A Framework for Communication Infrastructure against Disasters

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Abstract

The Great East Japan Earthquake, which occurred on March 11th 2011, caused significant damage around Tohoku region in Japan. Some means of communication on Internet, telephone and mobile phone have been used as reliable communication methods, but they were not available due to the earthquake. This fact requires a system capable of minimum communication in disasters. This paper proposes a framework for communication infrastructure against disasters.

Concept

1. Automatically starting the system
2. Operator free backup system
3. Keeping security of the system

Keeping Service and Data Backup at several nodes for each others

How much cost ?

Public Cloud system

Effects by Earthquake

Day	14 Mon	15 Tue	16 Wed	17 Thu	18 Fri	19 Sat	20 Sun	21 Mon	22 Tue	23 Wed
0:00						Wait	Wait	Wait		
6:00		9:20 ~ 12:30	6:20 ~ 10:00			Wait	Wait	Wait		
12:00	13:50 ~ 17:30			15:20 ~ 18:40		Wait	Wait	Wait		15:50 ~ 18:45
18:00				18:50 ~ 21:45		Wait	Wait	Wait	18:20 ~ 21:00	

Rolling blackouts in Saitama University
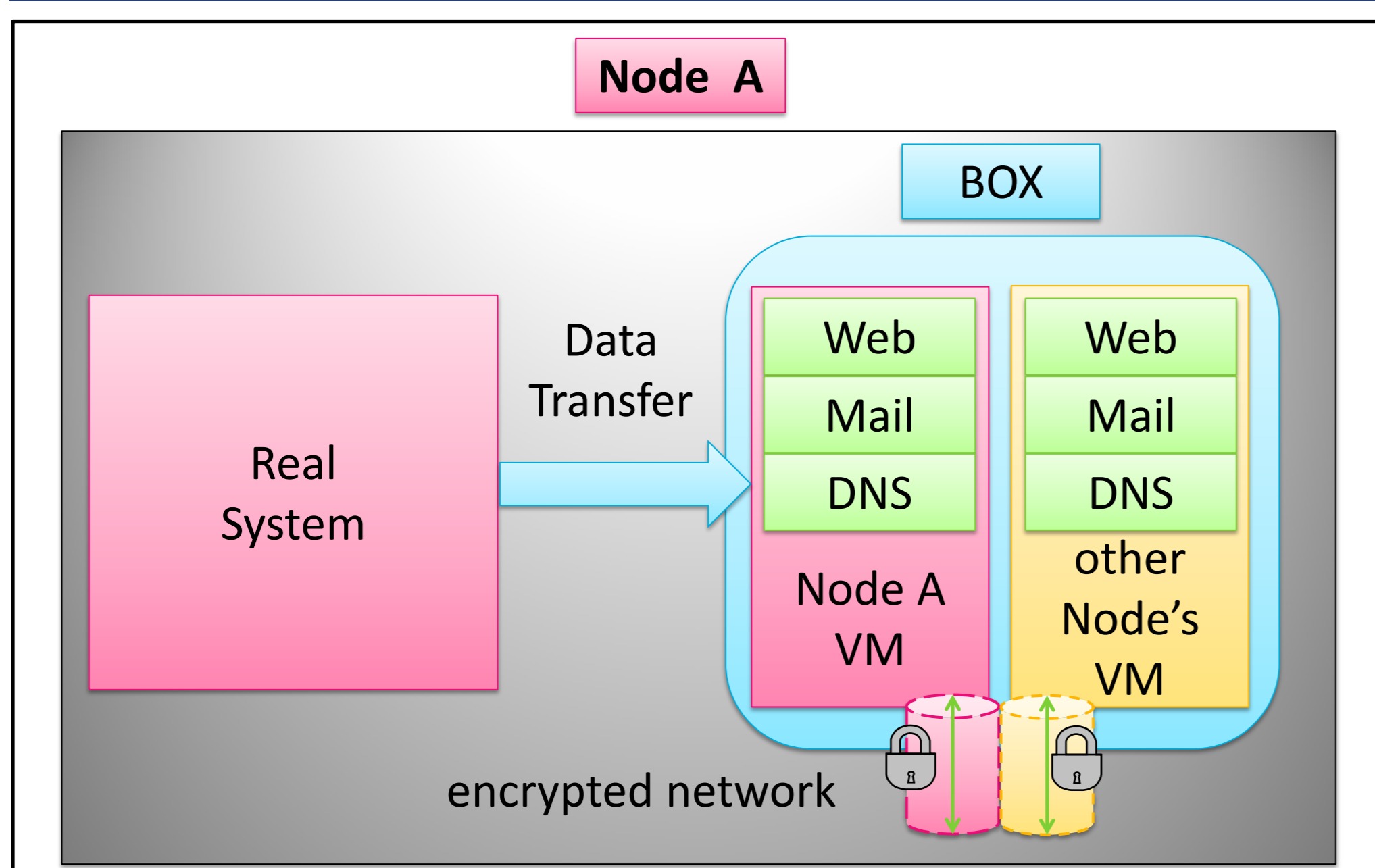
This idea is based on some lessons for disasters.
・Hardware trouble by rolling black out
・Unavailability of telephones, mobile phones, E-mail and Web
・Manpower necessary for system operation

