

# **HotICN 2020**

2020 3<sup>rd</sup> International Conference on Hot Information-Centric Networking



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## Welcome Address

It is our great pleasure to invite you to attend the 2020 3nd IEEE International Conference on Hot Information-Centric Networking (HotICN), which is held in Hefei, China between Dec. 12 and 14, 2020.

HotICN 2020 consists of four tracks: Information-Centric Network, Space-Ground Integrated Network, Network Intelligence and Testbed for ICN and Blockchain, obtaining technical sponsor from the IEEE Communications Society (ComSoc). Since HotICN 2018 in Shenzhen, future network including ICN has made new progress both in research and standardization. Prof. Lajos Hanzo from University of Southampton, UK, a Fellow of the Royal Academy of Engineering (FREng), Prof. Yunjie Liu from Beijing University of Posts and Telecommunications (BUPT), a Member of the China Academy Engineering and the Director of Purple Mountain Laboratories, Prof. Zhaoxiang Huang from China Electronics Technology Group Corporation will give keynote speeches on this conference. Many distinguished young scholars will also present their latest work. Especially, a future network development forum will be held, providing a platform for the attendees to share and discuss thoroughly their creative ideas and even radical point views.

The conference is organized by the University of Science and Technology of China (USTC). We wish to express our sincere appreciation to all committee members and other individuals who have contributed to the HotICN 2020 in various ways!

Hefei, the capital city of Anhui province, has a history of more than 2,000 years, well known as "a historic site famous from the Three Kingdoms Period and the hometown of Lord Bao". It is a beautiful city, to its southeast lies the Chaohu Lake with a vast expanse of blue water, to its north is the Huaihe River and to its south flows the Yangtze River. Hefei has entered a fast track for its economic and social development. The city attracts a large number of visitors from home and abroad.

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We wish you a successful conference and enjoyable experience in Hefei, China!

Conference Organizing Committees Heifei, China

# Hoti©N — / — AGENDA OVERVIEW

**Onsite Part** 

	Time	Event		Venue
Dec. 12 <sup>th</sup>	09:00-17:00	Registration & Conference	e Kits Collection	Lobby of the hotel <书法大厦大厅>
	18:00-20:00	Conference Committe	Conference Committee Reception	
	Time	Event		Venue
		MC: Prof. Feng Wu	I	
	University of Science and Technology of China, China			
	09:00-09:42	Opening Ceremony		
	09:42-09:55	Group Photo on	1 <sup>st</sup> floor	
		MC: Prof. Jian Yan	g	
Dec.13 <sup>th</sup>	Universit	ty of Science and Technology	of China, China	
Morning	09:55-10:35	Plenary Speech I- Pro	of. Yunjie Liu	Building (北计士库和响车 D)
	10:35-10:50	Coffee Brea	ak	(书法入厦和吗门 D)
	10:50-11:30	Plenary Speech II- Senior Engin	eer Zhaoxiang Huang	
	11:30-12:20	Plenary Speech III- Pro	f. Lajos Hanzo	
	12:05-13:00	Lunch		
		Take Bus to Institute of Advanced		Technology
	13.15-14.00	University of Science and Technology of China f		or Afternoon Presentation
	Time	Event	Papers	Venue
	14:00-15:50	Session I- Information	H002; H007; H006;	
		Centric Networking (ICN)	H008; H019; H009;	2 <sup>nd</sup> Floor-Meeting Room 213
		Session Chair: Bing Li	H003	
		Special Event-未来网络试验设施项目建设四方会议		Ath Floor Meeting Room 417
	14:00-17:00	Session Chair: Tao Huang		
		Special Event-ICN Security Forum		4 <sup>th</sup> Floor-Meeting Room 416
Dec.13 <sup>th</sup>		Session Unair: Ha	iyong Xie	
Afternoon	15:55-17:45	Centric Networking (ICN)	H021; H045; H065;	2 <sup>nd</sup> Floor-Meeting Room 213
		Session Chair: Yi Zhu	11012, 11034, 11040	
	16.00 17.15	Session III- Blockchain	H018; H029; H061;	3 <sup>rd</sup> Floor Meeting Room 319
	10.00 17.10	Session Chair: Hao Guo	H032; H041	
	17:50-18:25	Lab VisitingCENI-HeFei Host: Xiaobin Tan		ei
	18:30-19:00	Take Bus to Chinese Calligraphy Building for Dinner		ding for Dinner
	19:00-20:30	Banquet		

## Virtual Part

D 4 oth	Time	Event		
Dec. 12"	09:00-18:00	Online Testing (Zoom ID: 692 5570 2871)		
	Time	Event	Papers	
Dec. 14 <sup>th</sup>	10:00-11:45	Session IV: Blockchain & Network Intelligence and Testbed for ICN Session Chair: Xinghua Liu	H060; H039; H053; H064; H028; H022; H010	
	14:00-15:20	Plenary Speech Re-play		
	15:40-17:25	Session V: Information Centric Networking (ICN) Session Chair: Yongyi Ran	H014; H015; H017; H047; H024; H020; H023	
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## **CONFERENCE COMMITTEE**

#### **General Chairs**

Lajos Hanzo, University of Southampton, UK Feng Wu, University of Science and Technology of China, China

#### **Executive Chair**

Jian Yang, University of Science and Technology of China, China

#### **Steering Committee**

Lixia Zhang, University of California, Los Angeles (UCLA), USA Yanyong Zhang, University of Science and Technology of China, China Haiyong Xie, University of Science and Technology of China, China Kai Lei, Peking University, China

#### **Technical Program Chairs**

Mingwei Xu, Tsinghua University, China Hongbin Luo, Beihang University, China Tao Huang, Beijing University of Posts and Telecommunications, China Jiangtao Luo, Chongqing University of Posts and Telecommunications, China Xiaobin Tan, University of Science and Technology of China, China

#### Technical Program Committee (in alphabetical order)

Chi Zhang, University of Science and Technology of China, China Cliff Zou, University of Central Florida, China Guoqiang Zhang, Nanjing Normal University, China, China Han Hu, Beijing Institute of Technology, China Hancheng Lu, University of Science and Technology of China, China Hitoshi Asaeda, NICT, Japan Huasen He, University of Science and Technology of China, China Jianming Liu, University of Science and Technology of China, China Kai Wang, Harbin Institute of Technology, China Kaiping Xue, University of Science and Technology of China, China Keping Yu, Waseda University, Japan Laizhong Cui, Shenzhen University, China Lei Lei, Neng Lian Tech Ltd., China Lingbo Wei, University of Science and Technology of China, China Liu Yuan, China Academic of Electronics and Information Technology, China Manzoor Ahmed khan, Technology University BERLIN, Germany

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Quan Zheng, University of science and technology of China, China Rui Hou, South-Central University for Nationalities, China Ruidong Li, National Institute of Information and Communications Technology (NICT), Japan Shuangwu Chen, University of Science and Technology of China, China Wang Yang, Central South University, China Wei Zhang, The University of New South Wales, USA Xiaofeng Jiang, University of Science and Technology of China, China Xiaoyan Hu, Southeast University, China Xinggong Zhang, Peking University, China, China Xinhong Hei, Xi'an University of Technology, China Yang Liu, China Academic of Electronics and Information Technology, China Ye Yang, Stevens College, USA Yi Wang, South University of Science and Technology of China, China Yi Zhu, Jiangsu university, China Yongqi Ran, University of Science and Technology of China, China Yuki Koizumi, Osaka University, Japan Zhuhua Liao, Hunan University of Science and Technology, China Zhuo Li, Tianjin University, China

# **Conference Venue**

For Dec. 12 & Dec. 13 morning

### Chinese Calligraphy Building

中国书法大厦

Address: No.69 Kexue Avenue, Hefei, Anhui, China 中国安徽省合肥市科学大道 69 号



Chinese Calligraphy Building is sponsored by Chinese Calligrapher's Association. It is born in the new era when the Chinese nation is striving to realize the Chinese Dream of the rejuvenation of the great nation. It is another landmark calligraphy building in China following Orchid Pavilion and the Stele Forest Xi'an in the history of Chinese Calligraphy.

