SDN-BASED MULTIPATH DATA OFFLOADING SCHEME USING LINK QUALITY PREDICTION FOR LTE AND WIFI NETWORKS

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DESCRIPTION OF THE PROBLEM STATEMENT

1. Mobile data traffic growth strains LTE bandwidth and spectrum resources.

2. Heterogeneous Networks (HetNets) combining LTE + WiFi can balance load.

3. Challenge: Maintaining high throughput and low delay during user mobility.

4. Solution: Use SDN controllers with deep learning (BLSTM) to predict link quality (RSSI, PDR) and offload data intelligently across LTE and WiFi.

5. Objective: Improve throughput and stability via real-time prediction-based multipath offloading.

6. (demo video)

PROGRESS

1. Dependencies installed (TensorFlow, Mininet-WiFi, Ryu, etc.)
2. Configurations loaded from model_config.py and verified.
3. LSTM and BLSTM models trained successfully on IoT-LAB dataset.
4. Model weights (.h5) and scalers generated — 99.9% BLSTM accuracy achieved.
5. Mininet-WiFi topology created with LTE + WiFi + 10 nodes.
6. Dual-interface UE mobility between LTE and WiFi implemented.
7. Ryu controllers (LTE/WiFi) launched and communicating.
8. RSSI/PDR monitoring threads operational.
9. Basic code for channel prediction, traffic offloading, and controller coordination is implemented.
10. Current status: Facing runtime errors in data offloading and flow table updates.
11. Lstm & blstm model drivelink

PENDING WORK

- Fix runtime bugs in traffic_offloading.py (OpenFlow group table updates).

- Integrate real-time BLSTM inference (channel_predictor.py) with controller loop.

- Verify dynamic offloading decisions under mobility (Good → Bad transitions).

- Log throughput data and visualize results (throughput_analysis.py).

- Develop optional Flask dashboard for live monitoring.

- Achieve seamless LTE–WiFi offloading with adaptive throughput maintenance.

- Demonstrate performance gain similar to paper's ~6% throughput improvement over SD-MTOP.

Challenges faced

▶ Learning Mininet-WiFi
   Understanding the setup and operation of Mininet-WiFi was challenging, particularly mobility featureand integration for realistic network behavior.

▶ Improving LSTM and BiLSTM Accuracy
   Achieving high prediction accuracy required extensive experimentation with hyperparameters.

▶ Finding an Accurate Dataset
   Obtaining a suitable dataset that accurately represented LTE–WiFi network conditions was difficult.