企业。腾讯会议不断提升用户体验，为全球用户提供低延迟、便捷易用、安全可靠的远程音视频会议服务。
中国 5G+ 空天地一体化应急通信系统
China Mobile 5G and Space-Air-Ground Integrated Emergency Communication System

引言

针对重大自然灾害发生时的短时、短频、断线的“三断”问题，中国移动联合中国铁塔、中国电子、清华大学等多家单位进行联合技术研究，开发基于空天地一体化应急通信系统，提升应急通信保障能力和水平。目前，该系统已在全国各地完成了多个应急通信保障任务，为保障人民生命财产安全提供了有力支撑。

Introduction

Accordingly, China Mobile, in cooperation with AVIC and Xi’an University, has developed an innovative 5G Space-Air-Ground Integrated Emergency Communication System with fully independent intellectual property rights in response to the scenario of "three disruptions" (electricity, traffic, and mobile communication) resulting from extreme and severe disasters. The system has been placed into commercial operation and has been independently developed. Additionally, for the first time in the international community, emergency communications were established in a large area of rapid recovery following a natural disaster.

The technology of continuous air-ground signal coverage has been a breakthrough. For the first time in the industry, a continuous air-ground wireless network coverage algorithm has been proposed to enable drones to fly in rapid motion to continuously cover designated areas with air-ground signals. As part of the innovative approach, we proposed an antenna mounting scheme and a flight scheme that combine UAV flight parameters. Inevitably, the air-ground channel propagation model independently and innovatively develops the observation and recognition of Doppler effects at high-altitude and high-speed operation. The air-ground continuous coverage area of large fixed-wing UAV emergency communication systems exceeds 60 square kilometers based on the innovative technology. Moreover, the achievement has completely independent intellectual property rights and is currently being used in actual combat operations. Assisting the country to improve its emergency communication capacity in the face of different types of disasters and realizing modern development in a new era is achieved by increasing the capacity gap in the field of emergency communication in China.

在灾害发生时，快速响应是关键。中国 5G+ 空天地一体化应急通信系统通过卫星、无人机和地面基站等多手段协同工作，实现了空中、地面、地下三元一体的立体化应急通信体系，突破时域动态连续覆盖关键技术，在业界首次提出空中和地面组网同时覆盖、在广域范围内实现无人机应急通信系统的空中地连续覆盖面积超过 60 平方公里，中继无人机应急通信系统对选定区域内的连续覆盖面积超过 70 平方公里，该系统具备完全自主知识产权并已投入实际运行。进一步提升了中国应急救援手段，提升应对不同灾害类型的应急通信保障能力，同时也为广泛应用在应急救援场景提供了支持。

China Mobile has developed a four-level, three-dimensional Space-Air-Ground Integrated emergency communication system that supports high altitude, medium altitude, low altitude, and ground altitude communications in extreme disaster scenarios. The technology of continuous air-ground signal coverage has been a breakthrough. For the first time in the industry, a continuous air-ground wireless network coverage algorithm has been proposed to enable drones to fly in rapid motion to continuously cover designated areas with air-ground signals. As part of the innovative approach, we proposed an antenna mounting scheme and a flight scheme that combine UAV flight parameters. Inevitably, the air-ground channel propagation model independently and innovatively develops the observation and recognition of Doppler effects at high-altitude and high-speed operation. The air-ground continuous coverage area of large fixed-wing UAV emergency communication systems exceeds 60 square kilometers based on the innovative technology. Moreover, the achievement has completely independent intellectual property rights and is currently being used in actual combat operations. Assisting the country to improve its emergency communication capacity in the face of different types of disasters and realizing modern development in a new era is achieved by increasing the capacity gap in the field of emergency communication in China.

在灾害发生时，快速响应是关键。中国 5G+ 空天地一体化应急通信系统通过卫星、无人机和地面基站等多手段协同工作，实现了空中、地面、地下三元一体的立体化应急通信体系，突破时域动态连续覆盖关键技术，在业界首次提出空中和地面组网同时覆盖、在广域范围内实现无人机应急通信系统的空中地连续覆盖面积超过 60 平方公里，中继无人机应急通信系统对选定区域内的连续覆盖面积超过 70 平方公里，该系统具备完全自主知识产权并已投入实际运行。进一步提升了中国应急救援手段，提升应对不同灾害类型的应急通信保障能力，同时也为广泛应用在应急救援场景提供了支持。

China Mobile has developed a four-level, three-dimensional Space-Air-Ground Integrated emergency communication system that supports high altitude, medium altitude, low altitude, and ground altitude communications in extreme disaster scenarios. The technology of continuous air-ground signal coverage has been a breakthrough. For the first time in the industry, a continuous air-ground wireless network coverage algorithm has been proposed to enable drones to fly in rapid motion to continuously cover designated areas with air-ground signals. As part of the innovative approach, we proposed an antenna mounting scheme and a flight scheme that combine UAV flight parameters. Inevitably, the air-ground channel propagation model independently and innovatively develops the observation and recognition of Doppler effects at high-altitude and high-speed operation. The air-ground continuous coverage area of large fixed-wing UAV emergency communication systems exceeds 60 square kilometers based on the innovative technology. Moreover, the achievement has completely independent intellectual property rights and is currently being used in actual combat operations. Assisting the country to improve its emergency communication capacity in the face of different types of disasters and realizing modern development in a new era is achieved by increasing the capacity gap in the field of emergency communication in China.

中国 5G+ 空天地一体化应急通信系统作为新兴技术，将为政府、企业及公众提供有力的智能化支撑。未来，中国移动将继续在核心技术、关键设备等方面持续投入，为应对重大灾害提供有力支持。

The economic and social benefits are substantial, and it plays an important role in modernizing China’s emergency response system.

中国 5G+ 空天地一体化应急通信系统作为新兴技术，将为政府、企业及公众提供有力的智能化支撑。未来，中国移动将继续在核心技术、关键设备等方面持续投入，为应对重大灾害提供有力支持。

The economic and social benefits are substantial, and it plays an important role in modernizing China’s emergency response system.

China Mobile’s 5G emergency communication system has been deployed across four provinces, 1,200 kilometers, under the guidance of the China Ministry of Industry and Information Technology and the China Emergency Management System.

In the rescue process, the team accessed the public network generating traffic of 14.3GB, with a maximum of 648 users logging onto the network simultaneously. 3,704 SMS alerts were sent to 7,204 effective numbers, and mobile communications were continuously received for 6 hours, contributing to the rescue and relief effort in an irreplaceable and important way. It was stated in the text message, "This shows that China Mobile’s 5G emergency communication system has arrived on your way," which text message was widely shared on social media.

Furthermore, the achievements have played an important role in disaster response. The emergency communication support for people and rescue teams in the disaster area was widely reported by major media or media channels, both domestically and abroad.

The economic and social benefits are substantial, and it plays an important role in modernizing China’s emergency response system.