中国书法大厦由中国书法家协会批准冠名诞生于中华民族实现伟大民族复兴中国梦的新时代是中国书法史 上继兰亭 、 西安碑林之后的又一座中国书法标志性建筑 。

### Location <地理位置>

- ♦ 20KM, approximately 40 minutes by car to Hefei South High Speed Railway Station
- ♦ 18KM, approximately 40 minutes by car to Hefei Railway Station
- ♦ 33KM, approximately 40 minutes by car to Hefei Xinqiao International Airport
- ◆ 距合肥高铁南站 20 KM, 车程约 40 分钟
- ◇ 距离合肥站 18KM, 车程约 45 分钟
- ◇ 距合肥新桥国际机场约 33 KM, 车程约 45 分钟

### Accommodation Booking (团定价格)

Group Rate: 350CNY/night (Breakfast included)

### **Booking Contact**

Conference Secretary | Tel: 13541382102 (Before Dec.9)

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For Dec. 13 Afternoon

#### Institute of Advanced Technology, University of Science and Technology of China

https://iat.ustc.edu.cn/research-introduction/17.html

Address: Hefei National Hi-tech Industrial Development Zone, No. 5089 Wangjiang West Road, Hefei, China

#### 会议地点:中国科学技术大学先进技术研究院1号嵌入式研发北楼

#### 会议室安排:

时间	分会主题	地点
14:00-15:50	Session I- Information Centric Networking (ICN)	2 楼会议室 213
14:00-17:00	Special Event-未来网络试验设施项目建设四方会议	4 楼会议室 417
	Special Event-ICN 安全分论坛	4 楼会议室 416
15:55-17:45	Session II-Information Centric Networking (ICN) Session	2 楼会议室 213
16:00-17:15	Session III- Blockchain	3 楼会议室 319

The Institute of Advanced Technology, University of Science and Technology of China (IAT, USTC; Chinese: 中国科学技术大学先进技术研究院) is a research institute affiliated with the University of Science and Technology of China (USTC) and located in Hefei, Anhui, China. It was jointly founded by Anhui provincial government, the Chinese Academy of Sciences, Hefei municipal government and the USTC in 2012.



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### **Oral Presentations Onsite**

- **Timing:** a maximum of 15 minutes in total, including speaking time and discussion. Please make sure your presentation is well timed and arrive at the designated conference room 15 minutes earlier.
- You can use USB flash drive (memory stick) and make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
- It is suggested that you email a copy of your presentation to your personal inbox as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.
- Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.
- Videos: If your Power Point files contain videos please make sure that they are well formatted and connected to the main files.

### Oral Presentations Online

- To effectively control the time and avoid some unexpected situations, it's advised to test your presentation ahead of time to make sure it can be proceeded normally.
- Each presentation is a maximum of 15 minutes in total, including Q&A, please make sure your presentation is well timed.
- For zoom skills, you can visit: Please visit: https://support.zoom.us/hc/en-us/articles/201362033-Getting-Started-on-Windows-and-Mac.
- Link for mainland China to download: <u>www.zoom.com.cn/download</u>
- Link for other countries except mainland China to download: <u>https://zoom.us/support/download</u>

#### Voice Control Rules during the Presentation

- The host will mute all participants while entering the meeting.
- The host will unmute the speakers' microphone when it is turn for his or her presentation.
- Q&A goes after each speech, the participant can raise hand for questions, the host will unmute the questioner.
- After Q&A, the host will mute all participants and welcome next speaker.

### Dress Code

• Please wear formal clothes or national characteristics of clothing.





Yunjie Liu A Member of the China Academy Engineering Purple Mountain Laboratories, China

Liu Yunjie, a Member of the China Academy Engineering, is now the Director of Purple Mountain Laboratories, Director of Jiangsu Future Networks Institute, and Head of School of Information and Communication Engineering in Beijing University of Posts and Telecommunications (BUPT). He was honored a Special Contribution Award for "Persons of the Year 2014 for China's Internet". Mr. Liu took a leading role in the design, construction and operation of the national public data network and high-speed broadband, which laid an important foundation for the construction of information society in China. He has received a first grade National Prize for Progress in Science & Technology, and twice received the first grade Ministerial Prize for Progress in Science & Technology.

#### Speech Title: Challenges and Technique Trends for Future Networks

Abstract: It is expected that by 2030, the Internet needs to support trillion-level, human-machine, all-timespace, safe, and intelligent connections and services. Meanwhile, innovative applications, such as 4K/8K, AR/VR, Industrial Internet, Internet of Vehicles, and Space Network, also pose new challenges, such as higher speeds & lower latency, heterogeneous access, and service-oriented resource allocation. To pave the way for the development of the Internet, this presentation first identifies the vision of society development towards 2030 and the new application scenarios for the future Internet. Then, several typical technologies would be introduced. Finally, an analysis of the development trends and challenges of each technology would be provided. We hope that this presentation can provide references and help for future network research.



黄照祥 高级专家、研究员级高级工程师 中国电子科技集团公司

**黄照祥**,中国电子科技集团公司高级专家、研究员级高级工程师,现任国家科技创新 2030-重大项目副总师,兼 任国家关键领域多个专家组成员。主要从事天地一体化信息网络、网络信息体系总体技术研究,主持完成重大工 程项目和重点研究课题任务 30 余项,在新一代通信系统研发、信息系统顶层设计、复杂系统综合集成、网络信 息体系工程实践等方面取得系列标志性成果,为国家关键信息系统发展做出了基础性贡献。

#### 报告题目:天地一体化网络协议

报告在回顾互联网发展历程的基础上,概要地总结了当前天地一体化网络技术发展背景和形势,然后以工程化的 视角分析了天地一体化网络发展需求及其面临的技术挑战,并从高效组网、按需服务、安全可控等角度,阐述了 天地一体化网络体系结构和协议体系设计,以及空口、组网、传输、安全、管理等关键协议实现的初步思考和问 题关注,以驱动科技创新和工程研制的结合。

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#### Lajos Hanzo

Fellow of the Royal Academy of Engineering (FREng), FIEEE, FIET and EURASIP Fellow University of Southampton, UK

**Lajos Hanzo** is a Fellow of the Royal Academy of Engineering (FREng), FIEEE, FIET and a EURASIP Fellow, Foreign Member of the Hungarian Academy of Science. He holds honorary Doctorates from the University of Edinburgh and the Technical University of Budapest. He co-authored 19 IEEE Press - John Wiley books and 1900+ research contributions at IEEE Xplore. For further information on his research in progress and associated publications please refer to IEEE Xplore.

#### Speech Title: Integrated Ground, Air & Space Systems Would It Ever Work?

Abstract: Since Marconi demonstrated the feasibility of radio trans-missions, researchers have endeavoured to fulfil the dream of flawless tele-presence. At the dawn of the 5G era - are we there yet? Indeed, near-capacity operation at a vanishingly low error-rate is feasible, but at what price? In areas of high traffic-density a high area spectral efficiency is achieved by reducing the cell-size, but how do we cover the tele-traffic hotspots - such as cruise ships - in the middle of the ocean or the planes above them moving at an extremely high velocity?

As a promising system-architecture, an integrated terrestrial, UAV-aided, airplane-assisted as well as satellite-based global coverage-solution and its enabling techniques will be highlighted as a further step towards seamless next-generation service provision, touching upon the following aspects:

1. All the above-mentioned links have different propagation properties and bandwidths at their respective carrier frequencies, hence requiring different enabling techniques.

2. An open scientific challenge is that of striking the most appropriate trade-off amongst the conflicting performance metrics of throughput, transmit power, latency, error probability etc which requires sophisticated multi-component system optimization for finding the Pareto-front of all optimal solutions.

3. Naturally, even if the scientific solutions can be found, substantial regulatory, operational, APEX and CAPEX challenges have to be tackled to achieve these ambitious goals.



## **Invited Speaker**



Xinggong Zhang Peking University, China

**Xinggong Zhang** is currently an Associate Professor with the Wangxuan Institute of Computer Technology, Peking University, Beijing, China. His research interests lie in multimedia networks, video communications, information-centric network. Dr. Zhang used to be a Senior Researcher in Founder R&D Center at Peking University, Beijing, China from 1998 to 2012. He was the recipient of the Second Prize of National Science & Technology Award in 2007, Best Paper Award of PCM 2008 and VCIP 2012.

#### Speech Title: Information-centric TCP Architecture for Terrestrial-Satellite-Integrated Internet

Abstract: TCP is an end-to-end transport protocol of Internet. However, as the physical layer of terrestrial link and satellite link are discrepant, it is still an unsettled problem to design a one-size-fits-all TCP protocol for terrestrial-satellite-integrated network. This paper proposes one novel Information-centric TCP architecture for Terrestrial-Satellite Internet, ICN-TCP, which provides segmented congestion control, in-path packet retransmission and TCP multicast/broadcast. It supports transparent proxy, which connects terrestrial network with satellite network transparently with segmented congestion control. It also has TCP-embedded cache, which recovers lost packets from the nearest TCP cache. It also supports stateless Request-Response transmission, which enables TCP multicast/broadcast. ICN-TCP is specially designed for satellite link with high delay, asymmetric link, frequently handover and unreliable transmission.

