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Protection Methods for Multi-Link Failure in Optical Networks

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Outline

1 Introduction of Myself

2 Description of Multi-Link Failure

3 Multi-Dimensional Protection Methods

4 Future Work

5 Photos of Jiawei's Ph.D Defense

Brief Introduction

Chen Ma

马辰

Charles

Ph.D Candidate

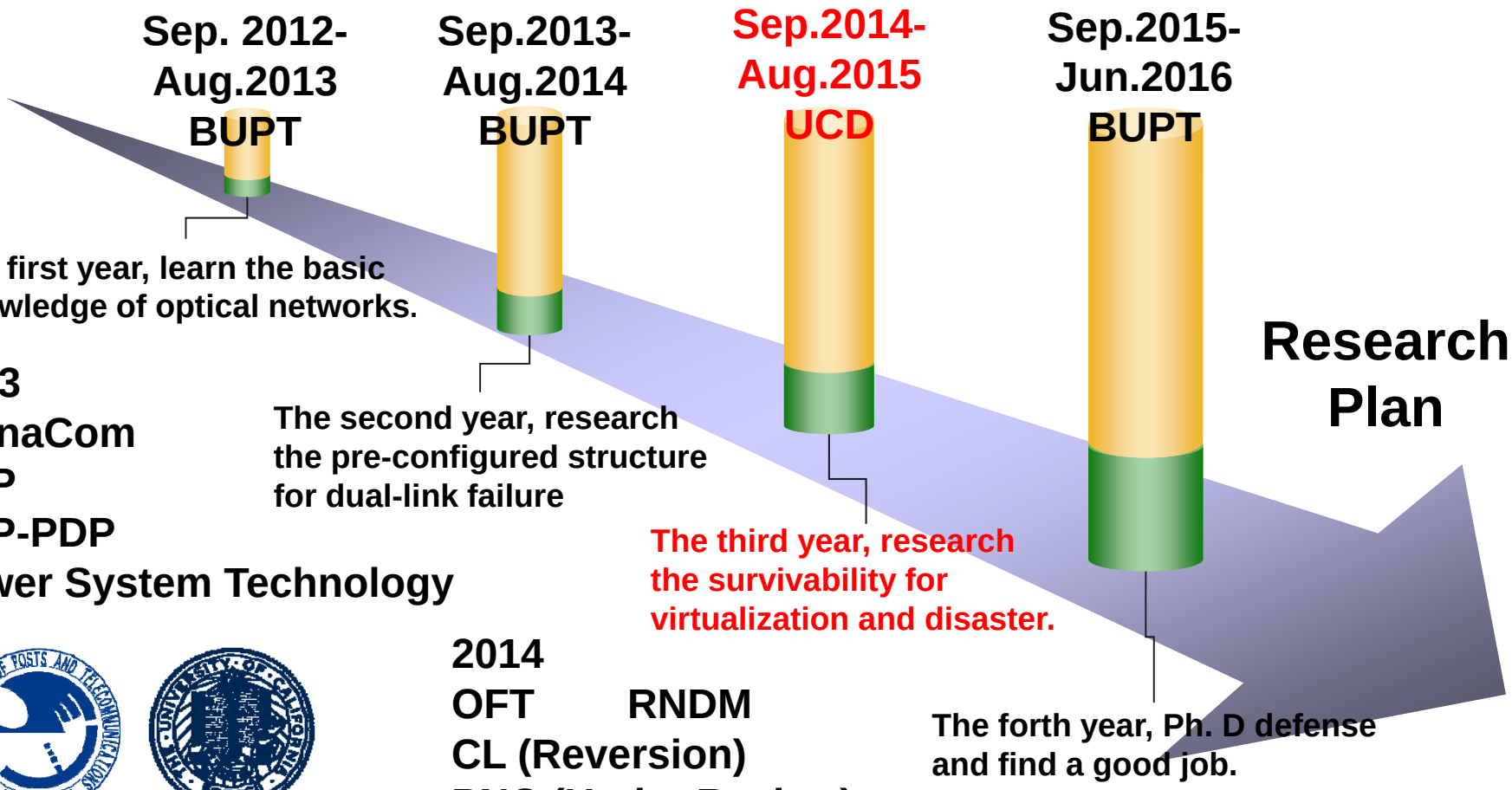
State Key Laboratory of Information Photonics and Optical Communications (IPOC), Beijing University of Posts and Telecommunications (BUPT)