中国移动 5G+ 空天地一体化应急通信系统作为新兴技术，将为政府、企业及公众提供有力的智能化支撑。未来，中国移动将继续在核心技术、关键设备等方面持续投入，为应对重大灾害提供有力支持。

The economic and social benefits are substantial, and it plays an important role in modernizing China’s emergency response system.

China Mobile’s 5G emergency communication system has been deployed across four provinces, 1,200 kilometers, under the guidance of the China Ministry of Industry and Information Technology and the China Emergency Management System.

In the rescue process, the team accessed the public network generating traffic of 14.3GB, with a maximum of 648 users logging onto the network simultaneously. 3,704 SMS alerts were sent to 7,204 effective numbers, and mobile communications were continuously received for 6 hours, contributing to the rescue and relief effort in an irreplaceable and important way. It was stated in the text message, "This shows that China Mobile’s 5G emergency communication system has arrived on your way," which text message was widely shared on social media.

Furthermore, the achievements have played an important role in disaster response. The emergency communication support for people and rescue teams in the disaster area was widely reported by major media or media channels, both domestically and abroad.

The economic and social benefits are substantial, and it plays an important role in modernizing China’s emergency response system.
超高清沉浸式视频制播
技术创新及应用

Innovation and Application of UHD Immersive Video Production and Broadcasting Technology

引言
中国移动咪咕公司以5G端到端产业链为核心，与
AI/DEE/BR阶梯融合，在超高清直播及视频多
技术能力不断，成功研发多项专利。2019年已
经实现5G+4K+VR超高清直播
28000+场，已成为超高清领域行业的领头羊

Introduction
In the field of live broadcasting, China Mobile Migu has developed a variety of technological innovations and in-depth research. In 2019, Migu has achieved more than 28,000 live broadcasts of 5G+4K+VR, making it the leader in the ultra-high definition industry.

5G即时沉浸式技术

Using a unique combination of "Ultra-low latency 5G live
streaming + broadcast-grade remote production + Cinematic
real-time color grading" and other broadcast technologies, we are
introducing the world's first 5G SR technology.

5G即时沉浸式技术

Using a unique combination of "Ultra-low latency 5G live
streaming + broadcast-grade remote production + Cinematic
real-time color grading" and other broadcast technologies, we are
introducing the world's first 5G SR technology.

5G即播沉浸式制片与传统方案的对比

对比

5G Instant Cinemagraph Solution

5G Instant Cinemagraph Solution

技术亮点

Technology Innovation

5G即刻沉浸式直播技术

融合超低延迟5G直播+5G直播级远程制作
- 电影级实时调色

技术特点

Composite scenarios-based video distributed processing
technology for heterogeneous network transmission.

它实现了即时多画面直播，实现多画

技术亮点

Technology Innovation

5G即刻沉浸式直播技术

融合超低延迟5G直播+5G直播级远程制作
- 电影级实时调色

技术特点

Composite scenarios-based video distributed processing
technology for heterogeneous network transmission.

它实现了即时多画面直播，实现多画

应用领域

Application Scenarios

2019年起，本成果已成功应用于演唱会、体育
赛事、教育等领域，不仅提升了5G+4K+5G
的应用场景，还推动了行业的发展创新。
端边云协同的分布式物联网操作系统 “CTWing OS”

CTWing OS, a Distributed IoT Operating System with End-Edge-Cloud Coordination

引言

“CTWing OS” 是一款由中国电信天翼云自主研发的分布式物联网操作系统。该系统设计了多层次的资源管理方案，支持边缘端到云的全链路通信，提供灵活高效的边缘计算服务，支持海量物联网设备的接入和管理。

Introduction

The CTWing OS is a distributed IoT operating system developed by China Telecom. It is designed to support edge-to-cloud communication and provide flexible and efficient edge computing services for a large number of IoT devices.

聚焦物联网管理发展复杂性与便捷性难题，解决端边云控制异构资源瓶颈。亿级超大规模终端设备接入，要求实时响应，超大规模数据解析，跨行业应用深度融合等关键技术问题，系统核心与技术指标发展迅速。

Aiming to address the complexity and convenience issues in managing IoT devices, CTWing OS addresses the challenges posed by the large-scale integration of edge, cloud, and device control. It is designed to provide real-time response and handle massive data processing.

中国通信学会于2021年10月15日对我司项目进行了科技成就评价，由我司总工程师、项目经理分别进行的评估，中国通信学会向我司颁发了“科技进步奖”，中国电子学会向我司颁发了“电子信息技术创新奖”。

Evaluation conducted by the China Communication Association on October 15, 2021, my company's project was assessed, and I was awarded the “Progress Technology Award” by the China Communication Association and the “Electronic Information Technology Innovation Award” by the China Electronics Association.

中国第一船级社（CCS）授予CTWing OS的船级社型式认证。

The China Classification Society (CCS) has granted a type approval to CTWing OS.

CTWing OS助力打造5G+AI+自动驾驶产业生态链，携手行业龙头共创行业新生态。

CTWing OS helps build a 5G+AI+autonomous driving industry ecosystem, working closely with industry leaders to create a new industry ecosystem.
工业 5G Advanced 的网络系统
Industrial 5G-Advanced Network System

引言
5G 与工业自动化的深度融合，可提升网络连接力和稳定性，打造未来工业通信新架构。作为全球5G发源地之一，中国科学院自动化研究所与华为联合发布“5G工业5G-Advanced”解决方案，实现5G技术与工业网的网络融合。

工业5G-Advanced系统通过数据处理、运营技术、信息技术和通信技术的融合创新，传输可靠性从99.9%提高到99.99%，端到端延时从10ms以上降低到4ms，指标达到国际先进水平。

"基于 5G Advanced 的柔性生产线解决方案"对外发布，成果亮相巴塞罗那通信展，获得国际广泛关注。

工业5G-Advanced系统架构
"5G Advanced (5G)-Based Industry Field Control Solution" 成果参展在2022年巴塞罗那通信展，获得国际广泛关注。

工业5G-Advanced系统架构
"5G Advanced (5G)-Based Industry Field Control Solution" was presented at the Barcelona Communication Exhibition and received extensive international attention.

On November 28, 2021, the Shenyang Institute of Automation of the Chinese Academy of Sciences and Huawei jointly released the "5G Advanced-based flexible production line solution", which enables the application of 5G in industry, from...
一种基于LCoS技术的光阀控制芯片
A Light-Modulating Chip Based on LCoS Technology

深圳慧新辰科技有限公司
Shenzhen Huixinchen Technology Co., Ltd.

引言

深圳慧新辰科技有限公司（简称“深圳慧新辰”）近日推出的新一代LCoS光阀芯片，其像素密度达到720P 6000PPI，产品寿命延长，价格下降，且性能提高100%。

Introduction

The 720P 6000PPI LCoS chip developed by Shenzhen Huixinchen Technology Co., Ltd. (Shenzhen Huixinchen) offers a longer lifespan and a lower price. The number of pixels has been increased by 100%.