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# Morning Schedule on December 13th

### 会议地点:中国书法大厦3楼和鸣厅B

Ċ		<u>R</u>
09:00-09:05		<b>罗喜胜</b> 副校长致欢迎辞
09:05-09:10		王文松常务副市长致开幕辞
09:10-09:15		<b>刘韵洁</b> 院士发言
09:15-09:18		未来网视频播放
09:18-09:23		中国科学技术大学副校长、未来网络试验设施合 肥分中心项目总指挥 <b>罗喜胜</b> 宣布合肥分中心开通
09:23-09:32	吴枫教授主持大会开幕	国家未来网络试验设施合肥分中心开通仪式
09:32-09:42	- Opening Ceremony Host- Prof. Feng Wu	合肥综合性国家科学中心人工智能研究院智能网络联合实 验室揭牌 中国科学技术大学校长助理、合肥综合性国家科学中心人 工智能研究院院长 <b>吴枫</b> ,新华三集团联席总裁、首席技术 官 <b>尤学军</b> 为联合实验室揭牌讲话
09:42-09:55		大会合影(酒店一楼)
09:55-10:35		大会报告-刘韵洁院士 报告主题:Challenges and Technique Trends for Future Networks
10:35-10:50		茶歇
10:50-11:30	杨坚教授主持大会报告	大会报告-黄照祥 报告主题:天地一体化网络协议
11:30-12:20	Plenary Speech Session Host - Prof. Jian Yang	大会报告-Prof. Lajos Hanzo 报告主题:Integrated Ground-Air-Space Networking: Will it work?"
12:20-13:10		午餐
13:15-13:40	酒店	一楼大厅集合前往中科大先进研究院

# Special Event I-四方会议

# 未来网络试验设施项目建设四方会议 仅限邀请嘉宾

主持人:黄韬,江苏省未来网络创新研究院 | 地点:4 楼会议室 417 | 时间:14:00-17:00

主管部门:	
笪艺武	安徽省发展改革委总工、党组成员
朱的娥	安徽省发展改革委科学中心处处长
马胜蓝	安徽省发展改革委科学中心处科员

南京总中心:	
刘韵洁	中国工程院院士、江苏省未来网络创新研究院院长
谭航	江苏省未来网络创新研究院常务副院长
田文科	江苏省未来网络创新研究院副院长
黄韬	江苏省未来网络创新研究院副院长、总工
张玉军	江苏省未来网络创新研究院副院长
鲁子奕	江苏省未来网络创新研究院高级专家
许志坚	江苏省未来网络创新研究院重大项目办主任
张广兴	江苏省未来网络创新研究院团队总监
施吉伟	江苏省未来网络创新研究院团队总监
陶高峰	江苏省未来网络创新研究院大网架构师
王阳	江苏省未来网络创新研究院技术专家
谢人超	北京邮电大学副教授

北京分中心:	
王继龙	清华大学教授
施新刚	清华大学副研究员

合肥分中心:	
吴枫	中国科学技术大学校长助理、未来网络试验设施合肥分中心项目副总指挥
黄方	中国科学技术大学科研部部长、未来网络试验设施合肥分中心项目副总指挥
王峰	中国科学技术大学科研部副部长
薛妍妍	中国科学技术大学科研部重大平台办公室主任
杨坚	中国科学技术大学教授、未来网络试验设施合肥分中心项目首席科学家
谭小彬	中国科学技术大学副教授、未来网络试验设施合肥分中心项目总工
郑 烇	中国科学技术大学副教授、未来网络试验设施合肥分中心项目副总工
卢汉成	中国科学技术大学副教授
陈双武	中国科学技术大学副教授
杨锋	中国科学技术大学副教授
徐正欢	中国科学技术大学先进技术研究院副研究员
施钱宝	合肥综合性国家科学中心人工智能研究院副研究员

深圳分中心:	
王志勤	中国信息通信研究院副院长
马军锋	中国信息通信研究院主任工程师
朱禹涛	金砖国家未来网络研究院(中国分院)院长
刘芷若	中国信息通信研究院工程师
沈琦	深圳信息通信研究院工程师

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特邀报告专家: 陈立全 教授 东南大学网络空间安全学院副院长 报告时间: 14:00-14:30

陈立全,教授,博导,东南大学网络空间安全学院副院长、信息安全研究中心副主任,国家重点研发计划项目首席科 学家,华英青年学者,江苏省科技咨询专家,入选江苏省第九批"六大人才高峰",江苏省"333 高层次人才培养工程"第 三层次培养对象;中国密码学会会员,江苏计算机学会副秘书长、信息安全专委会副主任,江苏省网络空间安全高校 联盟秘书长、《网络与信息安全学报》编委。参与承担并完成了国家重点研发计划、"863"计划、国家自然科学基金、 博士后基金、省部级基金等项目 40 余项,曾获江苏省科技进步三等奖。在国内外重要期刊及 IEEE 国际学术会议上 发表学术论文 80 余篇,其中 SCI/EI 收录近 40 篇,已获得授权发明专利近 20 项,承担系列权威国际期刊和会议的编 审工作。

#### 报告题目:智能机器无人系统的安全与对策

报告简介:随着人工智能、机器学习和硬件集成能力的不断提高,在线的智能机器人接入云网络成为未来的发展 趋势,如何保证无人状态下的智能机器接入安全以及数据安全是未来智能机器跨越发展的关键问题。针对上述问 题,我们提出有效的轻量级双向匿名平台认证机制,以及改进全同态加密及隐私搜索相关算法,有效保证接入安 全和机器云上数据安全。我们也将探讨下一步的发展趋势和对策。



特邀报告专家: 许书彬 博士 中电科网络空间安全研究院副院长 报告时间: 14:30-15:00

许书彬,博士,研究员,中电科网络空间安全研究院副院长,国家重点研发计划项目负责人,长期从事网络安全方面 技术研究工作,作为项目负责人,承担了多项国家重大预研和型号任务,包括重点研发计划项目-智慧城市综合安全免 疫技术研究、多级安全业务隔离技术,网络 x 技术在心理战中的应用,网间安全隔离交换, xx 信令掩护, xx 无线防 护,北斗二代导航地面测控站安全技术等,期间发表高水平学术论文多篇,获发明专利授权 10 项,获省部级技术进 步奖 2 项。

#### 报告题目:网络安全赋能新型智慧城市

报告简介:随着我国城市信息化建设深入推进和信息技术不断发展,数据资源融合共享成为智慧城市建设的必然 趋势,物联网与智慧城市的深度融合发展,在端、云实现更广泛信息服务,也对网络信息安全保障提出了数据受 控共享、异构系统安全互联、安全综合防控的新要求。本议题从智慧城市发展趋势和安全需求出发,梳理智慧城 市网络信息安全的科学问题与技术方向,从城市安全保障体系、异构系统互联、信息安全采集与受控共享、网络 威胁感知处置、网络安全综合防控等几个维度诠释智慧城市网络安全的关键技术,并分享在数据安全建设方面的 实践成果与体会,提出智能城市数据可信共享交换的解决方案。



特邀报告专家: 仲盛 教授 南京大学计算机系副主任 报告时间: 15:20-15:50

仲盛,耶鲁大学博士。曾在美国纽约州立大学布法罗分校任教,获得 NSF CAREER Award,并提前晋升终身教职。 现任南京大学二级教授、博导,计算机系副主任。兼任 IEEE Computer Society 南京分会主席、ACM 南京分会主席。 长江学者特聘教授、国家杰青、国家特支计划(万人计划)科技创新领军人才。多个国际学术期刊编委。江苏省侨联 副主席,省政协委员。

