Healthcare Claim Adjudication: Complete Step-by-Step Flow

JUL 20, 2025 • PAID

Follow a single claim through every microsecond of its journey from provider submissi final payment - here's the complete technical breakdown.

Healthcare Claim Adjudication Complet Table of Contents

Phase 1 Initial Reception and Validation

1. Step 1 The Claim Arrives
2. Step 2 Transport Layer Security Check
3. Step 3 Initial Payload Inspection
4. Step 4 EDI Syntax Validation
5. Step 5 Data Element Validation
6. Step 6 Segment Relationship Validation

Phase 2 Business Rule Processing and Initial Screening

7. Step 7 Business Rule Engine Initialization
8. Step 8 Duplicate Claim Detection
9. Step 9 Date and Time Validation
10. Step 10 Procedure Code Validation
11. Step 11 Diagnosis Code Validation

Phase 3 Member and Provider Verification

12. Step 12 Member Lookup and Identity Resolution
13. Step 13 Eligibility Verification Engine
14. Step 14 Coverage Period Validation
15. Step 15 Dependent Eligibility Checking
16. Step 16 Provider Directory Validation
17. Step 17 Provider Contract Status Verification
18. Step 18 Network Status Determination

Phase 4 Authorization and Pre-Approval Verification

19. Step 19 Prior Authorization Requirements Check
20. Step 20 Authorization Database Search
21. Step 21 Authorization Match Validation
22. Step 22 Unit Consumption and Tracking
23. Step 23 Referral Validation

Phase 5 Clinical Review and Medical Necessity

24. Step 24 Medical Coding Edit Engine
25. Step 25 Diagnosis-Procedure Relationship Analysis
26. Step 26 Medical Necessity Determination
27. Step 27 Experimental Investigational Screening
28. Step 28 Frequency and Duration Analysis

Phase 6 Fraud Detection and Risk Assessment

29. Step 29 Provider Behavior Analytics
30. Step 30 Real-Time Fraud Scoring

31. Step 31 Pattern Recognition Analysis
32. Step 32 Anomaly Detection
33. Step 33 Sanctions and Exclusions Screening

Phase 7 Benefits Calculation and Pricing

34. Step 34 Benefit Configuration Retrieval
35. Step 35 Covered Service Determination
36. Step 36 Fee Schedule Assignment
37. Step 37 Allowed Amount Calculation
38. Step 38 Deductible Application Logic
39. Step 39 Coinsurance and Copayment Calculation
40. Step 40 Out-of-Pocket Maximum Processing

Phase 8 Secondary Coverage and Coordinatio

41. Step 41 Other Coverage Identification
42. Step 42 Primary Payer Determination
43. Step 43 External Payer Communication
44. Step 44 COB Calculation Processing
45. Step 45 Subrogation Identification

Phase 9 Payment Authorization and Settleme

46. Step 46 Accumulator Updates
47. Step 47 Payment Authorization Generation
48. Step 48 Electronic Funds Transfer Preparation
49. Step 49 Check Processing Workflow
50. Step 50 General Ledger Integration

Phase 10 Communication and Documentation

51. Step 51 Explanation of Benefits Generation
52. Step 52 Provider Remittance Processing
53. Step 53 Member Portal Updates
54. Step 54 Provider Communication Workflows
55. Step 55 Regulatory Notification Requirements

Phase 11 Quality Assurance and Compliance

56. Step 56 Statistical Sampling for Audit
57. Step 57 Compliance Monitoring
58. Step 58 Audit Trail Generation
59. Step 59 Exception Reporting
60. Step 60 Performance Metrics Collection

Phase 12 Appeals and Grievance Preparation

61. Step 61 Appeal Documentation Preparation
62. Step 62 Grievance Tracking Integration
63. Step 63 Legal Hold Processing

Phase 13 Data Analytics and Machine Learnin

64. Step 64 Data Warehouse Population
65. Step 65 Machine Learning Model Updates
66. Step 66 Predictive Analytics Processing
67. Step 67 Business Intelligence Integration

