科技部計畫名稱：耐延遲網路下路由與資料管理技術(2/2)

科技部計畫編號：MOST103-2221-E-008-008-MY2

計畫主持人：胡誌麟

計畫參與人員：徐侑豐、黃毓芳、林浩筠、鄧皓軒、蕭歆儒、余承儒、張友恆

執行機構：國立中央大學通訊工程學系

Content

In delay/disruptive tolerant network(DTN), persistent end-to-end routing paths cannot be available. Data dissemination thus resorts to a new store-carry-and-forward paradigm: data delivery between two nodes will depend on mobile relay nodes that repeatedly forward data packets to neighboring nodes during their movements.

We now obtain four efforts: (A) Revision on “Part G: Message routing with dynamic cluster awareness (MDCA)” in our previous project, NSC 100-2221-E-008-085-MY3 (B) Messages forwarding with ferries in DTNs (C) Joint effects of bundle protocol and fountain coding for message transfer, and (D) Exploiting contact periodicity for probabilistic routing in DTNs

Part A

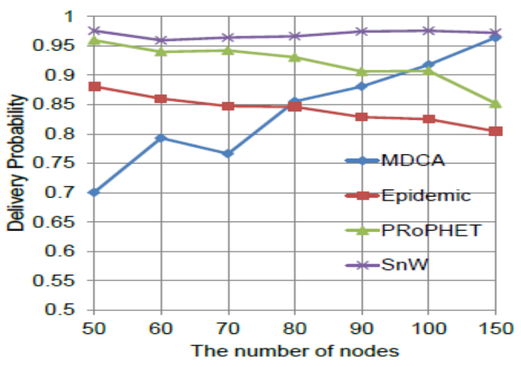
A1. Introduction

In the study, we propose a message routing scheme with dynamic cluster awareness, abbreviated as MDCA, for efficient message delivery services in DTNs. Firstly, MDCA can measure the expected node density to form a group of contacting nodes as a cluster. Secondly, MDCA can measure the message density in a cluster and can instruct any nodes in a cluster to replicate or forward messages to other nodes in the same cluster.

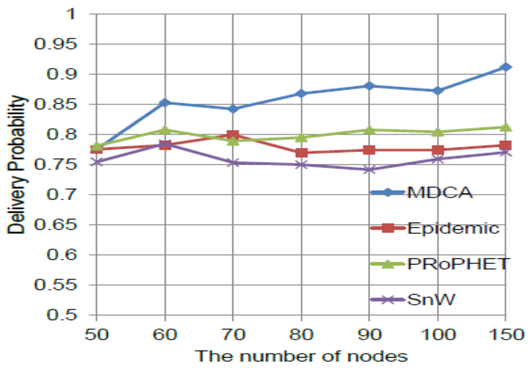
A2. Communication area estimation

This section describes numeric formulation of estimating a communication area among contact nodes through not only direct but indirect connections in a network, without using any location information like GPS.

A3. Performance result



● Delivery probability in the RWP



● Delivery probability in the TVCM

Performance results show that MDCA can obtain higher delivery probability than several typical schemes, including Epidemic, PRoPHET, and Spray and Wait (SnW), under the mobility model with human behavior patterns.