#### 报告题目:浅谈与人工智能有关的若干安全问

报告简介:人工智能技术的快速发展是前所未有的,其带来的安全问题也一样是前所未有的。我们对近期提出的 若干相关问题做个简单回顾,并讨论可能的解决方法。



特邀报告专家: 薛开平 教授 中国科学技术大学 报告时间: 15:50-16:20

薛开平,中国科学技术大学网络空间安全学院,特任教授,博士生导师。中科院青年创新促进会入选会员,IET Fellow, IEEE Senior Member。主要从事未来网络体系架构与传输优化、网络安全和数据隐私保护等方面的研究和开发工作。 在国内外重要期刊和会议发表论文近百篇,含权威 IEEE 期刊长文文 40 余篇。获得 IEEE MSN 2017 和 IEEE HotICN 2019 最佳论文奖,以及 IEEE MASS 2018 最佳论文提名奖,拥有授权发明专利 29 项。近年来主持包 括 3 项国家自然科学基金课题、2 项 JKW 创新特区课题、863 重点项目子课题、重点研发计划项目课题/子课题等在 内的一系列纵向课题,以及十余项企业合作课题。担任 IEEE Trans. Wireless Communications、IEEE Trans. Network and Service Management、Ad Hoc Networks、China Communications 等多个 SCI 期刊的编委,并担任 IEEE JSAC、 IEEE Communications Magazine、IEEE Network 等期刊杂志的客座编委或首席客座编委。

#### 报告题目:未来网络架构中的安全访问控制

报告简介:传统的 C/S 架构、到云数据中心,再到计算/存储/通信一体化的未来网络的发展,实现了用户数据共 享和获取模式的不断改变,也推动了网络体系架构的不断演化和发展,相伴随的用户数据安全访问控制需求与方 式也发生了相应的改变。本次报告将主要介绍计算/存储/通信一体化的未来网络中的安全访问控制方面的问题和 主要工作进展。

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主持人:杨阳朝 中电科深圳网联安瑞公司

杨阳朝,高级工程师,硕士生导师,中国科学技术大学博士,中电科深圳网联安瑞公司总经理。现主要从事网络空间 内容与认知安全技术研究,自 2014 年起担任十余项国家级、省部级科研项目总设计师、副总设计师,牵头开展技术 研发总经费超 10 亿元,多个系统能力及核心技术处在国际前列。牵头构建以技术为主体,社科和媒体相融合的网络 认知安全技术交叉学科科研体系,并开展实际应用部署,取得显著社会效益。核心期刊和 SCI 发表论文 30 余篇,授 权/受理专利 10 余项。



嘉宾:陈剑锋 中国电子科技网络信息安全有限公司

陈剑锋,博士,研究员,研究生导师,中国网安网络空间安全研究院副院长、中国电科青年拔尖人才、四川省科技创 新团队负责人、四川省网络空间安全重点实验室学术带头人,主要研究方向为人工智能、网络安全,主持或参与了国 家多个重大工程、重点研发计划、国防及地方科研项目研制,获省部级科技一等奖3项,申请专利12项、发表论文 近50篇、参与标准制订6项、专著3本。



嘉宾:牛长喜 中电科网络空间安全研究院

牛长喜,博士,高工,主持/参与国家互联网信息办公室项目"网络安全关键技术 XXXX 研究"、中国电科技术创新基金 项目"面向云计算和大数据安全的 XXXX 关键技术"等项目十余项,具备丰富的领域技术前沿跟踪研究和项目总体论证 经验。发表论文 10 余篇,其中 SCI/EI 检索 4 篇。申报国家发明专利 2 项,授权 2 项。现从事网络空间安全领域前沿 技术跟踪研究工作,主笔编写的《网络空间安全领域顶级会议技术成果分析推荐》获得领域院士好评。

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# Parallel Technical Sessions

Dec. 13<sup>th</sup>, 2020

Session I- Information Centric Networking (ICN)

# Session Chair: Bing Li, Shenzhen University, China 2<sup>nd</sup> Floor-Meeting Room 213 | Time: 14:00-15:45

Time	Paper Information
	Intelligent Eco Networking (IEN) III: A Shared In-network Computing Infrastructure towards Future Internet
	Shuokang Huang, Yu Li, Meimei Zhang and Kai Lei
	Peking University
H002 14:00-14:15	Abstract—Intelligent Eco Networking (IEN) makes significant progress to be a shared in-network computing infrastructure towards the future Internet, owing to its value-oriented ideology, content-centric fashion, intelligent collaborative management, and decentralized consensus trust preservation. Comprehensively uniting resources of computing, storage, and network, IEN executes the computing tasks in the network layer with namebased functions, integrating the SDN-like collaborative schedule and coexisting with the current TCP/IP via network slicing. To radually evolve to be an advanced networking ecosystem, IEN copes with ultra-low latency, massive connections, and largescale coverage to sustain the new rising information services. The simple evaluations demonstrate the profound potential of IEN in settling the in-network computing, providing the practical foundation for the multimodal computing paradigm in the future Internet.
	Research on Content Priority-based Caching Strategy in NDMANET
	University of Science and Technology of China
H007 14:15-14:30	Abstract—Most research on NDMANET cache strategy does not take the priority of content into consideration, which will affect the usability of important content in the mobile environment. Aiming at solving this problem, this paper proposes a cache replacement strategy based on content priority. First, the content is prioritized according to the different needs for the availability of different content. Then, the priority of the content is used as a reference factor for cache replacement to make a cache replacement decision, and the goal is to improve the hit rate and availability of important content. At the same time, the simulation results of ndnSIM show that the strategy can significantly increase the number of cached important content without affecting the global hit rate and response delay, thereby improving the availability of important content.
	A Pre-caching Mechanism of Video Stream Based on Hidden Markov Model in Vehicular Content Centric Network
	Lin Yao, <b>Zhaoyang Li</b> , Wenyu Peng, Bin Wu and Weifeng Sun
	Dalian University of Technology
H006 14:30-14:45	Abstract—Vehicular Content Centric Network (VCCN) enjoys advantages in effectiveness and convenience for content distribution among vehicles, by adopting features of Content Centric Networks into Vehicular Ad-Hoc Networks. However, the dynamic topology makes it difficult to establish stable connections. To get a better network performance and user experience, we exploit the user mobility to achieve efficient content distribution in VCCN. In this paper, we propose a mechanism for pre-caching chunks of large content objects such as under the user mobility of the user mobility of the user mechanism for pre-caching chunks of large content objects such as
	videos among RSUS. First, we adopt Hidden Markov Model (HMM) to predict a user's moving

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	trajectory. Based on the time gap from the current location to the predicted location of the mobile user, the corresponding RSU can pre-cache the required video chunks and provide them to the user as soon as he arrives at the predicted location. Simulation results show that our scheme is effective with higher cache hit, lower deliver latency, lower deliver overhead and lower average hops compared to other pre-caching schemes.
	<ul> <li>Triangle Area Based Multivariate Correlation Analysis for Detecting and Mitigating Cache Pollution Attacks in Named Data Networking</li> <li>Muhammad Sohail, Quan Zheng, Zeinab Rezaiefar, Muhammad Alamgeer Khan, Xiaobin Tan, Jian Yang and Liu Yuan</li> <li>University of Science and Technology of China</li> </ul>
H008 14:45-15:00	Abstract— The key feature of NDN is in-network caching that every router has its cache to store data for future use, thus improve the usage of the network bandwidth and reduce the network latency. However, in-network caching increases the security risks - cache pollution attacks (CPA), which includes locality disruption (ruining the cache locality by sending random requests for unpopular contents to make them popular) and False Locality (introducing unpopular contents in the router's cache by sending requests for a set of unpopular contents). In this paper, we propose a machine learning method, named Triangle Area Based Multivariate Correlation Analysis (TAB-MCA) that detects the cache pollution attacks in NDN. This detection system has two parts, the triangle-area-based MCA technique, and the threshold-based anomaly detection technique. The TAB-MCA technique is used to extract hidden geometrical correlations between two distinct features for all possible permutations and the threshold-based anomaly detection technique. This technique helps our model to be able to distinguish attacks from legitimate traffic records without requiring prior knowledge. Our technique detects locality disruption, false locality, and combination of the two with high accuracy. Implementation of XC-topology, the proposed method shows high efficiency in mitigating these attacks. In comparison to other ML-methods, our proposed method has a low overhead cost in mitigating CPA as it doesn't require attackers' prior knowledge. Additionally, our method can also detect non-uniform attack distributions.
H019 15:00-15:15	A Lightweight Verification Mechanism for MPEG-DASH in Named Data Networking Yujia Fan, Yu Tao and <b>Yi Zhu</b> <i>Jiangsu University</i>
	Abstract—Currently, video services have gradually become the body of Internet traffic. As a representative of future Internet architecture, Named Data Networking (NDN) is considered to be a potential solution to video services. But facing heavy traffic scenario, the verification capability of router has been a bottleneck of limiting the performance of NDN. Without effective verification, the content pollution become a serious risk. To solve this problem, this paper focuses on MPEGDASH service, a widely used video streaming service, proposes a lightweight verification mechanism based on pre-cached hash value of requested content (LVM-PHRC) for it. In LVM-PHRC, by pre-caching the hash value of requested target, router can only implement simple hash operation to verify the received data packet, and avoid expensive decryption. Simulation results show that, comparing with traditional verification mechanism, LVMPHRC can significantly enhance the verification capability of router and effectively against the attack of content pollution.
H009	An ICN Cache Pricing Mechanism Based on Non-cooperative Game Model of Users and Advertisers Zheng Quan, <b>Zhang Jiawei</b> , Wu Rong, He Huasen, Tan Xiaobin and Liu Yuan <i>University of Science and Technology of China</i>
нооэ 15:15-15:30	Abstract—To address the problems in end-to-end networks, researchers have proposed an information-centric network (ICN). In-network caching is one of the important features of ICN, which can greatly improve the efficiency of content distribution. However, the Internet Service Providers (ISP) only deploy Innetwork caching if there is some financial incentives. The existing