Phase 14 Financial Settlement and Reconciliation

68. Step 68 Daily Settlement Processing
69. Step 69 Bank Reconciliation
70. Step 70 Financial Reporting Integration

Phase 15 Continuous Monitoring and Optimization

71. Step 71 Real-Time Performance Monitoring
72. Step 72 Capacity Planning Analytics
73. Step 73 System Health Monitoring
74. Step 74 Security Monitoring
75. Step 75 Process Optimization

Summary Statistics

- Total Steps 75
- Total Phases 15
- Average Processing Time 2.3 seconds for auto-adjudicated claims
- Daily Volume 2.1 million claims processed
- Peak Capacity 50000 transactions per second
- System Uptime 99.97 percent
- Auto-Adjudication Rate 87 percent of submissions
- Microservices Involved 47
- Databases Queried 23
- Audit Events Generated 300 plus per claim

Phase 1: Initial Reception and Validatic

Step 1: The Claim Arrives

The provider's Epic practice management system fires an EDI 837 Professional transaction containing 23 service lines into your intake API gateway at 2:47:23 P a Tuesday. Your F5 load balancer immediately performs SSL termination and ro this 47KB payload to one of twelve active ingestion microservices running in you primary AWS us-east-1 region, while simultaneously logging the transaction to y centralized ELK stack for audit purposes.

Step 2: Transport Layer Security Check

Your API gateway validates the provider's OAuth 2.0 bearer token against your identity management service, checking digital certificates and ensuring the submitting entity matches the billing provider NPI in the claim header. If authentication fails, the system immediately returns an HTTP 401 with a standa error response and blocks any further processing to prevent unauthorized submissions.

Step 3: Initial Payload Inspection

The ingestion service performs rapid payload analysis, checking file size limits (5 max), scanning for malicious content using antivirus engines, and validating the envelope structure before queuing the transaction for deeper processing. Suspic payloads get quarantined in isolated storage with immediate security team notifications.

Step 4: EDI Syntax Validation

Your custom EDI parser, built on top of Microsoft BizTalk Server libraries, rips the transaction into 847 individual data elements, checking each segment agains HIPAA 5010 implementation guide while a separate thread validates control nur interchange headers, and functional group structures. If even one loop identifier malformed or a required segment is missing, the entire claim gets rejected with HTTP 400 response and a detailed TA1 functional acknowledgment queued for immediate return to the provider.

Step 5: Data Element Validation

Each data element undergoes field-level validation including data type checking (numeric, alphanumeric, date formats), length verification, and enumeration validation against HIPAA code sets. The system validates 127 different data elem types in parallel, using cached validation rules that are refreshed every 15 minut from your master data management system.

Step 6: Segment Relationship Validation

The parser verifies hierarchical loop relationships, ensuring that patient loops a properly nested under subscriber loops, service lines reference valid claim heade and all required parent-child relationships are maintained. Cross-segment valid rules check for consistency between related data elements across different segm of the transaction.

Phase 2: Business Rule Processing and Initial Screening

Step 7: Business Rule Engine Initialization

Your Drools-based rules engine loads 2,847 active validation rules from Redis ca and begins firing them against the normalized claim data using 16 parallel proce threads. Each rule evaluation takes 0.3 milliseconds on average, checking everyt from valid procedure code combinations to geographic billing restrictions and temporal consistency requirements.

Step 8: Duplicate Claim Detection

The system performs real-time duplicate checking using a composite hash of me ID, provider NPI, service dates, procedure codes, and billed amounts, querying b your active claims database and a 13-month rolling archive. Potential duplicates trigger immediate suspension with detailed match analysis for manual review te

Step 9: Date and Time Validation

Service dates undergo comprehensive validation including business day verificat provider contract effective date checking, and claim submission timeliness rules system also validates that service dates don't fall in the future and comply with p specific timely filing requirements, which can range from 90 days to 365 days depending on the contract terms.

Step 10: Procedure Code Validation

Your clinical coding service validates CPT, HCPCS, and ICD-10 procedure code against current code sets with effective date verification, checking for deleted cc gender-specific restrictions, and age-appropriate procedures. Invalid codes trigg immediate denial with specific error messaging for provider correction.

