NovaPay - Product Requirements Document

Version 3.2 - Confidential

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Executive Summary

NovaPay is a next-generation payment processing platform designed for mid-market SaaS companies with annual recurring revenue between $5M and $100M. The platform addresses the critical gap between consumer-grade payment tools (Stripe, PayPal) and enterprise-grade solutions (Adyen, Worldpay) that require dedicated integration teams.

The total addressable market for mid-market payment processing in North America is estimated at $4.2 billion annually, growing at 18% CAGR. NovaPay targets a 3% market share within 36 months of launch, representing approximately $126 million in annual processing revenue.

The product will launch in three phases: Phase 1 (Core Payments) targets Q3 2026, Phase 2 (Analytics and Fraud) targets Q1 2027, and Phase 3 (International Expansion) targets Q3 2027. Total development investment across all phases is budgeted at $18.5 million.

The project has been approved by the board of directors on December 3, 2025, with the condition that Phase 1 must demonstrate a minimum of 50 paying customers within 90 days of launch to unlock Phase 2 funding.

Executive Summary (continued)

Key Success Metrics

The steering committee has defined the following success criteria:

1. Phase 1 Launch: Minimum 50 paying customers within 90 days

2. Payment Processing Uptime: 99.97% availability (measured monthly)

3. Transaction Speed: P95 latency under 340 milliseconds for domestic transactions

4. Customer Satisfaction: Net Promoter Score of 45 or higher at 6-month mark

5. Revenue Target: $2.1 million ARR by end of Month 12

6. Churn Rate: Below 5% monthly for the first year

7. Fraud Rate: Below 0.08% of total transaction volume

The riskiest assumption identified during the FRAME phase is: "Mid-market SaaS companies will switch payment processors for better analytics and lower fees, despite the integration cost and switching risk."

This assumption will be tested through a beta program with 15 pre-committed design partners before the public launch. If fewer than 10 of the 15 partners complete integration within 30 days, the assumption is invalidated and the project pivots to a white-label model.

1. Problem Statement

1.1 The Mid-Market Payment Gap

Mid-market SaaS companies face a unique challenge in payment processing. They have outgrown consumer-grade solutions but cannot justify the cost and complexity of enterprise platforms.

Consumer-grade solutions like Stripe offer simple integration but lack:

- Multi-entity revenue recognition required by companies with $5M+ ARR

- Advanced dunning workflows that reduce involuntary churn

- Real-time cohort analytics tied to payment events

- Custom retry logic for failed subscription renewals

- SOC 2 Type II compliance reporting built into the dashboard

Enterprise solutions like Adyen offer these capabilities but require:

- Minimum annual processing volume of $50M+

- Dedicated integration teams of 3-5 engineers for 4-6 months

- Annual licensing fees starting at $250,000 regardless of volume

- Custom contract negotiations lasting 3-6 months

The result: mid-market companies either over-engineer workarounds on top of Stripe, or they accept limitations that cost them 2-4% of revenue annually.

1.2 Quantified Impact

Based on interviews with 47 mid-market SaaS CFOs (September-November 2025):

- Average annual revenue lost to failed payments: $340,000 (at $15M ARR)

- Average engineering hours on payment workarounds: 2,100 hours/year

- Average time to detect billing errors: 12.5 business days

- Companies that evaluated switching in last 12 months: 68%

- Companies that actually switched: only 11% (89% cited integration risk)

1. Problem Statement (continued)

1.3 Customer Quotes from Research

"We spend $180,000 a year on two engineers whose only job is maintaining our Stripe integration and building analytics Stripe doesn't provide." -- CTO, Series B fintech ($12M ARR)

"I know we're losing revenue to failed payments, but I can't quantify it because our payment provider doesn't give us cohort-level data. It's a black box." -- CFO, Series C martech ($28M ARR)

"We evaluated Adyen last year. They wanted $250K upfront, 6 months of integration work, and a 3-year commitment. For a company our size, that's insane." -- VP Engineering, Series B healthtech ($8M ARR)

"The thing that kills me is dunning. We lose about 3% of our subscribers every month to failed credit cards, and our current tool gives us exactly one retry attempt with no customization." -- Head of Revenue, bootstrapped SaaS ($6M ARR)

1.4 Competitive Landscape

Recurly (founded 2009, $195M funding): Subscription billing focus. Not a payment processor -- wraps Stripe. No processing control.

Chargebee (founded 2011, $470M funding): Subscription management. Enterprise-focused pricing, slow onboarding.

Paddle (founded 2012, $293M funding): Merchant of record model. Takes 5% revenue cut, limited US presence.

Maxio (founded 2023, $22M from merger): Financial ops for B2B SaaS. Narrow focus on billing only.

None offer integrated processing + analytics + AI dunning for mid-market SaaS. This is the gap NovaPay fills.

1. Problem Statement (continued)

1.5 Why Now?

Three market shifts make the timing right:

1. PCI DSS v4.0 Compliance Deadline (March 2025): The new PCI standard requires enhanced authentication and encryption. Many mid-market companies are updating their payment integrations -- a natural switching window.

2. Rising Interest Rates and Cash Flow Scrutiny: With rates at 5.25-5.50%, CFOs are under pressure to optimize cash flow. Every percentage point of failed payment recovery goes directly to the bottom line. NovaPay's AI dunning recovers an estimated 40% of otherwise-lost transactions.

3. AI/ML Infrastructure Cost Reduction: Running fraud detection and payment optimization models has dropped 73% in cost since 2023 (per AWS pricing benchmarks). Features that required $500K+ annual spend two years ago now cost under $140K.

1.6 Problem Statement Summary

Mid-market SaaS companies ($5M-$100M ARR) lose 2-4% of annual revenue to payment failures, lack the analytics to diagnose root causes, and face a market where solutions are either too basic (Stripe) or too expensive (Adyen). NovaPay solves this with enterprise-grade processing, analytics, and AI-powered dunning at mid-market pricing with self-serve integration.

2. User Research

2.1 Research Methodology

Three phases between August and December 2025:

Phase 1 -- Discovery Interviews (August-September 2025):

47 structured interviews with CFOs and VP Finance at mid-market SaaS companies. Average interview duration: 55 minutes. Companies ranged from $5M to $87M ARR. Industries: fintech (23%), martech (19%), healthtech (17%), vertical SaaS (15%), devtools (14%), edtech (12%).

Phase 2 -- Quantitative Survey (October 2025):

Online survey sent to 1,200 SaaS finance and engineering leaders. 312 complete responses (26% response rate). Margin of error: +/- 5.5% at 95% confidence.

Phase 3 -- Design Partner Validation (November-December 2025):

15 companies selected as design partners from Phase 1 participants. Each signed a Letter of Intent committing to $2,000/month during beta. Bi-weekly feedback sessions scheduled for February-May 2026.

2.2 Key Research Findings

Finding 1: Failed Payment Recovery is the #1 Pain Point

78% of respondents ranked "reducing involuntary churn from failed payments" as their top priority. This exceeded "lower processing fees" (62%), "better analytics" (54%), and "faster integration" (41%).

Finding 2: Switching Fear is Real but Addressable

89% of companies that considered switching but didn't cited "integration risk" as the primary barrier. However, when presented with a "parallel processing" migration path (run both processors for 30 days), 71% said they would reconsider.

2. User Research (continued)

Finding 3: Willingness to Pay Exceeds Current Spend

Median current cost: 2.9% + $0.30 per transaction. When shown the NovaPay value proposition, median willingness to pay was 3.2% + $0.25 per transaction -- higher percentage but lower fixed fee. Net revenue per transaction approximately 8% higher for NovaPay.

Finding 4: Analytics is the Differentiator, Not Price

Top answers to "What would make you switch tomorrow?":

1. "Show me where and why I'm losing revenue" (67%)

2. "Automatically recover failed payments without custom logic" (59%)

3. "Integrate in days, not months" (48%)

4. "Lower my processing fees by at least 0.5%" (34%)

Price is fourth. Analytics and automation are the real switching triggers.

2.3 User Personas

Persona 1: "The Growth CFO" -- Dana

Title: CFO or VP Finance at $10M-$50M ARR SaaS. Goal: Maximize net revenue retention, reduce involuntary churn. Frustration: Can't get cohort-level payment data. Buying trigger: Proof that switching recovers $X in failed payments. Quote: "If you show me I'll recover even 1% of lost revenue, the switching cost pays for itself in 2 months."

Persona 2: "The Integration-Averse CTO" -- Marcus

Title: CTO or VP Engineering at $5M-$25M ARR SaaS. Goal: Minimize engineering time on payment infrastructure. Frustration: Engineers spend 20+ hours/month on payment bugs. Buying trigger: Integration takes days, not months. Quote: "I'll switch tomorrow if integration takes less than a week."

Persona 3: "The Revenue Operations Lead" -- Priya

Title: Head of RevOps at $15M-$100M ARR SaaS. Goal: Unify payment data with CRM and financial reporting. Frustration: 10+ hours/week manually reconciling data across systems. Quote: "I export CSVs from three systems every Monday just to build one revenue report."

2. User Research (continued)

2.4 Jobs to Be Done Analysis

Core Job: "Help me maximize the revenue I collect from existing customers without adding engineering complexity."

Supporting Jobs:

1. "When a payment fails, automatically retry with the right card, at the right time, so I recover revenue without manual intervention."

2. "When I need to understand revenue trends, show me cohort-level analytics tied to payment events."

3. "When I need to switch processors, make migration seamless and reversible."

4. "When my auditor asks about PCI compliance, provide automated reports."

