



# Satellite Routing

IETF 116 Hackathon

Huawei & Nanjing University

March 25-31, 2023



# Hackathon Plan

- Simulation of satellite network based on NS3.
- Combine satellite network with existing routing protocols.
- Evaluation of existing routing protocols in satellite network.
  - Path delay variation of satellite network;
  - Path delay jitter variation of satellite network;
  - Packet Loss of satellite network;
  - Path switching of satellite network;

# Hackathon Development

## Build Enviroment:

- **OS**
  - Windows10
- **Hyper-v**
  - 10.0
- **Virtual Machine OS**
  - Ubuntu 20.04



- **G++/Gcc**
  - 9.4
- **NS3**
  - 3.31

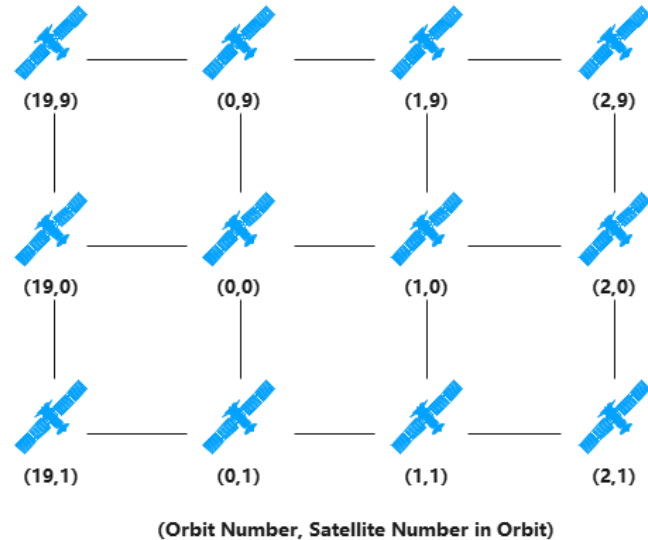


# Simulation Introduction

Basic simulation configuration for satellite network.

## Topology Configuration

- Satellite number: 20\*10
- Inclination angle: 65°
- Altitude: 700km
- Link bandwidth: 100Mbps
- Ground Stations: Shanghai、  
Nanjing、 Los Angeles

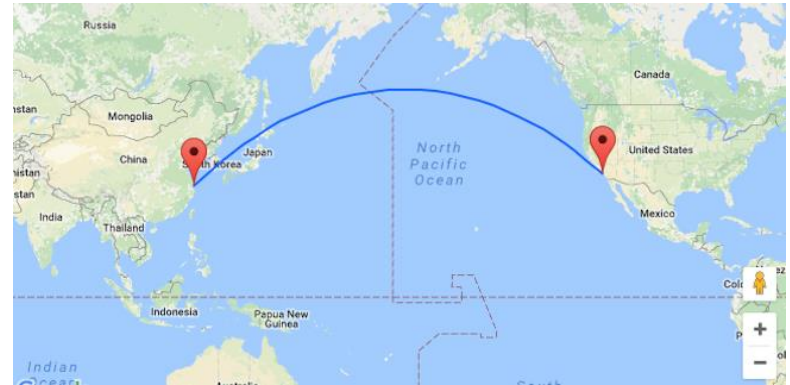


# Simulation Introduction

Basic simulation configuration for satellite network.

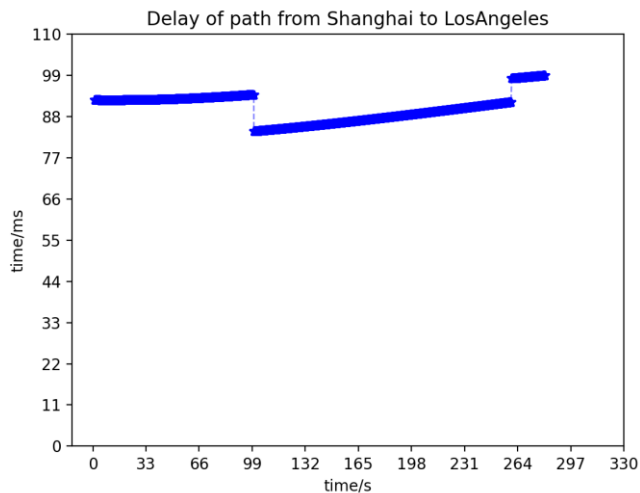
## Traffic Configuration:

- Simulation time: 300 seconds
- Transport layer protocol: UDP
- Sending rate: 2Mbps
- Max queue size: 100 pkts
- Source: Ground Station in Shanghai
- Destination: Ground Station in Los Angeles
- Routing protocols: OSPF and AODV

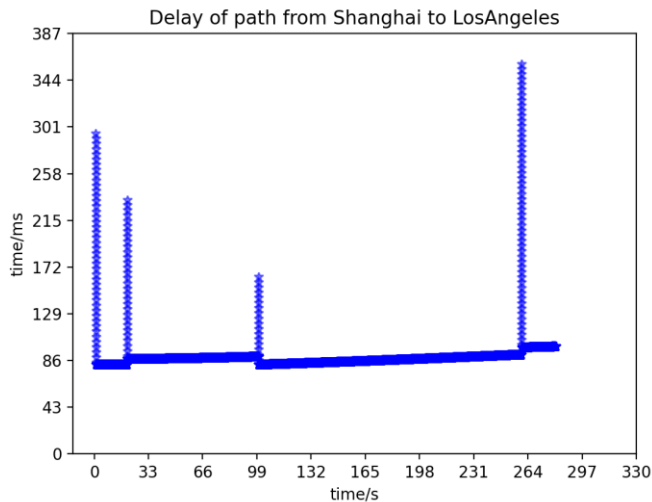


# Demo & Result

- Result1: Visualization of path delay variation.



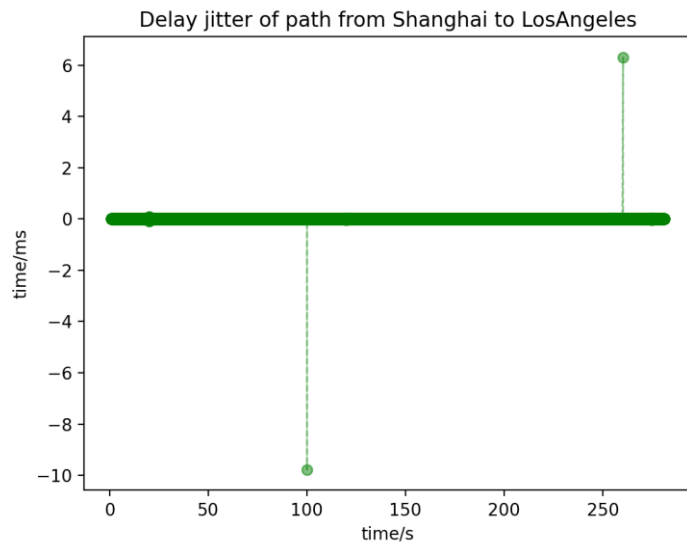
OSPF



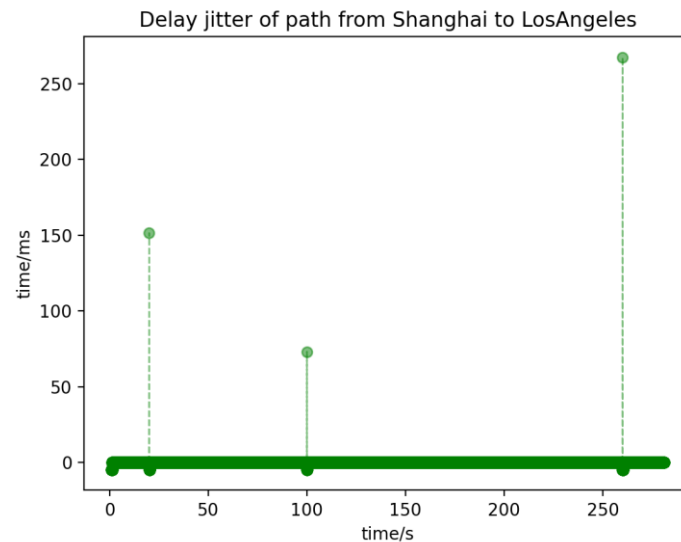
AODV

# Demo & Result

- Result2: Visualization of path delay jitter variation.