Step 11: Diagnosis Code Validation

ICD-10 diagnosis codes undergo validation for proper formatting, effective date clinical appropriateness, with machine learning models trained on 50 million historical claims assigning confidence scores to diagnosis-procedure relationshi The system also checks for required primary diagnosis presence and validates diagnosis sequencing rules.

Phase 3: Member and Provider Verification

Step 12: Member Lookup and Identity Resolut

The system queries your member database using a composite key of member ID, security number hash, and date of birth, retrieving cached member demographic include name variations, address history, and dependent relationships. Advanced fuzzy matching algorithms handle common data entry errors and name variation ensure accurate member identification.

Step 13: Eligibility Verification Engine

Your eligibility service performs complex temporal queries against enrollment databases to verify active coverage at the exact service date, checking plan effect dates, coverage tiers, dependent age limits, and continuation coverage status. Th system maintains cached eligibility snapshots that are refreshed every 8 minutes change data capture from the enrollment system.

Step 14: Coverage Period Validation

The system validates that service dates fall within the member's coverage period accounting for retroactive enrollments, COBRA continuations, and grace period premium payments. Special handling applies for members with multiple coverag periods or plan changes during the service month.

Step 15: Dependent Eligibility Checking

For dependent claims, the system verifies the dependent's relationship to the subscriber, validates age limits for different dependent types (children, disabled dependents, students), and confirms that required supporting documentation is file. Age-out processing handles automatic termination of dependent coverage a specified ages.

Step 16: Provider Directory Validation

Your provider directory service validates the rendering physician's NPI against internal credentialing records and external NPPES data, checking taxonomy cod practice locations, DEA registrations, and license status. The system also cross-references provider specialty against procedure appropriateness rules and valida board certifications for specialized procedures.

Step 17: Provider Contract Status Verification

The system verifies the provider's contract status and effective dates, ensuring t were contracted to provide services at the specific service location on the date of service. Contract validation includes checking for terminated agreements, suspe providers, and geographic service area restrictions.

Step 18: Network Status Determination

Your network management system determines whether the provider is in-netwo out-of-network, or has special contract arrangements like single case agreement emergency provider status. This determination affects benefit levels, member co sharing, and payment methodologies throughout the adjudication process.

Phase 4: Authorization and Pre-Approv Verification

Step 19: Prior Authorization Requirements Ch

The system cross-references procedure codes against authorization requirement matrices that vary by plan type, provider specialty, member demographics, and clinical circumstances. Requirements databases contain over 15,000 procedure-specific rules that are updated monthly based on medical policy changes and utilization management protocols.

Step 20: Authorization Database Search

Your prior authorization engine searches across three different authorization databases using fuzzy matching algorithms to find approvals that might cover th specific procedure code and diagnosis combination. The search considers proced code families, equivalent codes, and umbrella authorizations that might apply to requested services.

Step 21: Authorization Match Validation

When potential authorizations are found, the system validates exact match crite including procedure codes, diagnosis requirements, provider restrictions, facilit limitations, and service date ranges. Advanced matching considers authorizatior modifications, appeals outcomes, and peer review decisions that might affect cov

Step 22: Unit Consumption and Tracking

For matched authorizations, the system decrements authorized unit counts in re time, tracking cumulative utilization against approved quantities while maintair audit trails of consumption patterns. The system also checks for over-utilization scenarios and triggers alerts when authorization limits are approaching.

Step 23: Referral Validation

The system validates referral requirements for specialist services, checking that referring providers are contracted, referrals are current and specific to the requ services, and that specialist providers are accepting the referrals. Expired or mis referrals trigger automatic suspension for manual review.

Phase 5: Clinical Review and Medical Necessity

Step 24: Medical Coding Edit Engine

Your clinical validation service runs 34 different edit types against the claim, including Correct Coding Initiative (CCI) edits, mutually exclusive procedures, comprehensive/component relationships, and medically unlikely edits (MUEs). E edit type has specific override capabilities and appeals processes for legitimate clinical scenarios.

Step 25: Diagnosis-Procedure Relationship Analysis

Machine learning models trained on millions of historical claims analyze the cli appropriateness of procedure-diagnosis combinations, considering provider spe facility type, patient demographics, and temporal patterns. Confidence scores be threshold values trigger manual clinical review workflows.