5. "When a fraudulent transaction occurs, block it while minimizing false positives."

2.5 Feature Priority Matrix (from Survey, n=312)

Payment Processing Core: Desirability 95%, WTP included in base, Gap N/A

AI-Powered Smart Dunning: Desirability 84%, WTP $400/month, Gap High -- NO competitor offers ML-based retry optimization

Real-Time Revenue Analytics: Desirability 78%, WTP $350/month, Gap High -- only Chargebee offers partial analytics

Parallel Migration Tool: Desirability 71%, WTP $200/month, Gap Very High -- NO competitor offers this

Fraud Detection: Desirability 67%, WTP $300/month, Gap Medium -- Stripe Radar exists

2.6 Research Limitations

- Sample biased toward US-based SaaS (92%)

- Companies under $5M ARR excluded

- Design partner selection may introduce survivorship bias

- All data is self-reported (no direct observation)

2. User Research (continued)

2.7 Competitive User Experience Audit

Stripe (Score: 72/100):

Strengths: Best developer docs, fastest time to first transaction (under 2 hours), excellent API. Weaknesses: Limited analytics, basic dunning (3 fixed retries), revenue recognition requires $0.25/invoice add-on. Pricing: 2.9% + $0.30.

Chargebee (Score: 65/100):

Strengths: Good subscription management, decent analytics, Salesforce integration. Weaknesses: Not a processor (wraps Stripe), 3-4 week onboarding, opaque pricing. Pricing: $599/month + processor fees.

Recurly (Score: 61/100):

Strengths: Strong dunning, good subscription analytics. Weaknesses: Not a processor, dated UI, limited retry customization. Pricing: $499/month + processor fees.

Paddle (Score: 58/100):

Strengths: Merchant of Record simplifies taxes. Weaknesses: 5% revenue cut, limited US presence, no self-serve. Pricing: 5% + $0.50 per transaction.

Key Takeaway: No competitor scores above 75/100. The biggest gaps are in analytics (all below 50/100) and dunning intelligence (all use fixed retry schedules). NovaPay's target score: 85/100 at launch, 92/100 by Phase 2.

2. User Research (continued)

2.8 Survey Demographics and Response Analysis

Respondent Titles:

- CFO / VP Finance: 34% (106 respondents)
- CTO / VP Engineering: 28% (87 respondents)
- Head of Revenue / RevOps: 18% (56 respondents)
- CEO / Founder: 12% (37 respondents)
- Other (Product, Growth): 8% (26 respondents)

Company Size Distribution:

- $5M-$10M ARR: 31% (97)
- $10M-$25M ARR: 38% (119)
- $25M-$50M ARR: 19% (59)
- $50M-$100M ARR: 12% (37)

Current Processor:

- Stripe: 72%
- Braintree (PayPal): 14%
- Adyen: 6%
- Other: 8%

Average Monthly Failed Payment Rate:

- Cards: 4.2% of attempted charges fail
- ACH: 1.1% of attempted charges fail

Satisfaction with Current Provider (1-10):

- Overall: 6.2
- Analytics: 4.8
- Dunning/recovery: 4.1
- Integration experience: 7.3
- Customer support: 6.5
- Pricing transparency: 5.9

The lowest-rated areas (analytics: 4.8, dunning: 4.1) are exactly where NovaPay differentiates. This validates the product thesis: mid-market companies are adequately served on basic payment processing but severely underserved on intelligence and recovery.

3. Product Requirements -- Phase 1

3.1 Scope Definition

Phase 1 (IN):

- Card processing (Visa, Mastercard, Amex, Discover)
- ACH processing (US only)
- Subscription billing (create, update, cancel, pause)
- Basic retry logic (3 attempts, configurable intervals)
- Real-time transaction dashboard
- MRR/ARR tracking
- Webhook system
- REST API with OpenAPI 3.0 docs
- Sandbox environment
- Self-serve onboarding
- PCI DSS v4.0 Level 1 compliance

Phase 1 (OUT -- deferred to Phase 2):

- AI-powered smart dunning
- Cohort-level analytics
- Revenue recognition (ASC 606)
- Fraud detection engine
- Salesforce/HubSpot integrations

Phase 1 (OUT -- deferred to Phase 3):

- International payment methods (SEPA, iDEAL, Boleto)
- Multi-currency processing
- Tax calculation
- Marketplace/split payments
- White-label option

3. Product Requirements (continued)

3.2 Functional Requirements -- Payment Processing

REQ-PAY-001: Card Processing

Process credit/debit card transactions for Visa, Mastercard, Amex, Discover. Authorization within 500ms (P95) for domestic US. Support one-time and recurring charges.

REQ-PAY-002: ACH Processing

Process ACH debit/credit for US bank accounts. Initiation within 1 business day, settlement within 3-5 business days per NACHA rules. Support micro-deposit verification.

REQ-PAY-003: Subscription Management

Support creating, updating, canceling, pausing subscriptions. Intervals: weekly, monthly, quarterly, semi-annual, annual, custom. Automatic proration on mid-cycle changes.

REQ-PAY-004: Retry Logic

Automatic retry up to 3 times on failed recurring payments. Default schedule: Day 1, Day 3, Day 7. Configurable per merchant. After final failure: status changes to "past_due", webhook triggered.

REQ-PAY-005: Refunds

Full and partial refunds for card transactions within 180 days. Processing within 5 business days. ACH refunds within 3 business days.

3.3 Functional Requirements -- Analytics

REQ-ANA-001: Real-Time Transaction Feed

Display transactions with under 2-second latency. Show: amount, status, customer, payment method, timestamp, processing time.

REQ-ANA-002: MRR/ARR Tracking

Daily granularity. Account for: new, upgrades, downgrades, churn, reactivations. 24-month history minimum.

REQ-ANA-003: Payment Success Rate

Filterable by: time period, payment method, plan type, customer segment. Target: 96% cards, 99% ACH.

REQ-ANA-004: Failed Payment Analysis

Categorize by: insufficient funds, expired card, bank decline, fraud flag, technical error. Show count, amount, and trend.

3. Product Requirements (continued)

3.4 Functional Requirements -- API

REQ-API-001: REST API following OpenAPI 3.0. JSON request/response bodies. URL path versioning (/v1/).

REQ-API-002: API key authentication (publishable + secret keys). Client-side tokenization with publishable key. Server-side ops with secret key. Keys rotatable without downtime.

REQ-API-003: Configurable webhooks for payment events. Events: payment.succeeded, payment.failed, subscription.created, subscription.updated, subscription.canceled, refund.processed. HMAC-SHA256 signature verification. 5 retries with exponential backoff.

3.5 Non-Functional Requirements

REQ-NFR-001: Availability -- 99.97% uptime monthly. Scheduled maintenance max 4 hours/month, Sundays 2-6 AM EST. Max 13 minutes unplanned downtime per month.

REQ-NFR-002: Performance

Card authorization: P50 < 200ms, P95 < 340ms, P99 < 500ms

API response: P50 < 100ms, P95 < 250ms for reads

Dashboard freshness: < 2 seconds

Webhook delivery: < 5 seconds from event

REQ-NFR-003: Scalability -- 10,000 TPS at launch. Horizontal scaling to 100,000 TPS within 12 months. 1 billion transaction records with < 500ms query time.

REQ-NFR-004: Security -- PCI DSS v4.0 Level 1. AES-256 at rest, TLS 1.3 in transit. Card numbers tokenized immediately. SOC 2 Type II within 6 months. Quarterly pen testing.

REQ-NFR-005: Disaster Recovery -- RPO: 0 (zero data loss). RTO: under 15 minutes. Multi-region: us-east-1 primary, us-west-2 failover. Automated failover.

3. Product Requirements (continued)

3.6 Compliance Requirements

REQ-COM-001: PCI DSS v4.0 Level 1 certification before live transactions.

Annual on-site QSA audit, quarterly ASV scans, annual pen testing, continuous monitoring.

Estimated cost: $175,000 initial, $95,000 annual recertification.

REQ-COM-002: SOC 2 Type II within 6 months of launch. Security, Availability, Confidentiality criteria. Cost: $85,000 initial, $60,000 renewal.

REQ-COM-003: NACHA compliance for ACH. Proper authorization, timely returns, WEB entry class code, Regulation E compliance.

REQ-COM-004: Data Privacy -- CCPA, SOX readiness, GDPR readiness for Phase 3. Data retention: 7 years for transactions, PII purged on deletion with 90-day grace.

3.7 Integration Requirements

REQ-INT-001: Direct integrations with Visa (VisaNet), Mastercard, Amex (AEPN), Discover, and FedACH. Sponsor bank: First National Bank of Commerce (FNBC). ODFI partner: Celtic Bank. Both partnerships finalized November 2025.

REQ-INT-002: Third-party services -- Plaid (bank verification), Maxmind (geolocation), Twilio (SMS), SendGrid (email), Datadog (monitoring), PagerDuty (on-call).

REQ-INT-003: Phase 1 SDKs -- JavaScript/TypeScript, Python, Ruby, Node.js, PHP. Each with: complete API coverage, automatic retry, idempotency management, error handling. Time-to-first-transaction under 30 minutes.

3. Product Requirements (continued)

3.8 User Interface Requirements

REQ-UI-001: Merchant Dashboard at dashboard.novapay.com

Browsers: Chrome 90+, Firefox 90+, Safari 15+, Edge 90+

Responsive: tablet (1024px) and desktop (1280px+). Mobile read-only.