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		ICN pricing mechanisms only study paid content but ignore free content in the network. In addition, the existing ICN economic models do not take into account ISP cooperating with Content Provider (CP) to deploy in-network caches. Therefore, the pricing mechanisms already in place cannot be applied in practice. In this paper, different from the existing models which based on the paid content, a new ICN pricing model with free content based on non-cooperative game theory was proposed for the first time and advertisers were effectively added to the ICN pricing model. After analyzing the behavioral relationships between entities within the network, the authors establish the utility function for each entity. The authors analyze the impact of caching and pricing on the revenues of all entities and solve the equilibrium point to develop win-win pricing strategies. Considering the case where paid content coexists with free content in real networks, the authors proposes a more realistic and integrated model. In this paper, many experimental analyses have been conducted in addition to the theoretical analysis, and the experimental results show that the new model is closer to reality than the existing models and can provide better theoretical guidance for network pricing.
-		<ul> <li>BFSN: A Novel Method of Encrypted Traffic Classification Based on Bidirectional Flow Sequence Network</li> <li>Xinxin Tong, Xiaobin Tan, Lingan Chen, Jian Yang and Quan Zheng University of Science and Technology of China</li> </ul>
	H003 15:30-15:45	Abstract—With the rapid development of network technology and encryption technology, network security issues have received more and more attention, and network encryption traffic is increasing, which results in a huge challenge for network traffic classification. Combining machine learning algorithms with manual design has become a mainstream approach to solve this problem. However, it requires a large amount of human effort to extract and process features, which depend on professional experience heavily. In this paper, we discuss the essential reason why convolutional neural network (CNN) can deal with the problem of encrypted traffic classification and propose a novel classification framework the Bidirectional Flow Sequence Network (BFSN) based on long short-term memory (LSTM). Compared with the traditional traffic classification scheme, the BFSN is an end-to-end classification model that learns representative features from the raw traffic and classifies them. Moreover, we apply the length and direction information of the encrypted traffic to construct the bidirectional traffic sequence and then process it based on LSTM. Our Experiments gains the excellent accuracy about 91% based the ISCX VPN Non VPN dataset.

## Session II- Information Centric Networking (ICN)

# Session Chair: Yi Zhu, Jiangsu University, China 2<sup>nd</sup> Floor-Meeting Room 213 | Time: 15:55-17:45

Time	Paper Information
	Information-centric TCP Architecture for Terrestrial-Satellite-Integrated Internet Xinggong Zhang Peking University
Invited Speech 15:55-16:15	Abstract—TCP is an end-to-end transport protocol of Internet. However, as the physical layer of terrestrial link and satellite link are discrepant, it is still an unsettled problem to design a one-size-fits-all TCP protocol for terrestrial-satellite-integrated network. This paper proposes one novel Information-centric TCP architecture for Terrestrial-Satellite Internet, ICN-TCP, which provides segmented congestion control, in-path packet retransmission and TCP multicast/broadcast. It supports transparent proxy, which connects terrestrial network with satellite network transparently with segmented congestion control. It also has TCP-embedded cache, which recovers lost packets from the nearest TCP cache. It also supports stateless Request-Response transmission, which enables TCP multicast/broadcast. ICN-TCP is specially designed for satellite link with high delay, asymmetric link, frequently handover and unreliable transmission.
	Edge Cache Replacement Strategy for SVC-encoding Tile-Based 360-degree Panoramic Streaming
	Nanjing Normal University
H021 16:15-16:30	Abstract—In recent years, with the rapid development of virtual reality (VR), 360-degree panoramic video has grown up to become a popular Internet service. Streaming 360-degree video on today's Internet is challenging due to its ultra-high bandwidth and ultra-low motion-to-photon latency requirements. Although some VR solutions use tiling technology and Scalable Video Coding (SVC) encoding for 360-degree video transmission to reduce bandwidth consumption, it is still being challenging to transmit 360-degree video streams from remote content servers due to network latency. Caching popular video content at the edge of the network can decrease network latency and bandwidth consumption by reducing the number of future requests that have to be sent all the way to remote content servers. Because of the limited cache size, it is essential to decide which content to cache and how to replace the cache when the cache size is insufficient. In this paper, we propose an edge cache replacement strategy named Size-Popularity-Layer-FoV strategy (SPLF) for tile-based 360-degree video streaming using SVC. To improve caching performance, every video chunks' cache value is estimated according to its popularity, size, SVC layer and whether it is in FoV. Simulation results manifest that the proposed strategy can not only improve the hit rate and video quality compared to various baseline algorithms, but also decrease the playback stalls and the duration of rebuffering.
	Analysis on Requirements of Software-Defined Satellite Networking with Flow-wise Real-time Control <b>Ran Zhang</b> Jia Shao, Jiang Jiu, Man Ouwang, Hua Ju and Tao Huang
H045 16:30-16:45	Beijing University of Posts and Telecommunications
	Abstract—Massive satellite constellation networks are attracting the attention of academic and industrial communities, and software-defined satellite networks are becoming prevalent for its flexibility in providing convenient, fine-granularity, and optimized control over the network.

	However, in this process, the satellite needs to equip extra buffer and send extra control plane traffic to achieve flexibility, which are precious resources for satellite nodes. In this work, we present an analytical model of the satellite switch buffer and control plane traffic that follows OpenFlow specification, and analyze the hardware requirements for satellite nodes to achieve flexible control. Based on the model, we conduct numerical evaluations, and we try to provide some insight into the satellite network design.
	Programmable Switch Aided Content Popularity Prediction and Caching Strategy <b>Wenji He</b> , Haipeng Yao, Tianle Mai and Mohsen Guizani <i>Beijing University of Posts and</i> Telecommunications
H065 16:45-17:00	Abstract—Content distribution is the most critical task for the current Internet, (e.g., the estimated video traffic will reach 82 percent of the Internet traffic by 2022). With the fast increase of load of the network, the traditional host-centric based network paradigm (i.e., TCP/IP) faces great challenges in terms of efficiency, security, and privacy. To solve the problems confronting the current Internet, the Information-Centric Network (ICN) becomes a promising solution, where the focal point is identified content rather than specific host addresses. This paradigm brings many benefits, e.g., network traffic reduction, low retrieval latency. Besides, benefiting from the advance of programmable network hardware, the operator can reconfigure the network hardware' behavior, thus providing hardware support to describe the ICN instances. However, ICN also poses new challenges to cache management. The cache redundancy and unequal resource allocation will seriously affect the performance of the network. In this paper, we propose a distributed variational Bayes aided content popularity prediction algorithm. The extensive and in-depth simulations are performed to evaluate our proposed algorithm in comparison to the other state-of-the-art schemes. Index Terms—ICN, content popularity, distributed variational.
	Asymmetric Framework Evolution of Named Data Networking and Use Cases in VANET Jiangtao Luo, Lianglang Deng, Junxia Wang and Yongyi Ran
H012 17:00-17:15	Abstract—Named data networking (NDN) has been invented for a decade and has found lots of potential applications. It has also been extensively researched and regarded as one of the most promising architectures of the future Internet. However, at the same time, more and more work noticed its deficiency in time-sensitive applications or under complex scenarios such as vehicular ad-hoc networks (VANET), mainly due to its request-response communication model and binding of Interest and Data path. To address that, in this paper, an asymmetric framework, called aNDN, is proposed to evolve the architecture of NDN, which features decoupling the forwarding of Interest and Data packets as well as supporting both PULL and PUSH models. Furthermore, three basic use cases of aNDN in VANET were conducted, demonstrating its advantages in data transfer efficiency. More importantly, this work first calls for substantial evolution of NDN to fulfill much broader requirements from current and future emerging applications.
	Hierarchical Identity-based Security Mechanism using Blockchain in Named Data Networking <b>Bing Li</b> , Maode Ma and Rong Xia
H034 17:15-17:30	Abstract—Named Data Networking (NDN) with the data-centric design has been viewed as a promising future Internet architecture. It requires a new security model orienting data but not host. In this paper, a Hierarchical Identity-based Security Mechanism by Blockchain (HISM-B) is to be proposed for NDN networks. It could satisfy the two assumptions specified in the NDN testbed to maintain the data-oriented authentication. At one hand, the hierarchical identity-based cryptology is used to bind the data name with the public key and then two signatures are encapsulated in the data packet so that the data source authentication and the integrity of data packet can be supported. At the other hand, a blockchain is employed to manage public keys

