Missing Stripe Webhooks - Implementation Proposal

1. Context

The current Stripe integration relies on webhook events to synchronize subscription and payment data between Stripe and our platform. Based on analysis of the existing implementation and Stripe documentation, **5 critical webhook handlers are missing** that are essential for proper subscription lifecycle management.

Without these webhooks, the system cannot track important subscription state changes, leading to data inconsistency and potential revenue loss.

Missing / Required Webhooks

- `customer.subscription.updated` (critical for tracking subscription status changes, renewal dates, and cancellation schedules)
- `customer.subscription.deleted` (to handle permanent subscription deletion)
- `invoice.payment_action_required` (to notify users when payment requires 3D Secure authentication)
- `invoice.created` (to apply discounts or credits before invoice finalization)
- `invoice.finalized` (for audit trail and logging before payment attempt)

2. Current Implementation Status

Our system currently handles **3 webhook events** for payment processing:

Implemented Webhooks:

- `invoice.paid` / `invoice.payment_succeeded` → Updates billing status to DONE
- `invoice.payment_failed` → Updates billing status to PAST_DUE

Missing Webhooks:

- `customer.subscription.updated` → No handler (HIGH PRIORITY)

- `customer.subscription.deleted` → No handler (MEDIUM PRIORITY)
- `invoice.payment_action_required` → No handler (MEDIUM-HIGH PRIORITY)
- `invoice.created` → No handler (LOW PRIORITY)
- `invoice.finalized` → No handler (LOW PRIORITY)

3. Problem Analysis

Problem 1: Cannot Track Subscription Status Changes

Current Gap:
The system doesn't receive notifications when subscription status changes (active → past_due → canceled) or when users schedule cancellations.

Business Impact:

- Customer support cannot answer "When does my subscription renew?"
- No visibility when user schedules subscription cancellation
- Billing status may be out of sync with Stripe
- Risk of charging customers after they've cancelled

Example Scenario:
User clicks "Cancel Subscription" in Stripe Customer Portal → Stripe sets `cancel_at_period_end = true` → Our system doesn't know about it → User expects cancellation but we keep charging → Chargeback dispute and customer churn.

Problem 2: No Cleanup When Subscription is Deleted

Current Gap:
The system doesn't know when a subscription is permanently deleted from Stripe.

Business Impact:

- Users may retain access after subscription deletion
- Database contains stale subscription IDs
- No proper cleanup of subscription-related data

Problem 3: Users Not Notified for Payment Authentication

Current Gap:
When payment requires 3D Secure authentication (common for European customers), the system

doesn't notify users to complete the authentication.

Business Impact:

- Lost revenue from incomplete payments (estimated 5-10% of European transactions)
- Poor user experience - payment stuck without guidance
- Subscription may be cancelled due to failed authentication after 24 hours

4. Integration Plan - Backend

Assuming all required webhook events are available from Stripe, there are two main options to handle the missing webhooks:

Option 1 - Real-time Webhook Processing (Recommended)

- Process webhook events immediately when received from Stripe
- Update database in real-time to maintain synchronization
- Emit events to frontend via WebSocket for live updates

Option 2 - Scheduled Processing + Event Queue

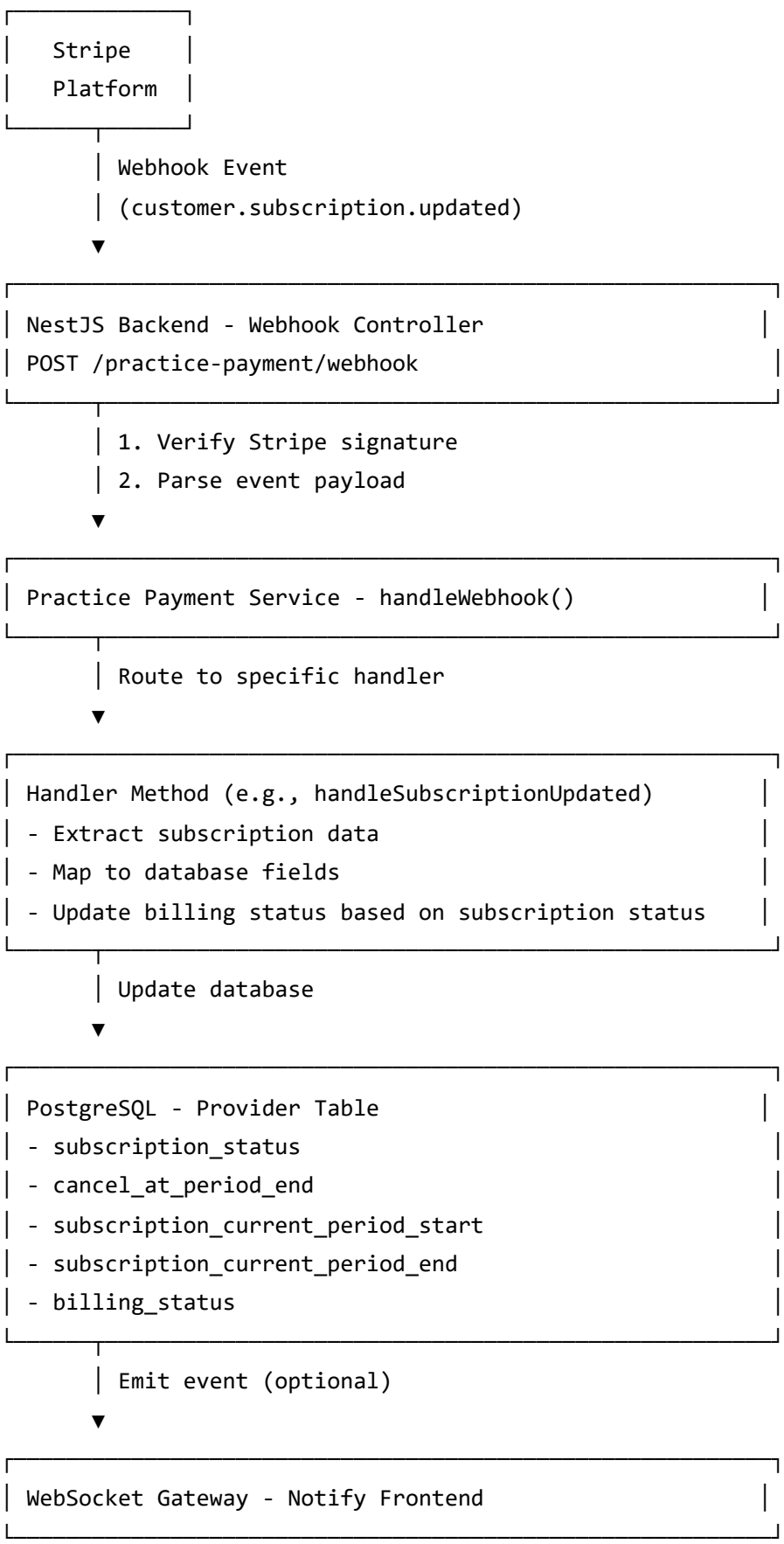
- Queue webhook events for batch processing
- Process events periodically via cron job
- Suitable for high-volume scenarios with rate limiting concerns

