

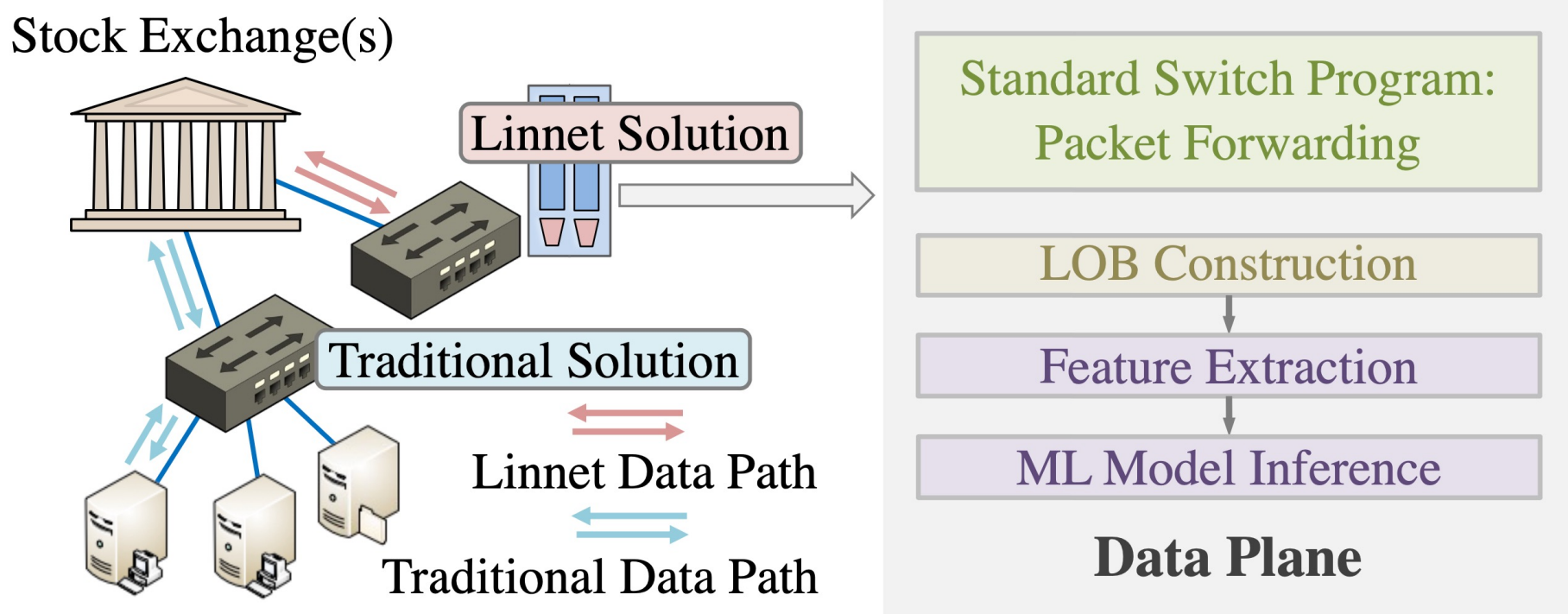
Linnet: Limit Order Books Within Switches