通过自主研发的芯片设计和封装技术，LCoS光阀芯片关键性能指标得到提升。

Improving major performance indicators of LCoS chip with unique technologies on chip design and packaging & testing

深圳慧新辰自主研发的LCoS芯片在设计封装和测试技术方面均具有极大的优越性，其产品具有高可靠性和低功耗等优势。

LCoS products developed by Shenzhen Huixinchen have a number of advantages over previous LCoS products in terms of technologies and pixel density, for example, brightness, reliability, extensibility, and product life. The advantage of LCoS products can also be improved.

2019年至今，深圳慧新辰成功发布无机取向LCoS芯片及配套光学模组，完成了无机取向LCoS芯片升级并达到量产条件，成功发布采用HXCA2672BU LCoS芯片的微投影产品。慧新辰科技通过自身独有的芯片设计和封装技术，采用高精度的光刻技术，将产品精度提升至6000PPI级别，以较低的工艺成本实现了产品关键性能的提升，将液晶产品的亮度驱动能力提升至百万级，大幅度提升产品的亮度、可靠性和可扩展性。

As of 2019, Shenzhen Huixinchen has achieved the following milestones: releasing the LCoS chip and supporting optical module (magneto vertical alignment of liquid crystal), upgrading the LCoS chip to mass production; and releasing the projector and optical engine motors T1 and L12H2, embedded with the company’s LCoS chip model HXCA2672BU together with its downstream customer. Using its unique chip design and packaging technology, Shenzhen Huixinchen adopts a mature 110mm process from a cooperative wafer supplier to raise the pixel density of mass produced LCoS chip products to 6000PPI, resulting in a lower cost and higher performance. Huixinchen’s vertical alignment technology, which it developed independently, is responsible for raising the brightness of its LCoS products to millions of nits, thereby enhancing their brightness, reliability, extensibility, and lifespan. These efforts are enabling LCoS products to be applied to sophisticated domains such as industrial manufacturing, optical communication, and vehicle-mounted devices.

无机取向LCoS产品
LCoS Products

LCoS芯片应用广泛且在不同领域开发成果显著
Seeing diversified applications of LCoS chips in increasing domains

LCoS芯片广泛应用于智慧教育、激光电视、5G光网络、虚拟现实、AR/VR、AR-HUD、3D打印等领域，其技术在智能微投影领域，深圳慧新辰的LCoS芯片产品为不同领域的下游应用厂商达成合作，面向全球市场的LCoS芯片出货量超过200万片。

汽车触控显示屏领域，预计2022年第三季度推出光学模组样机，已向乘用车在车载触摸屏激光雷达等光学芯片的开发样机签订，将在光通信、3D打印、半导体行业等领域均将达成合作意向。

Chips based on LCoS technology are widely used in light-related applications, including smart mini projectors, laser TVs, 5G optical networks, laser radars, AR/WVR, AR-HUD, and 3D printing. A total of over 203,000 LCoS chips have been delivered by Shenzhen Huixinchen to its downstream customers in global markets for smart mini projectors. The optical module is expected to be available in the third quarter of 2022 for desktop-touch ultra short throw projectors.

Shenzhen Huixinchen developed a light-modulating chip for industrial applications, enabling better face recognition in remote and complex settings.

Chips based on LCoS technology are also widely used in the semiconductor industry. In addition, Shenzhen Huixinchen has also accepted orders to pack light-modulating chips for vehicle-mounted devices.

5G光网络领域——WSS波长选择开关
WSS (Wavelength Selective Switch) for 5G Optical Network

车用触控显示领域
Vehicle-mounted display
Polymorphic Intelligent Network

Development Vision of Polymorphic Intelligent Network

Introduction

Polymorphic intelligent network is a major innovation in development paradigm in information network.

Application verification of polymorphic intelligent network in intelligent manufacturing industry

This case study in intelligent manufacturing industry presents how IP networking, as a critical component of the Polymorphic Intelligent Network (PIN), supports the deployment of advanced manufacturing technologies. The experiences gathered in this industry can be extrapolated to other sectors, highlighting the versatility and adaptability of PIN.
5G 增速器

5G Booster

中国移动等五家运营商联合研发

5G 增速器采用无线变频装置实现覆盖解决方案

5G Booster is based on wireless frequency shifting technology to solve coverage problem

5G 增速器是通过无线频率移位技术来解决覆盖问题的。5G 增速器采用无线变频装置，能够实现无源和有源模式的切换，从而提高覆盖范围和信号传输质量。

Induction

在 5G 时代，需要在无线频谱覆盖和容量方面进行更深入的研究。5G Booster 是中国移动等五家运营商联合研发的无线频率移位技术产品，能够有效提高 5G 网络的覆盖范围和传输速率。

Charm of Science and Technology Collection

5G 增速器已在 5G 三期建设中初步试用，在实际应用中显示出卓越的性能。该技术有望在未来 5G 网络建设中发挥重要作用。
TDOS 天元大数据操作系统
System Operation of TDOS Tianyuan Big Data

引言

数据要素是实现数据价值创造、实现数据要素价值化、数据要素市场化的基础。数据要素市场建设与发展，对于创新驱动和经济发展具有重要的战略支撑作用。天元大数据操作系统(TDOS)在“数字中国”、“新发展格局”等国家战略的推动下，从数据要素基础设施出发，实现了数据要素基础设施的建设。以“数据驱动”作为创新引擎，驱动数据要素价值化，促进数据要素市场，构建数据要素市场的新业态，形成数据要素市场的新动能，最终实现数据要素价值化，推动数字经济的发展。数据要素市场的发展，对于创新驱动和经济发展具有重要的战略支撑作用。天元大数据操作系统(TDOS)在“数字中国”、“新发展格局”等国家战略的推动下，从数据要素基础设施出发，实现了数据要素基础设施的建设。以“数据驱动”作为创新引擎，驱动数据要素价值化，促进数据要素市场，构建数据要素市场的新业态，形成数据要素市场的新动能，最终实现数据要素价值化，推动数字经济的发展。
Real-Time Geographic Information Service Platform for Ubiquitous Spatiotemporal Big Data

Introduction

Several key technologies have been developed in this project, including distributed organization, efficient data retrieval, high-performance spatiotemporal computing, and innovation of a spatiotemporal data model for real-time geographic information. Additionally, it has developed a fully autonomous distributed cross-platform GIS engine that can be used to build real-time geographic information services as well as to develop service product lines that correspond to those services.
项目构建了一系列新的地理信息服务平台，探索出了一系列实时地理信息产品，促进了多领域、大范围的应用。

Wide application of real-time geographic information services and deep promotion of GIS industry

实时地理信息服务平台在智慧城市、智慧社会、应急管理等领域提供了平台级集成化解决方案，包括城市管理和社会治理、城市规划、应急管理、国土资源管理、资源配置管理、电力、水利等行业整体应用。在经过三年以上的时间，该平台在10个省、50个市的百余项应用工程中，促进了国民经济和社会行业的数千个数据集成应用，为国家智慧城市和智慧社会的创建和发展提供了强有力的数据化支撑。

Over the past three years, the real-time geographic information service platform has been widely used in many fields, including smart cities, social management, and emergency evacuation. The solution has been used in more than 100 projects in more than ten provinces and 50 cities in China, promoting the development of China's GIS industry and contributing to the construction and development of smart cities and smart societies.

