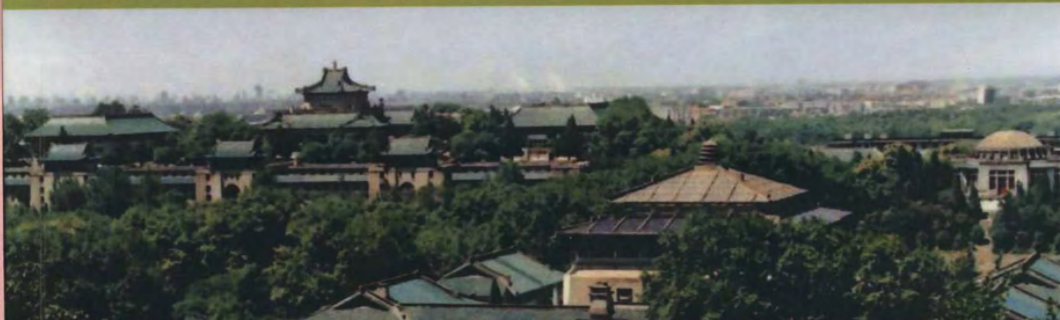


Declaration of Catherine Vassilkova

1. I, Catherine Vassilkova, am an employee of BEADOX LLC ("BEA").
2. I am over the age of 21 and have personal knowledge of the facts contained herein unless otherwise indicated.
3. I have worked in the field of information research and document retrieval for law firms since 2005.
4. I have been with BEA since I established the company in 2019.
5. BEA, based in Silver Spring, MD, conducts research at the District of Columbia federal and local courts, archives, government agencies, and libraries around the world. BEA's services include interlibrary loans, specialized research, article location and delivery, and other document retrieval. One of my responsibilities is to scan textbooks for requesters.
6. BEA specializes in the research and delivery of materials from the Linda Hall Library.
7. On September 24, 2025, I was asked by the requester Morrison and Foerster LLP to obtain a scan from the following book: The First International Conference on Multimedia Information Networking and Security : proceedings : Hubei, China, 17-20 November 2009 (2009) Volume 1.
8. On September 29, 2025, I obtained the requested excerpts including book cover, title page, copyright page, table of contents pages with hand-written date of receipt (March 5 2010), and article "MMSEmail: Delivering Emails to Mobile phone through MMS" on pages 663-666 from The First International Conference on Multimedia Information Networking and Security : proceedings : Hubei, China, 17-20 November 2009 (2009) Volume 1 from the Linda Hall Library. Those excerpts are included as Exhibit 1016.
9. I confirm that the first page of the Table of contents of the scanned book has a hand-written date of receipt of March 5 2010.
10. I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code.
11. Executed on the 1st of October, 2025, in Silver Spring, MD 20910.

Signed:

C. Vassilkova



**17-20
November 2009
Hubei,
China**

The First International Conference on
Multimedia Information Networking and Security

MINES 2009

Volume 1

Organized by



Supported by



Celebrating 125 Years
of Engineering the Future

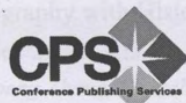


Proceedings

The First International Conference on Multimedia Information Networking and Security

Hubei, China
17– 20 November 2009

Sponsored by
IEEE Wuhan Section
IEEE Signal Processing Society Tainan Chapter



Los Alamitos, California
Washington • Tokyo



TK5105.15
..I5
2009
v.1

Copyright © 2009 by The Institute of Electrical and Electronics Engineers, Inc.

All rights reserved.

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries may photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Other copying, reprint, or republication requests should be addressed to: IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 133, Piscataway, NJ 08855-1331.

The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society, or the Institute of Electrical and Electronics Engineers, Inc.

IEEE Computer Society Order Number P3843

BMS Part Number CFP0996H-PRT

ISBN 978-0-7695-3843-3

Library of Congress Number 2009938338

Additional copies may be ordered from:

IEEE Computer Society
Customer Service Center
10662 Los Vaqueros Circle
P.O. Box 3014
Los Alamitos, CA 90720-1314
Tel: +1 800 272 6657
Fax: +1 714 821 4641
<http://computer.org/cspress>
csbooks@computer.org

IEEE Service Center
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
Tel: +1 732 981 0060
Fax: +1 732 981 9667
[http://shop.ieee.org/store/
customer-service@ieee.org](http://shop.ieee.org/store/customer-service@ieee.org)

IEEE Computer Society
Asia/Pacific Office
Watanabe Bldg., 1-4-2
Minami-Aoyama
Minato-ku, Tokyo 107-0062
JAPAN
Tel: +81 3 3408 3118
Fax: +81 3 3408 3553
tokyo.ofc@computer.org

Individual paper REPRINTS may be ordered at: <reprints@computer.org>

Editorial production by Lisa O'Conner

Cover art production by Alex Torres

Printed in the United States of America by The Printing House



**IEEE Computer Society
Conference Publishing Services (CPS)**

<http://www.computer.org/cps>

3.5.10jb

2009 International Conference on Multimedia Information Networking and Security

MINES 2009

Table of Contents **Volume - 1**

Greetings from the General Chairs - Volume 1	xv
Greetings from the Technical Program Committee Chairs - Volume 1	xvii
Organizing Committee - Volume 1	xix
Keynote Addresses - Volume 1	xxii