Major: Communication and Information System

Focus: Optical networks, survivability, multi-link failure

Research Plan of My Ph.D

Title: Survivability for Multi-Link Failure in Elastic Optical Networks



2013
ChinaCom
ACP
ACP-PDP
Power System Technology

2014
OFT RNDM
CL (Reversion)
PNC (Under Review)

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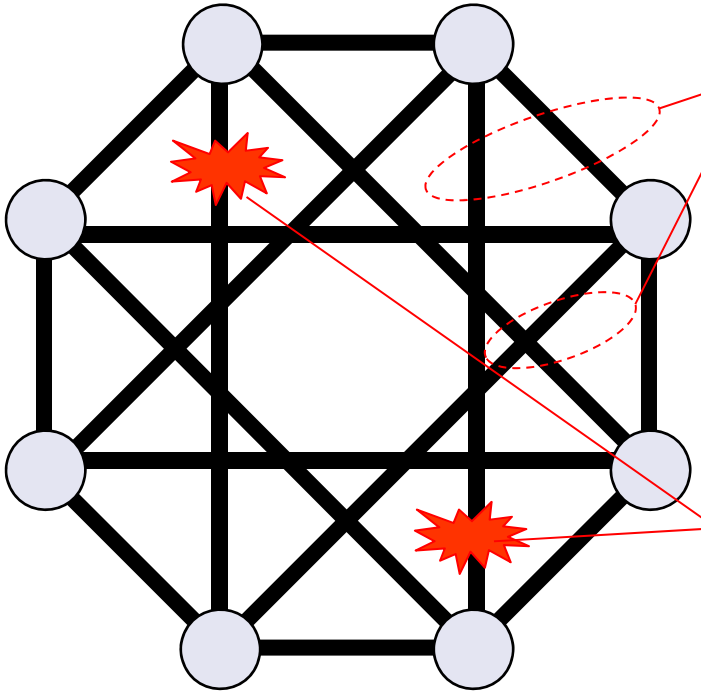
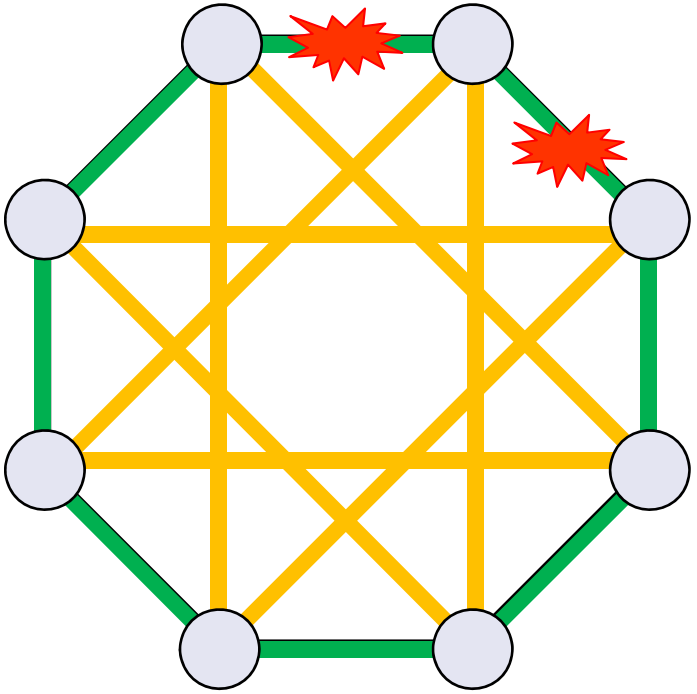
Dual-Link Failure in Optical Layer



SRLG:
Links in SRLG must be failed at the same time.

Random:
Any two links may be failed at the same time, so it includes SRLG.



Scenarios of dual-link failure in optical layer

P-Cycle for random dual - link failure in optical layer

Object: Find a protection structure which can handle random dual-link failure with minimum backup links.