项目构建一系列共享联动服务的全新应用，实现了实时地理信息为核心的数据共享，取得了巨大经济效益和显著社会效益。

A significant amount of social and economic benefits have been achieved through the sharing of geographical data in real-time and collaborative service applications.
全维可定义网络 5.0 新型网络架构

Network 5.0: A Novel Full-Dimension Definable Network Architecture

引言

全维可定义网络 5.0 新型网络架构立足于现有网络“边缘智能”等网状网络关系，通过提供网络、服务、应用对称的智能，形成以网络为基础与服务为主体的全维网络生态与服务体系，支撑网络空间战略的灵活部署。

Introduction

Network 5.0 aims to change the modal “Internet” situation of “connected but isolated” to the weak network. By strengthening the ability of the network, Network 5.0 reduces the application’s reliance on end equipment. It creates a new network infrastructure and governance paradigm with the network playing a leading role in the capabilities and responsibilities of the Internet, which can promote the governance capacity of cyberspace.

“以网络为中心、可信安全、能力内生”为核心设计理念

Core design concepts: network-centricity, credibility security, and endogenous functionality

产学研多维推广应用

Comprehensive promotion of Network 5.0

全维可定义网络 5.0 新型网络架构提出“以网络为中心，可信安全，能力内生”的核心设计理念，通过设计全维度可定义、协议灵活、安全机制内生化的下一代网络体系，将确定性传输、内生安全、自主资源、高效管理等作为内生的机制嵌入到网络的数据通信协议，形成多模态、体系化、可增量部署的创新网络基础架构，其功能性包括：

Full dimensionality: a new network architecture is defined on an end-to-end basis, ensuring that the network is truly end-to-end. The new architecture takes advantage of the flexibility of the network to support multiple functions and services on a single network.

全维可定义网络 5.0 新型网络架构

Network 5.0: A Novel Full-Dimension Definable Network Architecture

中国科学院计算技术研究所

Computer Network Information Center, Chinese Academy of Sciences

中国信息通信研究院

China Academy of Information and Communications Technology

中国信通院有限公司

China Telecom Co., Ltd.

华为技术有限公司

Huawei Technologies Co., Ltd.

“以网络为中心、可信安全、能力内生”为核心设计理念

The core design concept of Network 5.0 is “network-centric, credible, and endogenous.” It is designed to support multiple functions and services on a single network.

The new flexible IP protocol (NSP) is proposed. NSP enables the new features of diversified identification, flexible variable-length addressing, multi-semantic addressing routing, etc. Meanwhile, NSP also supports the endogenous security and deterministic transmission on network layer protocols.

The core design concept of Network 5.0 is “network-centric, credible, and endogenous.” It is designed to support multiple functions and services on a single network.

The concept of Computing Power Network was proposed for the first time. Computing Power Network can deeply integrate computing, networking, storage and other heterogeneous resources to build a new generation of ICT infrastructure. It takes the network as the main body to provide computing and networking integration services.

领导成就发布及国内外标准全面推广

Leading achievements release & national and international standardization

全维可定义网络 5.0 新型网络架构是该领域的创新性成果。成果在国际网络 5.0 峰会、中国 SDN/NFV/AI 大会、GNTC 2020 多场重要活动中对这一成果进行了宣传推广，发布于相关技术报告及技术白皮书 6 本，完成中国通信学会 18 项团体标准立项，其中 11 项团体标准已发布，在 CCSA 完成 10 多个行业标准立项。基于 ITU-T FG NET 2020 提出的 8 份报告，提出了未来 2030 网络的主要愿景、目标、驱动、架构设计的原则和主要要素等，在全球引起了广泛关注。

Network 5.0 is the innovative achievement of the Network 5.0 Industry and Technology Innovation Alliance. The alliance has promoted this achievement in many significant events such as the Network 5.0 summit, China SDN/NFV/AI conference and GNTC 2020, and released 6 relevant technical reports and technical white papers. China Communications Society has approved 18 group standard proposals, 11 of which have been published.

Over ten industrial standards have been approved by CCSA. As part of ITU-T FG NET 2020, 8 reports are proposed to describe the main vision, objectives, driving forces, principles, and main elements of the architecture design of the future 2030 network, which have attracted the attention of the international community.

开发了 DIP 模型样机，依托 CENI 寻求于网络与长周期综合试验平台开展研发与测试，同时，DIP 设备已在国际某大型工业制造企业开展应用。

The developed DIP prototypes were tested relying on the CENI backbone network and the Yangtze River Delta comprehensive test network. At present, DIP has been applied in a large international industrial manufacturing enterprise.
移动互联网 IPv6/SRv6 技术创新及超大规模部署
IPv6/SRv6 Technical Innovation and Hyperscale Deployment for Mobile Internet

中国移动通信集团有限公司
China Mobile Communications Group Co., Ltd.

引言


Introduction

The project aims to address technical challenges associated with the transition from IPv4/MPLS to IPv6/SRv6 during the evolution of the mobile Internet. China Mobile has been cultivating IPv6 mobile Internet and 4G/5G simultaneously for almost 30 years. In addition, China Mobile has built the world’s largest IPv6 mobile and fixed broadband networks, which serve more than 900 million consumers. To accelerate the adoption of IPv6/SRv6 in the global Internet, several technological innovations and standard breakthroughs have been achieved with G-SRv6.
建成全球超大规模的 IPv6 网络基础设施，主导多项 IPv6+创新技术，推动 IPv6/SRv6 在全球广泛部署

Having built the world’s large-scale IPv6 network infrastructure, driving numerous IPv6+ innovations, and promoting the deployment of IPv6/SRv6 worldwide.

移动网，中国联通全面部署 IPv6+”，2019年，中国联通在移动网络部署 IPv6，并宣告 IPv6+预商用。2020年，中国联通将 IPv6+推广到全国，累计部署 IPv6+基站超过 100 万， IPv6+用户数超过 1 亿，为 1.7 亿家庭宽带用户提供 IPv6 地址。

Mobile Network: China Mobile has completed the IPv6 upgrading in its network and built the global large-scale dual-stack 4G/5G network and single-stack VoLTE/VoNR network. These network infrastructures serve 700 million mobile subscribers with more than 6 million base stations, and also allocate IPv6 addresses for 170 million broadband home users.

项目简介：中国移动基于 IPv6/G-SRv6 构建的 IPv6+应用层网络，已与 1.5 万台路由器设备合成为 IPv6+设备，同时已将 G-SRv6 作为高价值业务的核心协议，基于 SDN/G-SRv6 的创新方案，覆盖全国 300 余个城市，上千个路由汇聚，构建全球领先的承载网。

Bearar Network: Recent upgrades to IPv6/SRv6 have been completed on approximately 15,000 routers. Meanwhile, SDN/G-SRv6 solutions for high-value services have been deployed in more than 300 cities and thousands of routers across the country.