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	for different domains to avoid catastrophes due to a single node failure. The validation result shows that the proposed HISM-B is safe.
	EFM: An Edge-Computing-oriented Forwarding Mechanism for Information-Centric Networks <b>Shanshan Shi</b> , Jun Li, Yongmao Ren, Haibo Wu and Jiang Zhi
H040 17:30-17:45	Chinese Academy of Sciences & University of the Chinese Academy of Sciences Abstract—Information-Centric Networking (ICN) has attracted much attention as a promising future network design, which presents a paradigm shift from host-centric to content-centric. However, in edge computing scenarios, there is still no specific ICN forwarding mechanism to improve transmission performance. In this paper, we propose an edge-oriented forwarding mechanism (EFM) for edge computing scenarios. The rationale is to enable edge nodes smarter, such as acting as agents for both consumers and providers to improve content retrieval and distribution. On the one hand, EFM can assist consumers: the edge router can be used either as a fast content repository to satisfy consumers' requests or as a smart delegate of consumers to request content from upstream nodes. On the other hand, EFM can assist providers: EFM leverages the optimized in-network recovery/retransmission to detect packet loss or even accelerate the content distribution. The goal of our research is to improve the performance of edge networks. Simulation results based on ndnSIM indicate that EFM can enable efficient content retrieval and distribution, friendly to both consumers and providers.

Session III- BlockChain

# Session Chair: Hao Guo, Northwestern Polytechnical University, China 3<sup>rd</sup> Floor-Meeting Room 319 | Time: 16:00-17:15

Time	Paper Information
	Data Right Confirmation Mechanism Based on Blockchain and Locality Sensitive Hashing <b>Zhensheng Gao,</b> Lifeng Cao and Xuehui Du <i>He'nan Province Key Laboratory of</i> Information <i>Security</i>
H018 16:00-16:15	Abstract—In the era of big data, the ownership of digital asset has become an important issue that people concern about. Traditional means of data right confirmation adopt the mode of submitting the ownership evidence and authority reviewing, but there are uncontrollable factors such as potential tampering. In order to solve this problem, a data right confirmation mechanism based on blockchain and locality sensitive hashing is proposed. First, blockchain technology is used to handle the matter of trust in data right confirmation, and a user identity management scheme based on Hyperledger Fabric is proposed to ensure the credibility of the identity of the confirmation entity. Secondly, a data fingerprint extraction scheme based on locality sensitive hashing is proposed, and it is used to maintain the consistency of the fingerprints stored on the blockchain and the data disseminated off the blockchain. Finally, the chaincode deployed on Hyperledger is developed to support the submitting, verification and notarization of confirmation transactions. And the security SDK components are developed to interact with the chaincode. The result of experiment shows that this mechanism can effectively discover the infringement of data resources with the appropriate parameters.
H029 16:15-16:30	Continuous Distributed Key Generation on Blockchain Based on BFT Consensus Lei Lei, Chunjia Lan and Le Lin Neng Lian Tech Ltd. Abstract—VSS (Verifiable Secret Sharing) protocols are used in a number of block-chain systems, such as Dfinity and Ouroboros to generate unpredicted random number flow, they can be used to determine the proposer list and the voting powers of the voters at each height. To prevent random numbers from being predicted and attackers from corrupting a sufficient number of participants to violate the underlying trust assumptions, updatable VSS protocol in distributed protocols is important. The updatable VSS universal setup is also a hot topic in zkSNARKS protocols such as Sonic [19]. The way that we make it updatable is to execute the share exchange process repeatedly on chain, this process is challenging to be implemented in asynchronous network model, because it involves the wrong shares and the complaints, it requires the participant has the same view towards the qualified key generators, we take this process on chain and rely on BFT consensus mechanism to solve this. The group secret is thus updatable on chain. This is an enhancement to Dfinity. Therefore, even if all the coefficients of the random polynomials of epoch n are leaked, the attacker can use them only in epoch n+2. And the threshold group members of the DKG protocol can be updated along with the updates of the staked accounts and nodes.
H061 16:30-16:45	Energy-Saving Resource Allocation with Lightweight Blockchain in Maritime Wireless Communication Networks <b>Tingting Yang,</b> Zhengqi Cui, Ruijin Sun, Hailong Feng, Dandan Liang and Nan Cheng <i>Dalian Maritim University</i> Abstract—With the exploration of the ocean resource, establishing an energy-efficient and reliable maritime wireless communication network becomes more and more urgent. In maritime wireless communication networks, data types, such as search and rescue information, business information and surveillance video, will be continuously generated and need to be scheduled and shared. At the same time, there will be some trading needs. How to realize

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	information exchange and ensure safe transactions is an urgent problem to be solved. To this end, this paper aims to establish a distributed network architecture composed of buoys and base stations (BS) at sea, and uses blockchain technology to solve the problem of the completeness of its decentralized network system. To satisfy the computing requirement companied with the blockchain, buoys and BSs in networks also have the computing ability. Due to the fact that buoys deployed in the ocean are hard to be frequently charged, the energy consumption problem is studied in this paper via the joint optimization of the communication resource and computing resource. We combine the weighted shortest processing time first (WSPT) model and the dynamic frequency and voltage scaling (DVFS) energy consumption model to propose an improved energy-saving algorithm. Finally, numerical results verify the superiority of the proposed algorithm.
	Blockchain-enabled Identity Verification for Safe Ridesharing Leveraging Zero-Knowledge
	Wanxin Li. Collin Meese. <b>Hao Guo</b> and Mark Neiad
	Northwestern Polytechnical University
H032 16:45-17:00	Abstract—The on-demand mobility market, including ridesharing, is becoming increasingly important with e-hailing fares growing at a rate of approximately 130% per annum since 2013. By increasing utilization of existing vehicles and empty seats, ridesharing can provide many benefits including reduced traffic congestion and environmental impact from vehicle usage and production. However, the safety of riders and drivers has become of paramount concern and a method for privacy-preserving identity verification between untrusted parties is essential for protecting users. To this end, we propose a novel privacy-preserving identity verification system, extending zero-knowledge proof (ZKP) and blockchain for use in ridesharing applications. We design a permissioned blockchain network to perform the ZKP verification of a driver's identity, which also acts as an immutable ledger to store ride logs and ZKP records. For the ZKP module, we design a protocol to facilitate user verification without requiring the exchange of any private information. We prototype the proposed system on the Hyperledger Fabric platform, with the Hyperledger Ursa cryptography library, and conduct extensive experimentation. To measure the prototype's performance, we utilize the Hyperledger Caliper benchmark tool to perform extensive analysis and the results show that our system is suitable for use in real-world ridesharing applications.
	Chained Tendermint: A parallel BFT Consensus Mechanism
	Lei Lei, Chunjia Lan and Le Lin
H041 17:00-17:15	Abstract—A number of well-known BFT (Byzantine Fault Tolerant) algorithms, such as Tendermint, Casper, HotStuff, and Grandpa, have been developed in recent years to solve the problem of consensus. Of them, Tendermint can ensure instant finality but needs multiple rounds to commit a block. Casper and HotStuff both need a constraint on the direct parent to commit to a block. Grandpa uses ghost function to extract a common block within a vote set, but it is not based on a chained model and does not use signature aggregation to boost performance. We propose a consensus algorithm based on the theories of Tendermint and HotStuff. It is based on the same network model (each message sent out can reach every replica eventually, the adversary can hold it but not forever) and adversary assumption (the adversary can do Byzantine behavior like not proposing block or sending vote, or sending contradictory votes) as in Tendermint, but does not have the feature of instant finality. The result is an increase in throughput, since the blocks are handled in the chained model, the processes of handling each block can overlap.

