#10 Accelerate Cross-Device Federated Learning With Semi-Reliable Model Multicast Over The Air
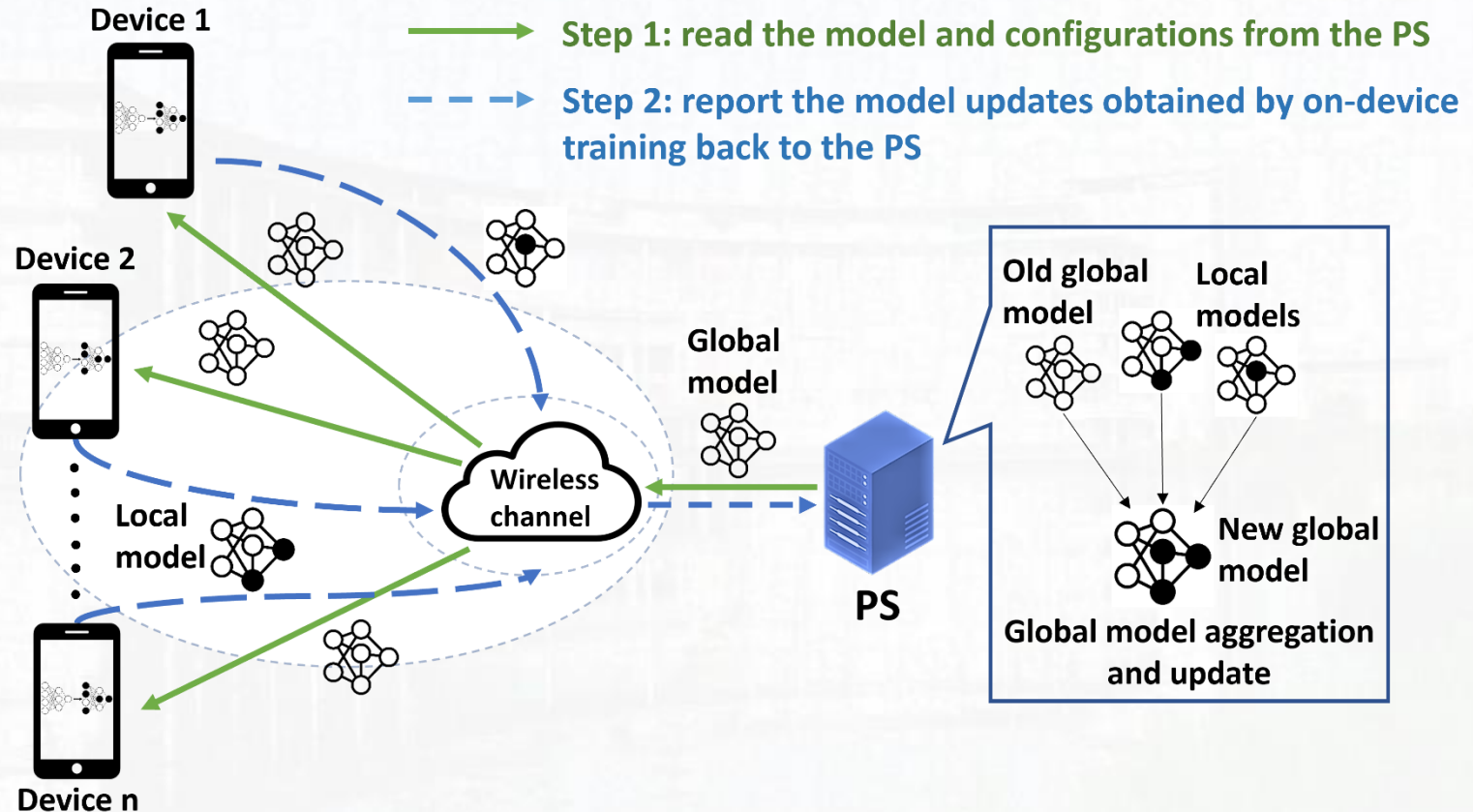
Southwest Jiaotong University

Yunzhi Lin, Shouxi Luo

- In emerging scenarios like unmanned aerial vehicles and self-driving cars, a lot of devices might conduct Federated Learning (FL) Iteratively over shared wireless channels.