云和互联网业务，中国移动已完成“移动云、网络云、IT 云”三大自研云平台的 IPv6+部署。覆盖服务区域 50 万台服务器，自研系统与应用也已全部完成 IPv6 升级。250 多个自研系统 IPv6 支持度达到 100%，130 个自有应用 IPv6 支持度达到 80%以上。

Cloud and Internet services: China Mobile has implemented IPv6 in more than 10 computing pools with more than 500,000 servers, including "mobile cloud", "network cloud", and "IT cloud". Aside from this, more than 250 self-operated websites and 130 applications have already implemented IPv6, and traffic to self-operated websites and self-owned applications reaches 100% and 80%, respectively.

实现 IPv6/SRv6 产业链全方位发展，产生显著经济效益和社会效益

Promoting the maturity of the IPv6/SRv6 industry chain, and bringing economic effectiveness and social benefits significantly.

目前中国移动已建成全球超大规模的 IPv6 4G/5G 网络，实现移动 IPv6 “3G 起步，4G 同步，5G 内生”，全国 66 万台基站和承载设备均支持 IPv6，产生巨大的经济效益，同时中国移动通过引入 G-SRv6 创新技术，可将网文写成压缩 8 倍以上，综合成本节省数百亿元。

There are significant economic benefits associated with China Mobile’s IPv6 4G/5G and bearer networks, which includes tens of thousands of devices. This G-SRv6 innovative technology has reduced network bandwidth costs by nearly billions of yuan.

中国移动实现 IPv6 网络产业链全方位发展，推动移动互联网应用的可用性、IPv6 用户规模、IPv6 网络性能等终端设备提供 IPv6 服务，为移动互联网 TOP50 的 200 余款云上应用提供 IPv6 服务，极大地促进了 IPv6 的应用发展。

There are also developed IPv6 industry chain and ecosystem, serving 170 million mobile phone subscribers, 170 million wired broadband users, 100 million IoT devices, as well as 200 IPv6-level services like Migu, Video. Thus IPv6 applications are greatly expanded.
“RPA+AI”——基于认知智能的人工智能组件融合应用成果

“RPA+AI”——An Fusion Application of Multiple AI Technologies Based on Cognitive Intelligence

引言

RPA+AI是数字化转型背景下的人工智能组件和RPA在业务流程中的深度融合，构建智能化的业务流程，推动AI在企业流程中的智能化应用。通过流程优化和能力提升，实现流程的自动化和智能化，为企业提供更高效、更智能的业务流程解决方案。

融合AI能力，赋能RPA智能认知

RPA能力的提升是RPA+AI应用的基础。通过对流程的自动化和智能化分析，可以实现对流程的高效执行和智能化决策。通过与AI的深度融合，可以实现对流程的快速优化和性能提升。

State Grid Corporation of China (SGCC) has integrated its business processes with RPA and artificial intelligence technology in order to develop an enterprise-level RPA service system, including face recognition, OCR (optical character recognition), voice recognition, and so on. As a result, its digital assets are strengthened, and its cross-departmental staff burdens are reduced substantially. A further benefit is that it improves the level of business digitalization and intelligence of the organization.

A solution to the bottleneck problem of traditional RPA applications' use in basic business scenarios has been developed by the Big Data Center of SGCC through the development of an RPA+AI engineering application platform under the direction of the Digitalization Department. This platform has been designed so that it is capable of continuously improving its application in complex business scenarios, as well as providing comprehensive coverage of all business scenarios. While performing complex system operations and data collection at the same time, it overcomes the limitation that traditional RPA can only process business in accordance with specific rules. To transform 'task automation' into 'process automation', the platform uses RPA tools and automated demand mining, as well as low-code automation to transform 'task automation' into 'process automation'. By utilizing other artificial intelligence technologies and deploying them at two levels (headquarters and branches), it achieves a one-stop packaging solution for various technological processes and realizes the production line to drive business applications.

RPA+AI application design in engineering disorders.

在趋势数字化转型中，RPA+AI应用的融合设计

国网公司针对传统RPA在基层业务应用的瓶颈，通过数字化能力的提升，打造了RPA+AI工程化应用平台，能够自动识别和处理复杂的业务流程，实现流程的自动化和智能化。

深度融合应用，典型场景共享

RPA+AI融合应用成果已在国网公司27家公司开展推广应用，在基层业务流程中实现了流程的自动化和智能化，降低了业务成本，提升了业务效率。

典型应用示例

RPA+AI融合应用在电力行业中具有广泛的应用前景，可以进一步提升业务流程的自动化和智能化，实现效率的提升。
RPA+AI 融合设计

AI 机器人

数字化服务

服务基层网点，助力减负增效
Reducing the burden on the gross-root staff as well as improving the efficiency of work.

传统的 RPA 工具主要针对周期性的，重复性的，机械性的操作任务，对非结构化数据处理以及跨系统业务处理的应对能力不足。RPA+AI 的融合应用可以实现对非结构化数据的智能化处理，拓展 RPA 的服务覆

盖范围，满足跨专业、跨层级、跨场景的数字化业务流程应用模式要求，进一步提升基层减负的效率。

Traditional RPA is mainly aimed at periodic, repetitive, and mechanical operation tasks. It's inadequate of dealing with unstructured data processing and cross-system business processing. The integrated application of RPA+AI can achieve intelligent processing of unstructured data, expand the service coverage of RPA, meet the requirements of cross-professional, cross-hierarchical, cross-scenario digital business process application modes, and further improve the efficiency of burden reduction.

以某大企业数据中心日均新用的 44 个应用为例，使用传统 RPA 模式，需投入资金约 700 万元，提升工作效率 3~5 倍，每每月平均工作日 50 70 小时，使用 RPA+AI 的融合应用，在投入不变的情况下，可以完成甚至更广范围的业务场景，实现工作机率 6~8 倍提升，平均每月节约工作时长可达 1200 小时以上。

With 44 RPA and AI fusion applications developed and used by the Big Data Center of SSGC as computing units, it costs approximately 7 million yuan compared to developing traditional RPA applications. 3-5 times more efficient work could be achieved, and about 50-70 hours of work per month can be saved. With the same investment condition, it would achieve business scenarios with wider coverage and deeper value. Fusion applications of RPA and AI are able to improve working efficiency by 6-8 times, resulting in a monthly savings of about 1200 working hours.

RPA+AI 融合应用扩展了传统 RPA 的服务能力，扩展自动化场景的范围和深度，切实服务基层网点减负和管理效能提升，持续推动数字化转型建设，为人工智能发展应用做出创新性贡献。

By combining RPA and AI applications, you are improving the service capabilities of traditional RPA applications, enlarging the scope of automation work scenes, effectively reducing the workload of cross-support service teams, and improving management efficiency. A number of innovative contributions are made to the development and application of artificial intelligence.
Theory and Method on Sparse Signal Processing Under Complex Communication Environments

Introduction

The next generation of wireless communication will result in ultra-wide bandwidths, ultra-large antennas, and ultra-dense cells, which traditional signal processing ideas are unlikely to accommodate. Through this paper, a new perspective is opened up for sparse signal processing, which will contribute to the enhancement of the information network infrastructure.