Dashboard Sections:

1. Overview: Real-time feed, MRR chart, success rate

2. Transactions: Searchable with filters

3. Subscriptions: Active management, plan config

4. Customers: Profiles with payment history

5. Analytics: MRR/ARR, failed payment analysis

6. Settings: API keys, webhooks, team management

7. Developers: API docs, SDK downloads, sandbox

REQ-UI-002: Self-serve onboarding in under 15 minutes:

1. Account creation (email + password)

2. Business verification (name, EIN, address)

3. Bank account linking via Plaid

4. API key generation

5. Sandbox activated automatically

6. Guided integration checklist

No phone calls, no mandatory demos, no training.

REQ-UI-003: Developer Portal at docs.novapay.com

Interactive API reference, quickstart guides per language, code samples, webhook testing tool, migration guides from Stripe/Chargebee/Recurly.

3. Product Requirements (continued)

3.9 Data Requirements

REQ-DATA-001: Transaction Data Model

Each record: Transaction ID (26-char alphanumeric), Merchant ID, Customer ID, Amount (cents), Currency (ISO 4217, Phase 1: USD only), Payment method type + last 4, Status (pending/authorized/captured/settled/refunded/failed), Failure reason code, Processing timestamps, Metadata (max 50 key-value pairs, 500 chars/value).

REQ-DATA-002: Retention

Transaction records: 7 years (IRS). Audit logs: 3 years. API request logs: 90 days. Tokens: 4 years or card expiration. Customer PII: until merchant-initiated deletion, 90-day grace period.

REQ-DATA-003: Data Export

CSV and JSON formats. Filterable transaction history, subscription data, customer data (excluding tokens), analytics reports. Max 10M records per request. Async processing with webhook notification.

3.10 Acceptance Criteria for Phase 1

AC-001: New merchant can sign up, tokenize a test card, process $1.00, see it in dashboard, and refund it -- all without contacting support.

AC-002: Subscription lifecycle: create, auto-bill, upgrade with proration, pause, resume, cancel -- all via API and dashboard.

AC-003: Failed payment triggers retry sequence (Day 1, 3, 7). Successful retry restores subscription. All retries fail -> "past_due" status + webhook.

AC-004: Under 10,000 TPS load: P95 card auth < 340ms, API P95 < 250ms, zero dropped transactions, dashboard updates < 2 seconds.

AC-005: Independent pen test with no critical/high unresolved findings.

AC-006: PCI DSS v4.0 Level 1 ROC issued.

AC-007: 10/15 design partners integrated and processing live. NPS 40+.

4. Technical Architecture

4.1 Architecture Overview

Microservices on AWS. Designed for high availability, horizontal scalability, and strict security isolation between payment processing and analytics.

Principles:

1. Event-driven: All state changes emit events

2. Idempotent: All operations safely retryable

3. Immutable: Transaction records append-only

4. Encrypted: All data encrypted, no exceptions

5. Observable: Structured logs, metrics, and traces everywhere

4.2 Service Decomposition (8 core services)

1. API Gateway (Kong) -- Rate limiting, auth, routing, SSL termination. Deployed in us-east-1 and us-west-2.

2. Payment Service (Go) -- Core processing logic. Processor adapters for card networks. State machine: pending -> authorized -> captured -> settled. P95 target: 50ms internal processing.

3. Subscription Service (Go) -- Billing cycles, proration, scheduled recurring charges.

4. Customer Service (Go) -- Profiles, payment method management, tokenization vault (isolated PCI environment).

5. Analytics Service (Python) -- Real-time aggregation, MRR/ARR engine. Pandas + numpy.

6. Webhook Service (Go) -- Event subscriptions, reliable delivery, retry with dead-letter queue.

7. Dashboard BFF (Node.js/Next.js) -- Aggregates data for web UI, auth, sessions.

8. Notification Service (Python) -- Email (SendGrid) and SMS (Twilio) dispatch.

4. Technical Architecture (continued)

4.3 Infrastructure

Compute: EKS (Kubernetes), min 3 nodes per service, auto-scaling on CPU and request rate, spot instances for non-critical workloads.

Storage: PostgreSQL (RDS Multi-AZ + read replicas), Redis (ElastiCache 3-node cluster), S3 (exports, logs, backups), DynamoDB (event sourcing, on-demand).

Networking: VPC public/private subnets, NAT Gateway, PrivateLink for service-to-service, CloudFront CDN, Route 53 with health checks.

Message Bus: Amazon MSK (Kafka), 3-broker cluster, 7-day retention. Topics: payments, subscriptions, customers, webhooks, analytics.

4.4 Payment Processing Flow

1. Frontend tokenizes card via NovaPay.js (card data never touches merchant servers)

2. Backend sends POST /v1/charges with token

3. Payment Service validates, resolves token, selects network by BIN

4. Authorization request to card network (timeout: 10s, 1 retry)

5. Network responds: approved -> "authorized" / declined -> "failed"

6. Settlement batch at 11 PM EST, funds in merchant bank within 2 business days

7. Events emitted at each state change -> Analytics, Webhook, Notification services

End-to-end customer-facing time: 1.5-3 seconds. Authorization only: 200-400ms.

4. Technical Architecture (continued)

4.5 Security Architecture (Defense in Depth)

Layer 1 -- Network: TLS 1.3 only, WAF at CloudFront, Shield Advanced DDoS protection, VPN for admin access.

Layer 2 -- Application: API key auth + rate limiting (1,000/min default), HMAC-SHA256 webhooks, input validation, parameterized queries (no raw SQL), CSP headers, CORS restrictions.

Layer 3 -- Data: Immediate card tokenization, isolated PCI vault (separate AWS account), AES-256 at rest, KMS key rotation every 90 days, application-layer PII encryption.

Layer 4 -- Operational: MFA required, RBAC with least privilege, audit logging, automated secret rotation, background checks for production access.

Layer 5 -- Monitoring: Real-time anomaly alerting, 24/7 on-call (PagerDuty, 15-min response SLA), quarterly incident response drills, mandatory post-mortems.

4.6 Monitoring and Observability

Logs (ELK Stack): Every request logged, sensitive data auto-redacted, 90-day retention + S3 archive.

Metrics (Datadog): Business metrics (TPS, success rate, MRR), infra metrics (CPU, memory, disk), 5 pre-built dashboards.

Traces (Jaeger): End-to-end distributed tracing. 100% sampling for failures, 10% for successes. 30-day retention.

Critical Alerts (page immediately): Success rate < 95% for 5 min, any health check fails 2x, DB replication lag > 30s, error rate > 5%.

Warning Alerts (Slack): Success rate < 97% for 10 min, P95 > 400ms, CPU > 70% for 15 min, disk > 80%.

4. Technical Architecture (continued)

4.7 Disaster Recovery

Primary: us-east-1 (Virginia). Failover: us-west-2 (Oregon).

Database: Synchronous replication (Multi-AZ) + cross-region read replica.

Kafka: MirrorMaker 2 for cross-region replication.

S3: Cross-region replication.

DNS: Route 53 health checks, 30-second evaluation. Auto-failover after 3 consecutive failures.

Manual failback (prevents flapping). Quarterly DR drill.

4.8 API Design Principles

1. RESTful with pragmatic exceptions (batch ops use POST /batch)

2. Consistent error format: type, code, message, param, decline_code

3. Cursor-based pagination: ?limit=25&starting_after=txn_abc123

4. Idempotency via Idempotency-Key header (24-hour validity)

5. URL path versioning (/v1/). 12-month support for deprecated versions.

6. Rate limiting: 1,000 req/min default. X-RateLimit-* headers.

4.9 Technology Stack Summary

Payment services: Go 1.21 (performance, concurrency)

Analytics: Python 3.12 (pandas/numpy)

Dashboard: Node.js 20 / Next.js 14 (SSR)

Database: PostgreSQL 16 (ACID for financial data)

Cache: Redis 7 (rate limiting, sessions)

Events: Kafka via MSK (durable streaming)

Event store: DynamoDB (serverless, append-only)

Orchestration: EKS / Kubernetes 1.28

CI/CD: GitHub Actions

Monitoring: Datadog + PagerDuty

Logs: ELK Stack

Tracing: Jaeger

Monthly infra cost at launch: $14,200. At 10,000 merchants: $47,000.

5. Go-to-Market Strategy

5.1 Launch Strategy

Stage 1 -- Closed Beta (February-May 2026):

15 design partners. Weekly feedback. Direct Slack with engineering. Goal: 10+ partners processing live. Exit: NPS 40+.

Stage 2 -- Limited Availability (June-July 2026):

100 merchants via waitlist. Application screening. Goal: validate scaling. Exit: 50+ paying, 99.95%+ uptime.

Stage 3 -- General Availability (August 2026):

Open registration, self-serve onboarding. Full marketing launch. Goal: 200 customers by end Q3. Press: TechCrunch exclusive + Product Hunt.

5.2 Pricing

Standard Plan: 2.7% + $0.25 per card transaction. ACH: 0.8% (capped $5). No monthly minimums, no setup fees. Basic analytics included.

Growth Plan ($499/month + transaction fees): Advanced analytics (cohorts, revenue recognition), priority support (4h SLA), custom webhooks, 5,000 req/min API limit.

Enterprise (custom): Volume discounts starting at $500K/month processing, dedicated account manager, custom integrations, SLA with financial penalties.

5.3 Positioning Statement

"For mid-market SaaS companies that lose revenue to payment failures and lack analytics to diagnose why, NovaPay is the payment platform that combines processing, analytics, and AI-powered recovery in one solution. Unlike Stripe (requires custom engineering) or Adyen (requires enterprise budgets), NovaPay delivers enterprise capabilities at mid-market pricing with self-serve onboarding."