Volume 1

Regular Session: Multimedia Security

Fooling Public-Key Watermarking Detectors with Optimal Color Noise	5
<i>Yongdong Wu and Robert H. Deng</i>	
Biometric Based Watermarking in Audio Signals	10
<i>Malay Kishore Dutta, Phalguni Gupta, and Vinay K. Pathak</i>	
Spatial Desynchronization: A Possible Way to Resist Calibration Attack	15
<i>Arijit Sur, Piyush Goel, and Jayanta Mukhopadhyay</i>	
Image Splicing Detection Using Camera Characteristic Inconsistency	20
<i>Zhen Fang, Shuozhong Wang, and Xinpeng Zhang</i>	
Detection of Image Region Duplication Forgery Using Model with Circle Block	25
<i>Junwen Wang, Guangjie Liu, Hongyuan Li, Yuewei Dai, and Zhiquan Wang</i>	
Steganography with Histogram-Preserving and Distortion-Constraining Properties	30
<i>Xinpeng Zhang, Shuozhong Wang, and Weiming Zhang</i>	

A Security Model for VoIP Steganography	35
<i>Zhiwei Yu, Clark Thomborson, Chaokun Wang, Junning Fu, and Jianmin Wang</i>	
Steganalysis Based on Regression Model and Bayesian Network	41
<i>Xiao Yi Yu and Aiming Wang</i>	
Detection of Quantization Data Hiding	45
<i>Xiao Yi Yu and Aiming Wang</i>	
Distortionless Data Hiding Based on Slantlet Transform	48
<i>Sushil Kumar and S.K. Muttou</i>	
Robust Perceptual Image Hash Using Gabor Filters	53
<i>Lina Wang, Xiaqiu Jiang, Donghui Hu, Dengpan Ye, and Shiguo Lian</i>	
Robust Image Copy Detection Using Local Invariant Feature	57
<i>Fuhao Zou, Hefei Ling, Xiaowei Li, Zhihua Xu, and Ping Li</i>	
The Automatic Fuzzy Fingerprint Vault Based on Geometric Hashing: Vulnerability Analysis and Security Enhancement	62
<i>Xiao Qiao Guo and Ai Qun Hu</i>	
A Classification Method of Unstructured P2P Multicast Video Streaming Based on SVM	68
<i>Chaobin Liu, Yuexiang Yang, and Chuan Tang</i>	
Multiple Faces Detection Through Facial Features and Modified Bayesian Classifier	73
<i>Xu Yan and Xiao-Wei Chen</i>	
Special Session 1: Security, Privacy, and Copyright in Multimedia Social Network	
Image Watermarking with Unequal Error Protection Capability	81
<i>Qin Chuan, Mao Qian, and Zhang Xinpeng</i>	
D-S Evidence Theory Based Digital Image Trustworthiness Evaluation Model	85
<i>Donghui Hu, Lina Wang, Yu Zhou, Yang Zhou, Xiaqiu Jiang, and Longfei Ma</i>	
Users' Privacy Issues with E-learning in Library2.0	90
<i>Deng Xiaozhao and Ruan Jianhai</i>	
A Literature Review of Privacy Research on Social Network Sites	93
<i>Xi Chen and Shuo Shi</i>	
Computer-Based Copyright Control System in Social Network and an Ordinal Measure Based on Gray Scale Value	98
<i>Longfei Ma, Dengpan Ye, Shiguo Lian, and Lina Wang</i>	
Application of Case-Oriented Evidence Mining in Forensic Computing	103
<i>Jun Zhang and Lina Wang</i>	
A Privacy Policy Conflict Detection Method Based on Sub-graph Isomorphism	107
<i>Yi Ren, Zhiyong Peng, Fangquan Cheng, and Sipei Guo</i>	

Regular Session: Trusted Computing

A Multi Channel Cognitive MAC Protocol with Efficient Channel Reservation and Collision Avoidance Method	115
<i>Sarah Mustafa Eljack, M. Azhar Igbal, and Wang Furong</i>	
A Mandatory Access Control Model with Enhanced Flexibility	120
<i>Yanfang Fan, Zhen Han, Jiqiang Liu, and Yong Zhao</i>	
A General Trust Model Based on Trust Algebra	125
<i>Wenzhong Yang, Cuanhe Huang, Bo Wang, Tong Wang, and Zhenyu Zhang</i>	
Research on Theory Model of Software Dynamic Trustiness Based on Behavior Integrity	130
<i>Guojun Peng, Fen Tao, Huanguo Zhang, and Jianming Fu</i>	
A Peer-to-Peer Framework for Accelerating Trust Establishment	135
<i>Bailing Liu and Hongwei Lu</i>	
A Portable TPM Scheme for General-Purpose Trusted Computing Based on EFI	140
<i>Lei Han, Jiqiang Liu, Dawei Zhang, Zhen Han, and Xueye Wei</i>	
Security Analysis of OIAP Implementation Based on BAN Logic	144
<i>Xu Shiwei, Zhang Huanguo, Yan Fei, Xu Mingdi, and Li Zhide</i>	
A Model-Based Fuzz Framework to the Security Testing of TCG Software Stack Implementations	149
<i>Yang Yang, Huanguo Zhang, Mi Pan, Jian Yang, Fan He, and Zhide Li</i>	
A Remote Anonymous Attestation Scheme with Improved Privacy CA	153
<i>Li Lixin, Li Chaoling, and Zhou Yanzhou</i>	
A Novel Algorithm for Construction Control Dependence Subgraph	158
<i>Zhe Han and Shihong Chen</i>	
Flexible Attestation of Policy Enforcement for Sensitive Dataflow Leakage Prevention	163
<i>Rong-wei Yu, Li-na Wang, Xiao-yan Ma, and Jin Ke</i>	
Protocol for Privacy-Preserving Set Pattern Matching	168
<i>Qiang Zheng, Shou-shan Luo, Yang Xin, and Yi-xian Yang</i>	
Trust Service Selection in Pervasive Computing	173
<i>Xiaoying Wang, Yingge Chen, and Benlian Xu</i>	
A Capacity Optimization Algorithm for Network Survivability Enhancement	177
<i>Lina Wang, Furong Zhou, Chi Guo, Xiaoying Zhang, and Mo Yang</i>	
Strengthen Military Academy's Information Security Management	182
<i>Liu Qingguo and Zhang Wei</i>	
A Novel Cloud-Based Subjective Trust Model	187
<i>Mo Yang, Lina Wang, and Yuandong Lei</i>	

