

Functional Specification: Real-Time Customer Insight Hub Project

1. Project Overview & Objectives

A unified live analytics dashboard that consolidates CRM, email, support, content, and analytics data to deliver actionable insights for Q3 campaigns while meeting GDPR/CCPA compliance and budget constraints.

- Project Objective: Deliver a real-time customer insight hub within 90 days that achieves a 12% conversion uplift, maintains <0.5% data quality errors, and attains 70% dashboard adoption by marketing and analytics teams.

2. Scope Boundaries:

Implement real-time ingestion, data validation, compliance checks, and BI integration for core customer touchpoints.

- In-Scope:
 - Real-time streaming from Salesforce, SendGrid, Zendesk, CMS GraphQL, GA4, Brandwatch
 - Data quality rules (duplicates, nulls, timestamp windows, sentiment bounds)
 - GDPR/CCPA retention enforcement and audit logs
 - Tableau/Looker integration for downstream reporting
 - Monitoring dashboards with Prometheus/Grafana alerts
- Out-of-Scope:
 - Advanced predictive modeling or AI recommendation engines
 - Deep integrations with new third-party loyalty platforms
 - Additional BI tools beyond Tableau/Looker
 - New API contract negotiations outside existing limits

3. Current State (As-Is)

- Marketers manually export Salesforce CSVs, load into Tableau, then build Excel reports-a 3-4 hour manual loop that delays insight delivery.
- Duplicate customer IDs and null/misaligned fields in the exported data inflate reach metrics and distort conversion calculations.
- There is no single audit trail or automated validation; stakeholders question data integrity and budgets overrun due to manual errors.

As-Is Process Flows

- Insight Generation:

- Happy path:

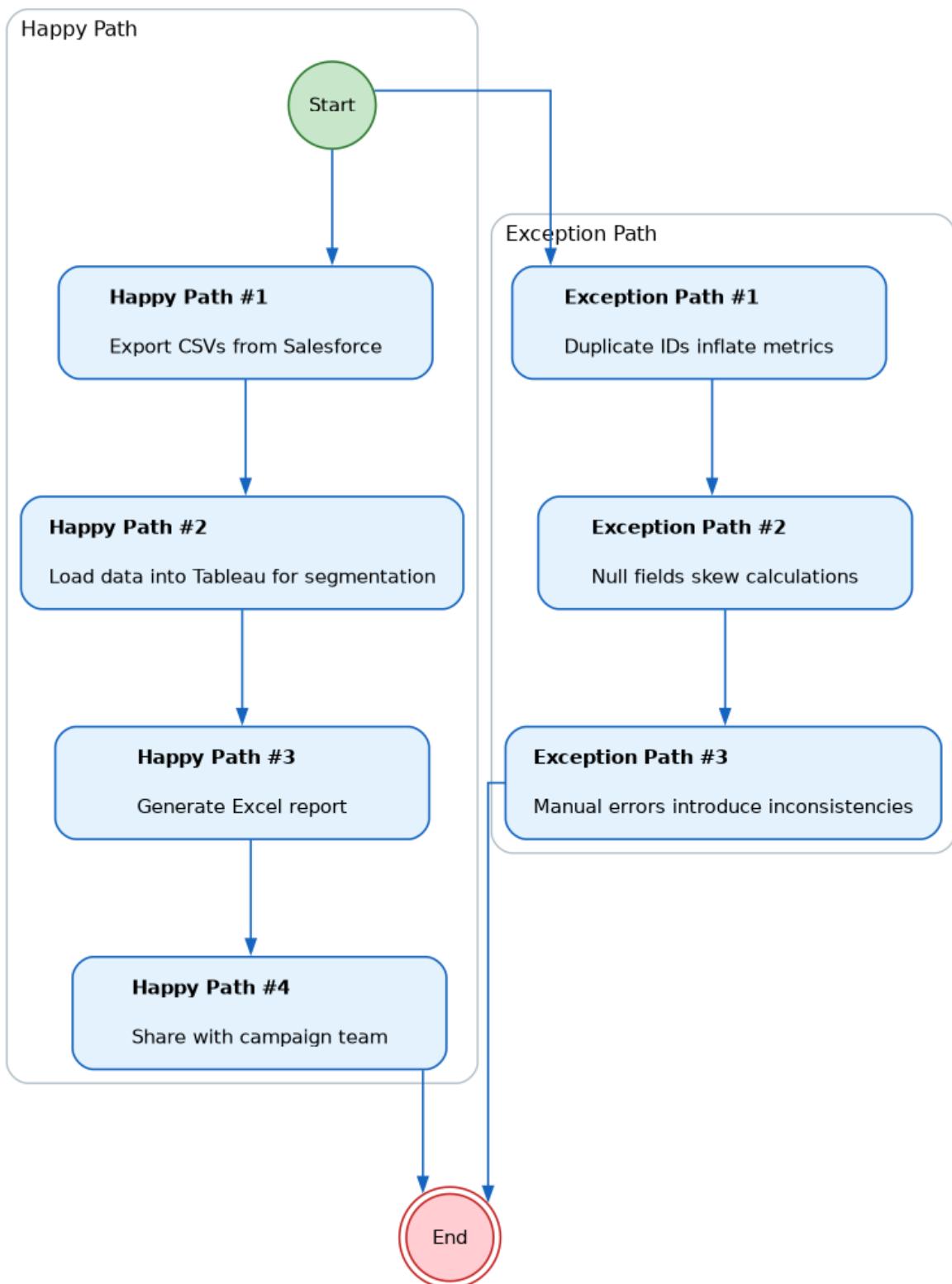
- 1. Export CSVs from Salesforce
- 2. Load data into Tableau for segmentation
- 3. Generate Excel report
- 4. Share with campaign team