5. Go-to-Market Strategy (continued)

5.4 Customer Acquisition Channels

Channel 1 -- Content Marketing ($15,000/month):

Weekly blog posts, monthly benchmarking report, SEO landing pages. Target: 50,000 organic monthly visitors by Month 6.

Channel 2 -- Developer Community ($8,000/month):

Open-source SDKs, technical blog posts on dev.to and HN, "The Payment Stack" newsletter, conference sponsorships (FinTech DevCon, SaaStr). Target: 5,000 sandbox accounts by Month 6.

Channel 3 -- Partnerships ($5,000/month):

Integration partnerships with Salesforce, HubSpot, Xero. Co-marketing with SaaS infra tools. Referral program with consultants and fractional CFOs. Target: 3 signed partnerships by launch.

Channel 4 -- Outbound Sales ($25,000/month):

2 Account Executives targeting $10M-$50M ARR SaaS. Lead sources: Crunchbase, PitchBook, LinkedIn Sales Nav. Target: 20 meetings/month per AE, 15% close rate.

5.5 Marketing Budget

Content Marketing: $180,000/year

Developer Community: $96,000/year

Partnerships: $60,000/year

Outbound Sales: $300,000/year

Events and Conferences: $48,000/year

Tools and Software: $36,000/year

Total: $720,000/year

CAC at 200 customers: $3,600. Average contract value: $10,500/year. LTV:CAC ratio: 8.7:1 (assuming 3-year lifetime). Well above healthy threshold of 3:1.

5. Go-to-Market Strategy (continued)

5.6 Success Metrics by Phase

Phase 1 (Q3 2026):

- 50 paying customers within 90 days

- $5M monthly processing volume by Month 3

- 96%+ card payment success rate

- 99.97% monthly uptime

- NPS 45+

- Median integration time under 5 days

- Under 3 support tickets per customer in first month

Phase 2 (Q1 2027):

- 200 paying customers

- $25M monthly processing volume

- 35%+ failed payment recovery rate (AI dunning)

- $2.1M ARR

- Under 5% monthly churn

Phase 3 (Q3 2027):

- 50 international merchants

- 15+ currencies supported

- $10M/month international processing

- $5M total ARR

6. Budget and Timeline

6.1 Development Budget

Total across all phases: $18.5 million.

Phase 1 -- Core Payments ($7.2 million):

Engineering (12 engineers x 9 months): $4,320,000 (60%)

Product and Design (3 people x 9 months): $1,080,000 (15%)

Infrastructure (AWS): $127,800 (1.8%)

Security and Compliance: $260,000 (3.6%)

Third-party services: $185,000 (2.6%)

QA and Testing: $540,000 (7.5%)

Contingency (10%): $687,200 (9.5%)

Phase 2 -- Analytics and Fraud ($6.3 million):

Engineering (15 engineers x 8 months): $4,000,000

Data Science (3 people x 8 months): $800,000

Product and Design: $720,000

Infrastructure scaling: $210,000

ML infrastructure: $180,000

Contingency: $590,000

Phase 3 -- International ($5.0 million):

Engineering (12 engineers x 7 months): $2,800,000

Legal and Compliance: $850,000

Partnerships: $450,000

Infrastructure (EU region): $320,000

Contingency: $580,000

6. Budget and Timeline (continued)

6.2 Team Structure

Phase 1 team: 18 people total.

Engineering (12):

1 VP Engineering -- Alex Rivera (hired October 2025)

2 Staff Engineers, payment systems (hired November 2025)

4 Senior Engineers, backend Go

2 Senior Engineers, frontend/dashboard

1 Senior Engineer, infrastructure/DevOps

1 Senior Engineer, security/compliance

1 QA Lead

Product and Design (3):

1 VP Product -- Sarah Chen

1 Senior Product Designer

1 Technical Writer

Operations (3):

1 Head of Customer Success

1 Solutions Engineer

1 Developer Advocate

Hiring Status (January 2026):

14 of 18 filled. Open: 2 Senior Backend, 1 Senior Frontend, 1 Developer Advocate. Target: all filled by February 28, 2026.

Key risk: Developer Advocate open for 8 weeks. If unfilled by March 15, developer community activities delayed 4-6 weeks. VP Product covers initial content creation as mitigation.

Total annual compensation: $5,760,000. Average per person: $320,000 (salary + equity + benefits).

Engineering range: $180,000-$450,000. Equity pool: 4.2% of company.

6. Budget and Timeline (continued)

6.3 Detailed Timeline -- Phase 1

January 2026: Foundation

Complete hiring. Architecture review. Dev environment setup.

February 2026: Core Infrastructure

Payment service (authorization flow). Database schema. API Gateway.

Deliverable: Authorization flow in sandbox.

March 2026: Payment Processing

Settlement and reconciliation. ACH integration.

Deliverable: Full payment lifecycle functional.

April 2026: Subscription Engine

Creation, billing cycles. Retry logic, proration.

Deliverable: Subscription lifecycle functional.

May 2026: Dashboard and Analytics

Transaction dashboard, real-time feed. MRR/ARR tracking.

Deliverable: Dashboard MVP functional.

June 2026: SDK and Documentation

JS, Python, Ruby, Node.js, PHP SDKs. API docs, quickstart guides.

Deliverable: Developer portal live.

July 2026: Security and Compliance

PCI assessment preparation. Pen testing, security audit.

Deliverable: PCI Level 1 ROC issued.

August 2026: Beta Launch

Closed beta with 15 design partners. Bug fixes, optimization.

Deliverable: 10+ partners processing live.

September 2026: General Availability

Week 1: Limited availability (100 merchants). Week 3: GA launch. Week 4: Press campaign.

Deliverable: 50 paying customers by Month 12.

6. Budget and Timeline (continued)

6.4 Critical Path

1. Payment network partnerships finalized (DONE November 2025)

2. Tokenization vault built and PCI-scoped (February 2026)

3. Card authorization flow functional (March 2026)

4. Settlement engine operational (April 2026)

5. PCI DSS v4.0 assessment passed (July 2026)

6. Beta launch (August 2026)

Highest risk: Step 5 (PCI assessment) -- depends on external QSA schedule.

Mitigation: QSA (CoalFire) engaged November 2025. Pre-assessment gap analysis April 2026.

6.5 Decision Gates

Feb 28: All 18 positions filled. Go/No-Go: delay if < 16.

Mar 31: Auth flow in sandbox. Go/No-Go: pivot if P95 > 500ms.

May 31: Dashboard MVP. Design partner feedback review.

Jul 31: PCI ROC issued. Go/No-Go: cannot launch without PCI.

Aug 31: 10+ partners live. Go/No-Go: if < 8, revisit onboarding.

Nov 30: 50 paying customers. Go/No-Go: unlock Phase 2 funding.

Dec 31: $2.1M ARR run rate. Board review of Phase 2.

The November 30 gate is most critical. Phase 2 funding ($6.3M) contingent on 50 customers. If missed, project enters sustainability mode until target is met.

6.6 Financial Projections

Month 3: 20 customers, $2M processing, $54K monthly revenue

Month 6: 50 customers, $8M processing, $216K revenue, $2.59M ARR

Month 12: 200 customers, $35M processing, $945K revenue, $11.3M ARR

Month 18: 400 customers, $80M processing, $2.16M revenue, $25.9M ARR

Month 24: 700 customers, $150M processing, $4.05M revenue, $48.6M ARR

Break-even: Month 16 (projected). 30% customer miss pushes to Month 22.

7. Risk Assessment

7.1 Risk Matrix

R1: PCI certification delayed. Probability Medium, Impact High. Mitigation: Pre-assessment April, 3-month buffer.

R2: Payment network issues. Probability Low, Impact High. Both partnerships signed, backup ODFI identified.

R3: Key engineer departure. Probability Medium, Impact Medium. No single points of failure.

R4: Performance targets missed. Probability Medium, Impact High. Load testing from Month 3.

R5: Design partner dropout. Probability Medium, Impact Medium. 15 partners for target of 10.

R6: Competitor launches similar. Probability Medium, Impact Low. First-mover advantage.

R7: Regulatory change. Probability Low, Impact High. Weekly regulatory monitoring.

R8: AWS region outage. Probability Low, Impact High. Multi-region, auto-failover.

R9: Security breach. Probability Low, Impact Critical. Defense-in-depth, pen testing.

R10: Budget overrun > 15%. Probability Medium, Impact Medium. 3-level contingency plan.

7.2 Top Risk: PCI Certification

PCI DSS v4.0 Level 1 is a hard requirement. Assessment takes 4-6 weeks, depends on external QSA.

Worst case: QSA finds critical gaps requiring 2+ months remediation. Delays beta from August to October, GA from September to November.

Mitigation: QSA (CoalFire) engaged, pre-assessment April, security engineer dedicated from Day 1, weekly compliance checkpoints, fallback: 2 additional engineers if critical gaps found.

7. Risk Assessment (continued)

7.3 Performance Risk

P95 target for card authorization: 340ms. Aggressive -- requires end-to-end processing in under 340ms for 95% of transactions.

Performance budget: Payment Service 50ms, DB 10ms, network 200ms, overhead 80ms = 340ms.

If missed:

340-500ms: Acceptable for beta, optimize before GA.

500-750ms: Requires architecture changes (connection pooling, edge processing).

> 750ms: Fundamental redesign needed.

Mitigation: Load testing from Month 3. Go/No-Go gate if sandbox P95 > 500ms.

7.4 Security Breach Risk

Impact: $2-10M direct cost, loss of trust, PCI revocation, potential shutdown.