A theoretical framework based on compressed-sensing is presented for sparsely processing wireless communication signals.

The multi-dimensional sparse characteristics of practical signals are systematically examined in complex wireless communication scenarios. In order to fully describe the intrinsic relationship between sparse signals and wireless channels, a mathematical model is developed. Wireless signal processing is conceptualized using a compressed-sensing-based theoretical framework. The development of a multi-dimensional sensor-structured compressed sensing system and a multi-domain cooperative sparse signal processing system is presented.

Using multi-dimensional compressed sensing, a theory for suppressing and eliminating time-frequency sparse noise and interference is developed. A prior information aided compressed sensing-based spectrum estimation method is provided, which considers the coexistence of narrowband and wideband interference. Enhanced mobile broadband services, and reduces interference from non-Gaussian sources of communication systems in a manner that is both effective and efficient.

In the next generation wireless communications, a hybrid network architecture that supports the coexistence of narrowband and wideband interference is used. The new hybrid network is characterized by the following features:

1. **Multi-domain cooperation:** Multi-domain cooperation is used to improve the performance of the network.
2. **Compressed sensing-based spectrum estimation:** Compressed sensing is used to estimate the spectrum of the network.
3. **Prior information aided:** Prior information is used to improve the performance of the spectrum estimation.

In large-scale antenna systems, spatial correlation is elucidated between multiple antennas. It is shown that the joint sparse feature among the support of the channel and impulse responses in ultra-large-scale multi-antenna systems can be verified. Based on basis expansion, a sparse representation method is proposed for time-varying channels.

A framework for multi-domain cooperation is investigated. The framework is based on the following features:

1. **Multi-domain cooperation:** Multi-domain cooperation is used to improve the performance of the network.
2. **Compressed sensing-based spectrum estimation:** Compressed sensing is used to estimate the spectrum of the network.
3. **Prior information aided:** Prior information is used to improve the performance of the spectrum estimation.

The multi-dimensional sparse characteristics of practical signals are systematically examined in complex wireless communication scenarios. In order to fully describe the intrinsic relationship between sparse signals and wireless channels, a mathematical model is developed. Wireless signal processing is conceptualized using a compressed-sensing-based theoretical framework. The development of a multi-dimensional sensor-structured compressed sensing system and a multi-domain cooperative sparse signal processing system is presented.

Using multi-dimensional compressed sensing, a theory for suppressing and eliminating time-frequency sparse noise and interference is developed. A prior information aided compressed sensing-based spectrum estimation method is provided, which considers the coexistence of narrowband and wideband interference. Enhanced mobile broadband services, and reduces interference from non-Gaussian sources of communication systems in a manner that is both effective and efficient.

In the next generation wireless communications, a hybrid network architecture that supports the coexistence of narrowband and wideband interference is used. The new hybrid network is characterized by the following features:

1. **Multi-domain cooperation:** Multi-domain cooperation is used to improve the performance of the network.
2. **Compressed sensing-based spectrum estimation:** Compressed sensing is used to estimate the spectrum of the network.
3. **Prior information aided:** Prior information is used to improve the performance of the spectrum estimation.

In large-scale antenna systems, spatial correlation is elucidated between multiple antennas. It is shown that the joint sparse feature among the support of the channel and impulse responses in ultra-large-scale multi-antenna systems can be verified. Based on basis expansion, a sparse representation method is proposed for time-varying channels.

A framework for multi-domain cooperation is investigated. The framework is based on the following features:

1. **Multi-domain cooperation:** Multi-domain cooperation is used to improve the performance of the network.
2. **Compressed sensing-based spectrum estimation:** Compressed sensing is used to estimate the spectrum of the network.
3. **Prior information aided:** Prior information is used to improve the performance of the spectrum estimation.
提出的噪声抑制算法可用于车载网领域，针对车载网络中异
后存在的视频、音频非时延噪声展
研究。提出了基于多级结构化
压缩感知理论的信号级噪声抑
制技术与信号处理，有效提升车牌
识别的准确性。

在物联网中，通过感知网所
提出的噪声抑制算法可用于
车联网领域。针对车联网中异
后存在的视频、音频非时延噪
声展研究。提出了基于多级结构
化压缩感知理论的信号级噪声抑
制技术与信号处理，有效提升车牌
识别的准确性。

在物联网中，提出的噪声抑制算法可
用于车载网领域。针对车
联网中异后存在的视频、音
频非时延噪声展研究。提出
了基于多级结构化压缩感知
理论的信号级噪声抑制技术与
信号处理，有效提升车牌识别
的准确性。

在车联网中，提出的噪声抑制算法可
用于车载网领域。针对车联网中异
后存在的视频、音频非时延噪声展
研究。提出了基于多级结构化压缩
感知理论的信号级噪声抑制技术与
信号处理，有效提升车牌识别的准
确性。

在物联网中，提出的噪声抑制算法可
用于车载网领域。针对车联网中异
后存在的视频、音频非时延噪声展
研究。提出了基于多级结构化压缩
感知理论的信号级噪声抑制技术与
信号处理，有效提升车牌识别的准
确性。

在物联网中，提出的噪声抑制算法可
用于车载网领域。针对车联网中异
后存在的视频、音频非时延噪声展
研究。提出了基于多级结构化压缩
感知理论的信号级噪声抑制技术与
信号处理，有效提升车牌识别的准
确性。

在物联网中，提出的噪声抑制算法可
用于车载网领域。针对车联网中异
后存在的视频、音频非时延噪声展
研究。提出了基于多级结构化压缩
感知理论的信号级噪声抑制技术与
信号处理，有效提升车牌识别的准
确性。
A New Generation of High-Performance Cloud AI Inference Chip

In the context of automated intelligence (AI) in the digital age, data is generated and processed in vast quantities at an unprecedented rate. To meet the growing demands of AI applications, high-performance chips are required to accelerate the processing of AI tasks, particularly inference tasks in cloud environments. The "DTU 2.0" (Deep Thinking Unit) is the second-generation AI chip from Enflame Technology Co., Ltd, positioned for cloud-based AI inference, benchmarking against the existing generation of AI chips.

**Introduction**

"DTU 2.0" (Deep Thinking Unit) is the second-generation AI chip from Enflame Technology Co., Ltd, positioned for cloud-based AI inference, benchmarking against the existing generation of AI chips. It is designed to address the challenge of providing high-performance inference capabilities in cloud environments, focusing on optimizing the processing of AI tasks.

**Leading Storage Architecture with High Throughput and Low Latency**

The multi-level distributed on-chip storage architecture, combined with the industry-leading HBM2E device memory system, realizes a chip-level high-bandwidth, high-capacity, and high-performance memory system, effectively improving memory access efficiency and data resident capacity.