Service Level

1. Web Service
2. Mail Service
3. DNS Service

The proposed framework supports basic communication.
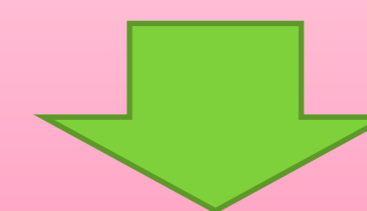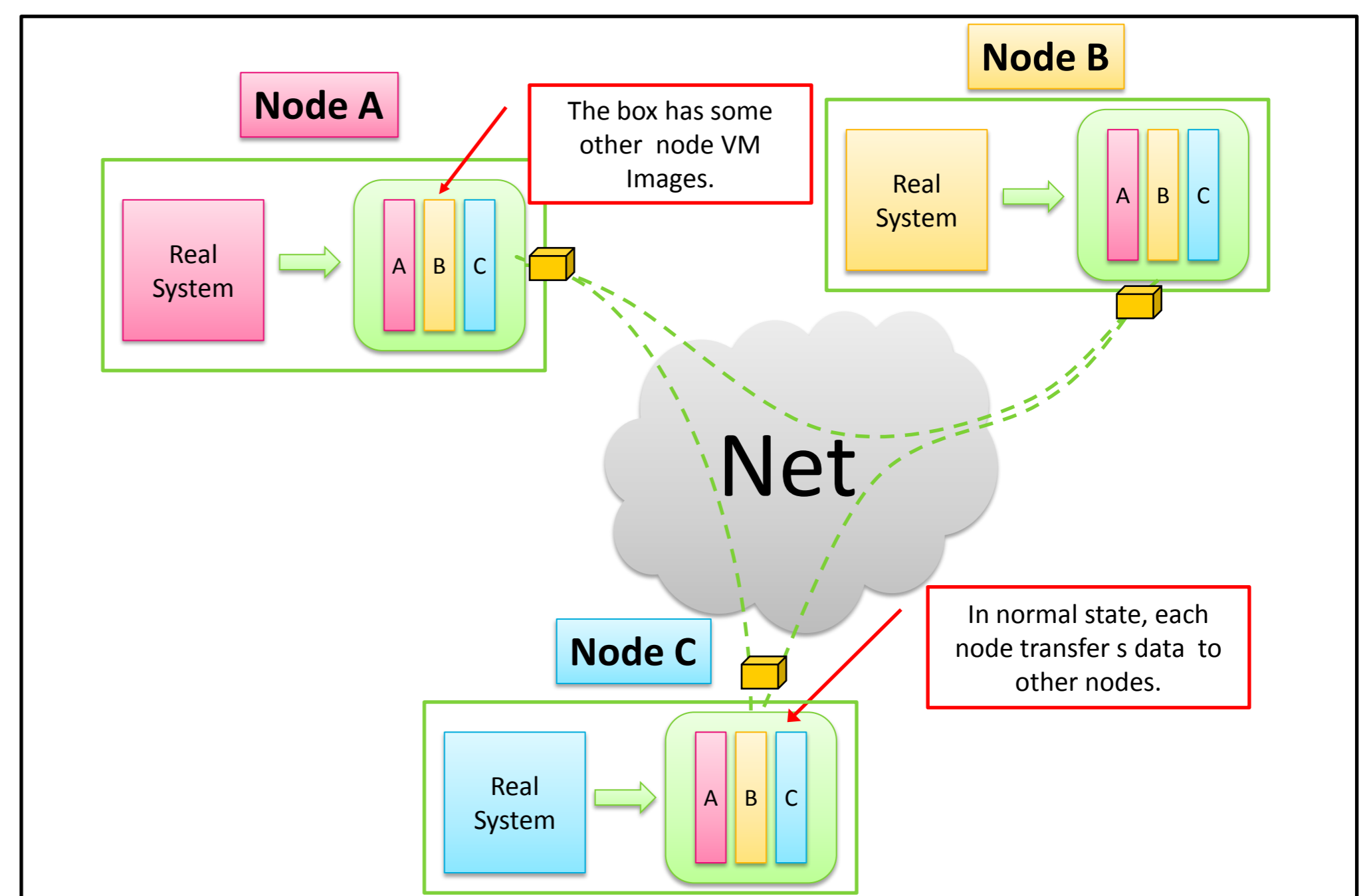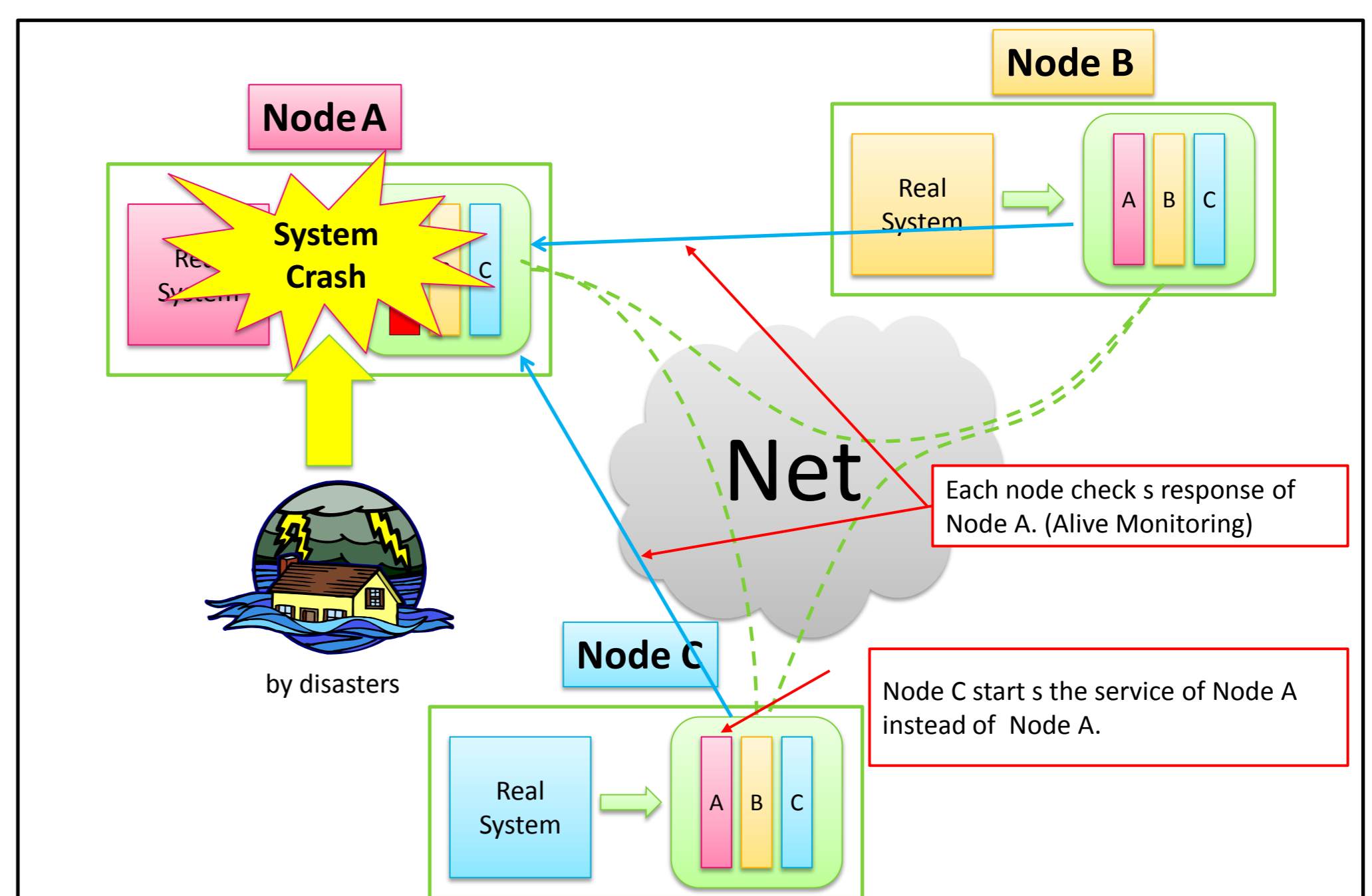
The 'BOX' for Disaster Response

The proposed hardware 'BOX'

Proposed Framework

Overview of the proposed system (normal state)

The box has some other node VM Images.

In normal state, each node transfer s data to other nodes.

In the case of emergency (in disasters)

System Crash

by disasters

Each node check s response of Node A. (Alive Monitoring)

Node C start s the service of Node A instead of Node A.

Discussion

A. How to select nodes for backup systems
B. How to exchange data among nodes
C. Security
D. Maintenance of 'BOX'
E. How to deal with recovery of primary servers
F. How to use the servers on backup systems