

CONTENTS

ZTE COMMUNICATIONS March 2021 Vol. 19 No. 1 (Issue 73)

Special Topic

Energy Consumption Challenges and Prospects on B5G Communication Systems

Editorial 01

GE Xiaohu, YANG Yang

Saving Energy for Wireless Transmission: An Important Revelation from Shannon Formula 02

To develop the energy-saving technologies for future wireless transmissions and networks, this paper presents two basic study points: The multiple events are merged into a single event; The high-order mode is changed to the low-order mode. For this reason, the authors seek that multiple events in wireless transmission links are fused into a single event from Shannon formulas. The authors also analyze the relationship between the information modulation and the error correction, and give a fusion structure of error-corrected modulation. The results of numerical analysis demonstrate the wireless energy saving methods for wireless systems based on Shannon formulas are the achievable efficient schemes.

ZHU Jinkang, ZHAO Ming

Efficient Network Slicing with Dynamic Resource Allocation 11

With the rapid development of wireless network technologies and the growing demand for a high QoS, the effective management of network resources has attracted a lot of attention. Specifically the authors reduce the time consumed for routing by slicing, but the routing success rate after slicing is reduced compared with the unsliced case. In this context, the authors propose a two-stage dynamic network resource allocation framework that first makes decisions on the slices to which flows are assigned, and coordinates resources among slices to ensure comparable routing success rate as in the unsliced case, while taking advantage of the time efficiency gains from slicing.

Ji Hong, ZHANG Tianxiang, ZHANG Kai, WANG Wanyuan, WU Weiwei

20 Enabling Energy Efficiency in 5G Network

This paper introduces NR cell switching on/off schemes in 3GPP to achieve energy efficiency in 5G RAN, including intra-system ES scheme and inter-system ES scheme. Additionally, NR architectural features including CU/DU split and dual connectivity are also considered in NR energy saving. How to apply artificial intelligence application in 5G networks is a new topic in 3GPP, and the authors also propose a machine learning based scheme to save energy by switching off the cell selected relying on the load prediction. According to the results of experiments in the real wireless environment, the ML based ES scheme can reduce more power consumption than the conventional ES scheme without load prediction.

LIU Zhuang, GAO Yin, LI Dapeng, CHEN Jiajun, HAN Jiren

30 Cluster Head Selection Algorithm for UAV Assisted Clustered IoT Network Utilizing Blockchain

An unmanned aerial vehicle (UAV) network assisted clustered IoT system is proposed, and a corresponding UAV cluster head (CH) selection algorithm is designed. In this scheme, UAVs are selected as CHs to serve IoT clusters. The proposed CH selection algorithm considers the maximal transmit power, residual energy and distance information of UAVs, which can greatly extend the working life of IoT clusters. Through Monte Carlo simulation, the key performance indexes of the system, including energy consumption, average secrecy rate and the maximal number of data packets received by the base station (BS), are evaluated. The simulation results show that the proposed algorithm has great advantages compared with the existing CH selection algorithms.

LIN Xinhua, ZHANG Jing, LI Qiang

Submission of a manuscript implies that the submitted work has not been published before (except as part of a thesis or lecture note or report or in the form of an abstract); that it is not under consideration for publication elsewhere; that its publication has been approved by all co-authors as well as by the authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors hand over the transferable copyrights of the accepted manuscript to *ZTE Communications*; and that the manuscript or parts thereof will not be published elsewhere in any language without the consent of the copyright holder. Copyrights include, without spatial or timely limitation, the mechanical, electronic and visual reproduction and distribution; electronic storage and retrieval; and all other forms of electronic publication or any other types of publication including all subsidiary rights.

Responsibility for content rests on authors of signed articles and not on the editorial board of *ZTE Communications* or its sponsors.

All rights reserved.