Recommendation

We should prefer **Option 1 (Real-time Webhook Processing)** because:

- It maintains real-time data synchronization with Stripe
- It allows us to provide immediate feedback to users
- It provides flexibility to implement our own **notification and alerting system**

Webhook Processing Flow (Option 1)



5. Missing Webhook Handlers - Detailed Analysis

Based on the current implementation analysis and Stripe documentation, the system is missing **5 critical webhook handlers**:

5.1. `customer.subscription.updated` (HIGH PRIORITY 🔴)

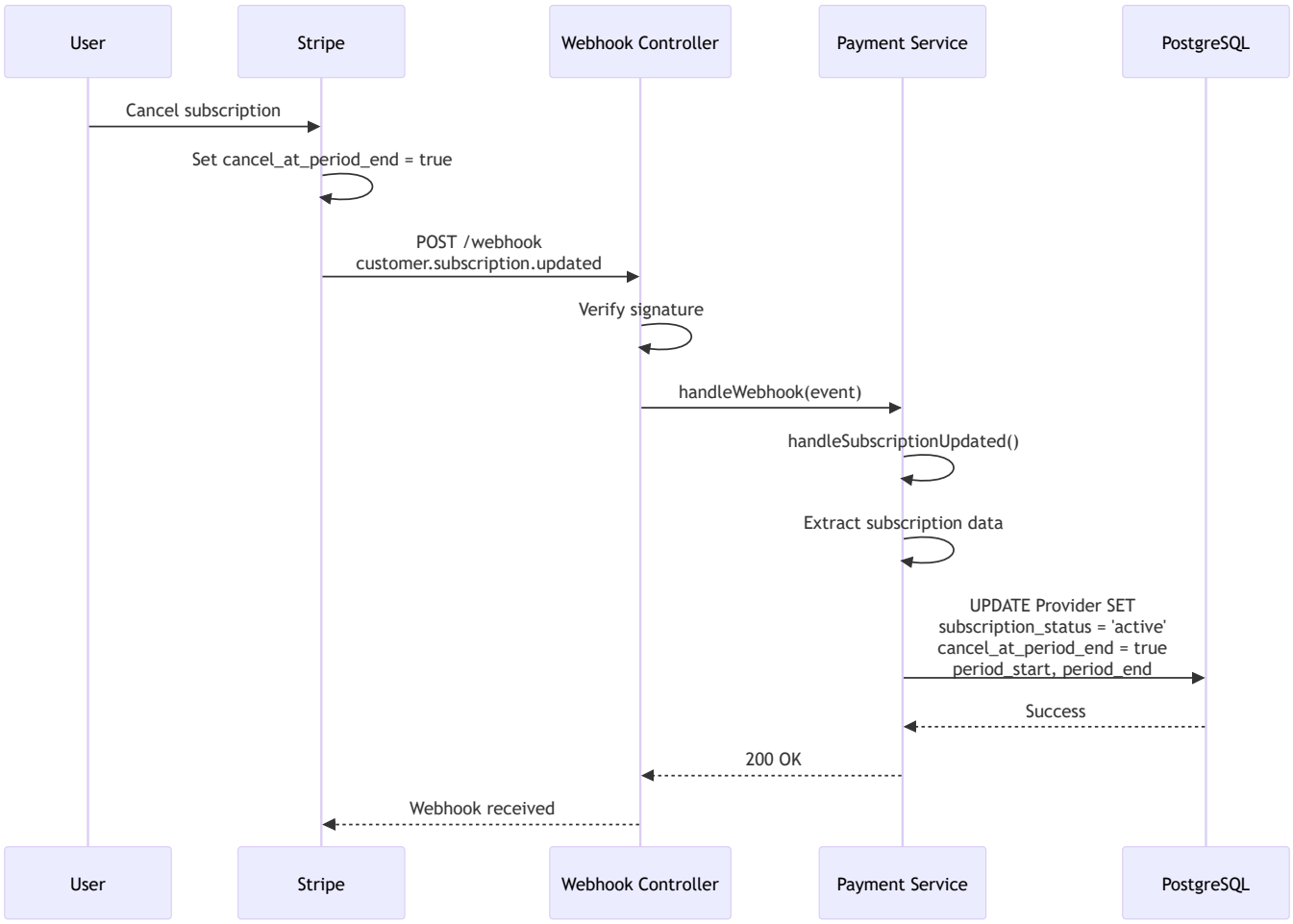
When Triggered:

- Subscription status changes (active → past_due → canceled)
- User schedules cancellation (`cancel_at_period_end` changes)
- Subscription renewal (billing cycle dates update)
- Subscription metadata changes

Why Critical:

- Cannot track when user schedules subscription cancellation
- No visibility into next billing cycle dates
- Billing status may be out of sync with Stripe
- Risk of charging customers after they've cancelled

Sequence Diagram:



Database Impact:

- Updates `subscription_status`, `cancel_at_period_end`, `subscription_current_period_start`, `subscription_current_period_end`
- Updates `billing_status` based on subscription status

5.2. `customer.subscription.deleted` (MEDIUM PRIORITY 🟡)

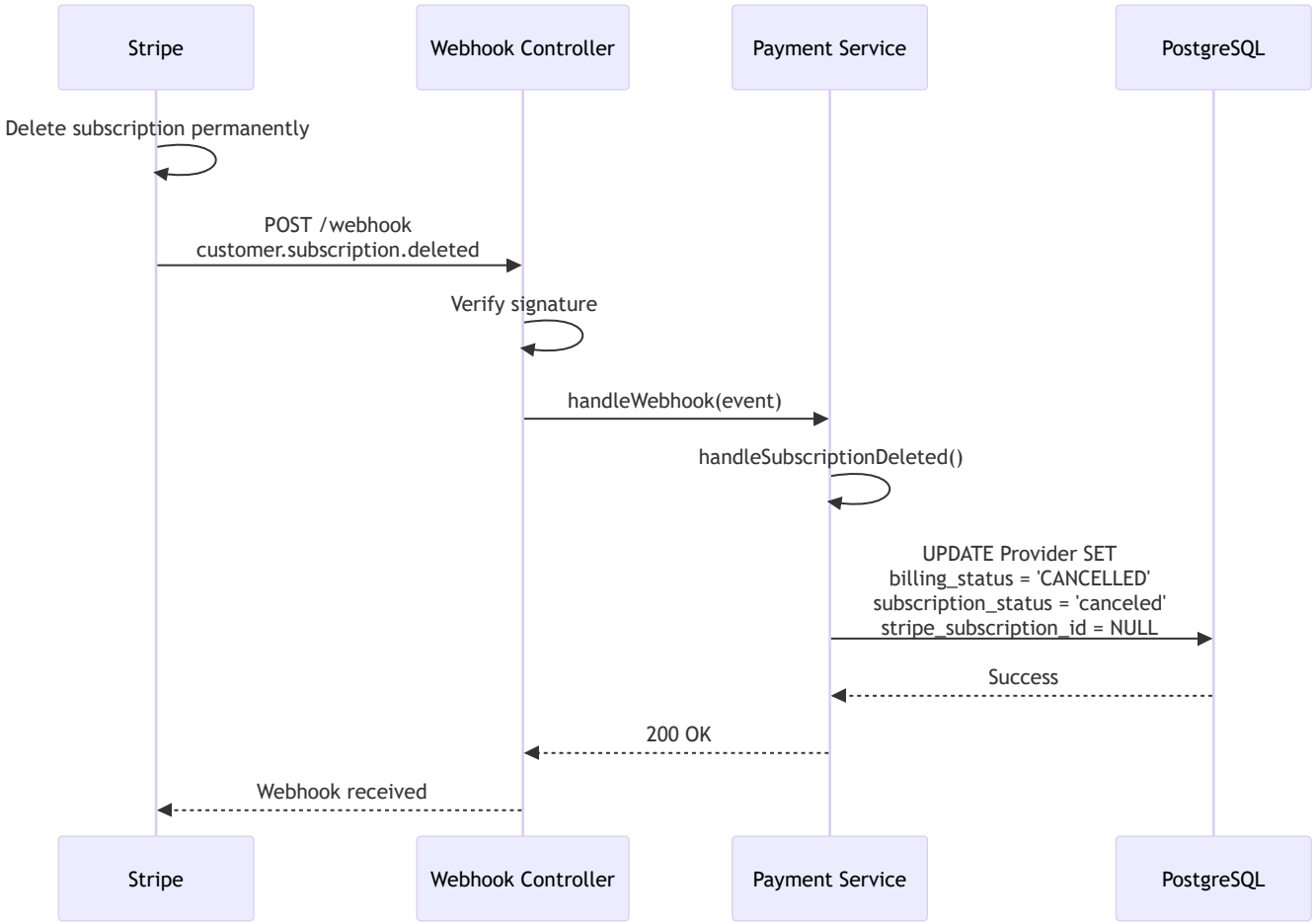
When Triggered:

- Subscription is permanently deleted from Stripe
- After subscription ends and retention period expires

Why Important:

- Users may retain access after subscription deletion
- Database contains stale subscription IDs
- No proper cleanup of subscription-related data

Sequence Diagram:



Database Impact:

- Sets `billing_status` to `CANCELLED`
- Clears `stripe_subscription_id`
- Sets `subscription_status` to `canceled`

5.3. `invoice.payment_action_required` (MEDIUM-HIGH PRIORITY 🟡)

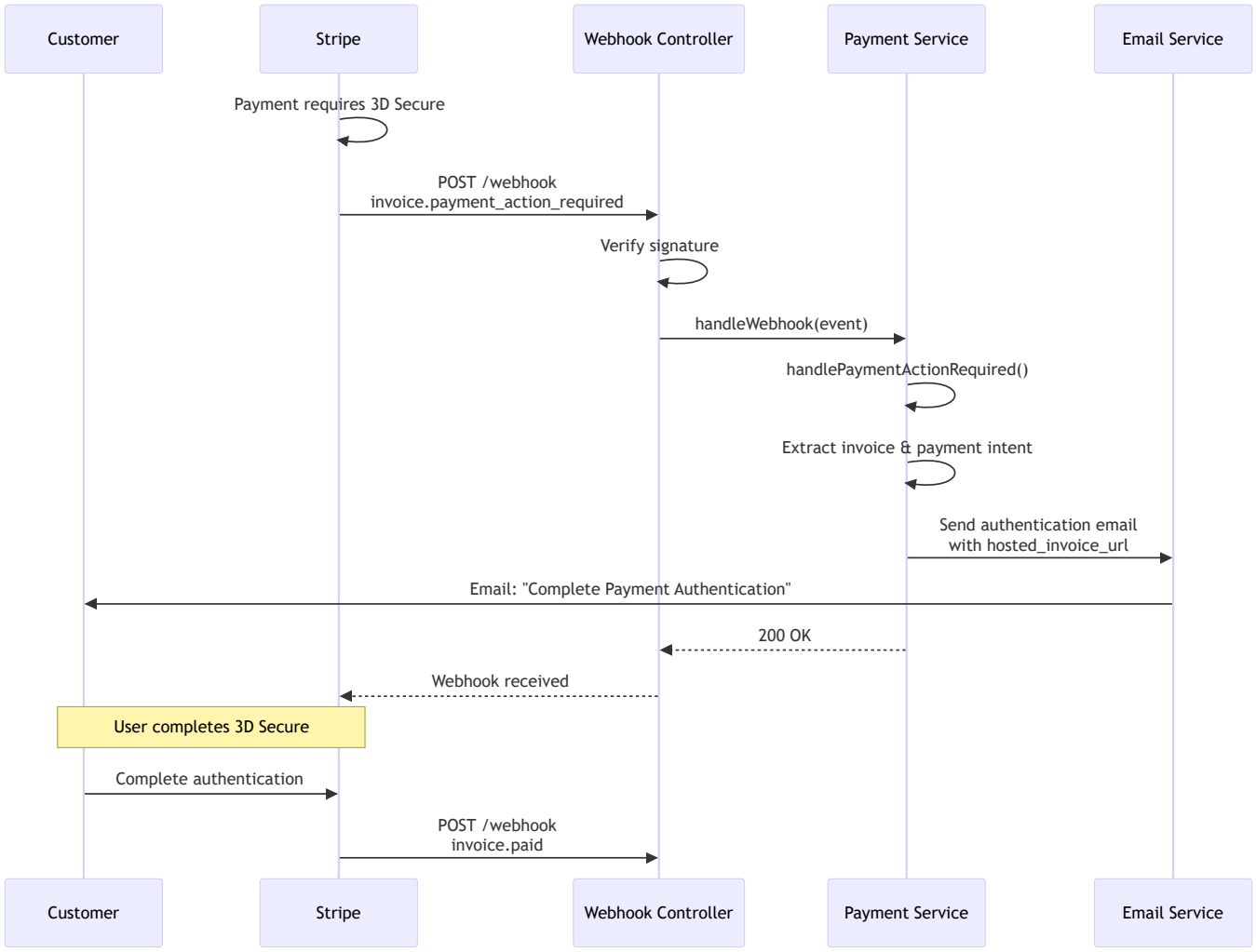
When Triggered:

- Payment requires 3D Secure authentication (SCA)
- Common for European customers
- Payment is stuck pending user action

Why Important:

- Lost revenue from incomplete payments (5-10% of European transactions)
- Poor user experience - payment stuck without guidance
- Subscription may be cancelled after 24 hours if not completed

Sequence Diagram:



Database Impact:

- No direct database changes
- Triggers email notification to user

5.4. `invoice.created` (LOW PRIORITY)