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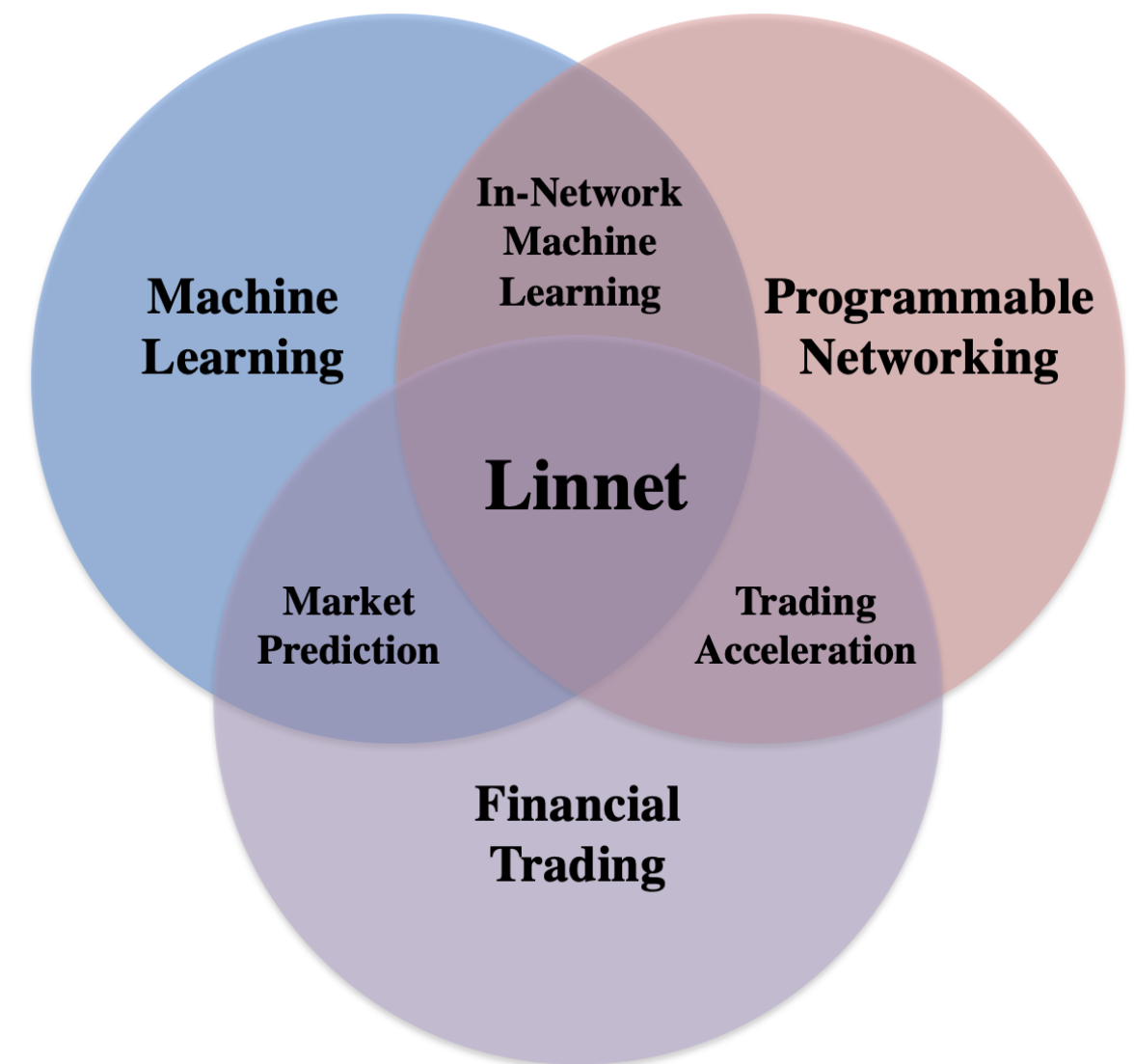
What is Linnet?

High frequency trading requires both high-accuracy and low latency. *Linnet* builds and updates limit order books (LOBs) from market data feeds within programmable switches, providing both *high-accuracy* and *low-latency* stock market prediction.

The Architecture of Linnet



Positioning and Scope of Linnet



1 Market by Order (MBO)

Time Type ID Side Size Price

Linnet is implemented in *P4* on the *BMv2* software switch.

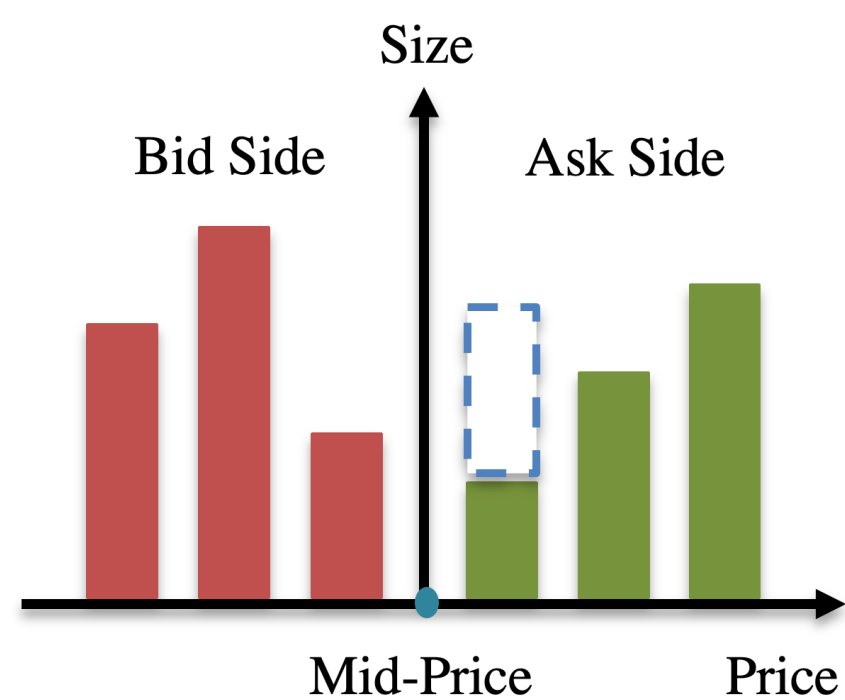
MBO: An order-based market data feed.

LOB: A real-time record of unmatched orders for a certain security which are utilized to buy or sell that security at specific prices or better.