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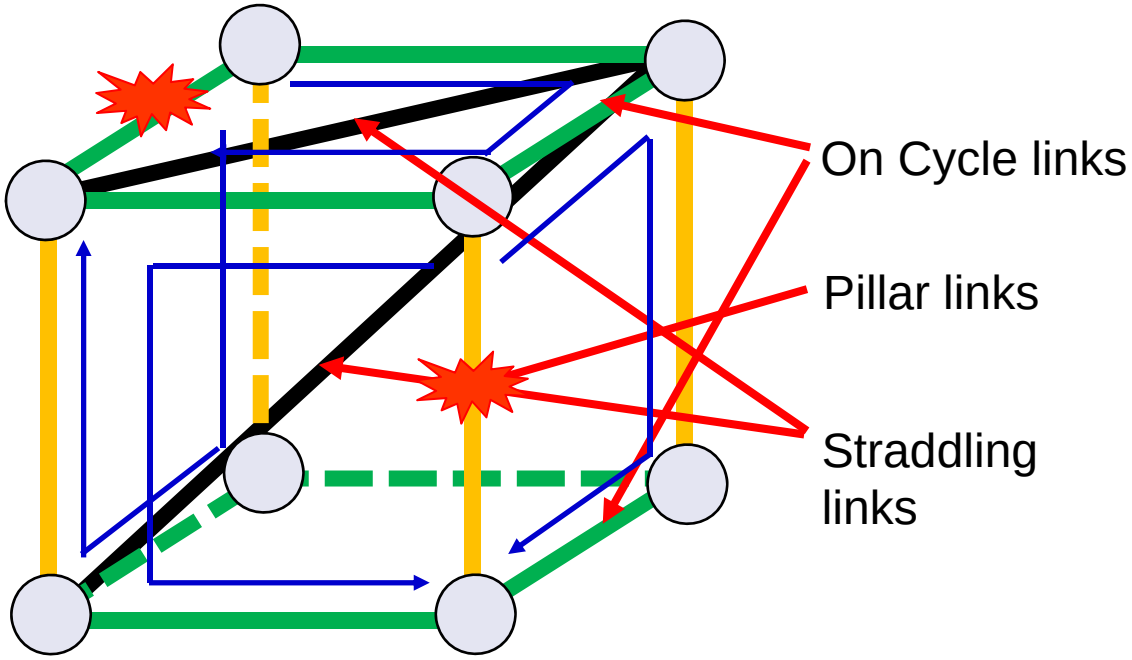
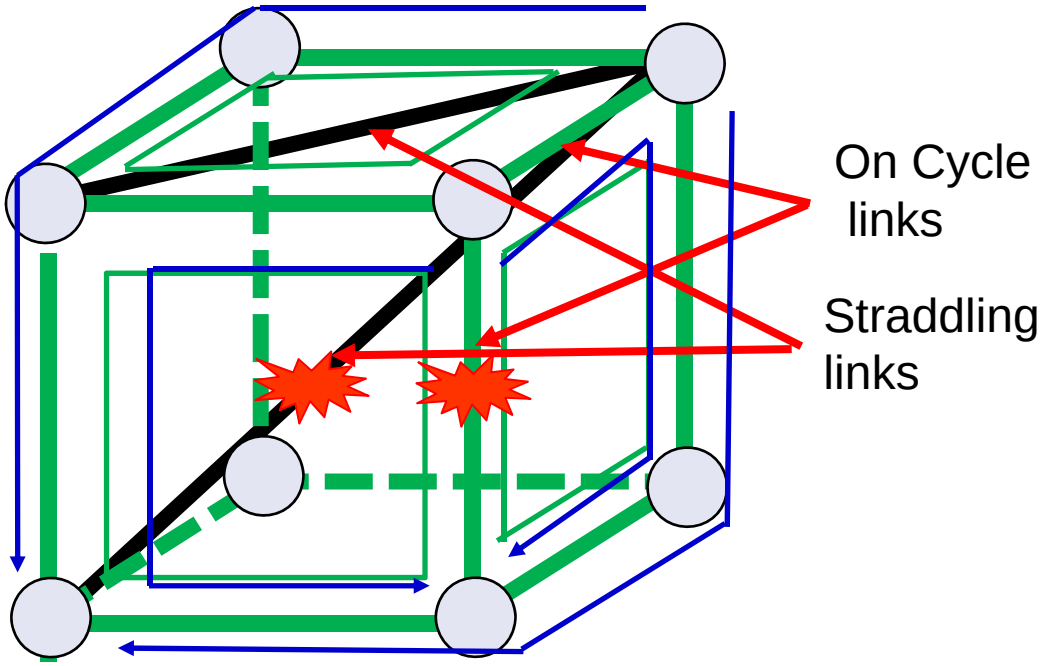
Pre-Configured Prism



P-Prism includes two node-disjoint cycles, as the top and bottom planes of prism. Every node must be belonged to only one cycle, and has at least one link which is connected to the other one.