CONTENTS

ZTE COMMUNICATIONS March 2021 Vol. 19 No. 1 (Issue 73)

Green Air-Ground Integrated Heterogeneous Network in 6G Era 39

The integration of aerial network and terrestrial network has been an inevitable paradigm in the 6G era. However, energy-efficient communications and networking among aerial network and terrestrial network face great challenges. This paper is dedicated to discussing green communications of the air-ground integrated heterogeneous network. The authors first provide a brief introduction to the characteristics of AGIHN in 6G networks, and then analyze the challenges of green AGIHN from the aspects of green terrestrial networks and green aerial networks. Finally, several solutions and key technologies to the green AGIHN are discussed.

WU Huici, LI Hanjie, TAO Xiaofeng

Kinetic Energy Harvesting Toward Battery-Free IoT: Fundamentals, Co-Design Necessity and Prospects 48

This paper gives a brief introduction to the configurations and basic principles of practical Kinetic energy harvesting IoT systems, including their mechanical, electrical, and computing parts. Although there are already a few commercial products in some specific application markets, the understanding and practice in the co-design and optimization of a single KEH-IoT device are far from mature, let alone the conceived multiagent energy-autonomous intelligent systems. Future research and development of the KEH-IoT system beckons for more exchange and collaboration among mechanical, electrical, and computer engineers toward general design guidelines to cope with these interdisciplinary engineering problems.

LIANG Junrui, LI Xin, YANG Hailiang

Review

Next Generation Semantic and Spatial Joint Perception—Neural Metric-Semantic Understanding 61

The author attempts to summarize the recent trends and applications of neural metric-semantic understanding. Starting with an overview of the underlying computer vision and machine learning concepts, he discusses critical aspects of such perception approaches. Specifically, the emphasis

is on fully leveraging the joint semantic and 3D information. Later on, many important applications of such perception capability such as novel view synthesis and semantic AR contents manipulation are also presented. Finally, the author concludes with a discussion of the technical implications of such technology under a 5G edge computing scenario.

ZHU Fang

Research Paper

72 Integrating Coarse Granularity Part-Level Features with Supervised Global-Level Features for Person Re-Identification

A robust coarse granularity part-level network for person Re-ID, which extracts robust regional features and integrates supervised global features for pedestrian images is proposed. CGPN gains two-fold benefit toward higher accuracy for person Re-ID. On one hand, CGPN learns to extract effective regional features for pedestrian images. On the other hand, CGPN learns to extract more accurate global features with a supervision strategy. The single model trained on three Re-ID datasets achieves state-of-the-art performances.

CAO Jiahao, MAO Xiaofei, LI Dongfang, ZHENG Qingfang, JIA Xia

82 Adaptability Analysis of Fluctuating Traffic for IP Switching and Optical Switching

This paper establishes a multi-layer network architecture through Clos network model and discusses the impacts of maximum allowable blocking rate and service bandwidth standard deviation on CAPEX of IP network and OTN network to find CAPEX demarcation point in different situations. As simulation results show, when the bandwidth deviation mean rate is 0.3 and the maximum allowable blocking rate is 0.01, the hardware cost of OTN switching will exceed IP switching as the average bandwidth is greater than 6 100 Mbit/s. When the service bandwidth fluctuation is severe, the hardware cost of OTN switching will increase and exceed IP switching as the single port rate is allowed in optical switching. The increasing of maximum allowable blocking rate can decrease the hardware cost of OTN switching. Finally, it is found that Flex Ethernet (FlexE) can be used to decrease CAPEX of OTN switching greatly at this time.

LIAN Meng, GU Rentao, JI Yuefeng, WANG Dajiang, LI Hongbiao

Serial parameters:CN 34-1294/TN*2003*q*16*90*en*P*¥ 20.00*2200*10*2021-03

Statement

This magazine is a free publication for you. If you do not want to receive it in the future, you can send the "TD unsubscribe" mail to magazine@zte.com.cn. We will not send you this magazine again after receiving your email. Thank you for your support.