**AI-focused Accelerating Computing Architecture**

In accordance with the design of artificial intelligence (AI) applications, the "DTU 2.0" can be implemented by using adapters, enabling comprehensive improvement of the multi-level optimization processing capabilities of algorithms, making it suitable for wide-ranging applications, focusing on reducing the average instruction execution time and improving the effective data resident capacity.

**Multi-level Implementation and Promotion**

The "DTU 2.0" provides a comprehensive range of operations, including image processing, voice recognition, natural language processing, and other AI applications.

**Empowering the AI Industry to Accelerate Development**

By continuously enhancing the performance and efficiency of AI chips, "DTU 2.0" provides a powerful tool for the development of AI applications, enabling the industry to realize rapid progress. Its high-performance capabilities ensure that AI applications can be deployed with high efficiency and accuracy, driving the advancement of AI technology.

**Funding Opportunities**

For more information on "DTU 2.0" and its potential applications, please contact Enflame Technology Co., Ltd for further details.
HPLC Sets up the Energy Internet Communication Highway

HPLC 架起能源互联网通信高速路

HPLC has made breakthroughs in key technologies such as time-frequency diversity coupling, timing optimization, and multi-network coordination of power line carriers.

项目完成架设电力线通信技术开发技术攻关，突破了电力线通信的时延分集技术、时序优化、多网络协调等关键技术，形成了完整的电力线载波通信（HPLC）技术体系。

There have been breakthroughs in key technologies such as time-frequency diversity coupling, timing optimization, and multi-network coordination of power line communication by the team, and a complete system for high-speed power line carrier communication (PLC).

A key characteristic of HPLC is its flexibility in physical block configuration, its transmission mechanism of the channel access timing relationship, and the ability to minimize communication delay to less than 50 milliseconds. Consequently, HPLC is capable of adapting to the business construction requirements represented by smart homes and smart cities.

Gaining full participation in the 5-megawatt smart meter project in Saudi Arabia, the team has extensive experience. With a market potential of 70 million smart meters in the future, Indonesia and Chile have highly recognized HPLC technology. Furthermore, the project team will establish a laboratory for the certification of IEEE 1901.1 standards. To expand the overseas market for smart meters, the team will seek investment from manufacturers with overseas manufacturing capabilities.

HPLC technology units have exceeded 200 million.

The number of HPLC communication units has exceeded 200 million.

The HPLC communication units have been deployed in 233 million energy meters in China, and the team has worked closely with a number of top domestic integrated circuit companies, including Topcom, HiSilicon, and Neusoft in technology transfer. Until now, the team has generated a communication income of 297 million yuan. The sales of HPLC products by integrated circuit companies exceeded 11.3 billion yuan. A vast market of 560 million energy meters is expected to be developed in China through collaboration with integrated circuit companies in the future.

HPLC has been widely used at home and abroad.
面向量产的智能重卡自动驾驶系统

Heavy-Duty Truck Autonomous Driving System for Mass Production

嬴彻科技（上海）有限公司
Inceptio Technology (Shanghai) Co., Ltd.

嬴彻科技（浙江）有限公司
Inceptio Technology (Zhejiang) Co., Ltd.

引言

自动驾驶技术的现实应用，可以实现降本增效的经济效益以及提升安全、节能环保等社会价值，中国商用车市场的规模庞大，但行业痛点突出，迫切需要创新的解决方案，从而成为自动驾驶技术最佳的现实应用场所。

Introduction

It is feasible to demonstrate the economic benefits of cost reduction and efficiency increase through the practical application of autonomous driving technology, as well as enhancing the social value of safety, energy conservation, and environmental protection through its practical application. Intercity freight in China is a large market, but there are significant pain points, and innovative solutions are essential, resulting in the best practical application scenario for autonomous driving.

全面基于量产、安全、高效、低碳的智能重卡自动驾驶技术

Comprehensive intelligent heavy-duty truck autonomous driving technology with safety, efficiency and low carbon for mass production

由于自动驾驶技术研发起点高，投入大，不确定性因素多，因此国际上汽车行业首款 L4 自动驾驶技术的探索，基本采用了后装的路线，并不直接面向量产。嬴彻科技在自动驾驶技术上实施了“全栈自研、面向量产”为核心技术策略。

Since the development and research of autonomous driving technologies has a high threshold with many uncertain factors and requires a substantial investment, the industry has begun exploring heavy-duty truck autonomous driving technology essentially adopting the technical route of retrofitting, rather than dealing directly with mass production, and it is difficult to rapidly implement it on a large scale.

Firstly, Inceptio Technology innovated and developed the world’s leading autonomous driving technology used in L4 trucks. In terms of algorithm, technical difficulties such as long-range sensing, adaptive cruise control, and fuel savings have been overcome. With respect to software, Xuanyan system has developed a unique system for managing information security and functional security. On the computing platform, the Xuanyan platform is characterized by a high degree of computing power, energy efficiency, and security. On the level of the on-line control chassis, the Xuanyan system is directly oriented to the mass production of trucks, and it is the first full redundant on-line control chassis in the industry.

其次，嬴彻成为业内率先通过卡车自动驾驶量产的技术公司，与产业链合作伙伴实现了五项行业量产技术的突破，包括：全冗余线控底盘、L3/L4 卡车级软件硬件套件，面向自动驾驶的人机交互系统；轮胎各类安全系统及安全设计在自动驾驶领域的测试验证体系。2021 年底率先实现 L3 级自动驾驶卡车的初步量产。

Secondly, Inceptio Technology became the first technology company in the industry to run through the mass production of autonomous driving trucks. In collaboration with the industry chain, they produced key leading breakthroughs in the industry, including a fully redundant wire control chassis, a L3/L4 truck hardware package with high vehicle quality, a human machine interaction system for autonomous vehicles, and a network security design scheme that ensures various malicious security intrusions and an industry-leading industry test and verification system. Towards the end of 2021, Inceptio-Technology became the first company to mass produce automatic driving trucks at the L3 level.

其次，嬴彻在技术领先性上，嬴彻已业内率先完成基于量产方案的 L4 级自动驾驶重卡全无人行驶测试。此外，打造国内首屈一指的卡车安全闭环平台，将更早实现卡车无人驾驶重卡的量产。

As in technology advancement, Inceptio is the first company in the industry to achieve the full un mann ed test of a L4 level autonomous driving heavy-duty truck based on the mass production scheme. Additionally, it has developed a leading-edge closed-loop platform for intelligent heavy-duty trucks, which will further improve the mass production of fully un manned heavy trucks.

在技术领先性上，嬴彻已业内率先实现基于量产方案的 L4 级自动驾驶重卡全无人行驶测试，此外，打造国内首屈一指的卡车安全闭环平台，将更早实现卡车无人驾驶重卡的量产。

在技术领先性上，嬴彻已业内率先实现基于量产方案的 L4 级自动驾驶重卡全无人行驶测试，此外，打造国内首屈一指的卡车安全闭环平台，将更早实现卡车无人驾驶重卡的量产。

嬴彻在技术领先性上，嬴彻已业内率先完成基于量产方案的 L4 级自动驾驶重卡全无人行驶测试。此外，打造国内首屈一指的卡车安全闭环平台，将更早实现卡车无人驾驶重卡的量产。
Automobiles and electric vehicles are expected to revolutionize the transportation industry, bringing about significant changes in terms of transportation efficiency, safety, and environmental impact. The use of advanced technologies in autonomous vehicles promises to reduce the number of accidents, improve traffic flow, and decrease pollution levels. Buildings with automated systems can also enhance energy efficiency and comfort levels for occupants. Continued investment in research and development is crucial for achieving these goals.