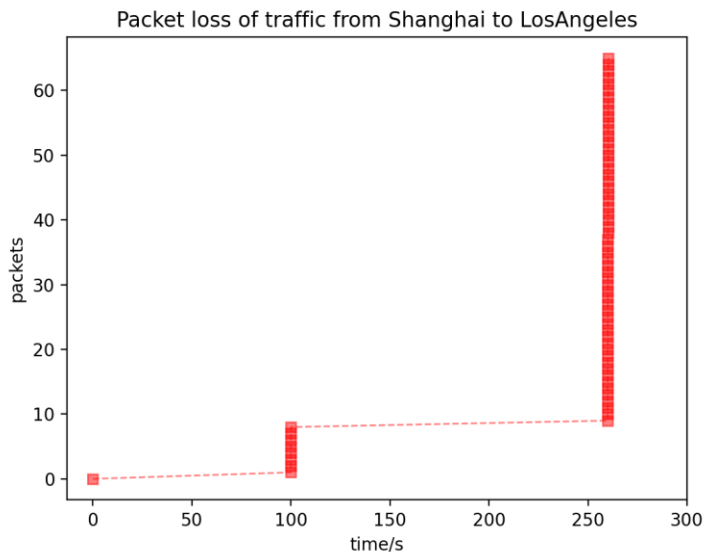
OSPF



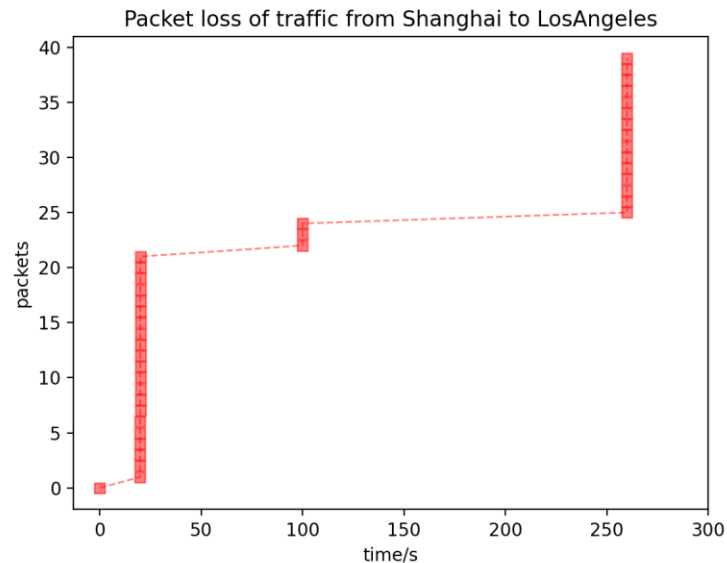
AODV

# Demo & Result

- Result3: Visualization of packet loss.