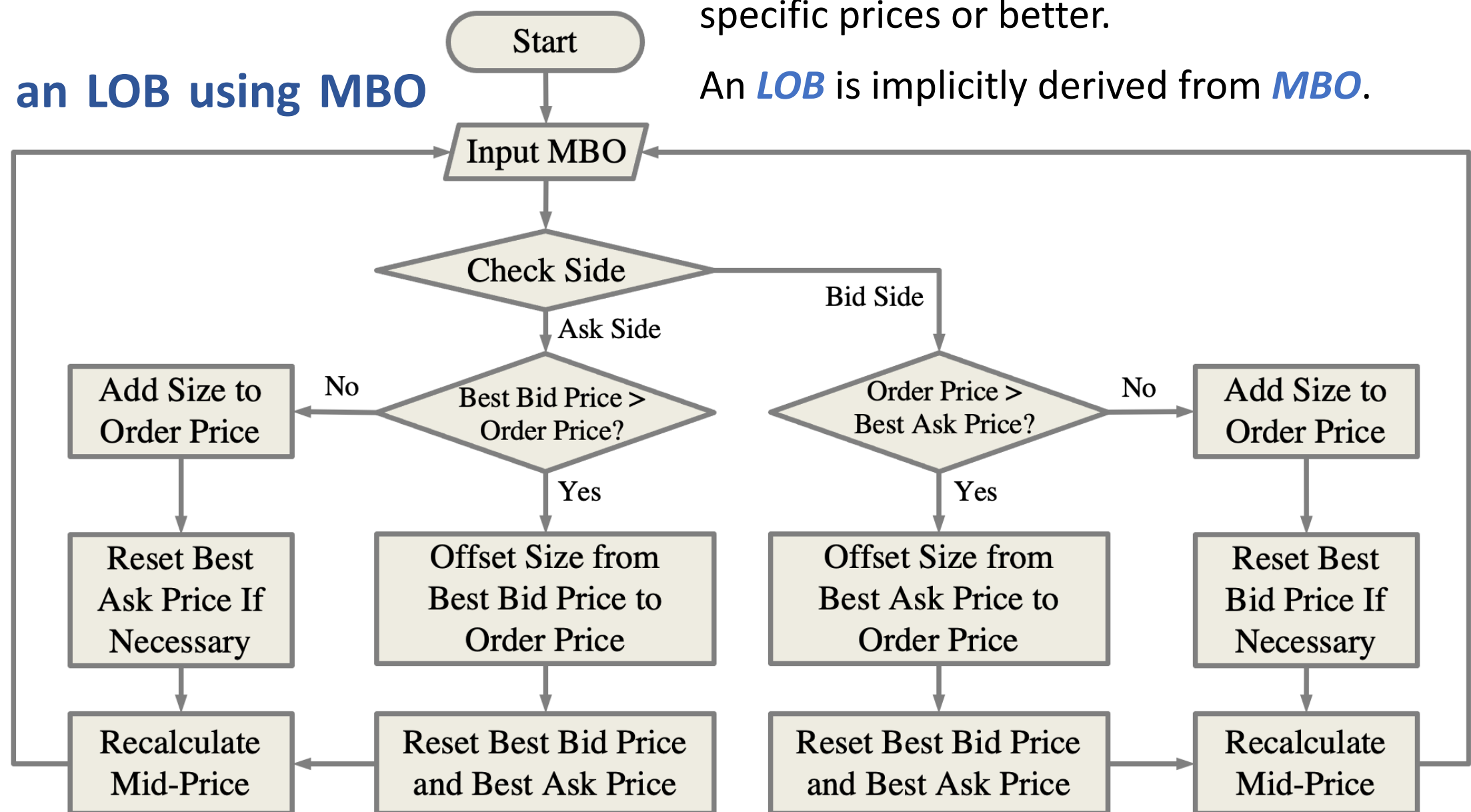
An **LOB** is implicitly derived from **MBO**.

3 Updating an LOB using MBO Feeds

2 Limit Order Book (LOB)



Preliminary Evaluation



Model	COST				NVDA				ASML			
	Switch (L)		Sklearn (U)		Switch (L)		Sklearn (U)		Switch (L)		Sklearn (U)	
	ACC	F1	ACC	F1	ACC	F1	ACC	F1	ACC	F1	ACC	F1
NB	92.94	45.69	93.06	45.85	79.80	66.19	81.26	66.74	89.24	43.51	91.27	46.15
DT	92.52	61.47	93.35	62.59	91.76	56.19	96.16	63.09	97.02	79.86	98.72	90.02
RF	93.11	62.26	93.23	62.42	96.28	68.23	97.86	73.71	95.95	69.28	98.19	82.29
XGB	86.27	79.76	90.00	83.32	95.71	62.87	97.86	69.48	95.10	71.96	95.10	76.11

- ✓ Functionality - Evaluated
- ✓ ML performance - Evaluated
- ✓ Porting to hardware - In progress (switch-ASIC / DPU)

- ❖ Dataset: *NASDAQ's Historical TotalView-ITCH sample data feeds*, Implementation Framework: *Planter*
- ❖ Linnet runs on a switch with a (L)imited size model. The benchmark runs on a server with an (U)nlimited size model.
- ❖ Stocks: COST (Costco Wholesale Corporation), NVDA (NVIDIA Corporation), ASML (ASML Holding NV).
- ❖ NB: naive Bayes, DT: decision tree, RF: random forest, XGB: extreme gradient boosting, ACC: accuracy, F1: f1-score.