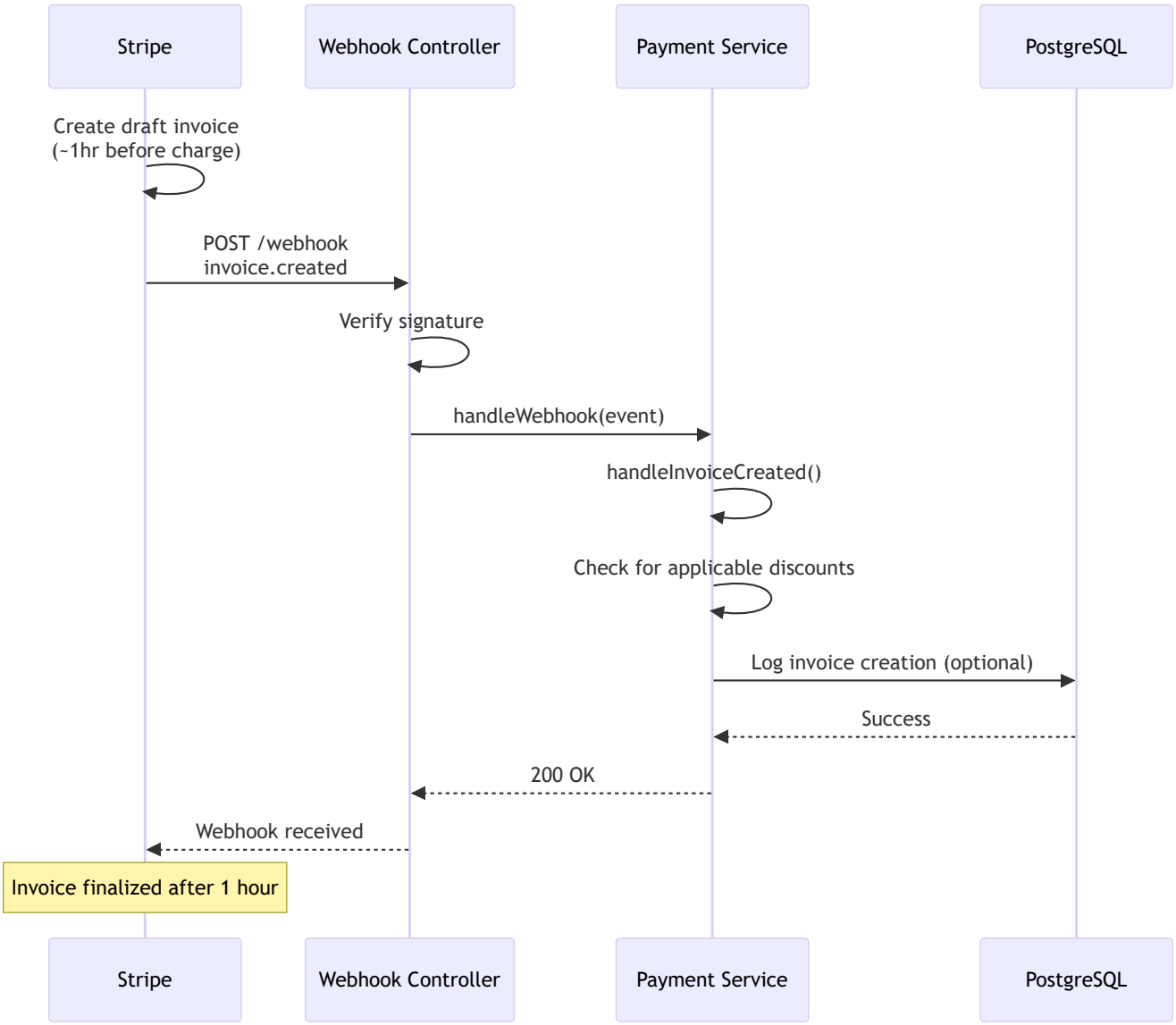
When Triggered:

- Draft invoice is created (~1 hour before finalization)
- Happens before invoice is finalized and charged

Why Useful:

- Apply discounts or credits before charge
- Modify invoice line items if needed
- Add metadata or custom fields

Sequence Diagram:



Database Impact:

- Optional logging only
- No billing status changes

5.5. `invoice.finalized` (LOW PRIORITY 🟣)