Mitigation:

- Defense-in-depth architecture

- Quarterly pen testing (independent firm)

- Bug bounty at GA (HackerOne, $10K-$50K bounties)

- 24/7 monitoring with anomaly detection

- Incident response playbook tested quarterly

- Cyber insurance: $5M coverage, $95K annual premium

7.5 Budget Contingency

Level 1 ($800K savings): Defer PHP SDK, use auto-generated docs, reduce QA team.

Level 2 ($1.2M savings): Reduce engineering to 10, delay DevAdvocate and Solutions Engineer.

Level 3 ($0 additional): Extend timeline from 9 to 12 months, reduce monthly burn 25%.

7. Risk Assessment (continued)

7.6 Assumption Tracking

A1: "Mid-market will switch for better analytics"

Status: PARTIALLY VALIDATED (68% evaluated switching, 71% would try parallel migration)

Kill criteria: < 8/15 partners complete integration

A2: "Self-serve onboarding in 15 minutes"

Status: UNVALIDATED. Prototype test with 5 partners by March 2026.

Kill criteria: Median > 2 hours after iteration

A3: "AI dunning recovers 40% of failed payments"

Status: UNVALIDATED (Phase 2). ML prototype by October 2026.

Kill criteria: Recovery rate < 25%

A4: "99.97% uptime from launch"

Status: UNVALIDATED. 3-month beta burn-in.

Kill criteria: < 99.9% during beta

A5: "TAM of $4.2B is accurate"

Status: PARTIALLY VALIDATED. Triangulate with industry reports.

Kill criteria: Independent analysis suggests < $2B

7.7 Competitive Response Scenarios

Stripe launches mid-market analytics (40% probability, 18 months): Accelerate AI dunning, compete on recovery metrics.

Chargebee acquires/builds processing (25%, 24 months): Emphasize self-serve speed and transparent pricing.

New funded competitor enters (60%, 18 months): Move fast, establish base and switching costs.

Economic downturn (30%, 24 months): Position as cost-saving tool (recovery > cost of platform).

7. Risk Assessment (continued)

7.8 Regulatory Landscape

Federal: OCC (sponsor bank), Federal Reserve (ACH), CFPB (consumer protections), FinCEN (AML).

Industry: PCI DSS v4.0 (mandatory), NACHA rules (ACH), SOC 2 Type II, SOX readiness.

State: Money Transmitter Licenses via FNBC umbrella (all 50 states).

Upcoming changes: CFPB Open Banking Rule (low impact -- B2B focus), PCI v4.0.1 (minor clarifications), FinCEN Beneficial Ownership (already in onboarding).

7.9 Insurance

Cyber Liability: $5M coverage, $95K/year (Coalition)

Errors and Omissions: $3M, $42K/year (Hartford)

Directors and Officers: $5M, $38K/year (Chubb)

General Liability: $2M, $12K/year (Hartford)

Total: $187,000/year

7.10 Exit Strategy (if targets missed)

Option A -- Pivot to White-Label: License technology to fintechs. Team reduction 18 -> 8. Lower revenue, faster break-even.

Option B -- Acqui-hire: Team expertise valuable. Potential acquirers: Stripe, Chargebee, Recurly, Maxio. Estimated value: $5-8M.

Option C -- Controlled Shutdown: Support existing customers 12 months. Return remaining capital ($4-6M of $18.5M).

8. Appendices

Appendix A: Glossary

ACH: Automated Clearing House. US bank-to-bank transfer network. Slower than cards (1-3 business days) but cheaper (0.5-1%).

ARR: Annual Recurring Revenue. MRR x 12. Primary SaaS revenue metric.

BIN: Bank Identification Number. First 6-8 digits of card number. Identifies issuing bank and network.

CAC: Customer Acquisition Cost. Total sales/marketing spend divided by new customers.

Churn: Percentage of customers who cancel per period. Voluntary (customer cancels) vs. involuntary (payment fails).

Dunning: Process of communicating about failed payments and retrying charges. Smart dunning uses ML to optimize timing.

Idempotency: Same operation multiple times produces same result. Critical in payments to prevent duplicate charges.

LTV: Lifetime Value. Total revenue per customer over relationship. LTV = ARPC x Average Lifetime.

MRR: Monthly Recurring Revenue. Decomposed into New, Expansion, Contraction, Churn MRR.

NPS: Net Promoter Score. -100 to +100. Promoters (9-10) minus Detractors (0-6).

ODFI: Originating Depository Financial Institution. Bank that initiates ACH transactions. NovaPay's ODFI: Celtic Bank.

P95: 95th percentile latency. 95% of requests complete within this time.

PCI DSS: Payment Card Industry Data Security Standard. Level 1 = highest tier (> 6M transactions/year).

QSA: Qualified Security Assessor. Certified firm for PCI audits.

RPO: Recovery Point Objective. Max acceptable data loss. RPO = 0 means zero loss.

RTO: Recovery Time Objective. Max acceptable downtime.

SOC 2 Type II: Audit of service organization controls over a time period (6-12 months).

Tokenization: Replacing sensitive data with non-sensitive tokens. Tokens process payments without exposing card data.

8. Appendices (continued)

Appendix B: Interview Guide

Introduction (5 min): Research purpose, recording consent, set expectations.

Section 1 -- Current Payment Stack (15 min):

1. What processor(s) do you use?

2. How long with current provider?

3. What was integration like? How long?

4. Monthly engineering hours on payment work?

5. Other tools for billing, analytics, dunning?

Section 2 -- Pain Points (15 min):

6. Most frustrating thing about current setup?

7. Annual revenue lost to failed payments?

8. How do you track payment analytics?

9. What happens when a payment fails? Walk through it.

10. Ever had a billing error affect a customer?

Section 3 -- Switching Criteria (10 min):

11. Considered switching in last 12 months?

12. What would it take to switch?

13. Biggest barrier to switching?

14. Would parallel processing migration change your calculus?

Section 4 -- Willingness to Pay (10 min):

15. Current per-transaction cost?

16. Value of 50% failed payment reduction?

17. Value of cohort-level payment analytics?

18. Total payment infrastructure budget?

Closing (5 min):

19. Anything we didn't ask?

20. Interest in being a design partner?

8. Appendices (continued)

Appendix C: Survey Results Summary (n=312)

Company Size:

$5M-$10M ARR: 31% (97). $10M-$25M: 38% (119). $25M-$50M: 19% (59). $50M-$100M: 12% (37).

Processor: Stripe 72%, Braintree 14%, Adyen 6%, Other 8%.

Failed Payment Rate: Cards 4.2%, ACH 1.1%.

Annual Revenue Lost to Failed Payments:

$5M-$10M ARR: $95,000. $10M-$25M: $215,000. $25M-$50M: $485,000. $50M-$100M: $890,000.

Provider Satisfaction (1-10): Overall 6.2, Analytics 4.8, Dunning 4.1, Integration 7.3, Support 6.5, Pricing 5.9.

Top Feature Requests (% "must-have"):

Failed payment recovery: 78%. Cohort analytics: 67%. Revenue recognition: 54%. Lower fees: 52%. Faster integration: 48%. Fraud detection: 43%. International payments: 31%. Multi-entity billing: 28%.

Appendix D: Design Partners

15 companies signed LOIs:

1. DataPulse ($12M, Analytics, Stripe)
2. HealthBridge ($8M, Healthtech, Stripe)
3. MarketForge ($22M, Martech, Stripe)
4. CodeShip Pro ($15M, DevTools, Braintree)
5. LearnPath ($6M, EdTech, Stripe)
6. CloudLedger ($34M, Fintech, Stripe)
7. RetailOS ($18M, Vertical SaaS, Stripe)
8. ComplianceAI ($11M, RegTech, Adyen)
9. TalentHub ($9M, HR Tech, Stripe)
10. GreenMetrics ($27M, CleanTech, Stripe)
11. SupplyChainIQ ($42M, Logistics, Braintree)
12. MediaStack ($7M, AdTech, Stripe)
13. PropertyPro ($16M, PropTech, Stripe)
14. FoodConnect ($5M, FoodTech, Stripe)
15. CyberVault ($31M, Cybersecurity, Adyen)

Beta revenue: $120,000 ($2K x 15 x 4 months). Forgone revenue (free period): $180K-$360K.

8. Appendices (continued)

Appendix E: Document History

Version 0.1 (Sep 15, 2025): Initial draft -- problem statement and user research.

Version 0.5 (Oct 10, 2025): Added requirements and architecture.

Version 1.0 (Nov 1, 2025): Complete first version for board review.

Version 2.0 (Dec 3, 2025): Revised per board feedback, added financial projections.

Version 3.0 (Jan 5, 2026): Updated team status, hiring, design partners.

Version 3.1 (Jan 10, 2026): Architecture updates, monitoring section.

Version 3.2 (Jan 15, 2026): Final review, timeline and budget updates.

Approvals:

CEO Michael Torres: Dec 3, 2025 -- Approved

CTO Alex Rivera: Dec 5, 2025 -- Approved

CFO Jennifer Walsh: Dec 5, 2025 -- Approved with conditions*

Board Chair David Kim: Dec 8, 2025 -- Approved

VP Engineering Alex Rivera: Jan 15, 2026 -- Approved (v3.2)

Head of Legal Amanda Foster: Jan 12, 2026 -- Approved

*CFO condition: Phase 2 funding contingent on 50 paying customers by November 30, 2026.

Distribution: Executive team, Board of Directors, Department heads.