- Unhappy path / exceptions:

- 1. Duplicate IDs inflate metrics
- 2. Null fields skew calculations
- 3. Manual errors introduce inconsistencies

Process

Insight Generation · AS-IS Process Flows



4. Future State (To-Be)

- Real-time sync from Salesforce to Snowflake within 15 min, cutting insight lag by 90%
- Automated Great Expectations checks eliminate duplicate and null errors before load
- Looker segmentation pane delivers instant drill-through with <2 s latency
- GDPR/CCPA audit logs retained per policy, ensuring compliance visibility
- Prometheus/Grafana alerts notify teams of API usage approaching limits

Future Process Flows

- Data Ingestion & Validation:

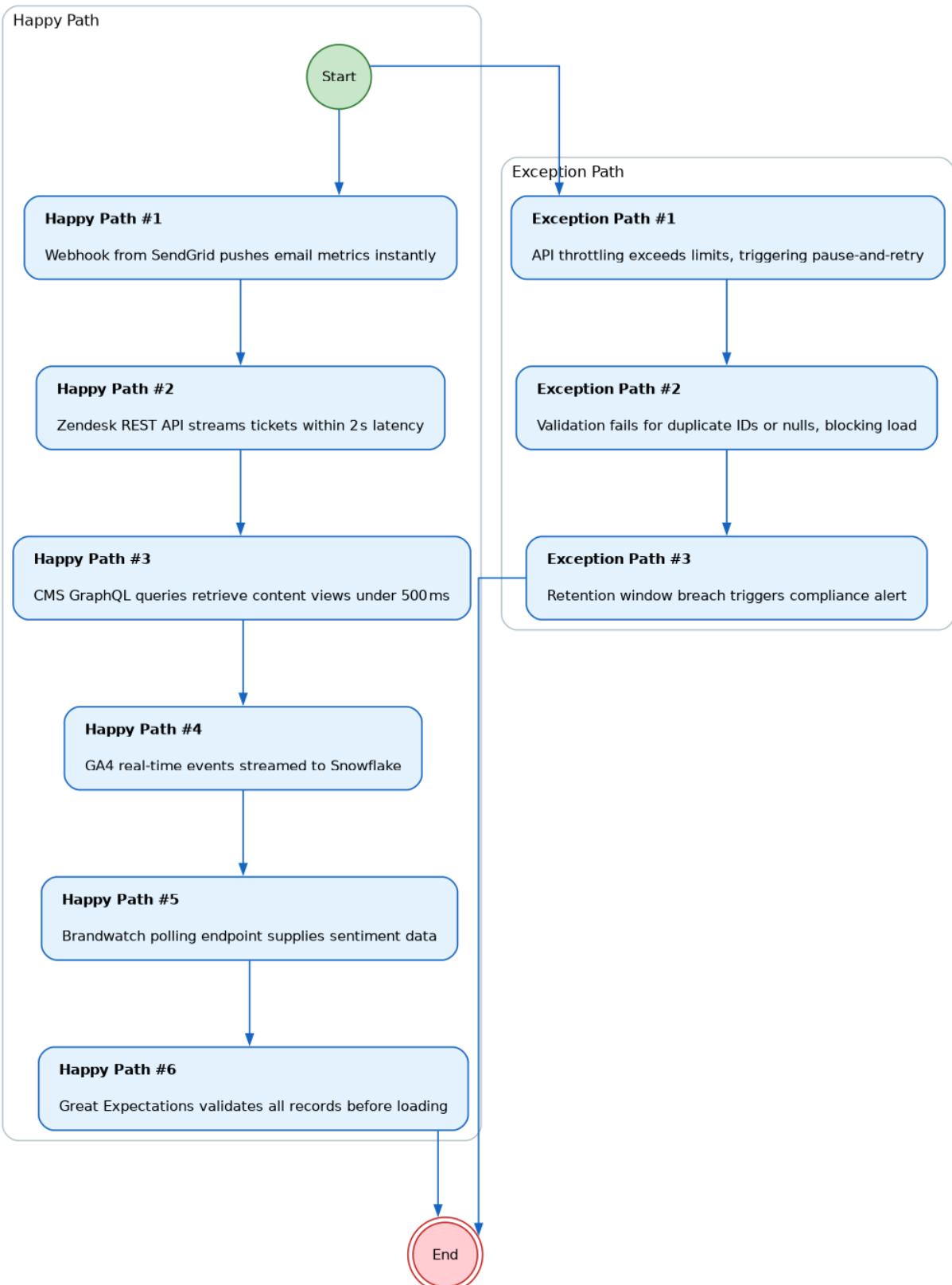
- Happy path:
 - 1. Webhook from SendGrid pushes email metrics instantly
 - 2. Zendesk REST API streams tickets within 2 s latency
 - 3. CMS GraphQL queries retrieve content views under 500 ms
 - 4. GA4 real-time events streamed to Snowflake
 - 5. Brandwatch polling endpoint supplies sentiment data
 - 6. Great Expectations validates all records before loading
- Unhappy path / exceptions:
 - 1. API throttling exceeds limits, triggering pause-and-retry
 - 2. Validation fails for duplicate IDs or nulls, blocking load
 - 3. Retention window breach triggers compliance alert