A Proxy Ring Signature Scheme with Revocable Anonymity from Bilinear Pairings	191
<i>Huaqun Wang</i>	
A New ID-Based Authenticated Key Agreement Between Members of Distinct Domains	195
<i>Song Xia, Juan You, Wenbao Han, and Lei Wang</i>	
A Trusted Bootstrap Scheme on EFI	200
<i>Rui Zhang, Jiqiang Liu, and Shuanghe Peng</i>	
On the Security of a Proxy Ring Signature with Revocable Anonymity	205
<i>Jianhong Zhang and Yixian Yang</i>	
Regular Session: Multimedia Computing and Networking	
Image Similarity: From Syntax to Weak Semantics Using Multimodal Features with Application to Multimedia Retrieval	213
<i>Jukka Perkiö, Antti Tuominen, and Petri Myllymäki</i>	
Weight-Adaptive Interval Neighborhood Graph for Characterizing the Difference in Spatial Relationships Between Objects	220
<i>Zhihui Hu, Howard Leung, and Yun Xu</i>	
Detection of Mouth Movements and its Applications to Cross-Modal Analysis of Planning Meetings	225
<i>Yingen Xiong, Bing Fang, and Francis Quek</i>	
A Novel SAR Images Restoration Using Multiscale SVR	230
<i>Hui Cheng and Hai Han</i>	
Two-Stage Feature Selection Method for Text Classification	234
<i>Xi Li, Hang Dai, and Mingwen Wang</i>	
An Approach for Lane Segmentation in Traffic Monitoring Systems	239
<i>Juncheng Liu and Miaoxin Wang</i>	
A New Accelerated Algorithm of Image Style Study	244
<i>Li Tang, JinYi Chang, Jian Li, and RongWei Yu</i>	
Efficient Distributed Data Collecting Algorithm in Wireless Sensor Networks	249
<i>Rongbo Zhu and Yueyun Shang</i>	
Non-interfering Multipath Geographic Routing for Wireless Multimedia Sensor Networks	254
<i>Bin Fu, RenFa Li, Xiongren Xiao, Caiping Liu, and Qiuwei Yang</i>	
A LDP Fast Protection Switching Scheme for Concurrent Multiple Failures in MPLS Network	259
<i>Jianhui Zhang, Jia Zhou, Jinqiu Ren, and Binqiang Wang</i>	
Forwarding Algorithm Using Prediction and Optimation Theory Over Multipath Network	263
<i>Cai Ling, Jinkuan Wang, Cuirong Wang, Laiquan Han, and Wang Bin</i>	

On Traffic Characteristics and Low-Cost Router Design	268
<i>Xiaohui Zhang, Shuqiao Chen, and Ping Lv</i>	
A Variable Forwarding Equivalence Class for MPLS Networks	273
<i>Laiquan Han, Jinkuan Wang, Cuirong Wang, and Ling Cai</i>	
Priority Based Adaptive Video Transmission Over Ad Hoc Networks	277
<i>Zheng Wan</i>	
Embedded Video Surveillance System Based on H.264	282
<i>Jun-Wei Gao and Ke-Bin Jia</i>	
A New Fast Motion Estimation Algorithm Based on H.264	287
<i>Hong-ye Li, Ming-jun Liu, and Zhi-qiang Zhang</i>	
A Scalable Multicast Scheme for High Definition Streaming Media	291
<i>You-Wei Zhang, Chan-Le Wu, and You-Wei Zhang</i>	
High Efficiency Real Time Rendering for Point-Based Model on GPU	296
<i>Dongjin Huang, Jianliang Lan, Wu Liu, and Youdong Ding</i>	
A New Circle Targets Extraction Algorithm	301
<i>Chen Zhong, Deng He, and Wang Guoyou</i>	
Improvements on IPD Algorithm for Triangular Mesh Reconstruction from 3D Point Cloud	305
<i>Chengjiang Long, Jianhui Zhao, Zhiyong Yuan, Yihua Ding, Yuanyuan Zhang, Lu Xiong, Guozhong Liang, and Xuanmin Jiang</i>	
Morphing 3D Mesh Models Based on Spherical Parameterization	309
<i>Zun-Jian Zhu and Ming-Yong Pang</i>	
Adaptively Up-Sampling Point-Sampled Models	314
<i>Xu-Fang Pang and Ming-Yong Pang</i>	
Research on Application of Network Coding in Hybrid Mesh ALM Model	319
<i>Lian He, Chanle Wu, Jun Yue, Shi Cheng, and Gang Ye</i>	
An Immittance Spectral Frequency Parameters Quantization Algorithm Based on Gaussian Mixture Model	324
<i>Wang Xiaochen, Zhang Yong, Hu Ruimin, and Du Xi</i>	
MFCC Extraction Based on F-Ratio and Correlated Distance Criterion in Speaker Recognition	329
<i>Jian-wei Zhu, Shui-fa Sun, Zhi-ping Dan, and Bang-jun Lei</i>	
Regular Session: Network Security	
On Group Key Management for Secure Multicast Employing the Inverse Element	337
<i>Wen Tao Zhu and Robert H. Deng</i>	
A Secure Certificateless Authenticated Group Key Agreement Protocol	342
<i>Manman Geng, Futai Zhang, and Meng Gao</i>	

