Supplementary Results

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In this document, we provide additional experimental results as supplementary material to the main paper.

Effectiveness of Inter-layer Modeling. To verify the effectiveness of incorporating inter-layer relationships in link prediction, we design a comparison method, referred to as No Inter-Layer, which retains the overall architecture of CLF-ULP but removes all components related to inter-layer interactions. Specifically, in the structural modeling, GAT is applied to each layer independently, without inter-layer attention fusion. In the temporal modeling, each layer employs an independent LSTM instead of a shared-parameter LSTM. During training, the inter-layer consistency loss is also removed from the loss function.

The comparative results are presented in Table 1. The results indicate that the No Inter-Layer variant experiences a noticeable performance drop, particularly in terms of the AP metric. This supports our main claim that incorporating inter-layer relationships is crucial for effective link prediction in dynamic multiplex UAV networks.

Table 1: AUC and AP with and without considering inter-layer relationships

Methods	RW		GM		RPG		MG	
	AUC	AP	AUC	AP	AUC	AP	AUC	AP
No Inter-Layer	0.9723	0.6106	0.9698	0.6522	0.9293	0.5223	0.9772	0.6150
CLF-ULP	0.9790	0.6650	0.9748	0.6951	0.9470	0.5853	0.9820	0.6591

Node Embedding Visualization. A key novelty of this model is its incorporation of inter-layer relationships by aggregating the node embeddings

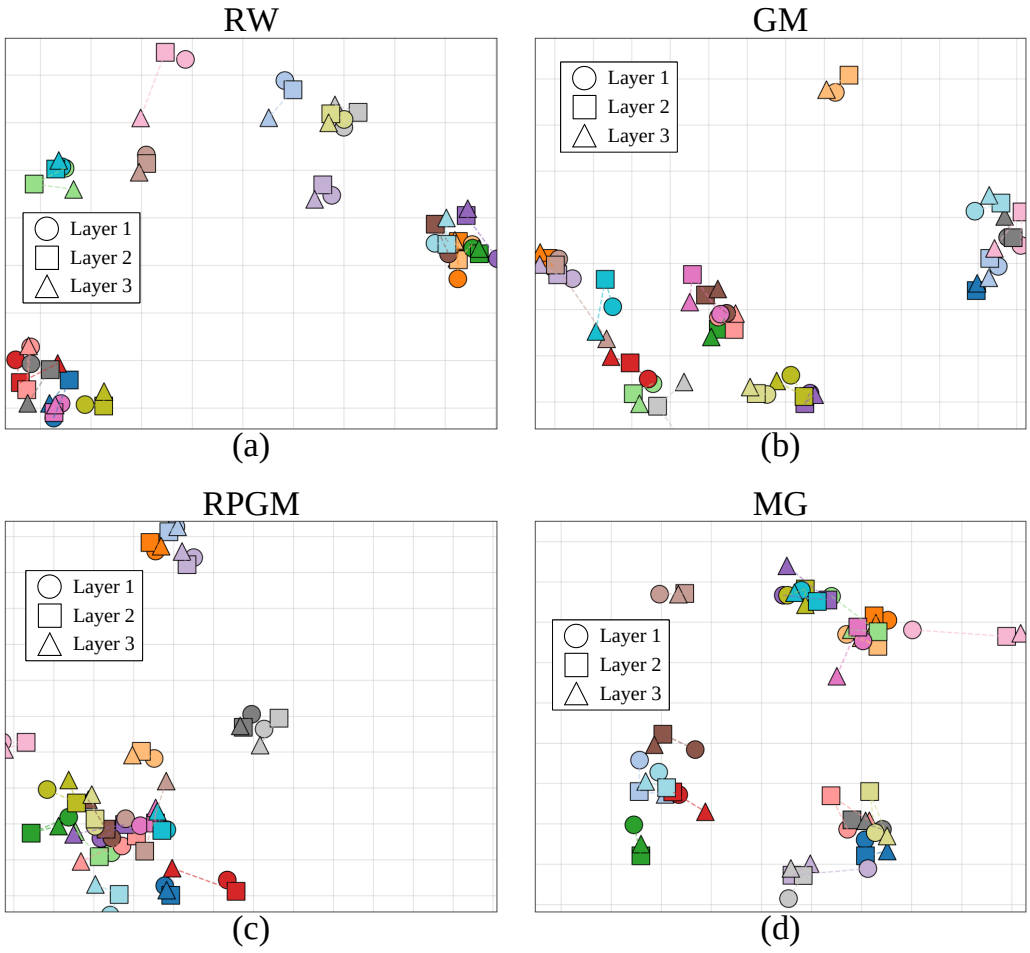

Figure 1: Node embedding visualization for the four mobility models used in the main paper.

across layers through attention fusion to obtain enhanced node representations.

We randomly select a multiplex snapshot from the dataset for each mobility model and apply t-SNE [1] to project the node embeddings into a two-dimensional space. In this space, the closer two points are, the more similar their embeddings. As shown in Fig. 1, we visualize the embeddings of the first 20 nodes, sorted by label, and omit the rest for clarity.

We observe that markers with different shapes but the same color tend to cluster together, indicating that identical nodes across different layers have

similar embeddings. This suggests that the node representations generated by CLF-ULP effectively capture inter-layer relationships, thereby contributing to improved link prediction performance.

References

[1] L. v. d. Maaten and G. Hinton, "Visualizing data using t-sne," *Journal of machine learning research*, vol. 9, no. Nov, pp. 2579–2605, 2008.