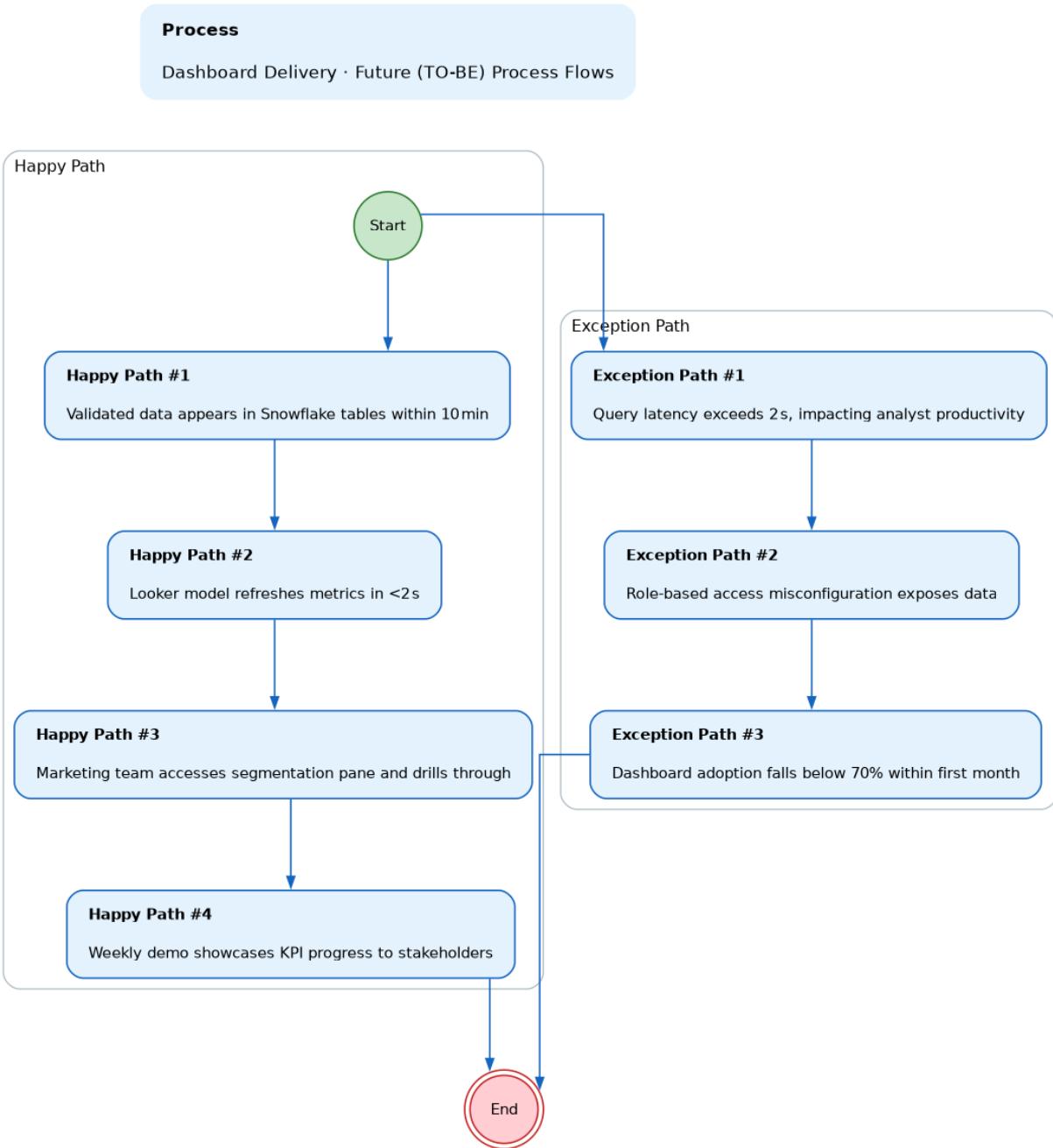
- Dashboard Delivery:

- Happy path:
 - 1. Validated data appears in Snowflake tables within 10 min
 - 2. Looker model refreshes metrics in <2 s
 - 3. Marketing team accesses segmentation pane and drills through
 - 4. Weekly demo showcases KPI progress to stakeholders
- Unhappy path / exceptions:
 - 1. Query latency exceeds 2 s, impacting analyst productivity
 - 2. Role-based access misconfiguration exposes data
 - 3. Dashboard adoption falls below 70% within first month

Process

Data Ingestion & Validation · Future (TO-BE) Process Flows





5. Stakeholders & Personas

- Campaign Lead: Read-only user who drills through insights to inform campaign strategy.
- Creative Analyst: User with query creation rights focused on ad performance slices.
- Marketing Data Scientist: Full query access to raw tables for deep analysis and model building.

6. Functional Requirements Overview

The hub ingests data from multiple sources, validates it, stores it in Snowflake, and exposes it through Looker/ Tableau dashboards with real-time freshness and compliance controls.

7. Non-Functional Requirements

- Encryption at rest (AES-256) and in transit (TLS 1.3).
- Audit log retention: 90 days GDPR, 30 days CCPA.
- API usage monitoring with Prometheus/Grafana alerts.

8. Assumptions

- Two senior developers are available for the data layer refactor.
- Existing BI tools (Tableau/Looker) can integrate without additional licensing.
- CRM migration downtime window is known and can be coordinated.
- API rate limits will remain stable during project execution.

9. Risks

- API throttling could delay ingestion, affecting real-time freshness.
- Data quality gaps may erode stakeholder confidence if not caught early.
- Budget overruns from unexpected API costs or licensing changes.
- Compliance breaches due to audit log mismanagement.
- Stakeholder resistance if adoption targets are not met.

10. Open Issues

- Exact timing and duration of CRM migration downtime.
- Final approval of GDPR/CCPA retention thresholds for all data types.
- Confirmation of Tableau license capacity beyond 50 concurrent users.
- Detailed mapping of data lineage from source to dashboard metrics.

11. Functional Requirements

Functional Requirements

Spec ID	Specification Description	Business Rules	Data Dependency

FR-1	Real-time ingestion from Salesforce into Snowflake via API calls every 15 minutes.	Must respect 150 requests/min limit; data partitioned by customer ID; error handling with retry logic.
FR-2	Email engagement stream from SendGrid using webhooks to capture opens/clicks instantly.	Webhook payload validated for required fields; timestamp must be within last 24 hours.
FR-3	Support ticket ingestion from Zendesk REST API with <2s latency requirement.	Token rotation every 30 days; limit queries to 100 req/s; map status codes to sentiment scores.
FR-4	CMS content view metrics retrieved via GraphQL queries under 500ms per request.	Payload size <500MB; cache results for 5 minutes to avoid throttling.
FR-5	Great Expectations validation rules: duplicate IDs, null fields, timestamp windows, sentiment bounds, and active-contact flag.	Validation must pass before data is loaded into Snowflake; failures logged and blocked with alert.