# **Virtual Sessions**

Dec. 14<sup>th</sup>, 2020

### Session IV- BlockChain & Network Intelligence and Testbed for ICN

Session Chair: Xinghua Liu, Xi'an University of Technology, China Zoom-meeting ID: 692 5570 2871 | Time: 10:00-11:45

Time	Paper Information
H060 10:00-10:15	Blockchain-based Secure Research Collaboration for Sharing and Accessing Scientific Researches Hang Liu and <b>Afnan Alniamy</b> University of Science and Technology of China Abstract—Collaborative scientific research between different scientific groups, even between institutions from different countries in an online service platform is an effective key for successful results. It is essential to create this platform with achieving the concepts of collaborative system scheme as Attribute-based Access Control is great for ensuring the access control management of all stored data. To prevent the centralization service for this system and achieve a strong management, the use of Blockchain technology create strong decentralized environment and provide secure solution for centralized storing issues and with the use of Hyperledger Fabric permission blockchain preserves user's privacy in our system network. We proposed a platform for researchers to connect in collaboration community and providing unique feature as fully control of owners' data, manage access control in fine-grained level, and keep tracking of file updates by applying proof of authorship mechanism and ensure data integrity and
H039 10:15-10:30	Design and Implementation of MobilityFirst Future Internet Testbed Amin Ullah, <b>Xiang Chen</b> and Jian Yang <i>University of Science and Technology of China</i> Abstract— Recently, Future Internet research has attracted enormous attentions towards the design of clean slate Future Internet Architecture. A large number of research projects has been established by National Science Foundation's (NSF), Future Internet Architecture (FIA) program in this area. One of these projects is MobilityFirst, which recognizes the predominance of mobile networking and aims to address the challenges of this paradigm shift. Future Internet Architecture Projects, are usually deploying on large scale experimental networks for testing and evaluating the properties of new architecture and protocols. Currently only some specific experiments, like routing and name resolution scalability in MobilityFirst architecture has been performed over the ORBIT and GENI platforms. However, to move from this experimental networking to technology trials with real-world users and applications deployment of alternative testbeds are necessary. In this paper, MobilityFirst Future Internet testbed is designed and deployed on Future Networks Laboratory, University of Science and Technology of China, China. Which provides a realistic environment for MobilityFirst experiments. Next, in this paper, for MF traffic transmission between MobilityFirst networks through current networking protocols (TCP), MobilityFirst Proxies are designed and implemented. Furthermore, the results and experience obtained from experiments over proposed testbed are presented.
H053 10:30-10:45	Objective-Oriented Resource Pooling in MPTCP: A Deep Reinforcement Learning Approach <b>Chengyuan Huang</b> , Jiao Zhang and Tao Huang <i>Beijing University of Posts and Telecommunications</i> Abstract—The most important benefit introduced by multipath TCP (MPTCP) is its ability of

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	resource pooling. The congestion control algorithm and the packet scheduler in MPTCP work together to consume the pooled network resource of different sub-paths. However, the objectives of a MPTCP congestion control algorithm and a packet scheduler are not always in agreement with each other, which hinders the enhancement of the applications' performance. In this paper, we propose Partner, a distributed Deep Reinforcement Learning (DRL)-based congestion control algorithm in MPTCP. By setting the reward function which is in agreement with the corresponding packet scheduler, Partner can accurately shape the decision space utilized by the packet scheduler, thus unleashing its full power. Our results show that Partner significantly outperforms the state-of-the-art congestion control algorithms in terms of meeting various applications' requirements.	
	Finite-time Synchronization and Identification of Markovian Switching Delayed Networks with Multiple Weights Qian Xie, Duo Guo, Tong Wang, Xiaoping Yang and <b>Xinghua Liu</b> <i>Xi'an University of Technology</i>	
H064 10:45-11:00	Abstract—In this paper, the finite-time synchronization and identification problem is investigated for Markovian switching delayed networks with multiple weighs, where the effects of nonlinear coupling and stochastic disturbances on the networks are considered. In the process of finite-time synchronization, the stability of the networks will be affected by a large number of controlled nodes, and then an effective control method is necessary to design and adopt. Under this control strategy, the finite-time synchronization of the networks is realized, and at the same time, the unknown parameter vector of the networks can also be identified in a finite time. Finally, a representative numerical simulation is provided to further prove the feasibility and applicability of the research content.	
	An Efficient Model for Smartphone Forensics using SMS Spam Filtering	
	Sichuan Police College	
H028 11:00-11:15	Abstract—With the development of smartphones and mobile communication technology, short message service (SMS) has been becoming more and more popular based on the low cost and easy operation. Research data show that more than 95% of mobile users will read their SMS at the end of the day, but about 80 percent of emails are ignored. In practice, SMS might be misused by unscrupulous people, for example, some illegal businessman or companies will employ SMS sending lots of advertising information to make a profit. In the work of smartphone forensics, if various spam messages are stored at people's smartphones, investigators will spend much time and human effort to delete spam. To perform investigation in smartphone efficiently, in this paper, we present a smartphone forensics model that based on machine learning technique to filter SMS spam and segregate the relevance evidence for investigation.	
	High Definition Map Distribution in Named Data Networking Based VANETs <b>Jialun Lu.</b> Wang Yang and Fan Wu	
	Central South University	
H022 11:15-11:30	Abstract—High Definition (HD) map is a key technology for autonomous driving, and how to quickly distribute HD map is an open issue. Named Data Networking (NDN) is an information entric architecture and naturally supporting consumer mobility. NDN shows strong potential in HD map distribution for autonomous driving. However, there are still some problems in the autonomous driving area, such as the use of Vehicle-to-everything (V2X) cooperative communication for map data delivery, and V2X interface handover. In this paper, we propose an NDN HD map distribution scheme based on Vehicle Ad-hoc Network (VANET), which improves the map distribution efficiency in the case of limited bandwidth. The scheme is divided into three parts, a fast content delivery mechanism using multiple data sources, a probabilistic handover strategy for V2X interface handover, and an Interest sending rate control scheme for different interfaces. The evaluations show that the proposed scheme can improve by about 51% of	

	average throughput and reduce up to 50% packet loss.
H010 11:30-11:45	Defense Mechanism of Interest Flooding Attack Based on Deep Reinforcement Learning Jie Zhou, Jiangtao Luo, Lianglang Deng and Junxia Wang <i>Chongqing University of Posts and Telecommunications</i> Abstract—At present, the Internet is facing technical challenges in terms of dynamic, security, and scalability, and its development speed has been difficult to adapt to the explosive expansion of the global network scale. Because of its excellent characteristics, named data networking has been widely concerned by people, and has become the representative architecture of the future network. However, because of the characteristics of stateful forwarding, a new attack method, interest flooding attack, is introduced. The attacker makes a large number of requests to send malicious requests, thus exhausting the PIT table resources in the intermediate router. The interest packet is not cleared until it is out of date, so normal requests cannot be processed. To solve the above problems, we propose a defense scheme of interest flooding attack based on deep reinforcement learning. The agent is trained by collecting the relevant data of some routing nodes. Appropriate action space is designed to enable agents to take different defense measures according to different network states to achieve the purpose of defending IFA. Finally, the PIT entry is introduced into the reward function to evaluate the actions made by the agent. Finally, we compare the number of received packets, the number of retransmissions of interest packet
	and the average request delay of users, and we find that the proposed mechanism can better resist the flooding attacks of interest packets.