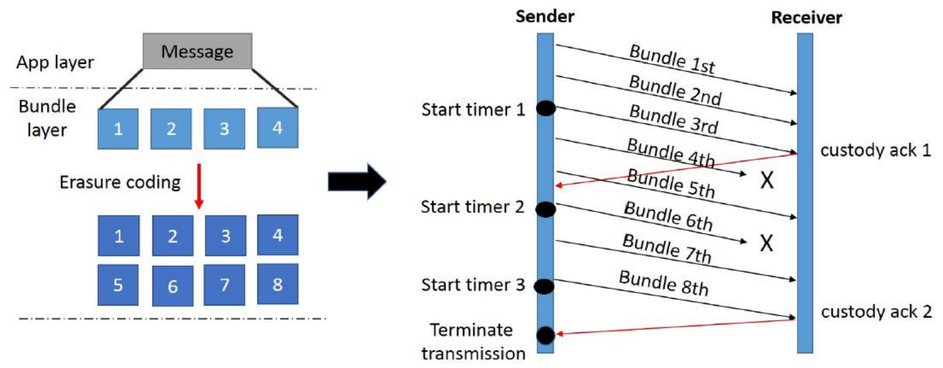
Part B

B1. Introduction

Custody transfer is employed to ensure the arrival of bundles by the granularity of acknowledge to every bundle and erasure coding is the other technique which restores bundles without acknowledge or retransmission to shorten transmission time. However, they increase the overall transmission time and guarantee no successful message delivery, respectively. To both reduce message transmission time and guarantee the arrival of messages, the proposed scheme, called NEW, will use erasure coding to generate redundant bundles and still maintain the functions of DTN bundles protocols.

B2. “NEW” message delivery scheme

The NEW design involves five phases, including bundle replication, custody transfer, variable timer, selective acknowledge, and bundle recovery.



● Bundle replication ● variable timer and selective acknowledge

B3. Summary

Our proposed NEW scheme is able to leverage the effects of custody transfer and erasure coding technique. The joint effects can result in reduced transmission latency time by erasure coding and bundle loss-intolerance by custody transfer in DTNs.

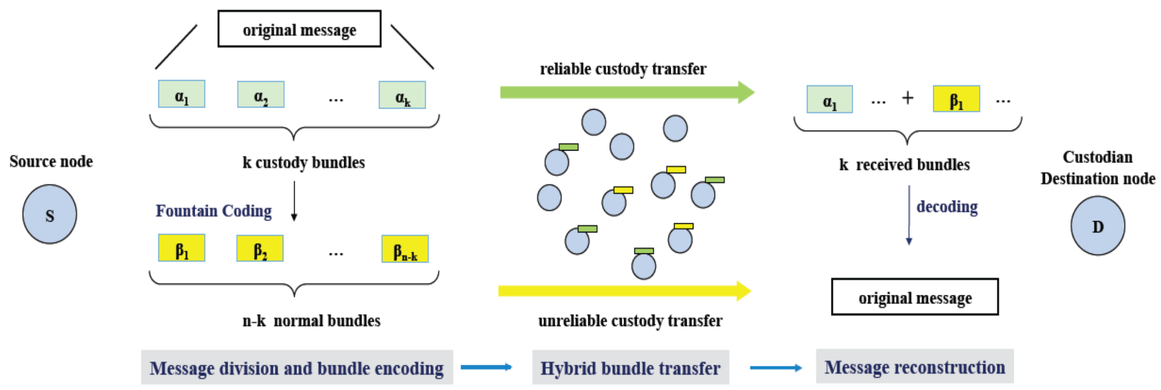
Part C

C1. Introduction

The Bundle Protocol is proposed to construct a network on challenged environments where resource-constrained nodes can convey message distribution. In this study, we take advantage of custody transfer and coding-based paradigms to design a hybrid message delivery approach. Then, we conduct performance study to examine the joint effects of custody transfer and Fountain coding.

C2. Approach design

We design a hybrid message delivery technique, which is capable of incorporating the principle of Fountain coding into the custody transfer.



● A hybrid message delivery with jointly effects of custody transfer and Fountain coding fashions

C3. Summary

The simulation results have manifested that the joint effects of custody transfer and Fountain coding are able to achieve high performance of message transfer in DTNs.

Part D

D1. Introduction

The famous PRoPHET has the critical problem of unreliable delivery predictability because of its aging formulation. To remedy this problem, we propose a complementary scheme based on contact periodicity to maintain the performance of probabilistic routing in delay-tolerant networks.

D2. Probabilistic Routing Scheme

This section develops a new probabilistic routing scheme using contact periodicity among mobile nodes in DTNs. In our design, the proposed scheme contains three procedures: period determination, routing metric decision, and message scheduling policy.

D3. Summary

Compared with PRoPHETv2 in the case of congested message traffic, the delivery rate by our proposed scheme is almost the same with PRoPHETv2’s, but note worthily the transmission overhead by our proposed scheme is only about 50% of PRoPHETv2’s.