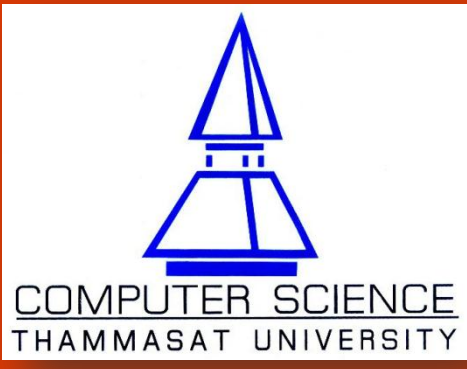


Enabling continued operation of IT services and infrastructures during floods and other disasters



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Executive Summary

- Organizations increasingly rely on information technology (IT) for nearly all their tasks, making it essential for such services to continue operation even during disaster events to avoid further impacts with respect to economic and human loss.
- This project studies the effectiveness of machine virtualization technologies in improving the continuity of IT infrastructures and the services they deliver during and after a disaster through backup and temporarily relocation of operational servers.

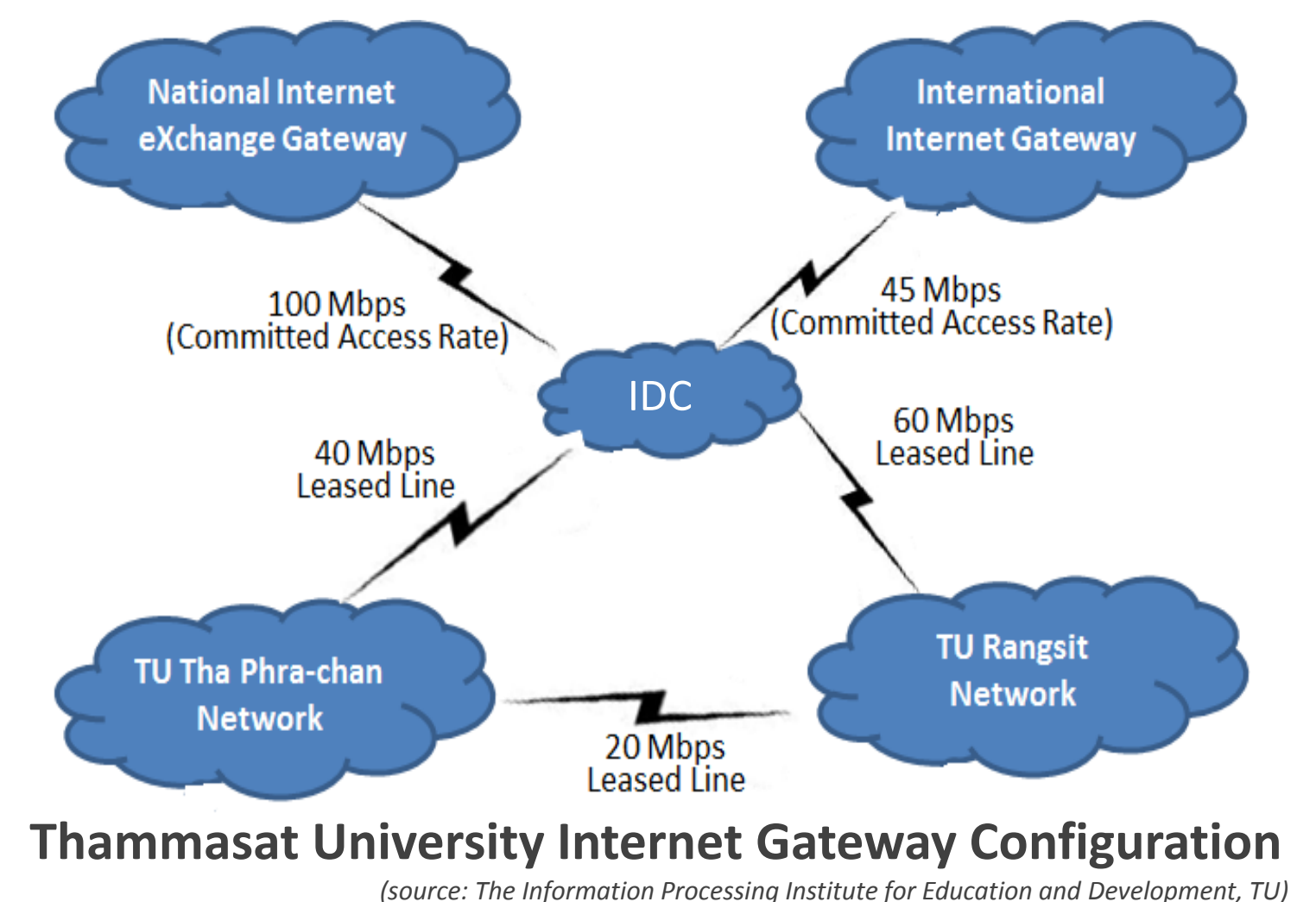
Research Goals

- Collection and analysis of data related to damaged IT services due to the 2011 Thailand flood.
- Studies of the nature of the IT services and their infrastructure designs.
- Studies of the practicality and scalability of VM live migration and backup/checkpointing in wide-area setting.
- Investigation of virtualization-based resilient middleware architectures for service continuity.