CPK-Based Authentication and Key Agreement Protocols with Anonymity for Wireless Network	347
<i>Huifang Hou and Suhua Liu</i>	
Secure ID-Based Proxy Signcryption Scheme with Designated Proxy Signcrypter	351
<i>Xiu-Xia Tian, Jian-Ping Xu, Hong-Jiao Li, Yuan Peng, and An-Qin Zhang</i>	
A Signature Scheme Based Trusted Computing Plat	356
<i>Hongqiang Jiao, Yanjun Zhang, and Hui Li</i>	
Robust and Secure yet Simple Data Collection in WSNs Applying to Marine Gas Turbine	360
<i>Yongbao Liu and Wei Ren</i>	
Broadcast Authentication Scheme Based on Tornado Code for Wireless Sensor Networks	365
<i>Jianmin Zhang, Qingmin Cui, and Xiande Liu</i>	
A Risk Assessment Method Based on Grey Relational Projection in Ad Hoc Networks	370
<i>Fu Cai, Huang Chu, Zhang Yunhe, Han LanSheng, and Peng Bing</i>	
An Improved Identity-Based Encryption Scheme Without Bilinear Map	374
<i>Minghui Zheng, Huihua Zhou, and Guohua Cui</i>	
On a Model of Internet Topology Structure	378
<i>Ye Xu and Zhuo Wang</i>	
Network Worm Propagating Model Based on Network Topology Unit	383
<i>Wei Zhang, Shize Guo, and Kangfeng Zheng</i>	
Modeling Email Worm Propagation Using Game Theory	388
<i>Xin Sun, Yanheng Liu, and Jian Wang</i>	
Modeling the Chaotic Dynamics of Early Worm Propagation	393
<i>Yu Yao, Wei Ying, Fu-xiang Gao, and Ge Yu</i>	
A Novel Multi-level Security Policy Model for Protecting Documents	398
<i>Hui Wang, Zongpu Jia, Bibo Lu, and Zihao Shen</i>	
Strategy Optimization for P2P Security Using BloomFilter	403
<i>Jian-ming Fu, Ying Xu, Hui-jun Xiong, and Wei Wu</i>	
The Denial of Service Attack Analysis of WLAN Authentication Infrastructure	407
<i>Song Yubo, Chen Xi, and Hu Aiqun</i>	
A Novel Computer Virus Detection Method from Ideas of Immunology	412
<i>Jie Zeng and Tao Li</i>	
An Integrated Decision System for Intrusion Detection	417
<i>Ling Wang and Haijun Xiao</i>	
A Novel Anomaly Detection Approach for Executable Program Security	422
<i>Wei Pan, Weihua Li, and Wanxin Zhao</i>	
Applying Attack Graphs to Network Security Metric	427
<i>Anming Xie, Weiping Wen, Li Zhang, Jianbin Hu, and Zhong Chen</i>	

Detection of Insertional Covert Channels Using Chi-square Test	432
<i>Cai Zhiyong, Shen Ying, and Shen Changxiang</i>	

Workshop 3: 2009 International Workshop on Secure Multimedia Communication and Services (SECMCS'09)

The Impact of Dynamic Adversarial Attacks on the Stability of Heterogeneous Multimedia Networks	439
<i>Dimitrios Koukopoulos</i>	
Effects of Cooperation-Based Peer-to-Peer Authentication on System Performance	444
<i>Esther Palomar, Arturo Ribagorda, Juan E. Tapiador, and Julio Hernandez-Castro</i>	
An IND-CCA2 Secure Key-Policy Attribute Based Key Encapsulation Scheme	449
<i>Changji Wang, Yang Liu, and Jung-Tae Kim</i>	
A Secure Proxy Blind Signature Scheme Based on ECDLP	454
<i>Lanlan Hu, Kangfeng Zheng, Zhengming Hu, and Yixian Yang</i>	
Short Signatures for Multi-source Network Coding	458
<i>Wenjie Yan, Mingxi Yang, Layuan Li, and Huajing Fang</i>	
Research on Secure Digital Content Distribution for Peer to Peer E-commerce Applications	463
<i>Xi Chen and Shiguo Lian</i>	
Modeling Robust Hash from Authentication Code Space View	468
<i>Guangjie Liu, Yuxin Zhao, Zhiquan Wang, and Shiguo Lian</i>	
Coded Fingerprinting Codes Based on Delay Embedding	473
<i>Hongyuan Li, Guangjie Liu, Junwen Wang, Yuewei Dai, and Zhiquan Wang</i>	
An Intra Prediction Mode-Based Video Encryption Algorithm in H.264	478
<i>Jianguo Jiang, Shiyi Xing, and Meibin Qi</i>	
Security Analysis of Content-Based Watermarking Authentication Framework	483
<i>Jinwei Wang, Guangjie Liu, and Shiguo Lian</i>	
Selective Encryption for G.729 Speech Using Chaotic Maps	488
<i>Zhaopin Su, Jianguo Jiang, Shiguo Lian, Donghui Hu, Changyong Liang, and Guofu Zhang</i>	
Special Session 4: Watermarking and Steganography	
Blind JPEG Steganalysis Based on Correlations of DCT Coefficients in Multi-directions and Calibrations	495
<i>Yong Wang, JiuFen Liu, and WeiMing Zhang</i>	
United-Judgment Methods Based on Parameter-Estimation for Image Steganalysis	500
<i>Jicang Lu, Fenlin Liu, Xiangyang Luo, and Chunfang Yang</i>	
Steganalysis Based on Artificial Immune System	505
<i>Dawei Wei and Shishu Zhang</i>	