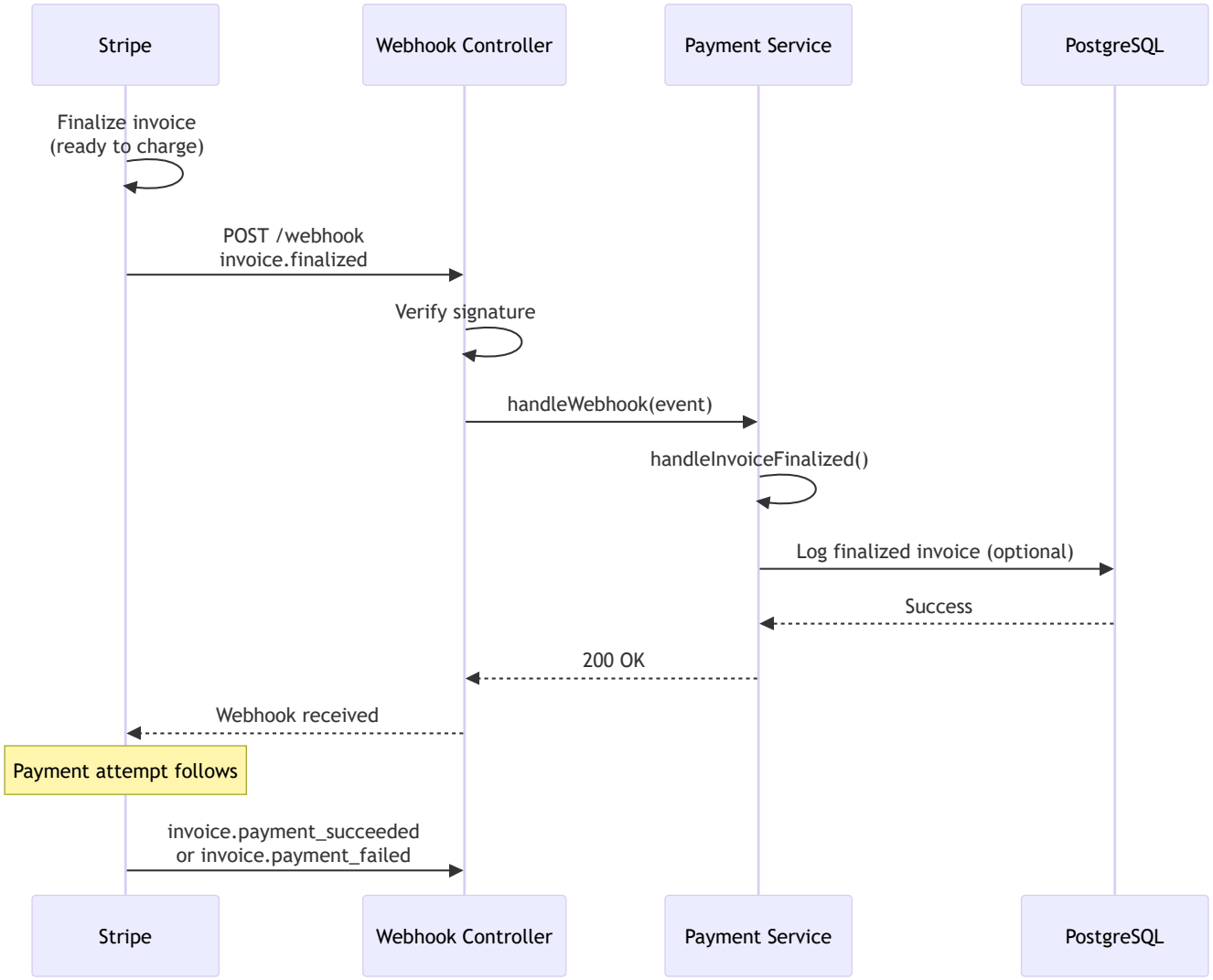
When Triggered:

- Invoice is finalized and ready to be charged
- Happens after `invoice.created` and before payment attempt

Why Useful:

- Logging and tracking purposes
- Last chance to review invoice before charge
- Audit trail for billing operations

Sequence Diagram:



Database Impact:

- Optional logging only
- No billing status changes

6. Integration Plan - Frontend

To support the new webhook integration, several updates are required on the frontend to display subscription information and handle user notifications.

6.1. Subscription Status Display

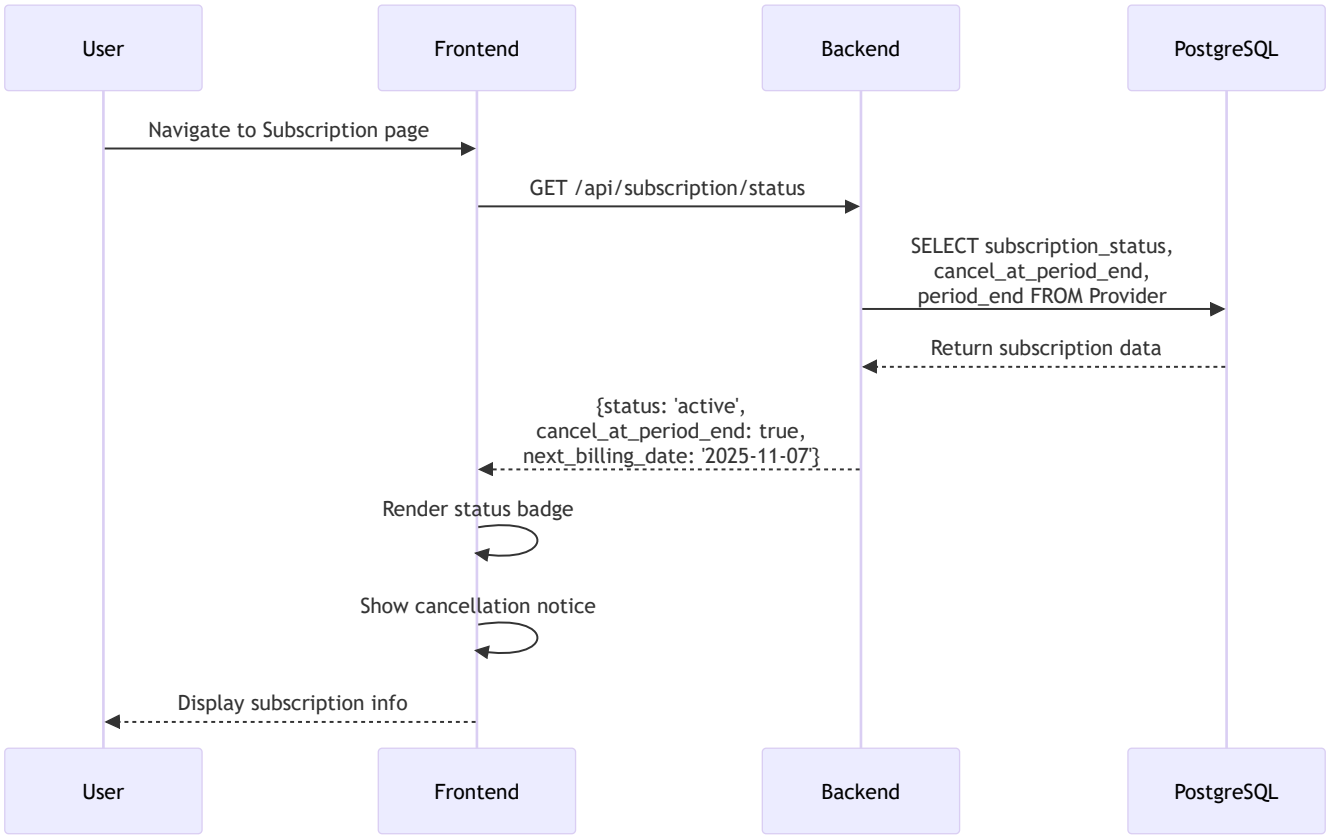
Requirements:

- Display current subscription status to users (Active, Past Due, Cancelled, Unpaid)
- Show next billing date from `subscription_current_period_end`
- Show cancellation schedule if `cancel_at_period_end = true`
- Display warning when subscription is scheduled for cancellation

UI Components Needed:

- Subscription status badge (color-coded by status)
- Billing cycle information panel
- Cancellation notice banner (when applicable)

Sequence Diagram:



6.2. Payment Action Required Notification

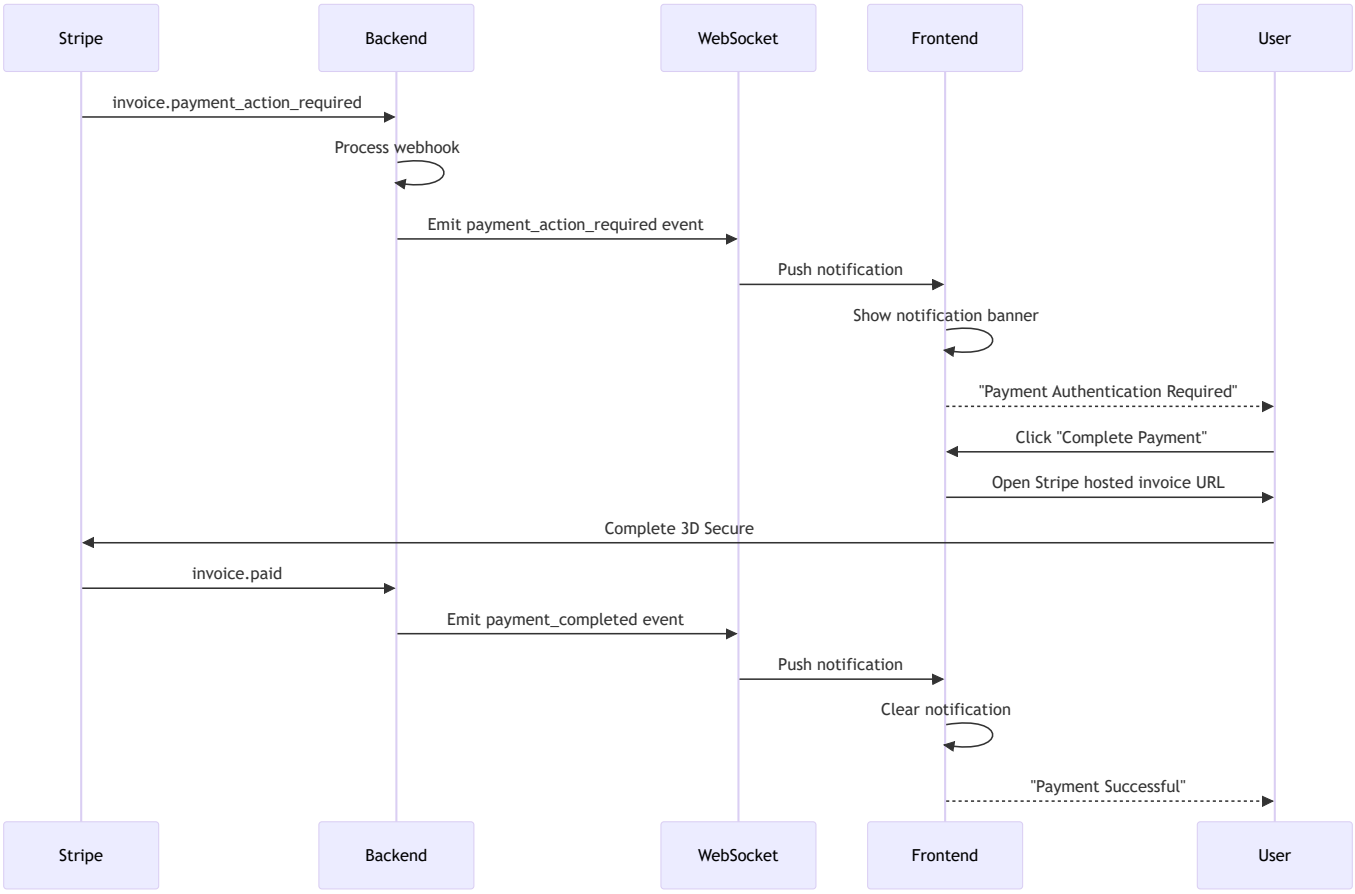
Requirements:

- Display notification when payment requires 3D Secure authentication
- Provide "Complete Payment" button linking to Stripe hosted invoice
- Show countdown timer (payment expires in 24 hours)
- Clear notification after successful payment

UI Components Needed:

- Notification banner/modal for payment action required
- "Complete Payment Authentication" button
- Timer component showing time remaining

Sequence Diagram:



6.3. Real-time Updates via WebSocket

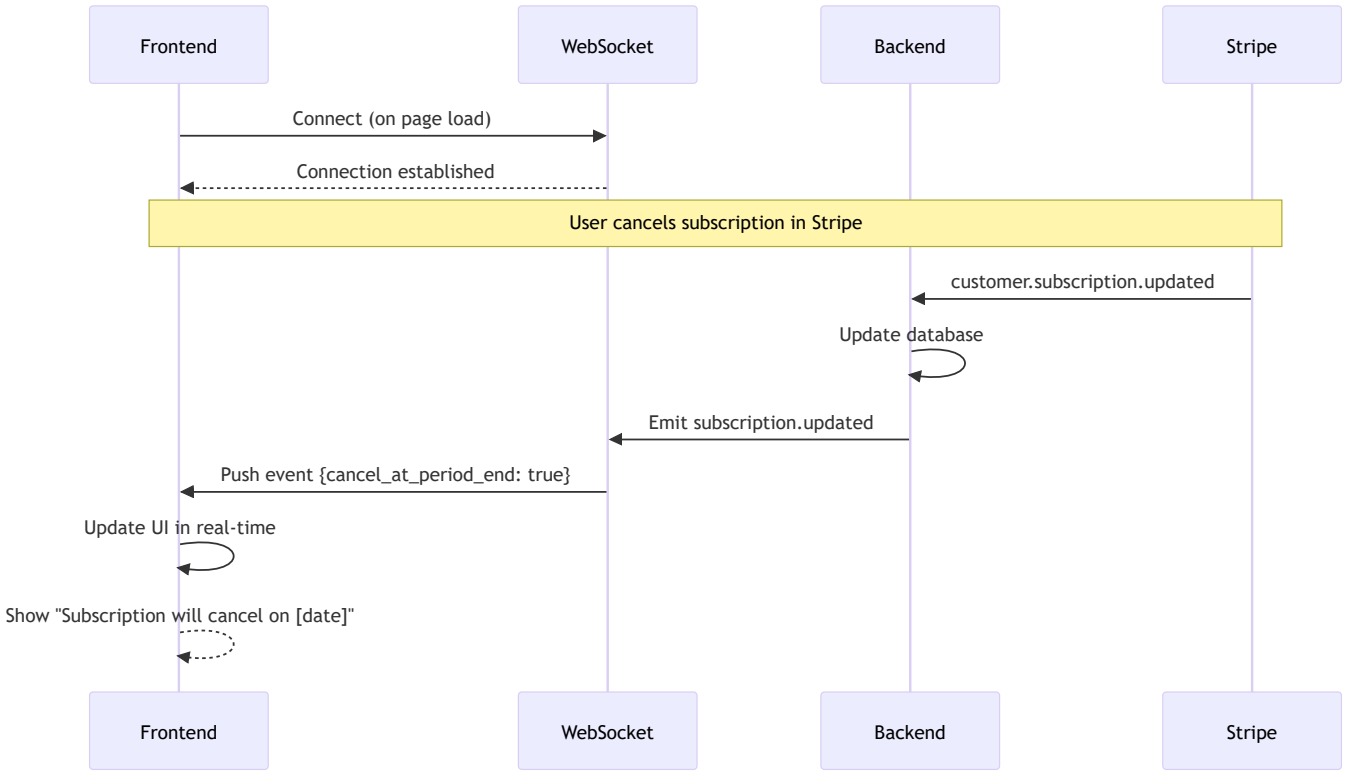
Requirements:

- Establish WebSocket connection for real-time subscription updates
- Listen for subscription status changes
- Update UI immediately when webhook events are processed
- Handle reconnection and error states

Events to Listen For:

- `subscription.updated` - Update subscription status and billing dates
- `subscription.deleted` - Show subscription cancelled message
- `payment.action_required` - Show payment authentication notification
- `payment.succeeded` - Clear notifications and update status

Sequence Diagram:



This proposal is based on analysis of current implementation and Stripe documentation. Detailed implementation code is available in supporting documentation.