Intelligent RTC Framework for Demand Sensing and Forecasting in Enterprise Supply Chains

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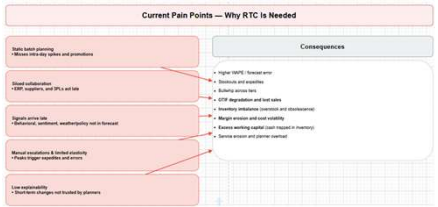
Abstract

Global supply chains are repeatedly disrupted by demand swings, supplier constraints, and logistics delays. **This work presents an Intelligent Real-Time Communication (RTC) framework** that unifies **SAP Integrated Business Planning (IBP)**, **SAP Business Technology Platform (BTP)** services (AI Core, Event Mesh, Integration Suite, API Management, Alert Notification), and **SAP HANA Cloud** to enable **continuous sensing → prediction → constrained re-planning**. External **exogenous signals**—consumer behavior, search interest, social sentiment, and context (weather/news/holiday/policy)—are fused via **learning-to-rank (LTR) uplift modeling** to generate near-term demand adjustments at SKU/region/channel. **AI Core** serves anomaly detection, short-term prediction, and adaptive re-planning endpoints; **Event Mesh** orchestrates event-driven updates across ERP, suppliers, and logistics partners; **Integration Suite** connects SAP and non-SAP systems; **HANA Cloud** consolidates plan state, telemetry, and KPIs for predictive scoring and scenario analysis. **IBP** consumes uplift signals for constraint-aware re-planning. The approach aims to increase forecast accuracy, reduce stockouts, shorten response time, and strengthen enterprise resilience. We describe the system architecture, supplier/logistics touchpoints via **SAP Business Network**, operating loop, and measurable KPIs that guide rollout.

Problem Statement

- Static, batch planning misses intra-day promotion spikes, channel shifts, or lane disruptions.
- Siloed collaboration across ERP, suppliers, and 3PLs slows corrective action and propagates error.
- External signals (behavioral, sentiment, weather/policy) are weak individually but powerful when fused—yet rarely reach IBP in time.
- Manual escalations and limited compute elasticity during peaks drive expedites, stockouts, and obsolescence.
- Lack of explain ability in short-term adjustments undermines planner trust and adoption.



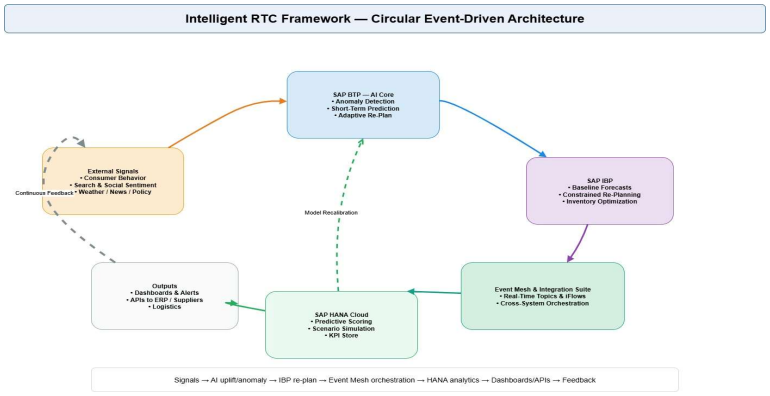
Background and Method of Approach

Framework Components
- SAP IBP (planning core): baseline forecasts, forecast consumption, constraint-aware re-planning, inventory optimization
- BTP — AI Core: models for anomaly detection, t+1…t+14 uplift, adaptive re-plan hints; registry, versioning, controlled rollout
- BTP — Event Mesh: publish/subscribe topics (for example, /demand/update, /supply/asn, /logistics/eta, /risk/alert) for real-time orchestration
- BTP — Integration Suite: iFlows/mappings across ERP, SAP Business Network (suppliers & logistics), and external APIs (weather/news/commerce)
- BTP — API Management: secure, governed read/write APIs for partner apps and portals
- SAP HANA Cloud: analytical backbone—feature/KPI store, predictive scoring, what-if scenario simulation; event telemetry for audit/ML
- Identity & compliance: Cloud Identity Services and XSUAA; OAuth, quotas, policy controls
- Alert Notification: threshold-based alerts to email/Teams/Slack with acknowledgment tracking

