LEO SOFTWARE DEFINED NETWORKING BASED ON ONBOARD CONTROLLER

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Introduction

Software Defined Satellite Network

➤ Multi-layer Structure
- Manage plane: Network Operate and Control Center (NOCC)
- Control plane:GEO satellites and ground stations
- Data plane: MEO/LEO satellites

➤ Single-layer Structure
- Manage plane and control plane: NOCC
- Data plane: LEO satellites

Dynamic Characters of Satellites

➤ High propagation delay
-- long waiting time
➤ Frequent handover
-- more control message

Control Policy

Network Control Architecture

➤ Control plane: one satellite in every orbit

   make use of permanent inter satellite links (ISL)

➤ Data plane: LEO satellites and gateways

The architecture of SDSN in LEO constellation

Controller & switch

switch
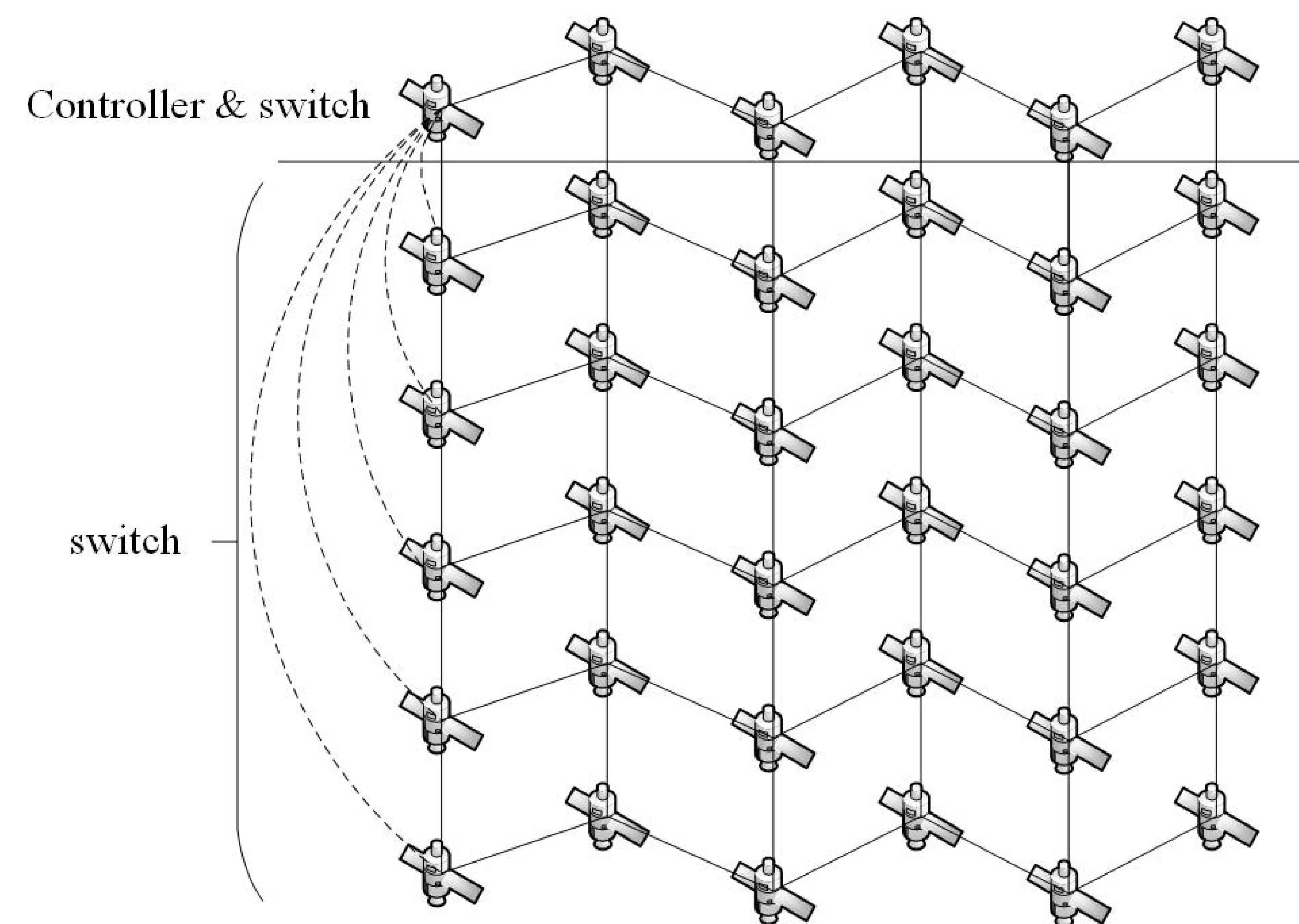
➤ Functions
- Date plane devices: forwarding
- Control plane devices: managing the whole network status, including
   managing topology
   calculating routing table
   managing spot beam, ISLs and other resource