GA-Based LSB-Matching Steganography to Hold Second-Order Statistics	510
<i>Guangjie Liu, Zhan Zhang, Yuewei Dai, and Zhiquan Wang</i>	
A Novel Reversible Data Hiding Based on Exploiting Modification Direction Algorithm	514
<i>Kang-Kang Chen and Jian-Jun Wang</i>	
The Provable Extracting Security of Information Hiding	519
<i>Jing Liu and Guang-ming Tang</i>	
Spread Spectrum Watermarking: Zero Rate Embedding to High Payload System	525
<i>Santi P. Maity, Claude Delpha, and Amit Phadikar</i>	
A Performance Evaluation of Collusion Attacks in Multimedia Fingerprinting	530
<i>Hui Feng, Hefei Ling, Fuhao Zou, Zhengding Lu, and Jiazhong Chen</i>	
An Algorithmic Aspect of Zernike Moments in the Presence of Rotation	535
<i>Shijun Xiang</i>	
A Novel Multi-logo Image Watermarking Scheme Resisting Geometrical Attacks	540
<i>Han-ling Zhang and Zhi-gang Chen</i>	
Vector Polygon Blind Watermarking Based on Canonical Correlation Analysis	544
<i>Guangling Sun, Zhoubiao Shen, and Huan Chen</i>	
A Semi-fragile Digital Watermarking Algorithm for 2D Vector Graphics Tamper Localization	549
<i>Han-ling Zhang and Ming-ming Gao</i>	
A Novel Double 3D Digital Watermarking Scheme	553
<i>Kong Xiangzeng and Yao Zhiqiang</i>	
Workshop 1: First International Workshop on Network Steganography (IWNS 2009)	
Steganography in Handling Oversized IP Packets	559
<i>Wojciech Mazurczyk and Krzysztof Szczypiorski</i>	
Covert Timing Channel with Distribution Matching	565
<i>Guangjie Liu, Jiangtao Zhai, Yuewei Dai, and Zhiquan Wang</i>	
A Performance Analysis of HICCUPS—A Steganographic System for WLAN	569
<i>Krzysztof Szczypiorski</i>	
Cryptanalysis on Majority-Voting Based Self-Recovery Watermarking Scheme	573
<i>Hongjie He and Jiashu Zhang</i>	
Lightweight Information Hiding in H.264/AVC Video Stream	578
<i>Ke Liao, Dengpan Ye, Shiguo Lian, Zhichuan Guo, and Jinlin Wang</i>	
Image Error Concealment and Quality Access Control Based on Data Hiding and Cryptography	583
<i>Amit Phadikar, Santi P. Maity, and Claude Delpha</i>	

A Reliable Watermarking Algorithm Based on Wavelet Transform for Satellite Images	588
--	-----

M. Abolfathi and R. Amirfattahi

Special Session 3: Internet Based Services

Composite E-services Behavioral Requirements Based on Activity Chain and Their Dynamic Operation Semantics	595
---	-----

Bo Chen, Chungui Li, and Qixian Cai

Data Privacy Preserving Mechanism Based on Tenant Customization for SaaS	599
--	-----

Kun Zhang, Yuliang Shi, Qingzhong Li, and Ji Bian

Performance Analysis of Available Bandwidth Estimation Algorithm Based on EWMA and Kalman Filter	604
---	-----

Jian-hui Zhang and Bin Wang

Modeling and Performance Evaluation of the AoE Protocol	609
---	-----

Chuang He and Wenbi Rao

Study on an Advance Order Tactic in a Two-Echelon Supply Chain	613
--	-----

Jian-hu Cai, Li-ping Wang, and Zu-feng Shao

An Ontology-Based Architecture for Service Discovery	618
--	-----

Yingzi Wang, Xiaolin Zheng, and Deren Chen

Special Session 2: Semantics Based Multimedia Understanding

Color Based Segmentation and Shape Based Matching of Forest Flames from Monocular Images	625
---	-----

*Zhong Zhang, Jianhui Zhao, Zhiyong Yuan, Dengyi Zhang, Shizhong Han,
and Chengzhang Qu*

Learning Hybrid Template by EM-Type Algorithm	629
---	-----

Bin Lai, Deng-Yi Zhang, Cheng-Zhang Qu, Jian-Hui Zhao, and Zhi-Yong Yuan

Ontology for the Object Recognition in Images	633
---	-----

Bin Zheng, Lina Huang, and Xinhai Lu

A Rapid Object Detection Method for Satellite Image with Large Size	637
---	-----

*Youwang Ke, Jianhui Zhao, Zhiyong Yuan, Chengzhang Qu, Shizhong Han,
Zhong Zhang, Xuanmin Jiang, and Guozhong Liang*

Improved Speaker Identification Algorithm Based on Discriminative Weighted Method	642
--	-----

Shaomei Li, Yunfei Guo, and Lixiong Liu

Multi-level Partition of Unity Algebraic Point Set Surfaces	645
---	-----

Chunxia Xiao, Guangpu Feng, Yu Chu, Zhongyi Du, and Xunhua Yang

Regular Session: Multimedia Service Application

QoS Based Parallel File Transfer for Grid Economics	653
<i>Ching-Hsien Hsu, Tai-Lung Chen, and Kun-Ho Lee</i>	
A Proxy-Caching Prefix Assignment Algorithm Based on P2P Cooperation in the Media Streaming System	658
<i>Rui-chun Tang, Qing-lei Wei, and Bin Liu</i>	
MMSEmail: Delivering Emails to Mobile Phone Through MMS	663
<i>Lidong Wang and Liping Qian</i>	
Use Intelligent Mobile Phones in Coal Mine Production and Safety Monitor	667
<i>Qing-xun Ma</i>	
Earthquake Response SMS System Using DBMS	670
<i>Xingmin Shi and Jianxing Wang</i>	
Robust Frame Error Concealment Algorithm for H.264/AVC Wireless Video Applications	675
<i>Min Li and Bo Wang</i>	
Research on the Application of XML in Web Services	680
<i>Chen Zhifeng</i>	
The Study and Application on a Method of Group Decision-Making on Case-Based Reasoning	684
<i>Jing Lin</i>	