SAP Business Network touchpoints
- Supplier confirmations and advance ship notices (ASNs) that reveal capacity and shortage risk
- Quality and chargeback events that indicate reliability risk
- Logistics milestones and estimated time of arrival updates from Business Network for Logistics that flow into Event Mesh and HANA for predictive estimated time of arrival and re planning.

Exogenous signal fusion
- Behavioral signals such as search queries, product page dwell time, add to cart, and abandonment
- Sentiment signals such as brand and category polarity and influencer spikes
- Context signals such as weather alerts, holidays, school schedules, and policy changes
- Commerce signals such as competitor price changes and promotion calendars
- Fusion through learning to rank uplift modeling produces a near term demand uplift or decay by product, region, and channel that SAP Integrated Business Planning consumes for constraint aware re planning

Operating loop
1 Sense through Business Network events and external signals landing via Integration Suite and HANA
2 Predict through AI Core with uplift and anomaly scoring at granular levels
3 Plan through SAP Integrated Business Planning with updates to supply, allocations, and safety stock under constraints
4 Orchestrate through Event Mesh broadcasting plan deltas to enterprise resource planning, warehouse management, transport management, suppliers, and third party logistics
5 Optimize through HANA with scenarios and computation of key performance indicators such as accuracy measures, on time and in full, and fill rate
6 Act and learn through alerts that trigger actions while realized outcomes feed back for drift monitoring and retraining



Signals → AI uplift/anomaly → IBP re-plan → Event Mesh → HANA analytics → Dashboards/APIs → Feedback

Results

Quantitative impact
- **Forecast accuracy:** +15–20% at near-term horizons
- **Stockouts/backorders:** −25–30% on targeted assortments
- **Lead time to plan change:** −10–15% via event-driven updates
- **Operational cost (expedites/safety-stock/obsolescence):** −10–12%
- **Visibility / OTIF:** +~25% through real-time dashboards and alerts

COVID and sentiment example
Rising cases and local policy restrictions reduce store traffic while online demand rises. Supplier advance ship notices slip for two critical components. AI Core outputs regional uplift with a decline for stores and a rise for online commerce. SAP Integrated Business Planning re allocates distribution center stock and adjusts safety stock. Event Mesh publishes new waves to enterprise resource planning, warehouse management, and transport management and notifies suppliers through SAP Business Network. HANA evaluates expedited versus re route cost and planners accept the lowest cost plan that preserves on time and in full. The observed outcome is a reduction in stockouts and an improvement in service level in impacted regions.

Conclusion

From static to adaptive planning, the Intelligent Real Time Communication approach creates a continuous event driven loop with explainable near term adjustments. The combination of SAP Integrated Business Planning planning logic, Business Technology Platform artificial intelligence and events, HANA analytics, and Business Network signals converts noisy indicators into actionable and constraint aware plans. Organizations achieve higher accuracy, better availability, faster response, and lower cost while maintaining governance and security. Next steps include expansion of signal libraries, introduction of generative copilot support for planners, automation of mitigation playbooks as Event Mesh topics, and standardization of an application programming interface catalog for multi brand and multi region rollout. .

Baseline vs RTC Outcomes — Key Performance Indicators

KPI	Baseline	RTC	Δ
Forecast Accuracy (Accuracy = 1 − WAPE (Weighted Absolute Percentage Error))	70%	85–90%	+15–20%
Stockouts / Backorders (Index; lower = better)	100	70	−25–30%
Lead Time to Plan Change (days)	7.0	6.0	−10–15%
Operational Cost (Index)	100	89	−10–12%
Visibility / OTIF (Index)	75	100	+~25%

Real Time Communications Conference and Expo at Illinois Tech
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