



University
of Victoria

Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BA (University of Posts & Telecommunications, 2014)

“SmartSharing: A CDN with Smart Contract-based Local OTT Sharing”

Department of Computer Science

Tuesday, September 11, 2018

10:00 A.M.

Engineering and Computer Science Building
Room 467

Supervisory Committee:

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Dr. Sudhakar Ganti, Department of Computer Science, UVic (Member)

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Abstract

Content delivery networks (CDNs) depend on distributed cache servers to reduce the content delivery distance and latency to end users. Nevertheless, a CDN's cache footprint is greatly limited by the high cost in deploying and maintaining largescale cache servers. To break the limit, CDN providers adopt a new content caching strategy that allows end users to share their storage/bandwidth resources with each other. Two core questions need to answer in this CDN strategy: (1) how to incentivize end users to contribute their resources? and (2) how to facilitate transparent, secure content exchange among end users? We propose a new CDN solution, called SmartSharing, where users contribute their Over-the-top (OTT) devices as mini cache servers. With SmartSharing, an OTT device can share the content the OTT owner is downloading and in addition can cache content for neighboring OTT devices in the same area. To incentivize end users to contribute their resources, SmartSharing uses game theory and the ExpectationMaximization (EM) algorithm to determine content delivery schedule and the pricing scheme. To facilitate content trading among end users, SmartSharing uses smart contracts in Ethereum to create a transparent and safe transaction platform. We evaluate SmartSharing with real-world trace driven simulation as well as smart contract prototype in Ethereum using content meta-data and the derived pricing scheme. By disclosing the internal dynamics in content delivery schedule and pricing scheme and analyzing the overhead in content trading, we show that SmartSharing is an effective new CDN solution that benefits content providers, CDN, and end users.