Author Index - Volume 1	688
--------------------------------------	-----

MMSEmail: Delivering Emails to Mobile phone through MMS

WANG Lidong

Dept. of R & D

National Computer network Emergency technical
Team/ Coordination Center of China
Beijing, China
e-mail: GMwanglidong@gmail.com

QIAN Liping

Dept. of Computer

Beijing University of Civil Engineering and
Architecture
Beijing, China
e-mail: wangzs@vip.sina.com

Abstract—With the development of mobile communication, there arises the requirement of ubiquitous access to Internet Email service from small screen terminals such as mobile phones and PDAs. This paper proposed a framework, MMSEmail, for delivering Emails to mobile phones through Multimedia Messaging Service (MMS). MMSEmail integrates the functions of Email proxy, content adaptation broker and MMS sender. It not only implements immediate Email delivery by utilizing PUSH mechanism of MMS, but also supports user profile-based content adaptation, spam email filtering and text presentation of Email attachments with special file types as .doc, .rtf and .pdf. Being designed based on the de-facto standards, the framework has great extensibility.

Keywords—MMS; E-mail; mobile communication; PUSH; POP3

I. INTRODUCTION

By December 2008, the data released by MIIT show that the amount of valid mobile phone numbers had reached 641.2 million, among which 253.9 million used mobile packet data services. According to CNNIC, the amount of Chinese netizens surfing the Internet with mobile phones has reached 73.05 million by July 2008, about 28.9% percent of all netizens. The above two statistics show that mobile phone has become one of the most popular means for accessing Internet services, especially for browsing Web pages and processing Emails. Although capabilities of mobile terminals are on the increase, they are still greatly inferior to desktop computers and have various models that quite distinct from computing capability, resolution and color. Email clients for small-screen terminal have been developed and then deployed in some high-end mobile terminals. However, the deficiency in presenting email contents comparing to normal PC, the incapability of processing Email attachments with special file types as .doc, .rtf and .pdf, and the flooding spam emails together cool the enthusiasm of mobile phone users to process email with the limited bandwidth of mobile communication.

Nowadays, Multimedia Messaging Service (MMS) has captured the attention of wireless developers everywhere, especially in China. It allows delivering multimedia content such as text, image, audio, video and their combinations from phone to phone or from Internet applications to phone and increases satisfaction of mobile subscriber user experience.

This paper exploits characteristics of MMS, presented a framework, MMSEmail, for MMS-enabled email presentation. MMSEmail not only implements immediate email delivering by utilizing PUSH mechanism of MMS, but also supports user profile-based content adaptation and text presentation of Email attachments with special file types as .doc, .rtf and .pdf, thus provides an alternative means to present emails on mobile terminals.

The rest of this paper is structured as follows: Section 2 provides an overview of MMS. Section 3 presents the architecture and characteristics of our MMSEmail. Section 4 goes into more depth on content adaptation and section 5 concludes with a summary.

II. MULTIMEDIA MESSAGING SERVICE

A. Architecture of MM

MMS is developed in accordance with 3GPP standards (3GPP TS 23.140 [1]) and WAP Forum standards (WAP-205, 206 and 209 [2-4]). A reference of MMS architecture and a conclusion of its external interfaces are depicted in Fig. 1.

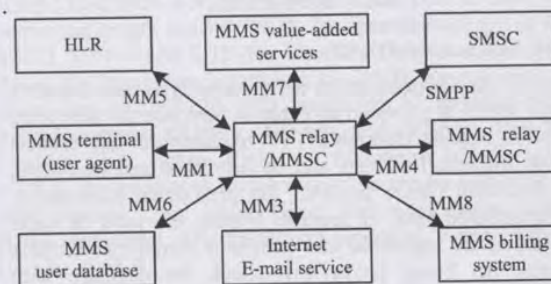


Figure 1. A reference of MMS architecture.

In MMS architecture, the core component is MMS Center (MMSC). The interface between MMSC and other external components can be concluded as follows:

- MM1: the interface between MMS user agent and MMSC. It is used for sending and retrieving multimedia messages (including PULL and PUSH) and for notifying message arrival or delivering report.
- MM2: the interface between MMS Relay and MMSC.

- MM3: the interface between MMSC and external servers (such as e-mail server).
- MM4: the interface between MMSC and other MMS relay servers.
- MM5: the interface between MMSC and HLR.
- MM6: the interface between MMSC and user DB.
- MM7: the interface between MMSC and value-added service (VAS) applications.
- MM8: the interface between MMSC and the billing systems.

B. Sending and Receiving an MM

The following steps provide a general view of transaction flow for delivering a multimedia message (MM) between two mobile phones.

- MM sender invokes a WSP/HTTP POST request to MMSC with the message embedded as the content body.
- MMSC responds to the request, caches the received MM and then informs the receiver that an MM is available. The information conveyed shall include an URI that will be used to actually retrieve the message in a subsequent operation by MM receiver.
- MMS supports message fetch with "immediate retrieval" transaction or "delayed retrieval" transaction. MM receiver initiates the retrieval activity with the specified URI using a WSP/HTTP GET operation. Receiver client can convey its capabilities to MMSC.
- MMSC delivers the specified MM to the receiver.
- The receiver invokes a WSP/HTTP POST operation to confirm having received the MM.
- MMSC sends delivery report to originate sender.