Classification: CONFIDENTIAL

Storage: Google Drive > NovaPay > Product > PRD (access-controlled)

Next Review: April 15, 2026

--- END OF DOCUMENT ---

Appendix F: Detailed Competitor Feature Matrix

This appendix provides a feature-by-feature comparison across all major competitors evaluated during the research phase.

Payment Processing:
Stripe: Full processing, all major cards, ACH, wire. Score: 10/10
Chargebee: No processing (wraps Stripe/Braintree). Score: 0/10
Recurly: No processing (wraps Stripe/Braintree/Adyen). Score: 0/10
Paddle: Full processing as Merchant of Record. Score: 8/10
NovaPay (target): Full processing, all major cards, ACH. Score: 9/10

Subscription Management:
Stripe: Basic (Stripe Billing add-on). Score: 7/10
Chargebee: Excellent, core strength. Score: 9/10
Recurly: Very good. Score: 8/10
Paddle: Good but limited customization. Score: 6/10
NovaPay (target): Good, covers 90% of use cases. Score: 8/10

Analytics -- Transaction Level:
Stripe: Basic dashboard, no cohort analysis. Score: 5/10
Chargebee: Moderate, some segmentation. Score: 6/10
Recurly: Basic. Score: 4/10
Paddle: Focused on international sales metrics. Score: 5/10
NovaPay (target): Real-time, cohort-level, MRR decomposition. Score: 9/10

Dunning and Recovery:
Stripe: 3 fixed retries, no customization. Score: 3/10
Chargebee: Customizable sequences, no ML. Score: 6/10
Recurly: Best current dunning among competitors. Score: 7/10
Paddle: Basic retry logic. Score: 3/10
NovaPay Phase 1 (target): Configurable 3-retry. Score: 5/10
NovaPay Phase 2 (target): AI-powered smart dunning. Score: 9/10

Self-Serve Onboarding:
Stripe: Excellent, best in class. Score: 10/10
Chargebee: Requires sales call and training. Score: 4/10
Recurly: Moderate, some setup assistance needed. Score: 6/10
Paddle: Requires manual merchant approval. Score: 3/10
NovaPay (target): 15-minute self-serve, no calls. Score: 9/10

Appendix F: Competitor Matrix (continued)

API Quality:
Stripe: Industry gold standard. Score: 10/10
Chargebee: Good, well-documented. Score: 7/10
Recurly: Adequate. Score: 6/10
Paddle: Limited, less mature. Score: 5/10
NovaPay (target): Stripe-quality API with OpenAPI 3.0. Score: 9/10

International Payments:
Stripe: Excellent, 135+ currencies. Score: 10/10
Chargebee: Good via underlying processor. Score: 7/10
Recurly: Good via underlying processor. Score: 7/10
Paddle: Excellent, core strength as MoR. Score: 9/10
NovaPay Phase 1: USD only. Score: 1/10
NovaPay Phase 3: 15+ currencies. Score: 7/10

Fraud Detection:
Stripe: Stripe Radar, ML-based. Score: 8/10
Chargebee: Via underlying processor. Score: 4/10
Recurly: Via underlying processor. Score: 4/10
Paddle: Included as MoR responsibility. Score: 7/10
NovaPay Phase 1: Basic (Maxmind IP screening). Score: 3/10
NovaPay Phase 2: Real-time ML scoring. Score: 8/10

Pricing Transparency:
Stripe: Fully transparent, published rates. Score: 9/10
Chargebee: Requires sales call for pricing. Score: 3/10
Recurly: Partially published, enterprise custom. Score: 5/10
Paddle: Published but complex (percentage of revenue). Score: 6/10
NovaPay (target): Fully transparent, published. Score: 9/10

Overall Scores:
Stripe: 72/100. Chargebee: 65/100. Recurly: 61/100. Paddle: 58/100.
NovaPay Phase 1 target: 78/100.
NovaPay Phase 2 target: 88/100.
NovaPay Phase 3 target: 92/100.

Key insight: NovaPay does not need to beat Stripe on every dimension. It needs to win decisively on analytics (9 vs 5), dunning (9 vs 3), and onboarding simplicity vs enterprise competitors (9 vs 3-4), while being "good enough" on everything else.

Appendix G: Database Migration Strategy

G.1 Why Migration Matters

The most common reason mid-market companies don't switch payment processors is fear of data migration. 89% of non-switchers cited "integration risk" as their primary concern. This appendix details NovaPay's migration strategy designed to eliminate this barrier.

G.2 Parallel Processing Architecture

NovaPay's unique approach: run both the old and new processor simultaneously.

Phase A -- Shadow Mode (Days 1-7):
All transactions continue through the existing processor. NovaPay receives a copy of each transaction via webhook and processes it in shadow mode (validates, tokenizes, but does not charge). This validates that NovaPay can handle the merchant's transaction patterns without any risk.

Metrics tracked during shadow mode:
- Token creation success rate (target: 100%)
- Transaction validation match rate (target: 99.5%+)
- Latency comparison (NovaPay vs. existing processor)
- Error rate (target: 0%)

Phase B -- Split Traffic (Days 8-21):
A percentage of new transactions route through NovaPay. Starting at 5%, increasing to 25%, then 50% based on success criteria at each stage.

Split criteria for escalation:
5% -> 25%: Zero failed transactions attributable to NovaPay for 48 hours
25% -> 50%: Success rate within 0.1% of existing processor for 72 hours
50% -> 100%: Merchant explicitly approves full cutover

Phase C -- Full Cutover (Days 22-30):
100% of transactions through NovaPay. Existing processor remains active as fallback for 30 additional days. Automatic rollback triggered if NovaPay success rate drops below 95% for 5 consecutive minutes.

Phase D -- Decommission (Day 60):
Existing processor integration removed. Historical data exported and imported into NovaPay. Migration complete.

G.3 Data Migration

Transaction History: Imported via batch API. Supported source formats: Stripe export (JSON), Braintree export (CSV), custom format via mapping template. Historical data available in NovaPay dashboard within 24 hours of import.

Customer Records: Migrated with tokenized payment methods. Tokens from Stripe/Braintree are re-tokenized in NovaPay's vault. No customer action required -- payment methods migrate transparently.

Subscription Data: Active subscriptions recreated in NovaPay with matching billing dates. No gap in billing cycles. Proration handled automatically for the switchover period.

Appendix G: Migration Strategy (continued)

G.4 Rollback Procedures

At any point during migration, the merchant can roll back to their previous processor:

Automatic Rollback Triggers:
- NovaPay success rate drops below 95% for 5 consecutive minutes
- NovaPay P95 latency exceeds 1000ms for 10 consecutive minutes
- Any database error affecting transaction processing

Manual Rollback: Merchant can trigger via dashboard toggle or API call. Takes effect within 60 seconds. All in-flight transactions on NovaPay are completed; new transactions route to previous processor.

Post-Rollback: NovaPay team conducts root cause analysis. Migration can be re-attempted once issues are resolved. No data loss -- all NovaPay transactions during the migration period are preserved.

G.5 Migration Timeline Estimates

Stripe to NovaPay: 14-21 days (fastest, best-documented migration path)
Braintree to NovaPay: 21-28 days (additional complexity in token migration)
Adyen to NovaPay: 28-35 days (custom contract terms may require coordination)
Custom processor: 30-45 days (requires custom migration mapping)

G.6 Migration Support

Standard Plan: Self-serve migration guide, email support
Growth Plan: Dedicated migration specialist, daily check-ins during migration
Enterprise Plan: On-site migration team, zero-downtime guarantee, custom rollback SLA

G.7 Migration Cost

NovaPay charges no migration fee. The only cost is the parallel processing period where both processors are active (merchant pays both sets of transaction fees for 2-4 weeks). Estimated cost: 0.1-0.3% of monthly processing volume.

For a merchant processing $10M/month, the parallel processing cost is approximately $10,000-$30,000 -- a one-time cost that is recovered within 2-3 months through lower failed payment rates.

Appendix H: Compliance Documentation

H.1 PCI DSS v4.0 Compliance Roadmap

NovaPay's PCI compliance follows a structured timeline:

January 2026: Scope Definition
- Define Cardholder Data Environment (CDE) boundaries
- Document all system components that store, process, or transmit cardholder data
- Identify all third-party service providers with CDE access
- Deliverable: PCI Scope Document

February 2026: Gap Assessment
- Internal review against all 12 PCI DSS v4.0 requirements
- Identify gaps between current state and compliance requirements
- Deliverable: Gap Assessment Report with remediation plan

March-April 2026: Remediation
- Address all identified gaps
- Implement required security controls
- Deploy monitoring and logging infrastructure
- Deliverable: Remediation Completion Report

April 2026: Pre-Assessment (CoalFire)
- QSA conducts preliminary review
- Identifies any remaining gaps before formal assessment
- Deliverable: Pre-Assessment Findings

May-June 2026: Final Remediation
- Address any findings from pre-assessment
- Conduct internal penetration testing
- Prepare evidence documentation for formal assessment
- Deliverable: Assessment-Ready Package

July 2026: Formal Assessment (CoalFire)
- 4-6 week on-site and remote assessment
- QSA evaluates all 12 requirements, 78 sub-requirements
- Deliverable: Report on Compliance (ROC) and Attestation of Compliance (AOC)

H.2 PCI DSS v4.0 Requirements Summary

Requirement 1: Install and maintain network security controls
Requirement 2: Apply secure configurations to all system components
Requirement 3: Protect stored account data
Requirement 4: Protect cardholder data with strong cryptography during transmission

Requirement 5: Protect all systems and networks from malicious software
Requirement 6: Develop and maintain secure systems and software

Appendix H: Compliance (continued)