Controller Communication Structure
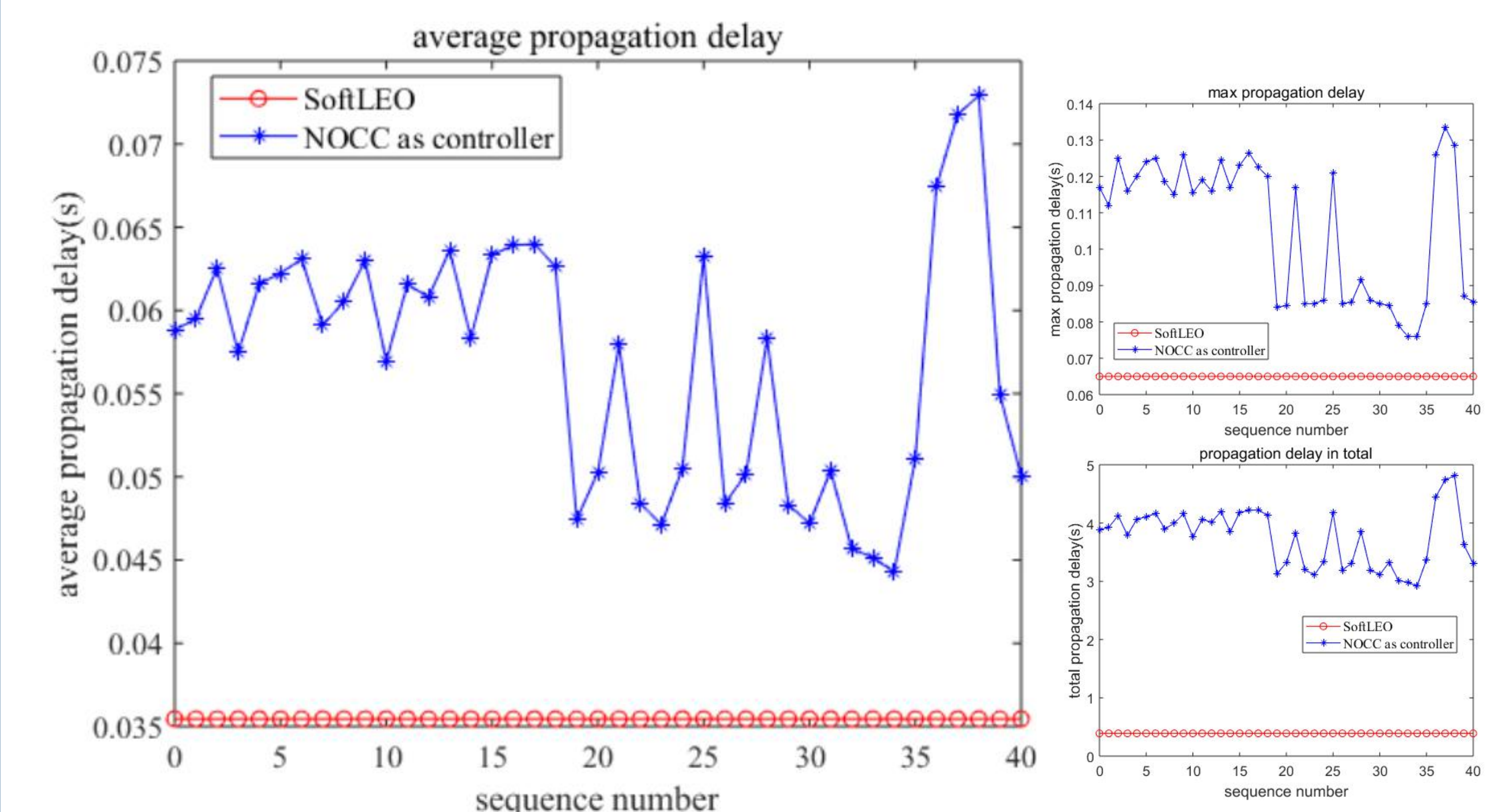
➤ Horizontal Approach
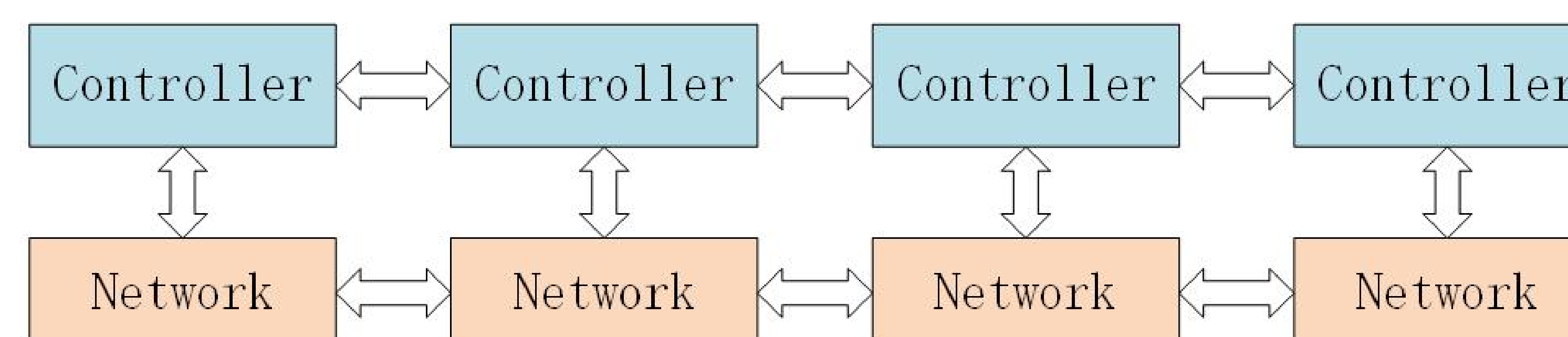
Simulation

Simulation Requirement

➤ Software: STK, MATLAB, Mininet
- STK: getting propagation delay of every ISL
- MATLAB: calculating delay between controllers and switches with Dijkstra algorithm
- Mininet: calculating throughput

Simulation Results

➤ Propagation delay

➤ Throughput