III. MMSEMAIL

A. Architecture of MMSEmail

MMSEmail is designed to deliver emails to mobile phone through MMS. It provided an external interface for accepting adaptation request through HTTP registration. The request contains the email address and its username and password, the destination phone number, the preference information and the expired time of request. During the term of valid registration, the registered user profile is stored into Profiles database. An Email proxy will check the database with regular intervals. If a request is activated, the email proxy acts as the email client, connect to the specified Email server and fetch emails, then pass them to the Content Adaptation Broker. The Broker adapts the submitted email according to rules in Profiles database, converts them to SMIL format and returns them to the Email proxy. The Email proxy then starts to send them each with an MMS to the destination phone. MMSEmail implemented an MMS sender with a GPRS modem and third-party MMS SDK. The generated MM can be sent as real MM and factually presented on the screen of the destination phone. The architecture of MMSEmail is shown in Fig. 2.

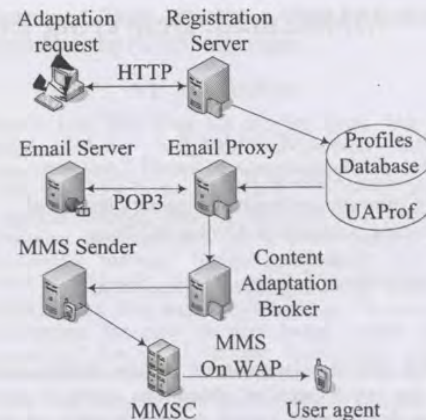


Figure 2. Architecture of MMSEmail.

B. Personalized Aadaptation Support

In order to extend MMSEmail's capability of supporting personalized adaptation, MMSEmail considers two ways to acquire CPI (Capability Preference information) of the receptor: by the specialized User-Agent parameter in registration profile or by parsing CC/PP[5] and UAPProf [6] with free libraries such as HP's DELI (<http://delicon.sourceforge.net/>).

W3C's CC/PP (Composite Capability / Preference Profile) and WAP forum's UAPProf are compatible standards. CC/PP defines a high-level structured framework for describing and transmitting information about the capabilities of Web clients and the display preferences of Web users using the Resource Description Framework (RDF). UAPProf is a variant of CC/PP and have become the industry standard for describing and exchanging CPI of mobile terminals. The UAPProf of a mobile terminal is often stored in a profile depository which is generally maintained by its manufacturer and its URL can be conveyed with some headers in request, such as x-wap-profile or Profile. The adapting proxy can retrieve its CPI by parsing the received XML document.

In first phase, we utilize the capability and preference information of the receiving terminal submitted by its user during registration.

C. Email Proxy

Most Internet-based email accounts use POP3 (Post Office Protocol v.3). POP3 allows an email client to collect the email on a remote server (POP server). Initially, the server host starts the POP3 service by listening on TCP port 110. When an email client wishes to make use of the service, it establishes a TCP connection with the server host. When the connection is established, the POP3 server sends a greeting. The client and POP3 server then exchange commands and responses (respectively) until the connection is closed or aborted [7].

Our POP3 proxy is an application level proxy for POP3 protocol. It establishes connection, trough remote servers,

with POP3 clients. The proxy has multiple threads, each checks the email servers in its list in turns and in a time period interval. It reads the login ID, determines which server the account is located on, connects to the server, and logs in. Then, it fetches the new mails back and forwards them to content adaptation broker. After all email messages from an ID is retrieved and forwarded, the connection is closed. Flow control mechanism is considered to fine tune the server's performance and avoid overloading the POP3 proxy. A session is determined to be timeout if the proxy doesn't see any data received from remote email server within 30 seconds. The checking interval can be set from several minutes to several hours. The maximum number of active connections can be configured to limit the number of threads that can be simultaneously opened at a specific moment of time.

IV. CONTENT ADAPTATION BROKER

Content adaptation is a process to convert the content unsupported by the receptor to the content the receptor understands, while keeps the meaning of source content as far as possible. MMSEmail focuses on two categories of adaptation techniques: structure adaptation which reorganizes the series of object into a SMIL file (currently it had implemented a module to adapt an Email to a SMIL file) and media object adaptation which adapts the format and quality of multimedia objects (currently it had implemented modules of retrieving text from special type file of .doc, .pdf and .rtf).

A. SMIL Convertor

In accordance with "MMS Conformance Document" [8], Synchronized Multimedia Integration Language (SMIL) should be used as the presentation language for MM. Since mobile terminals may not allow us to take full advantage of the presentation capabilities offered by SMIL 2.0 or its simplest profile "SMIL Basic", [8] identifies a very limited subset of SMIL elements (MMS SMIL) for the first phase of MMS.

An MM consists of a "slide show", that is, a succession of one or several pages, each containing at most two regions: one for text and the other contains either an image or a video clip. A simple scheme of the organization of a MM is depicted in Fig. 3.

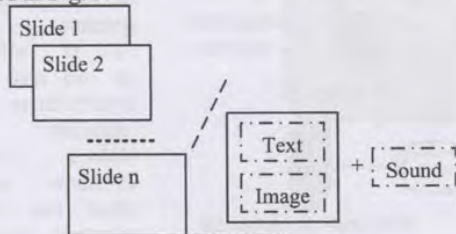


Figure 3. Structure of an MM.

MMSEmail only retrieves the sender, time, receiver and subject from the header of an Email. For decoded text of the body and attachments, MMSEmail fragments the extracted

text object into blocks whose length is at most 30KB and parks them into the body part of MMS PDU (Fig. 4). Before factually sent to the destination phone, the newly generated MM can be tentatively presented on a desktop computer, e.g., with SMILSlidePlayer developed by MDS Technology Co. Ltd to verify the adaptation effects.

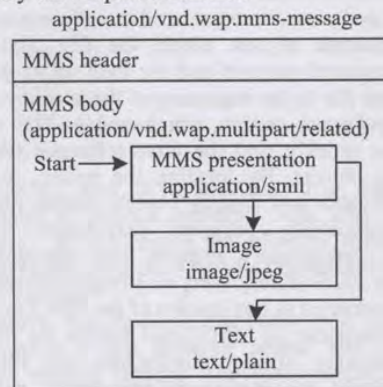


Figure 4. An example of MMS PDU.