- For the one-to-many model delivery involved in training, a promising optimization is to employ existing PHY-aided L2 wireless multicast techniques for help.
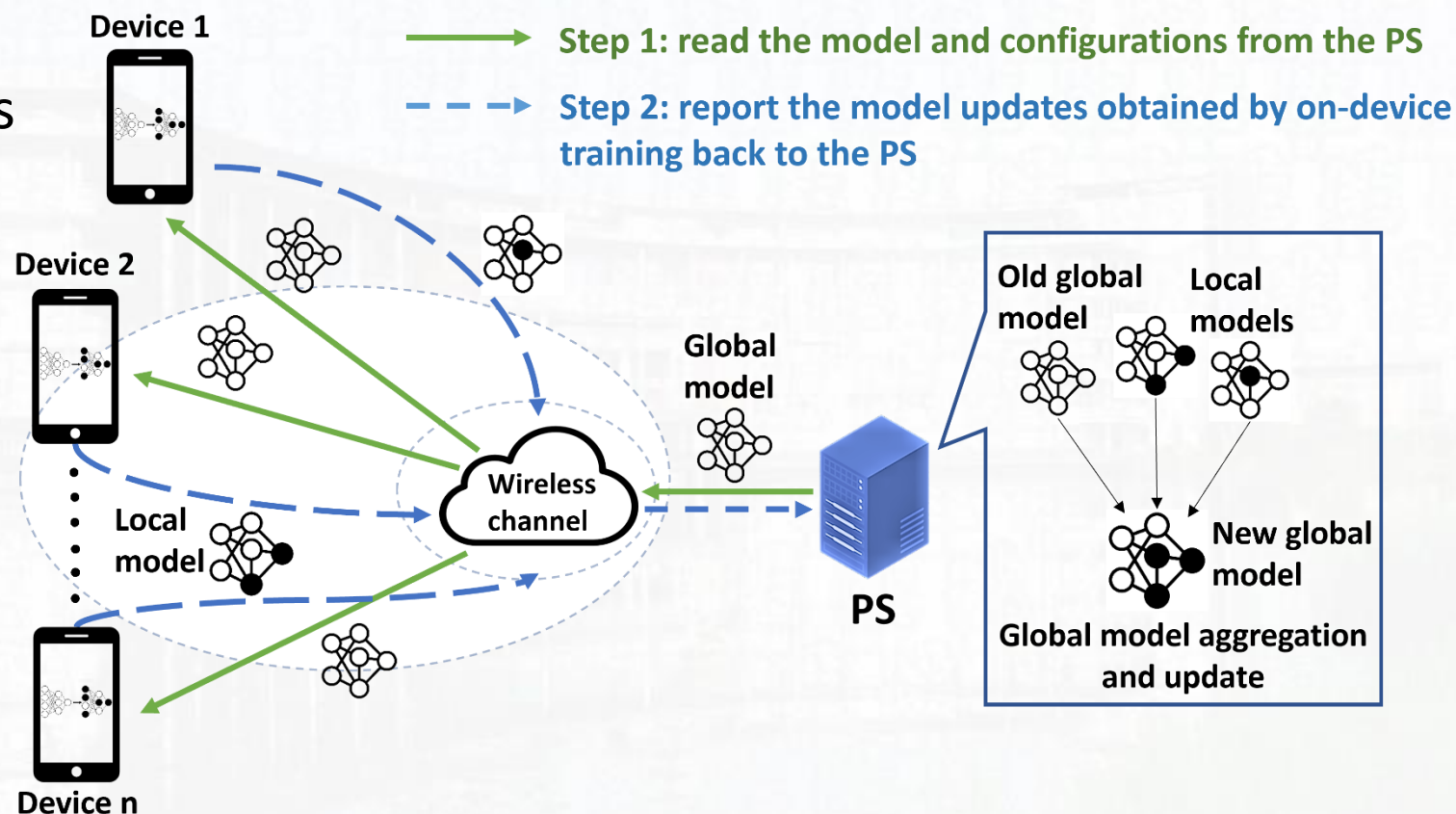
- Existing PHY-aided Layer 2 multicast techniques provide either totally unreliable or reliable delivery service, mismatching with the fact that FL tasks in practice generally tolerate loss-bounded model/gradient transmissions.

- By exploring this type of tolerance, there is a large room for the optimization of model multicast performance.

Step 1: read the model and configurations from the PS

Step 2: report the model updates obtained by on-device training back to the PS

Device 1

Device 2

Local model

Device n

Wireless channel

Global model

PS

Old global model | Local models

Global model aggregation and update

New global model

We propose SRMP, a novel protocol to achieve semi-reliable model multicast for cross-device FL over shared wireless channels.

Unreliable transmission does bring benefits in some cases; however, it also leads to slow convergence.
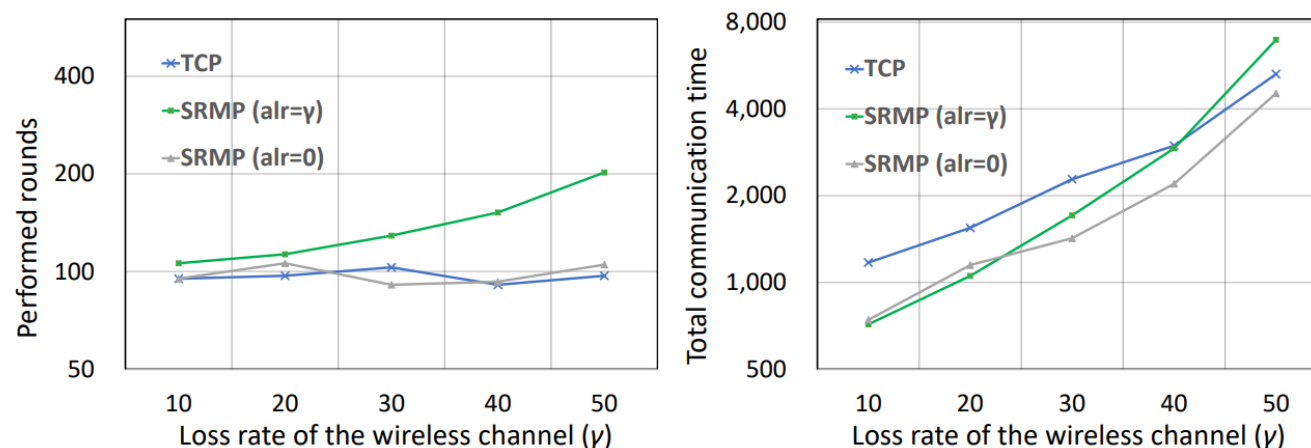
(a) Impact of γ on the performed rounds

(b) Impact of γ on the total communication time

1. How to find the sweet spot?
2. How to achieve loss-bounded delivery more effectively?

- We show that semi-reliable model multicasting is a promising optimization for the acceleration of FL over the shared wireless channel, and preliminarily propose SRMP to explore the design.

- Future work:
  - More thoughtful retransmission designs for SRMP;
  - Methods to configure the protocol parameters respecting the characteristics of both the trained FL model and underlying network environments;
  - Comprehensive performance study.

Thank You!

竢 实 扬 华　自 强 不 息