

# Hybrid AI Trading System — S1 Digital Assets (S1 RX68 BTC\_MOM) Production Architecture

Momentum (XGBoost-gated trend continuation) · Crypto Perpetuals · routed to EdgeX (perpetuals). 16 configs (BTC · ETH · SOL · XRP × 1M / 3M / 5M / 15M). Per-config XGBoost model + shared FinBERT + regime gate, with Optuna→Backtrader cold-path retraining.

## 1 DATA SOURCES

Twelve Data primary OHLCV · TradingView Pine v6 (S1 RX68 BTC\_MOM) fires webhook on bar close.  
 Symbols: BTC · ETH · SOL · XRP · Timeframes: 1M / 3M / 5M / 15M · 16 active configs.  
 Sentiment: FinBERT on Alpha-Vantage crypto news (last 30 articles per asset).  
 Asset class: Crypto Perpetuals → EdgeX (perpetuals).

## 2 INGESTION

HMAC webhook → Redis Streams queue → ingestion worker → TimescaleDB persist + Redis cache warm.  
 Per-config topic key: s1.rx68.{symbol},{tf} (16 streams).  
 Bar-close idempotency by (config\_id, bar\_time) — duplicate webhooks dropped.

## 3 FEATURE ENGINEERING

Indicators + ML features + derived metrics. StandardScaler fitted in cold path, frozen in hot path.  
 Feature set: OHLCV · RSI · ATR · BB · MACD · returns z-score · vol-of-vol · funding tilt.  
 Per-config feature parity vs Pine source (≤ 1 bp/bar drift gate).

## 4 INTELLIGENCE GATES

Three independent gates in parallel — all must agree before signal advances.

### Regime filter

SMA-20 of returns · BTC dominance proxy  
 → bull/bear/flat

### XGBoost classifier

Per-config XGBoost momentum classifier  
 predicts edge per bar · 16 .pkl

### FinBERT sentiment

FinBERT on Alpha-Vantage crypto news (a  
 acts as kill switch when negative

## 5 ORCHESTRATOR

Aggregates gate scores, sizes positions, emits final BUY / SELL / HOLD with size.

### Score aggregator

weighted gate ensemble  
 per-config min-score thresh.

### Position sizing

Fixed-fractional notional · ATR stop ·  
 24/7 session

### Decision engine + KILL SWITCH

Funding-rate awareness · perp liquidation  
 buffer · 24/7 kill switch

## 6 EXECUTION

Broker-agnostic adapter routes orders. All 16 configs run Paper Trading ≥ 90 days before Live promotion.

### Paper trading

in-memory · fee-modelled

### Broker adapter

EdgeX (perpetuals)

### Live trading

BTC · ETH · SOL · XRP perpetuals

## 7 OBSERVABILITY

Prometheus scrapes per-config metrics; Grafana dashboards split PF/WR/MDD by symbol × timeframe.  
 Alert Manager pages on-call via PagerDuty on drawdown breach, model staleness, parity drift.  
 Live targets: Net P&L \$+2,186,966 · PF 1.48 – 9.61 · WR 55.6% – 74.6% · ~12k trades baseline.

## LEGEND

→ Solid arrow — hot-path live data flow  
 - - - → Dashed arrow — cold-path model artefacts  
 ····· Dotted line — observability tap

- Amber — risk gate / kill switch
- Red — production trading / blocks
- Cyan — data ingestion
- Green — feature engineering
- Blue — research / training (cold)
- Purple — intelligence / HAI gates
- Bronze — execution
- Olive — observability

## SCRIPT IDENTITY

S1 · RX68 · BTC\_MOM  
 Archetype: Momentum (XGBoost-gated trend continuation)  
 Configs: 4×4 = 16  
 Promotion: PF>1.10 ∧ WR>55%

## INFRASTRUCTURE

Single Hetzner host · Docker Compose  
 Caddy fronts TLS · GitHub Actions deploys  
 Doppler injects secrets · Storage Box nightly

## Per-script services

- 16 model worker shards (S1\_RX68\_\*.pkl)
- 1 sentiment worker (FinBERT GPU pool)
- 1 regime worker (SMA-20 + macro feed)
- 1 broker adapter (EdgeX)
- 1 risk daemon (per-config caps)

## Storage

TimescaleDB: bars + signals + fills  
 Redis: feature cache + rate-limit buckets  
 S3: model artefacts + Optuna trials

## A · COLD PATH — Research / Training

Offline loop. Optuna sweeps hyperparams in vectorbt for speed; Backtrader validates with realistic slippage. Winning models register via MLflow and ship back to the hot path.

## S1-specific

Optuna TPE on RSI / ATR / momentum window — 48h crypto walk-forward

## Promotion gate

PF > 1.10 · WR > 55% · MDD ≤ band  
 Pine ↔ Python parity drift < 1 bp/bar  
 Artefact: s1\_rx68\_results\_final.json

## DATA FLOW SUMMARY · S1 RX68 BTC\_MOM

- 1 Pine bar-close on TradingView (1M / 3M / 5M / 15M) fires HMAC webhook → FastAPI / webhook/{secret}/s1
- 2 Worker computes per-config features (OHLCV · RSI · ATR · BB · MACD · returns z-score · vol-of-vol · funding tilt...) and warms Redis cache.
- 3 3 gates evaluate in parallel: Regime (macro tilt) · XGBoost (S1 edge model) · FinBERT (sentiment kill).
- 4 Orchestrator aggregates scores → sizes via Fixed-fractional notional → BUY/SELL/HOLD with size.
- 5 Order routed to EdgeX (perpetuals) after ≥90d Paper validation; Funding-rate awareness · perp liquidation buffer · 24/7 kill switch.
- 6 Prometheus + Grafana track per-config PF/WR/MDD; PagerDuty pages on drift vs baseline (\$+2,186,966).

## CONFIG MATRIX (16 active models)

Symbol	Timeframes routed	Engine archetype	Broker leg
BTC	1M · 3M · 5M · 15M	Momentum (XGBoost-gated trend cont)	EdgeX
ETH	1M · 3M · 5M · 15M	Momentum (XGBoost-gated trend cont)	EdgeX
SOL	1M · 3M · 5M · 15M	Momentum (XGBoost-gated trend cont)	EdgeX
XRP	1M · 3M · 5M · 15M	Momentum (XGBoost-gated trend cont)	EdgeX

Total active configs: 4 symbols × 4 TFs = 16 — each backed by its own .pkl model and per-config calibration JSON.