B. Media Object Adapter

Some attachment rule is implemented to tell the proxy how to process email attachments. These rules include removing all attached files, removing attachments containing keywords, converting attachments to text, et al.

[8] defines the maximum set of requirements and guidelines for end-to-end interoperability of MMS. It specifies a suite of media types, formats and maximum size belonging to "Core MM Content Domain". There are some differences in media formats and size between 3GPP and 3GPP2 standards. For MM Content Class Text in 3GPP, the maximum length can be 30KB, the character set can be US-ASCII, UTF-8 and UTF-16. For MM Content Class Image Basic, the maximum length can be 30KB, the resolution of image can be 160*120. Still Image can be Baseline JPEG, Bitmap can be GIF87a, GIF89a and WBMP. For MM Content Class Image Rich, the maximum length can be 100KB, the maximum image resolution can be 640*480. For MM Content Class Video Basic, the video format can be H.263 and AMR. The maximum length of Video Rich can even be 300KB.

MMSEmail reserves interfaces for incorporating appropriate tools or APIs freely available on Internet to convert media types or size. The adapted objects are then embedded into a SMIL file. For multimedia playing, SMIL timing and synchronization elements can be taken into consideration, particularly <par>...</par> parallel time container.

C. Text Extractor

MMSEmail implements modules for automatically extracting text from email attachments with file types .html, .pdf, .doc and .rtf [9].

The structure of PDF file contains four parts: header, body, cross-reference table and trailer. The first line of a PDF file is a header identifying the version of the PDF specification to which the file conforms. The PDF document body contains a collection of objects such as fonts, graphics and pages. Cross-reference table is stored at the end of the PDF file and can be used to locate and directly access pages and other important objects within the file. The trailer contains the keyword `startxref` and the byte offset from the beginning of the file to the beginning of the `xref` keyword in the last cross-reference section, which enables PDF reading application can quickly find the cross-reference table and certain special objects. By locating the trailer, searching cross-reference table and finding objects within PDF file, MMSEmail repeatedly retrieves text-stream between "stream" and "endstream" sections and decodes them through calling ZLIB library API, all strings between "BT" and "ET" are extracted as text content of the PDF file.

The .doc file parser of MMSEmail fulfills the functions of format analyzing of .doc file header and FIB (File Information Block), recognizing the text-stream, extracting and transcoding the text. For .doc files containing Chinese characters, MMSEmail needs to convert Unicode to GBK code which is the default code of Windows platform.

RTF provides a format for text and graphics interchange that can be used with different OS. An RTF file consists of unformatted text, control words, control symbols and groups. The control words, control symbols (backslash '\'), and braces ({}) constitute control information. The .rtf file parser evaluates and separates control information from plain text, acts on control information and collects text from the document. All other characters in the file are plain text. A standard RTF file can consist of only 7-bit ASCII characters, all characters above 0x80 must be in the escaped form, \hh. So for .rtf file with Chinese characters, when MMSEmail encounters raw characters in the leading-byte range of the double-byte character, it regards the next character as the trailing byte of the double-byte character and combines the two characters into one double-byte character.

V. CONCLUSION AND FUTURE WORKS

With the development of mobile communication, there arises the requirement of ubiquitous access to Internet Email service from small screen terminals such as mobile phones and PDAs. In view of the advantages of MMS, we design a

framework, MMSEmail, for adapting Email to MMS. MMSEmail is capable of: 1) decoding email attachments and converting .pdf, .doc and .rtf files to text; 2) encapsulating the meta-data retrieved from Email header and text converted from Email body and attachments into MMS SMIL; and 3) validating the presentation effect of the generated MM. Our method provides a new way for immediate Email delivery to mobile communication terminals. As a result of adopting industry standard interfaces, the architecture can be flexibly extended to other MMS-enabled applications.

In future, MMSEmail will implement adaptation algorithms for other media objects and synthesizes them with the extracted text into SMIL, so that the presentation effect of the adapted MMS comports with that of a normal PC-version Email clients.

ACKNOWLEDGMENT

This research was partially supported by the general projects of Sci. & Tec. Development of Beijing Municipal Education Commission under grant KM200610016004.

REFERENCES

- [1] 3GPP. "Multimedia Messaging Service (MMS); Functional description; Stage 2," 3GPP TS 23.140, V6.13.0. Jun, 2006.
- [2] WAP Forum. "Wireless Application Protocol Multimedia Messaging Service Architecture Overview Specification," WAP-205-MMSArchOverview-20010425-1.
- [3] WAP Forum. "Wireless Application Protocol Multimedia Messaging Service Client Transaction Specification," WAP-206-MMSCTR-20020115-a.
- [4] WAP Forum. "Wireless Application Protocol MMS Encapsulation Protocol. 05-Jan-2002," WAP-209-MMSEncapsulation-20020105-a.
- [5] W3C. "Composite Capability/Preference Profiles (CC/PP): A user side framework for content negotiation," July 27, 1999.
- [6] WAP Forum. "WAG UAPProf, Version 20-Oct-2001," WAP-248-UAPROF-20011020-a.
- [7] J. Myers, M. Rose. "RFC 1939: Post Office Protocol - Version 3," May 1996.
- [8] Open Mobile Alliance. "MMS Conformance Document, Version 1.3," Oct 27, 2005. OMA-TS-MMS-CONF-V1_3-20051027-C.
- [9] Wang Lidong, Qian Liping. "An Alternative Means for Delivering Web Documents to Mobile Phones," Proc. International Conference on Wireless Communications, Networking and Mobile Computing (WICOM 2007), IEEE Press, Sep. 2007, pp. 3093-3096, doi: 10.1109/WICOM.2007.768.