1. C. Ma, J. Zhang, Y. Zhao, et. al. Optical Fiber Technology, vol.20, no.5, Oct. 2014, pp.443-452
2. C. Ma, J. Zhang, Y. Zhao, et. al. CHINACOM, 14-16 Aug 2013, Guilin, China, pp.756-760
3. C. Ma, J. Zhang, Y. Zhao, et. al. ACPC, 12-15 Nov. 2013, Beijing, China, Post-Dealine Paper, AF2C.6
4. C. Ma, J. Zhang, Y. Zhao, et. al. ACPC, 12-15 Nov. 2013, Beijing, China, AF2G.15

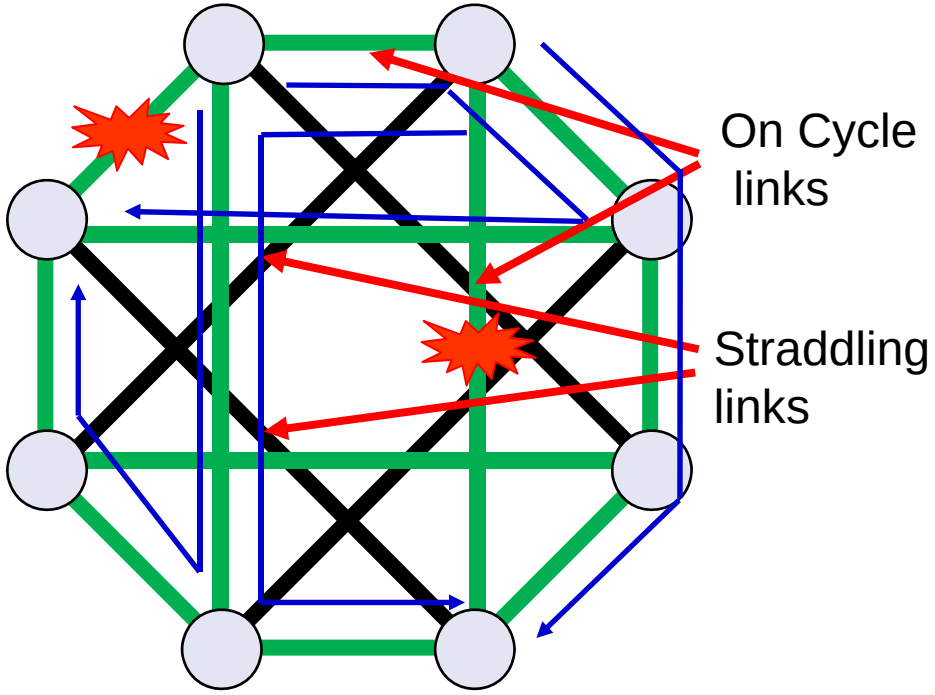
Pre-Configured Ball



Definition 1: ***pre-configured ball*** **(*p-Ball*)** is a subset $\Phi(V_b, E_b)$ of $G(V, E)$ with several planes, and a ring can be found as the border of each plane. To deal with dual-link failure, p-Ball has several characteristics: (i) V_b is equal to V, and every node v in V_b is shared by at least three of the n rings set R; (ii) E_b is a subset of E, and every edge e in E_b is shared by at least two different rings of R; (iii) For any two rings r_i and r_j in R, they have at most one shared link.

1. C. Ma, J. Zhang, Y. Zhao, et. al. Pre-Configured Ball (p-Ball) Protection Method with Minimum Backup Links for Dual-Link Failure in Optical Mesh Networks. IEEE Communications Letters. (Revised)

Pre-Configured Poly



Pre-Configured Polyhedron (p-Poly) Protection For a given physical topology, if a *k*-link connected sub-graph could be constructed on it and all links are marked as on-structure link or straddling links, this *k*-link connected sub-graph is referred as a p-Poly protection structure.