Requirement 7: Restrict access to system components and cardholder data by business need to know

Requirement 8: Identify users and authenticate access to system components

Requirement 9: Restrict physical access to cardholder data

Requirement 10: Log and monitor all access to system components and cardholder data

Requirement 11: Test security of systems and networks regularly

Requirement 12: Support information security with organizational policies and programs

H.3 SOC 2 Type II Timeline

Month 1-3 post-launch: Define scope and trust service criteria

Month 3-4: Engage audit firm, establish control framework

Month 4-9: Observation period (minimum 6 months)

Month 9-10: Audit fieldwork

Month 10-11: Report issuance

H.4 Data Privacy Compliance

CCPA Requirements (California Consumer Privacy Act):
- Right to know: Consumers can request what personal data NovaPay holds
- Right to delete: Consumers can request deletion of their data
- Right to opt-out: Consumers can opt out of data sharing
- NovaPay role: Processor (not controller) for most merchant data

GDPR Readiness (for Phase 3 international expansion):
- Data Protection Officer to be appointed before Phase 3
- Data Processing Agreements with all EU merchants
- Right to erasure implementation
- Data portability API
- Cross-border data transfer mechanism (Standard Contractual Clauses)

H.5 Compliance Budget

PCI DSS v4.0 initial certification: $175,000

PCI annual recertification: $95,000

SOC 2 Type II initial audit: $85,000

SOC 2 annual renewal: $60,000

Quarterly penetration testing: $40,000/year

ASV quarterly scanning: $12,000/year

Compliance team (1 FTE): $200,000/year

Compliance software (Vanta): $24,000/year

Total Year 1 compliance cost: $536,000

Total annual ongoing cost: $431,000

Appendix I: Technical Specifications

I.1 API Endpoint Reference (Phase 1)

Payments:
POST   /v1/charges   Create a charge
GET   /v1/charges/:id   Retrieve a charge
POST   /v1/charges/:id/capture Capture an authorized charge
POST   /v1/charges/:id/refund   Refund a charge (full or partial)
GET   /v1/charges   List charges (paginated)

Subscriptions:
POST   /v1/subscriptions   Create a subscription
GET   /v1/subscriptions/:id   Retrieve a subscription
PATCH /v1/subscriptions/:id   Update a subscription
DELETE /v1/subscriptions/:id   Cancel a subscription
POST   /v1/subscriptions/:id/pause   Pause a subscription
POST   /v1/subscriptions/:id/resume Resume a paused subscription

Customers:
POST   /v1/customers   Create a customer
GET   /v1/customers/:id   Retrieve a customer
PATCH /v1/customers/:id   Update a customer
DELETE /v1/customers/:id   Delete a customer
GET   /v1/customers   List customers (paginated)

Payment Methods:
POST   /v1/payment_methods   Attach a payment method to a customer
GET   /v1/payment_methods/:id Retrieve a payment method
DELETE /v1/payment_methods/:id Detach a payment method
GET   /v1/customers/:id/payment_methods List customer's payment methods

Webhooks:
POST   /v1/webhook_endpoints   Create a webhook endpoint
GET   /v1/webhook_endpoints/:id Retrieve a webhook endpoint
PATCH /v1/webhook_endpoints/:id Update a webhook endpoint
DELETE /v1/webhook_endpoints/:id Delete a webhook endpoint

Events:
GET   /v1/events   List events (paginated)
GET   /v1/events/:id   Retrieve an event

Total Phase 1 endpoints: 22
Average response time target: P50 < 100ms, P95 < 250ms

Appendix I: Technical Specs (continued)

I.2 Error Codes Reference

Payment Errors (card_error):
card_declined: The card was declined by the issuing bank
insufficient_funds: The card has insufficient funds
expired_card: The card has expired
incorrect_cvc: The CVC number is incorrect
processing_error: An error occurred while processing the card
lost_card: The card has been reported as lost
stolen_card: The card has been reported as stolen
card_not_supported: The card type is not supported

API Errors (api_error):
internal_error: An internal server error occurred
network_error: A network communication error occurred
timeout: The request timed out

Authentication Errors (authentication_error):
invalid_api_key: The API key provided is invalid
expired_api_key: The API key has expired
missing_api_key: No API key was provided

Validation Errors (validation_error):
invalid_amount: The amount is invalid (must be positive integer)
invalid_currency: The currency is not supported
missing_required_field: A required field is missing
invalid_field_format: A field has an invalid format

Rate Limit Errors (rate_limit_error):
rate_limit_exceeded: Too many requests, please retry after X seconds

I.3 Webhook Event Types

payment.created: A new payment has been initiated
payment.authorized: A payment has been authorized
payment.captured: An authorized payment has been captured
payment.failed: A payment attempt has failed
payment.refunded: A payment has been refunded (full or partial)
subscription.created: A new subscription has been created
subscription.updated: A subscription has been modified
subscription.canceled: A subscription has been canceled
subscription.past_due: A subscription has entered past_due status
customer.created: A new customer has been created

customer.updated: A customer record has been modified
invoice.created: A new invoice has been generated
invoice.paid: An invoice has been paid

Total event types: 13 in Phase 1

Appendix J: Load Testing Plan

J.1 Load Testing Strategy

Load testing begins in Month 3 (March 2026) and runs continuously through launch. The strategy follows a progressive approach:

Stage 1: Component Testing (March)
- Individual service load tests
- Target: Payment Service handles 5,000 TPS internally
- Tools: k6 for HTTP load testing, custom Go benchmarks for service-level

Stage 2: Integration Testing (April)
- End-to-end payment flow under load
- Target: 1,000 TPS end-to-end with P95 < 500ms
- Simulated payment network responses (mock service)

Stage 3: Production-Like Testing (May-June)
- Full stack with real (sandbox) payment network connections
- Target: 5,000 TPS with P95 < 400ms
- Include: database persistence, event emission, webhook delivery

Stage 4: Peak Load Testing (July)
- Simulate 2x expected peak load (20,000 TPS)
- Verify graceful degradation under extreme load
- Verify auto-scaling triggers correctly
- Target: No data loss, no dropped transactions, degraded latency acceptable

J.2 Load Test Scenarios

Scenario A: Steady State
- 2,000 TPS sustained for 4 hours
- Mix: 70% card charges, 20% subscription renewals, 10% refunds
- Expected: P95 < 340ms, zero errors

Scenario B: Traffic Spike
- Ramp from 500 TPS to 10,000 TPS over 30 minutes
- Sustained at 10,000 TPS for 1 hour
- Ramp down to 2,000 TPS over 15 minutes
- Expected: Auto-scaling triggers within 2 minutes, P95 < 500ms during spike

Scenario C: Payment Network Degradation
- Simulate payment network responding with 500ms latency (vs. normal 150ms)
- 2,000 TPS sustained
- Expected: Overall P95 < 700ms, no timeouts, correct error handling

Scenario D: Database Failover

- Trigger RDS failover during 1,000 TPS sustained load
- Expected: < 30 seconds of elevated error rate, automatic recovery, zero data loss

J.3 Performance Budget

Total P95 budget for card authorization: 340ms
- API Gateway: 10ms
- Payment Service logic: 30ms
- Database read: 10ms
- Payment network round-trip: 200ms
- Database write: 10ms
- Event emission: 5ms
- Response serialization: 5ms
- Network overhead: 70ms
Total: 340ms

Appendix J: Load Testing (continued)

J.4 Load Testing Infrastructure

Environment: Dedicated EKS cluster mirroring production configuration. Isolated from development and staging environments to prevent interference.

Load Generators: 10 x c5.4xlarge EC2 instances distributed across 3 AZs. Each instance runs k6 with custom NovaPay scenario scripts. Total generation capacity: 50,000 TPS.

Monitoring: Dedicated Datadog dashboards for load testing. Real-time alerting on P95 breach. Jaeger trace sampling increased to 100% during tests.

Mock Services: Payment network responses simulated with configurable latency and error rates. Allows testing of timeout handling, retry logic, and error scenarios without incurring real network costs.

Cost: Load testing infrastructure estimated at $3,500 per test session (4-8 hours). Monthly load testing budget: $14,000. Total Phase 1 load testing budget: $70,000.

J.5 Performance Regression Testing

After each deployment, an automated performance test runs as part of the CI/CD pipeline:

1. Deploy to staging environment
2. Run abbreviated load test (15 minutes, 500 TPS)
3. Compare P50, P95, P99 against baseline
4. If P95 regresses by more than 10%: deployment blocked, team notified
5. If P95 regresses by more than 25%: automatic rollback

This prevents performance regressions from reaching production. The baseline is updated after each successful release.

J.6 Capacity Planning

Launch (September 2026): 10,000 TPS capacity. Expected load: 100-500 TPS.
Month 6 (March 2027): Scale to 25,000 TPS. Expected load: 2,000-5,000 TPS.
Month 12 (September 2027): Scale to 50,000 TPS. Expected load: 5,000-15,000 TPS.
Month 18 (March 2028): Scale to 100,000 TPS. Expected load: 15,000-30,000 TPS.

Over-provisioning ratio: 3-5x expected load. This provides headroom for traffic spikes (e.g., end-of-month billing cycles) and prevents capacity-related incidents.

