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Education

NEW YORK UNIVERSITY — New York, NY

PhD in Computer Science, Sep 2012
Thesis title: "Combating Sybil attacks in cooperative systems"
Advisors: Jinyang Li and Lakshminarayanan Subramanian

Master in Computer Science, 2008
Thesis title: "Efficient cooperative backup with decentralized trust management"
Advisor: Jinyang Li

NATIONAL UNIVERSITY OF SINGAPORE — Singapore

B.S. (first class honors) in Computer Science, 2005
Minor in Mathematics

Research Interests

Distributed systems, security and privacy, databases and storage systems.

Major Research Projects

2011-present **Combating information censorship [1].** Currently leading the design and implementation of *Robin*, a micro-blogging service designed for citizens to exchange information when a government shuts down Internet during critical periods. In Robin, citizens use their mobile devices' censor to exchange messages with nearby devices through WiFi when opportunity arises. To defend against flooding and information poisoning attack from the adversarial government, each device uses a summary of the social graph to select good messages. The summary is secure against an adversary who tries to deannonymize user indentities.

2011-present **Platform for private data in cloud computing [2].** Currently building a platform for private data (PPD) on which applications will run in the cloud. Untrusted applications running on PPD have to conform with data policies specified by the data's owners. PPD uses virtualization techniques to isolate each instance of untrusted applications in a separate isolated environment. Communication between isolated environments are tracked and policied using information flow control. We use hardware remote attestation technique for the cloud provider to prove that applications are, in fact, run on the PPD platform.

2010-2011 **Robust reputation for CDNs [6].** Led the design and implementation of *Credo*, a reputation system to incentivize bandwidth contribution in a peer-to-peer content distribution network. Credo has two main advantages over existing solutions. First, in Credo, the reputation score of each node reflects its net bandwidth contribution accurately. Second, Credo is resilient against three common attacks on reputation systems: Sybil attack, white-washing and collusion.

2009-2011 **Online migration for geo-distributed storage systems [4].** Co-designed and built the *Nomad* storage system to support online migration of data across data centers at anytime, even when there are concurrent updates. Nomad can help applications improve data locality to user, and to cope with the dynamic changing workload, and user movements.

2009-2011 **Sybil-resilient node admission control [5] [7].** Led the design of *GateKeeper*, a distributed node admission control protocol that accepts identities into the system according to the underlying social network among users. GateKeeper admits most honest nodes into the system while limiting the number of admitted Sybil nodes to a constant when there is a constant number of attack edges between the adversary and honest users in the social network. Such defense is optimal for social network-based node admission control.

2008-2010 **Sybil-resilient online voting [8].** Led the design and implementation of an online content-voting system, called *SumUp*, that prevents an attacker from casting many votes using fake identities (Sybil attack). SumUp exploits the insight that the number of links from the attacker to honest users is small in a social network. Specifically, SumUp can limit the number of bogus votes to the number of such links. Moreover, if the attacker repeatedly casts bogus votes, SumUp eventually eliminates the attacker from the social network.

2006-2008 **Cooperative backup system [10][3] .** Built a reliable and inexpensive cooperative backup system, called *Friendstore*, for home users. In Friendstore, users replicate backup data on their friends' machines to provide a high assurance for data reliability . Friendstore also introduces a novel coding scheme, XOR(1,2), to trade off bandwidth for storage by letting a node store coded data belonging to multiple users.

2005-2006 **Dynamic self-tuning database buffers [11].** Co-designed and built a buffer management component for PostgreSQL that uses an analytical equation to minimize cache miss rate. The component can automatically tune the buffer pool sizes based on the predicted miss rate. Unlike previous approaches, our analytical equation does not make strong assumption about the underlying workloads.

2004-2005 **Analysis of users induced congestion control [9][12].** Existing wisdom attributes the stability of the Internet to the TCP congestion control. However, users also play an important role by aborting connections when there is congestion. We derived an analytical model of users' reaction to congestion. We verified the model by reproducing user actions based on information from a network level trace.

Work Experience

2006-present **Research Assistant** *New York University*

Advisors: Jinyang Li and Lakshminarayanan Subramanian

5/2011-11/2011 **Visiting Researcher** *UC Berkeley*

Mentor: Dawn Song. Lead designer and implementer for the Robin and PPD projects.

6/2009-8/2009 **Research Internship** *Microsoft Research-Silicon Valley*

Mentors: Marcos K. Aguilera and Mahesh Balakrishnan. Worked on the Nomad project.

6/2007 - 8/2007 **Software Engineer Internship** *Google Inc.*

Mentors: Frank Dabek and Wilson Hsieh. Built tools to better understand Bigtable's performance, and optimized MapReduce to work across multiple data centers.