For more information, please visit the website at [Inception Technology](https://www.inception-tech.com).

**Key Features**
- **16x8** CPU Core
- **32xARM** Core
- **10xNN** Accelerator
- 22nm Process Technology
- 256GB Storage Capacity

**Applications**
- Autonomous Driving
- Industrial Automation
- Robotics
- Healthcare

**Advantages**
- High performance and efficiency
- Low power consumption
- Robust design for various environments

**Contact Information**
- **Email:** info@inception-tech.com
- **Website:** www.inception-tech.com

---

*Inception Technology* is a leading provider of advanced automotive and industrial computing solutions.
新型冠状病毒信息库 RCoV19

Resource for Coronavirus 2019 (RCoV19)

中国科学院北京基因组研究所（国家生物信息中心）
Beijing Institute of Genomics,
Chinese Academy of Sciences/ China National Center for Bioinformation

RCoV19于2020年1月22日公布并持续更新，是面向全球开放的新冠病毒相关基因组和蛋白质序列数据库、在线分析和下载平台，具有突出的先进性和创新性，在一定程度上处于国际领先水平。

As the open-access resource of SARS-CoV-2, RCoV19 shared to the world is publicly made available since 22 January 2020 and continually updated, maintaining its position as the largest public research platform for SARS-CoV-2 in the world. With its advanced technology, RCoV19 leads the international field in the following areas:

- **Integrative Annotation:** Includes standardized data annotation and analysis, providing comprehensive information for researchers and public health authorities.
- **Diverse Functional Modules:** Offers a variety of tools for sequence analysis, phylogenetic tree construction, and more.
- **Dynamic Visualization:** Provides interactive visualizations of evolutionary relationships and temporal changes.
- **Web Services:** Includes a search engine, BLAST alignment, and other web services.

**International Cooperation:** RCoV19 is widely applied by international researchers, supporting the global study of the evolution, monitoring, and origins of SARS-CoV-2.

RCoV19 has been widely applied by international researchers, supporting the global study on the evolution, monitoring, and origins of SARS-CoV-2.

目前，RCoV19已收录新冠病毒序列超1200多万条，为全球181个国家的200多万用户提供服务，国际用户占比高达60%以上，数据下载量超71亿，数据集相关论文累计被引430余次。在助力国际抗疫中，与美国国家生物技术信息中心共同共享世界新冠病毒基因组数据库、科研策略与技术，与世界卫生组织、国家生物信息中心等单位合作，搭建了国际疫情信息共享平台，为国际疫情防控提供了有力支撑。“我们将继续发挥中国科研优势，为全球新冠疫情防控提供科技支撑，参与国际抗疫合作。”
RCoV19 has been globally acknowledged, promoting the influence in this field.

A white paper entitled “Fighting COVID-19: China in Action” was published by the State Council of China in June 2020. The research was recognized as one of the top ten achievements in bioinformatics in China in 2020, and one of the scientific highlights of the Chinese Academy of Sciences in 2021. It was also selected for inclusion in the Belt and Road Innovation Development Report 2021. The team was recognized by the Ministry of Science and Technology of China in 2021 as an “Excellent Group for Fighting COVID-19” by over 20 international institutions with web sites on their websites, including the US National Institutes of Health, Elsevier Publishing Group, and the National Biotechnology Center of Korea, which has greatly enhanced its international influence in this field.
银河麒麟高级服务器操作系统
Kylin Advanced Server OS V10

麒麟软件有限公司
KylinSoft

引言

银河麒麟高级服务器操作系统 V10 是针对行业级关键业务，适应虚拟化、云计算、大数据、人工智能，工业互联网时代对自主可控、安全韧性、高性能、扩展性和实时性的需求，根据 CMMI 5 级成熟度体系，研发过程符合 CMMI 5 级管理体系，提供安全、高效、易管理的新一代自主服务器操作系统。

Introduction

In the era of virtualization, cloud computing, big data, artificial intelligence, and the industrial internet, Kylin Advanced Server OS V10 meets the demands of corporate-level critical businesses in terms of reliability, security, performance, scalability, and real-time performance of the host system. As a result of its development in accordance with Protection Level 4 and the CMMI management system, it provides endogenous safety and security, reliable cloud-native functionality, and enjoys high performance and manageability.

openKylin(开放麒麟) 中国首个桌面操作系统社区

openKylin community is China's first real community of desktop operating system.

openKylin(开放麒麟) 社区是由麒麟软件有限公司主办成立的桌面操作系统社区，旨在“共创”为核心，以“开源魅力，共创未来”为社区理念，在开源、自愿、平等、协作的基础上，通过开放、平等的社区协作，构建桌面操作系统社区顶级社区，推动 Linux 开源技术及其软硬件生态繁荣发展。

开源人才培养

Open source talent training

高校师生作为最有活力的技术群体之一，是未来开源发展的重要力量。KylinSoft 作为中国开源社区的重要力量在在未来将发挥重要的作用。

开源人才培养

KylinSoft Corporation (KylinSoft) is the primary developer of openKylin, the root community of desktop operating systems. Through the concept of joint creation and "passing strength with open source and creating is better future," it intends to create a top-tier community of desktop operating systems in order to facilitate a prosperous development of Linux. In open source and exclusive community cooperation based on principles such as code source, voluntariness, equality, and collaboration.

openKylin 的社区目标是打造“产业主导、平权自主、技术先进、生态丰富”的桌面操作系统顶级社区，自 2022 年 6 月 openKylin 社区成立以来，积极推出社区建设，目前已有 50+ 企业加入社区，包括操作系统厂商、CPU厂商、GPU厂商、BIOS厂商、软件厂商等，覆盖了行业 50% 的头部企业。成立了 29 个社区 SIG 组，从多维度推动社区繁荣发展，打造开源操作系统创新生态。

It is the objective of the openKylin community to establish itself as a rooted community of desktop operating systems that are dominant in the industry, platform-independent, technologically advanced, and ecosystem-friendly. There has been a concerted effort to propel the development of this community since it was established in June 2022. As of today, 50+ enterprises (including manufacturers of operating systems, CPUs, GPUs, complex machines, software, etc.) have joined the community, representing 50% of the leading enterprises in the industry. There are 29 community SIGs that have been formed to promote the prosperous development of the community from a variety of perspectives and to build an innovative ecosystem for open source operating systems.

在未来的 Kylin 社区中，将建立高校师生社区，通过互动交流、学习共享、项目众筹、实践创新，联合多维度研究发展方向，持续人才第一的理念，探索中国操作系统行业人才培养新模式。