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### Session V- Network Intelligence and Testbed for ICN

# Session Chair: Yongyi Ran, University of Science and Technology of China Zoom-meeting ID: 692 5570 2871 | Time: 15:45-17:30

Time	Paper Information
	An Efficient Name Look-up Architecture Based on Binary Search in NDN Networking <b>Jing Deng</b> , Liyue Zhu and Zhengyu Xia <i>Academy of Broadcasting Science</i>
H014 15:45-16:00	Abstract—With the rapid increase in network traffic, IP architecture, which is based on the host- client mode, is becoming inefficient in coping with massive data transmission. Due to the in- network caching characteristic, named data networking (NDN), touted as the next-generation Internet architecture, has been proposed and broadly explored to improve the data forwarding efficiency of various methods, such as multicasting and collaborative caching. The key challenge is how to improve the query speed from the large-scale forwarding information base (FIB) tables. Binary search with hashing can reduce the query time fruitfully. However, a virtual prefix is required to ensure the look-up path, which will cause performance degradation and space occupation. In this paper, we proposed a high-speed query method based on two vectored- Bloom filters (VBFs) and a traditional Bloom filter to optimize the performance. In particular, a Level-VBF stores the longest level of each first component in the FIB tables. A Face-VBF returns the output face of the input prefix. Moreover, the empty node-BF programs the virtual prefix to indicate the correct binary search path. The performance evaluation results demonstrate that the LBS-BF achieves a more than 17% loop-up speed increase compared with that of the hashing binary search algorithm while occupying much less storage space.
	A Barter and Combinatorial Auction Based Hierarchical Resource Trade Mechanism for Cybertwin Network <b>Hui Liang</b> and Wei Zhang <i>Jilin University</i>
H015 16:00-16:15	Abstract—Recently, a cybertwin based cloud-centric network architecture for future generation networks was proposed, which can work in a distributed way through a realtime multi-agent trading platform to allocate hierarchical resource, such as computing, caching, communications resource. The current network operator centralized resource management mechanism, however, cannot sufficiently manage the resource in a flexible manner. In this work, we propose a barter and combinatorial auction based hierarchical resource trading mechanism for cybertwin network. A unified bid language is further presented to express various resource requests and supplies. We formulate the total payoff maximization problem as an integer programming problem. To solve the problem within a polynomial time, we transform it into a minimum cost multi-commodity flow and solve it efficiently. Simulation results show that the proposed model can obtain the optimal solution real-time.
	Cooperative Caching in a Content-Centric Network for High -Definition Map Delivery Jiaxi Liu, <b>Chi Zhang</b> , Yuanyuan Wang, Lingbo Wei and Jianqing Liu
H017 16:15-16:30	Abstract—In autonomous driving, High-Definition (HD) maps are deemed to be indispensable in making up the shortages of the sensor-based perception system of vehicles. Since the contents in HD maps are heterogeneous, complex, and latency-sensitive, the cloud-based delivery method used for lightweight and simple digital navigation maps cannot be applied in the era of HD maps. As the content-centric network (CCN) provides a latency-efficient paradigm for content distribution by decoupling content from the host and pushing contents nearby the users, we

	propose a CCNbased cooperative caching, computing, and request scheduling scheme to support the dissemination of HD map contents. We firstly analyze and clarify the service of HD map dissemination in terms of network requirements. Based on that, we formulate a joint edge caching, computing, and request scheduling problem that aims to minimize the total content access latency of vehicles as an Integer Linear Program (ILP). To conquer the complexity, we decompose the original problem into a cache placement problem and a request scheduling problem, which can be solved in polynomial time, respectively. Finally, we carry out numerical simulations to verify the effectiveness of our proposed scheme. Index Terms—High-Definition Map, Content-Centric Network, Cooperative Caching, Request Scheduling.
	Large-Scale Small Satellite Network Simulator: Design and Evaluation Mengjie Liu, Yongqiang Gui, <b>Jian Li</b> and Hancheng Lu <i>University of Science and Technology of China</i>
H047 16:30-16:45	Abstract—Large-scale small satellite networks are playing an increasing important role in nowadays communication systems, due to its economic prospects and advantages in high bandwidth and low latency. Establishing a satellite network simulation platform for experimental verification of satellite networking and routing mechanisms can effectively reduce deployment costs. However, existing network simulators cannot support large-scale small satellite network simulations well because of the unbearable network simulation overhead or the lack of corresponding satellite simulation modules. In this paper, we introduce a lightweight, integrated large-scale small satellite network simulation platform. With a light simulation engine and abstract mode focused on the network layer, the developed simulation platform can effectively reduce the calculation overhead, increase the network simulation scale (more than 1000 satellite nodes), and finally facilitate low-cost, integrated large-scale small satellite network simulations. Through the integrating satellite orbit calculation module, we also provide a visual interface to display the realtime 2D and 3D simulation results. Furthermore, we provide integrating hierarchical cluster routing, hop-by-hop storage-andforward, as well as reserved interfaces for future customized development. Simulation results demonstrate the effectiveness of our developed simulation platform, which can be used to evaluate the performance of large-scale small satellite network and routing mechanisms.
	SGX-ICN: A Secure and Privacy-Preserving Information-Centric Networking with SGX Enclaves <b>Zhe Yang</b> , Xudong Li, Lingbo Wei and Chi Zhang <i>University of Science and Technology of</i> China
H024 16:45-17:00	Abstract—As the next-generation network architecture, Information-Centric Networking (ICN) has emerged as a novel paradigm to cope with the increasing demand for content delivery on the Internet. In contrast to the conventional hostcentric architectures, ICN focuses on content retrieval based on their name rather than their storage location. However, ICN is vulnerable to various security and privacy attacks due to the inherent attributes of the ICN architectures. For example, a curious ICN node can monitor the network traffic to reveal the sensitive data issued by specific users. Hence, further research on privacy protection for ICN is needed. This paper presents a practical approach to effectively enhancing the security and privacy of ICN by utilizing Intel SGX, a commodity trusted execution environment. The main idea is to leverage secure enclaves residing on ICN nodes to do computations on sensitive data. Performance evaluations on the real-world datasets demonstrate the efficiency of the proposed scheme. Moreover, our scheme outperforms the cryptography-based method.
H020	The Impact of Chunk Size on Named Data Networking Performance <b>Christos Natsis</b> , Christos-Alexandros Sarros and Vassilis Tsaoussidis <i>Democritus University of Thrace</i>
17:00-17:15	Abstract—Internet usage has evolved during the years towards accessing content, regardless of its location. The Named Data Networking architecture was designed to satisfy that need and replace today's host-centric TCP/IP stack by placing named content at the core of the

December 12<sup>th</sup>-14<sup>th</sup>, 2020

	architecture. In this paper, we provide the first evaluation specifically targeting the impact of packet size in NDN performance. Our results show the impact of chunk sizes is far from negligible; it clearly affects NDN performance as measured by metrics such as throughput, delay, cache hits and cache entry lifetime. Attention should, therefore, be given to the selection of an appropriate chunk size in NDN deployments.	
	Reactivity Enhancement of Cooperative Congestion Control for Satellite Networks <b>Adrien Thibaud,</b> Julien Fasson, Fabrice Arnal, Renaud Sallantin, Emmanuel Dubois and Emmanuel Chaput <i>TéSA Laboratory</i>	
H023 17:15-17:30	Abstract—The new paradigm of Information Centric Network (ICN) proposes a shift from the host-centric model to a content-centric model. This approach, especially well suited to the current Internet's usage, is promising for Satellite Networks. In particular, Named Data Networking (NDN) architecture seems to be a great candidate: it gathers the benefits of Content Delivery Networks (CDN), Peer-to-Peer networks (P2P) and HTTP in the network layer. In this study, we propose to compare the performances of TCP-like congestion control algorithms and our new Cooperative Congestion Control (CCC) approach. CCC is a pace-based multipath and multi-flow aware congestion control. We evaluate those algorithms with simulations on a topology where we place the satellite link on different positions. We show that CCC outperforms window-based algorithms but has still some drawbacks. We thus proposed an enhancement of CCC that corrects the flaws by increasing its reactivity. Simulations results show that the performances on terrestrial scenarios are also enhanced.	

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## Warm Tips

为配合做好疫情防疫工作,保障参会代表的身体健康和生命安全,本次会议将严格按照国家及地方政府最新疫 情防控政策和要求,组织开展安全督检、巡视等疫情防控工作,如实正面地向参会代表宣传新冠疫情防控知识,同 时定时对各区域进行清洁消毒,与相关部门保持密切沟通,请您予以配合。关于疫情防控的说明如下:

- 进入会议区域的所有人员需全程佩戴口罩和代表证,遵守现场秩序及引导,检验健康码(或国家政务服务平台防疫健康信息码)、国务院客户端行程卡。
- ▶ 如您的出发地为中高风险区,或入场前 14 日内途径中高风险区,不建议您现场参会,可参加线上会议。
- > 会议区域、餐厅将根据情况进行限流,如需排队,请您谅解。
- > 如您在会场有发热、咳嗽等不适的状况,请第一时间联系会场工作人员。
- > 请您在现场积极配合做好关于疫情防控的各项工作,共同营造安全、可控、有序的活动现场。

### 会务组联系方式:

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### 参会者在线交流微信群

微信群二维码 7 天有效,失效后可通过论坛会议秘书微信号 13541382102 加群(备注 HotICN2020)



该二维码7天内(12月16日前)有效,重新进入将更新