Honors and Awards

2010–2012 Google PhD Fellowship in Distributed Systems.

2006–2010 Henry MacCracken Fellowship, New York University.

2001–2005 Dean's List at National University of Singapore.

2002 5^{th} Place in the ACM Programming Contest, Singapore Site.

2001 Singapore Scholarship (Only 12 Vietnamese students were chosen from all universities to study at National University of Singapore).

1999-2001 Awards at Vietnamese National and Regional competitions in Maths and programming.

Publications

[1] **Nguyen Tran**, Albert Kim, Charalampos Papamanthou, Yahel Ben-David, Lakshminarayanan Subramanian, and Dawn Song. Attack-resilient micro-blogging service to circumvent government imposed communication blackouts. Ongoing work.

[2] Krste Asanovic, Petros Maniatis, Prashanth Mohan, Charalampos Papamanthou, Elaine Shi, Dawn Song, Emil Stefanov, Mohit Tiwari, and **Nguyen Tran**. PPD: A platform for private data. In submission.

[3] **Nguyen Tran**, Frank Chiang, and Jinyang Li. Efficient cooperative backup with decentralized trust management. *ACM Transaction on Storage (TOS)*, 8(3), 2012.

[4] **Nguyen Tran**, Marcos K. Aguilera, and Mahesh Balakrishnan. Online migration for geo-distributed storage systems. In *Proceedings of USENIX Annual Technical Conference (USENIX ATC)*, 2011.

[5] **Nguyen Tran**, Jinyang Li, Lakshminarayanan Subramanian, and Sherman S.M. Chow. Optimal sybil-resilient node admission control. In *Proceedings of IEEE International Conference on Computer Communications (INFOCOM)*, 2011.

[6] **Nguyen Tran**, Jinyang Li, and Lakshminarayanan Subramanian. Collusion-resilient credit-based reputations for peer-to-peer content distribution. In *Workshop on the Economics of Networks, Systems, and Computation (NetEcon)*, 2010.

[7] **Nguyen Tran**, Jinyang Li, Lakshminarayanan Subramanian, and Sherman S.M. Chow. Brief announcement: Improving social-network-based sybil-resilient node admission control. In *Proceedings of Symposium on Principles of Distributed Computing (PODC)*, 2010.

[8] **Nguyen Tran**, Bonan Min, Jinyang Li, and Lakshminarayanan Subramanian. Sybil-resilient online content voting. In *Proceedings of the 6th USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, April 2009.

[9] Y.C. Tay, **Dinh Nguyen Tran**, E.Y. Liu, Wei Tsang Ooi, and Robert Morris. Equilibrium analysis through separation of user and network behavior. In *Elsevier Computer Networks journal*, June 2008.

[10] **Dinh Nguyen Tran**, Frank Chiang, and Jinyang Li. Friendstore: cooperative online backup using trusted nodes. In *Proceedings of the 1st International Workshop on Social Network Systems (SocialNets)*, Apr 2008.

[11] **Dinh Nguyen Tran**, Phung Chinh Huynh, Y. C. Tay, and Anthony K. H. Tung. A new approach to dynamic self-tuning of database buffers. *ACM Transaction on Storage (TOS)*, 4(1):1–25, 2008.

[12] **Dinh Nguyen Tran**, Wei Tsang Ooi, and Y.C. Tay. Sax: A tool for studying congestion-induced surfer behavior. In *Proceedings of Passive and Active Network Measurement conference (PAM)*, March 2006.

[13] Chu-Ming Ng, Cam-Thach Nguyen, **Dinh-Nguyen Tran**, and Tiow-Seng Tan. Analyzing pref-fetching in large-scale visual simulation. In *Proceedings of Computer Graphic International conference (CGI)*, June 2005.

Talks

[1] "Online migration for geo-distributed storage systems", USENIX Annual Technical Conference (USENIX ATC), Portland, June 2011.

[2] "Optimal Sybil-resilient Node Admission Control", International Conference on Computer Communications (INFOCOM), Shanghai, April 2011.

[3] "Combating Sybil attacks in cooperative systems", invited talk at Yale (March 2010), ETH Zurich and EPFL (August 2010), PARC (June 2011).

[4] "Nomad: Migratable storage for data centers", intern talk at MSR-SVC (August 2009).

[5] "Sybil-resilient online content voting", Networked Systems Design and Implementation conference (NSDI), Boston, April 2009.

[6] "Sybil-resilient online content voting", invited talk at MIT, April 2009.

[7] "Friendstore: Cooperative Online Backup Using Trusted Nodes", Social Network Systems workshop, Glasgow, April 2008.

[8] "SAX: A Tool for Studying Congestion-induced Surfer Behavior", Passive and Active Measurement conference (PAM), Adelaide, March 2006.

References

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