1. C. Ma, J. Zhang, Y. Zhao, et. al. Pre-Configured Polyhedron (p-Poly) with Optimal Protection Efficiency for Dual-Link Failure in Optical Mesh Networks. RNDM, 17-19 Nov. 2014, Barcelona, Spain, (Accepted)

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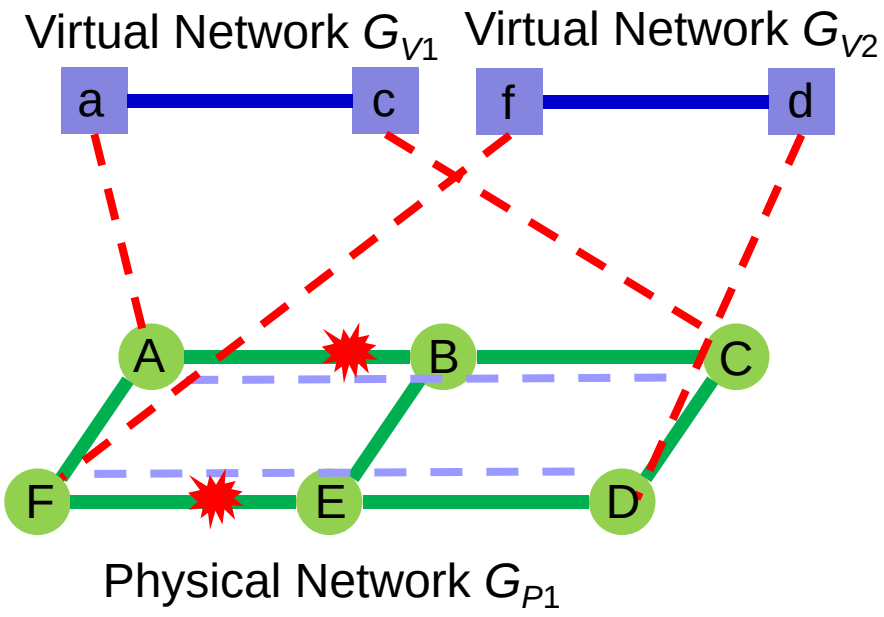
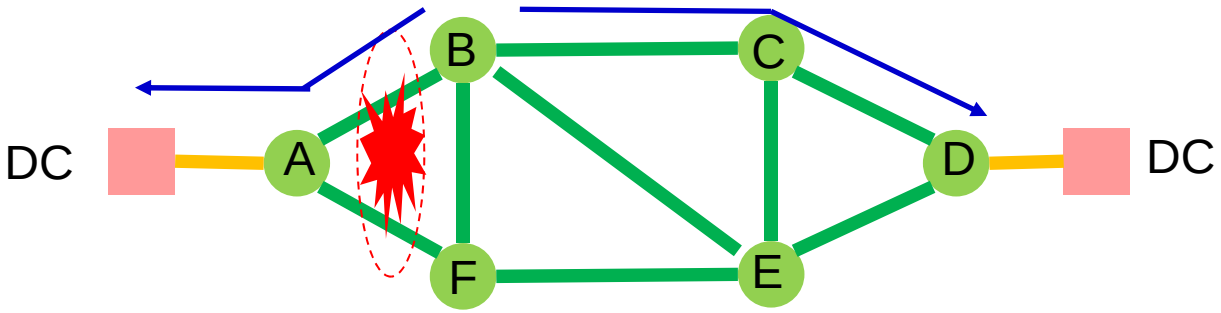
Multi-Link Failure of Virtualization



The work in the future:

1. The model of multi-link failure of virtualization
2. The methods to deal with the scenarios.
3. The indexes to evaluate the effect of link failure.

Multi-Link Failure of Anycast



The work in the future:

1. The model of multi-link failure of in datacenter networks.
2. The methods to deal with the scenarios.
3. The indexes to evaluate the effect of link failure.

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The Ph.D Defense of Jiawei

Teachers

Advisors

Professor and Jiawei

Students of BUPT

THANK YOU!
Q&A

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