OSPF

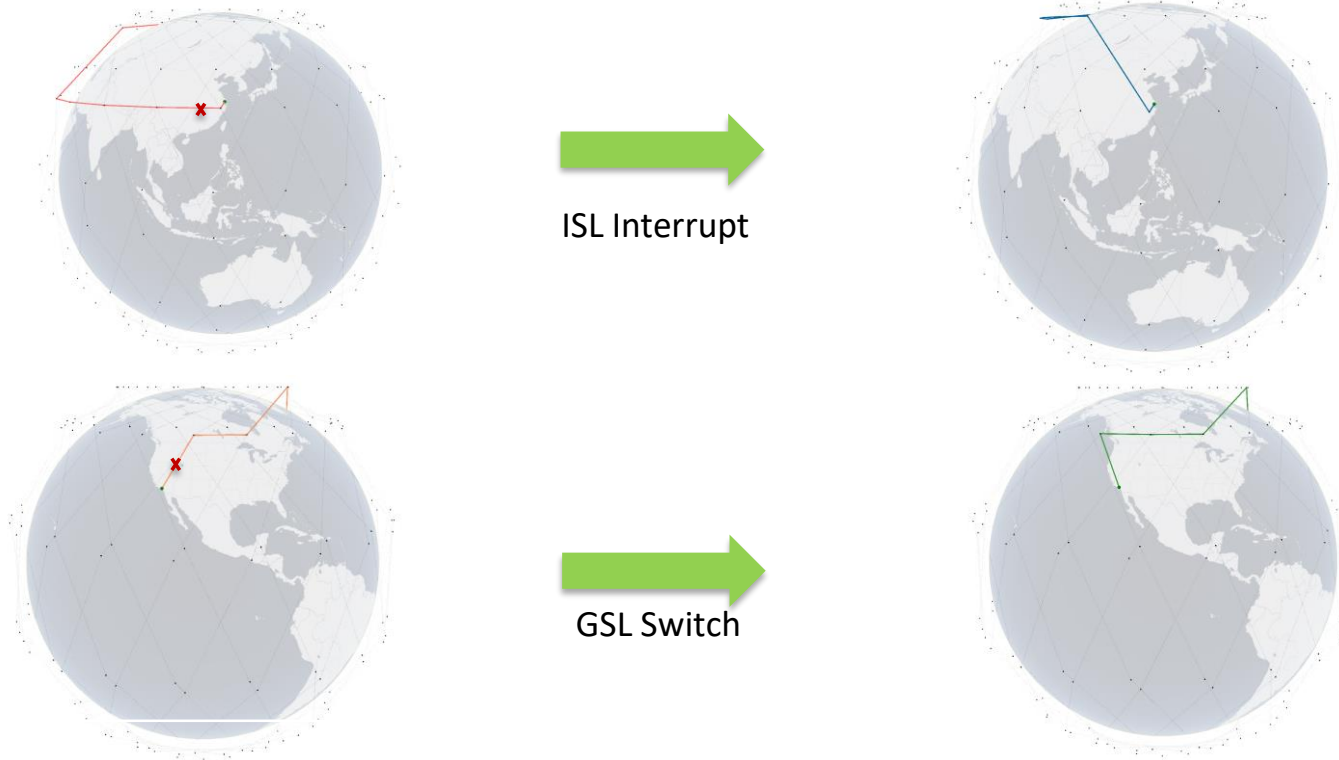


AODV



# Demo & Result

- Result4: Visualization of path switching.



# What we learned

- The existing terrestrial routing protocols(OSPF, AODV) can't adapt to the satellite network and will result in frequent packet loss and Large delay Jitter.
- OSPF protocol is better than AODV in the performance of path delay jitter but worse in the packet loss(in this case).

## **In the future:**

- Adapt more existing routing protocols to the satellite network.
- Improve the existing routing protocols to adapt to the satellite network.
- Improve the simulation speed of satellite network.
- Cooperate with partners who interest in satellite network, join us to improve it together!

# Thank you :)

## Team members(Huawei):

- Zhenbin Li ([lizhenbin@huawei.com](mailto:lizhenbin@huawei.com))
- Li Zhang ([zhangli344@Huawei.com](mailto:zhangli344@Huawei.com))
- Qiangzhou Gao ([gaoqiangzhou@huawei.com](mailto:gaoqiangzhou@huawei.com))

## Team members(NJU):

- Haibo Zhou ([haibozhou@nju.edu.cn](mailto:haibozhou@nju.edu.cn))
- Xiaoyu Liu ([xyliu0119@163.com](mailto:xyliu0119@163.com))
- Ting Ma ([majiawan27@163.com](mailto:majiawan27@163.com))
- Zhixuan Tang ([zhixuantang@smail.nju.edu.cn](mailto:zhixuantang@smail.nju.edu.cn))
- Xiaohan Qin ([xhderemail@smail.nju.edu.cn](mailto:xhderemail@smail.nju.edu.cn))

Open Communities: <https://github.com/Satellite-Routing>