Case study: Thammasat University (TU) Rangsit Campus



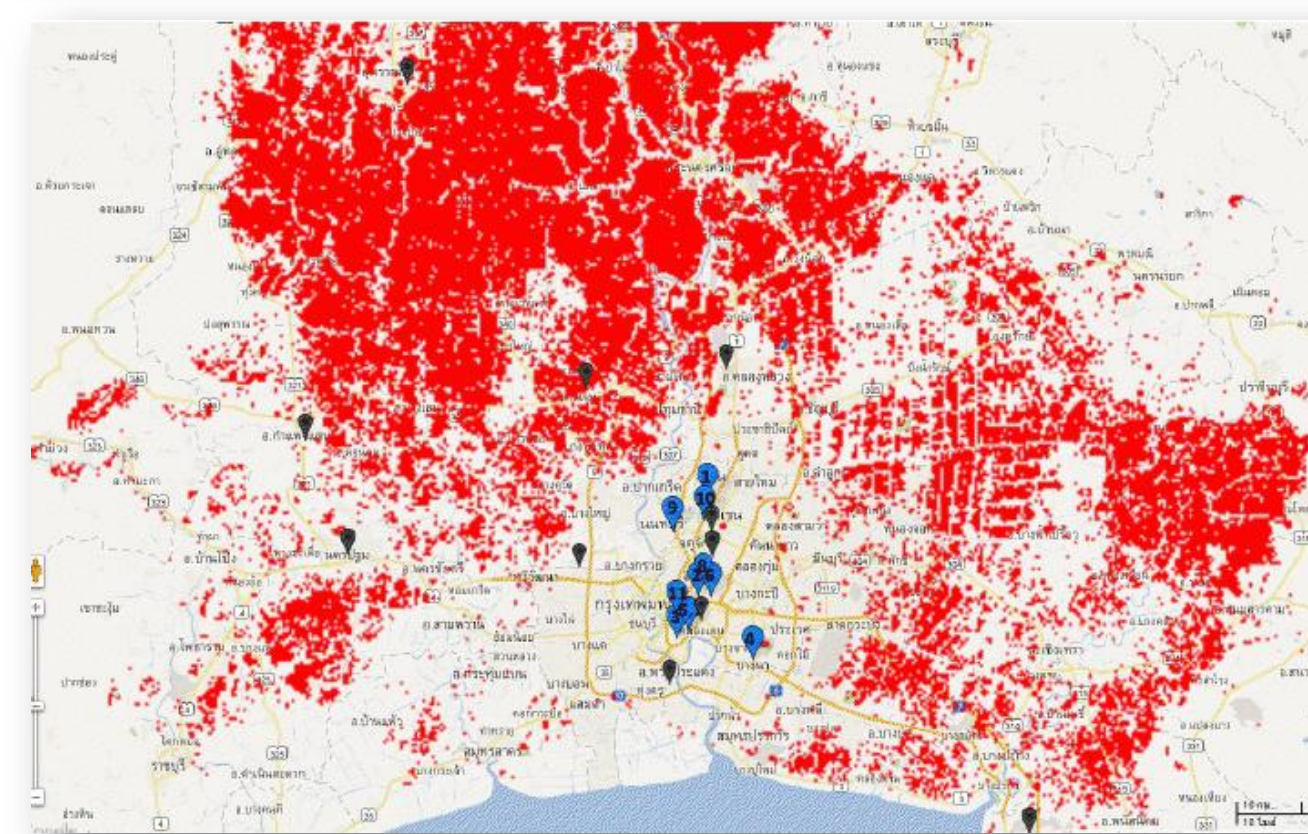
- TU provides over 26 IT services for public, students, staffs, and faculty members. These services include E-mail, E-HR, E-Office, Intranet, Data warehouse, E-Library, E-Learning, etc.
 - Within 6 hours after an evacuation notification, most services were temporary terminated and a few IT servers were physically migrated to an Internet Data Center (IDC). Electricity and network connectivity services were interrupted.
 - The flood level was approximately 2.23m high for 48 days. IT equipment (e.g., PCs, servers, telephone infrastructure) suffered severe damage, and all IT and educational services were disrupted for the entire period.
- Timeline: Oct 2011, Nov 2011, Dec 2011



Methodology

- Collection and analysis of data related to damaged IT services due to the 2011 Thailand flood to assess the requirements in terms of time frame and scale of data movement needed during and after the disaster based on different classes of services.
- Design and conduct wide-area IT infrastructure migration experiments
 - Evaluate the trade-off between maintaining high-availability of the underlying services and the ability to transfer an increased number of services with little downtime.
 - Explore dynamic priority assignment to properly schedule efficient VM image transfer.
- Design recommendation for an IDC-based resilient middleware for disaster recovery.

Preliminary Findings



Severely affected areas in the 2011 Thailand flood are shown in red color. The blue pins represent IDC locations. The black pins display university campuses.
(Modified from the Google flood crisis map)

- After the incident, some countermeasures were sought and/or implemented to reduce risks from similar loss (e.g., installation of UPS, design of flood-resilient building) and to improve IT infrastructures (e.g., Gigabit optical fiber installation, interest in using virtualized servers).
- All of the above changes show the possibility of leveraging IDCs as disaster recovery sites.



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