Appendix K: Customer Success Playbook

K.1 Onboarding Journey

Day 0: Account Created
- Welcome email with getting started guide
- Sandbox environment auto-provisioned
- In-app guided tour activates on first dashboard login

Day 1: Integration Started
- SDK downloaded, first API call made
- If no API call within 24 hours: automated email with quick-start video

Day 3: Integration Checkpoint
- If test transaction not yet processed: proactive email from Customer Success
- Offer of 15-minute integration call (optional, not mandatory)

Day 5: Integration Target
- Target: first test transaction processed
- If not: automated in-app prompt with common troubleshooting steps

Day 7: Go-Live Ready
- Pre-go-live checklist available in dashboard
- Automated checks: webhook configured, error handling tested, production keys generated
- Customer Success reviews account readiness

Day 14: First Live Transaction
- Target: merchant processes first real transaction
- Celebration email with "first transaction" milestone badge

Day 30: Health Check
- Automated health score based on: transaction volume, success rate, dashboard usage
- If health score < 70: proactive outreach from Customer Success
- If health score > 90: request for testimonial/case study

K.2 Support Tiers

Tier 1 -- Self-Serve (all plans):
- Knowledge base with 100+ articles
- Interactive API troubleshooter
- Community forum
- Status page with real-time updates
- Response time: N/A (self-serve)

Tier 2 -- Email Support (all plans):

- Technical support team
- Standard: 24-hour response SLA
- Growth: 4-hour response SLA
- Enterprise: 1-hour response SLA

Tier 3 -- Dedicated Support (Enterprise only):
- Named account manager
- Dedicated Slack channel
- Quarterly business reviews
- Custom integration support

Appendix K: Customer Success (continued)

K.3 Churn Prevention Signals

The following signals indicate a customer is at risk of churning:

High Risk (immediate outreach):
- Transaction volume drops > 50% week-over-week
- Customer support ticket marked "switching" or "alternative"
- No dashboard logins for 14+ consecutive days
- Failed payment rate exceeds 10% for 7+ days

Medium Risk (monitor and engage):
- Transaction volume drops 20-50% week-over-week
- NPS survey response of 6 or below
- Support tickets increasing (> 3 in one week)
- No feature adoption beyond basic payment processing

Low Risk (standard engagement):
- Minor volume fluctuations (< 20%)
- Occasional support tickets
- Limited analytics dashboard usage

K.4 Expansion Revenue Strategy

NovaPay revenue grows through three mechanisms:

1. Usage Growth: As merchants grow, their transaction volume grows. Revenue scales automatically without any upsell required. A merchant that doubles ARR roughly doubles their NovaPay spend.

2. Plan Upgrades: Standard to Growth plan upgrade triggered by:
- Merchant asks about cohort analytics (Growth feature)
- Merchant processing > $500K/month (volume threshold)
- Merchant opens > 5 support tickets/month (priority support value)

3. Feature Adoption: Phase 2 features (AI dunning, fraud detection) available as paid add-ons. Target: 40% of existing customers adopt at least one Phase 2 feature within 6 months of launch.

K.5 Customer Success Metrics

Onboarding:
- Time to first API call: target < 2 hours
- Time to first test transaction: target < 5 days
- Time to first live transaction: target < 14 days
- Onboarding completion rate: target > 85%

Engagement:

- Weekly dashboard active users: target > 70% of merchants
- Average support tickets per merchant per month: target < 2
- Feature adoption rate (beyond basic payments): target > 60%

Retention:

- Monthly churn rate: target < 5%
- Net Revenue Retention (NRR): target > 110%
- NPS: target > 45

Appendix L: Financial Model Assumptions

L.1 Revenue Model Assumptions

Transaction Revenue:
- Average transaction value: $85 (based on mid-market SaaS subscription payments)
- Average transactions per customer per month: 2,500
- Blended take rate: 2.7% + $0.25 per transaction
- Average revenue per customer per month: $6,362 (transaction fees)
- Additional platform fee (Growth plan): $499/month
- Blended average revenue per customer: $7,000/month ($84,000/year)

Note: The blended average includes a mix of Standard plan (60% of customers, transaction fees only) and Growth plan (35% of customers, $499 + transaction fees) and Enterprise (5%, custom pricing averaging $15,000/month).

Cost Structure:
- Interchange and network fees: 1.8% + $0.10 per transaction (passed through)
- NovaPay gross margin on transaction fees: approximately 35%
- Platform fee (Growth/Enterprise): 85% gross margin
- Blended gross margin: 45% in Year 1, growing to 55% by Year 3 as platform fee revenue increases

L.2 Customer Growth Assumptions

Month 1-3: 5 new customers/month (beta partners converting)
Month 4-6: 10 new customers/month (limited availability + outbound)
Month 7-12: 20 new customers/month (GA + full marketing)
Month 13-18: 30 new customers/month (word of mouth + content flywheel)
Month 19-24: 40 new customers/month (established brand + partnerships)

Monthly churn: 5% for first 6 months, declining to 3% by Month 18 as product matures and switching costs increase.

L.3 Infrastructure Cost Model

Base cost (0 customers): $8,000/month (EKS cluster, RDS, Redis, monitoring)
Per-customer marginal cost: $35/month (storage, compute scaling, API calls)
Per-transaction marginal cost: $0.002 (compute, logging, network)

At 200 customers processing 500,000 transactions/month:
Base: $8,000 + Customer: $7,000 + Transaction: $1,000 = $16,000/month
Actual infrastructure spend will be higher ($47,000) due to redundancy, DR, and over-provisioning.

L.4 Break-Even Analysis

Fixed monthly costs at scale:

Engineering team: $480,000/month

Operations team: $80,000/month

Marketing: $60,000/month

Infrastructure: $47,000/month

Compliance: $36,000/month

Office and overhead: $25,000/month

Total fixed: $728,000/month

Variable cost per customer: $35/month + interchange passthrough

Break-even customers (at $7,000/month average revenue, 45% gross margin):

$728,000 / ($7,000 x 0.45 - $35) = $728,000 / $3,115 = 234 customers

This aligns with Month 13-14 projections, consistent with the Month 16 break-even estimate that includes cumulative investment recovery.

Appendix L: Financial Model (continued)

L.5 Sensitivity Analysis

What if customer acquisition is 30% slower?

Scenario: 70% of projected customer growth rate.
Month 12 customers: 140 (vs. 200 baseline)
Month 12 ARR: $7.9M (vs. $11.3M)
Break-even pushed to: Month 22 (vs. Month 16)
Additional funding required: $0 (existing budget sufficient through Month 24)
Impact: Phase 2 funding gate at 50 customers still achievable, just delayed by ~2 months.

What if churn is 2x higher?

Scenario: 10% monthly churn instead of 5%.
Month 12 customers: 135 (vs. 200)
Month 12 ARR: $7.6M (vs. $11.3M)
Break-even: Month 24 (marginal)
Impact: Severe -- product-market fit questioned. Triggers investigation of churn drivers before Phase 2 investment.

What if average revenue per customer is 25% lower?

Scenario: $5,250/month instead of $7,000 (more Standard plan, fewer Growth).
Month 12 revenue: $709K/month (vs. $945K)
Break-even customers needed: 312 (vs. 234)
Break-even: Month 20
Impact: Moderate -- need to accelerate Growth plan conversion or increase take rate.

What if infrastructure costs are 2x higher?

Scenario: $94,000/month instead of $47,000.
Impact on break-even: Pushed back by 1 month (Month 17 vs. 16)
Impact: Minimal -- infrastructure is a small portion of total costs.

L.6 Funding Requirements

Current funding: $18.5M (Series A, closed November 2025)
Runway at current burn rate: 24 months (through November 2027)
Series B trigger: 200+ customers, $2M+ ARR, Phase 2 launched
Series B target: $40-60M at $200-300M pre-money valuation
Series B timeline: Q2 2027

If Series B is not raised:

- Path to profitability exists at 234 customers (break-even)
- Can reach profitability without additional funding if growth targets are met
- Contingency: reduce team from 18 to 12, extend runway to 30 months

Appendix M: Legal and Contractual Framework

M.1 Merchant Agreement Structure

The NovaPay Merchant Agreement consists of four documents:

1. Master Services Agreement (MSA):
- Term: Month-to-month for Standard, 12-month minimum for Growth, custom for Enterprise
- Termination: 30 days notice for Standard/Growth, per contract for Enterprise
- Liability cap: 12 months of fees paid
- Governing law: State of Delaware
- Dispute resolution: Binding arbitration (AAA rules)

2. Acceptable Use Policy (AUP):
- Prohibited businesses: gambling, adult content, illegal substances, weapons, cryptocurrency (evaluated case-by-case)
- Transaction limits: $50,000 per single transaction (Standard), $250,000 (Growth), custom (Enterprise)
- Velocity limits: 10,000 transactions/day (Standard), 50,000 (Growth), custom (Enterprise)

3. Data Processing Agreement (DPA):
- NovaPay as data processor, merchant as data controller
- Sub-processor list maintained and updated with 30-day notice
- Data breach notification within 72 hours
- Data deletion upon termination (90-day grace period)

4. Service Level Agreement (SLA):
Standard: 99.9% monthly uptime, no financial credit
Growth: 99.95% monthly uptime, 5% credit for breach
Enterprise: 99.99% monthly uptime, custom credit schedule

M.2 Key Legal Risks

1. Merchant fraud: Merchants using NovaPay for fraudulent transactions. Mitigation: KYB verification, transaction monitoring, reserve requirements for high-risk merchants.

2. Chargeback liability: Excessive chargebacks can result in penalties from card networks. Mitigation: Chargeback monitoring, automatic merchant suspension at 1% chargeback rate.

3. Data breach liability: Notification requirements vary by state. Mitigation: Cyber insurance ($5M), incident response plan, PCI compliance.

4. Regulatory action: State money transmitter enforcement. Mitigation: Operating under FNBC umbrella, maintaining MSP registration with all networks.

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