Step 26: Medical Necessity Determination

Your medical necessity engine evaluates whether services meet plan-specific cov criteria through rule-based algorithms and AI-powered clinical decision suppor

tools. The system references evidence-based guidelines, FDA approvals, and mec society recommendations to assess treatment appropriateness.

Step 27: Experimental/Investigational Screeni

The system screens procedures against databases of experimental and investigati treatments, checking FDA approval status, clinical trial registrations, and publis medical literature. Potentially experimental procedures get flagged for specializ review by medical directors.

Step 28: Frequency and Duration Analysis

The system analyzes service frequency against clinical guidelines and plan limita identifying potential overutilization or inappropriate treatment patterns. Freque edits consider diagnosis-specific norms, provider specialty standards, and memb specific treatment history.

Phase 6: Fraud Detection and Risk Assessment

Step 29: Provider Behavior Analytics

Behavioral analytics engines compare this claim against the provider's historical billing patterns using statistical process control methods, flagging outliers like unusual procedure frequencies, atypical time-of-day submissions, or geographic anomalies. The system maintains rolling 12-month baselines for each provider a 200+ behavioral metrics.

Step 30: Real-Time Fraud Scoring

Ensemble machine learning models calculate real-time fraud risk scores using 3 features including billing velocity patterns, procedure combinations, diagnosis coherence, and cross-provider collaboration indicators. Scores above predetermi thresholds trigger immediate special investigation unit review.

Step 31: Pattern Recognition Analysis

Advanced analytics identify suspicious billing patterns across multiple claims ar providers, detecting schemes like upcoding, unbundling, phantom billing, and kickback arrangements. Graph databases track provider relationships and referr patterns to identify potential fraud networks.

Step 32: Anomaly Detection

Statistical anomaly detection algorithms identify claims that deviate significantl normal patterns, considering factors like unusual procedure combinations, extre cost variations, and temporal clustering of similar services. Machine learning mo continuously adapt to new fraud patterns as they emerge.

Step 33: Sanctions and Exclusions Screening

The system performs real-time screening against OIG exclusion lists, state Medi sanctions, and internal provider disciplinary actions, ensuring that sanctioned providers cannot receive payments. Automated daily updates ensure screening databases remain current with regulatory changes.

Phase 7: Benefits Calculation and Prici

Step 34: Benefit Configuration Retrieva

The pricing service retrieves the member's specific benefit configuration from yo rules engine, loading plan-specific deductibles, coinsurance rates, copayment amounts, and out-of-pocket maximums. Benefit configurations include over 200 possible parameters that affect cost-sharing calculations.

Step 35: Covered Service Determination

The system determines which services are covered benefits under the member's checking exclusions lists, limitations, and special conditions that might affect

coverage. Non-covered services get separated for appropriate denial processing v
specific reason codes.

Step 36: Fee Schedule Assignment

Your pricing engine queries the appropriate fee schedule based on provider con
terms, geographic location, procedure code specificity, and effective date ranges.
system maintains 47 different fee schedules across various provider types and
geographic regions, each with different update cycles and effective date logic.

Step 37: Allowed Amount Calculation

The system calculates allowed amounts by applying negotiated rates, discount
schedules, and bonus arrangements specific to each provider contract. Multiple
schedules might apply to different service lines on the same claim, each requirin
separate calculation methodologies and rounding rules.

Step 38: Deductible Application Logic

The deductible engine applies appropriate deductible amounts based on benefit
design, service categories, and network status, tracking year-to-date accumulatic
across individual and family deductibles. Complex family deductible logic ensur
proper credit allocation among covered family members.

Step 39: Coinsurance and Copayment Calculat

The system calculates member cost-sharing based on plan-specific coinsurance
percentages and copayment amounts, applying different rates for in-network ver
out-of-network services. Specialized logic handles graduated coinsurance rates a
procedure-specific copayment overrides.

Step 40: Out-of-Pocket Maximum Processing

Out-of-pocket calculations track cumulative member expenses against annual
maximums, considering which expenses count toward limits and applying prope

family aggregation rules. The system handles embedded individual maximums w
family coverage and specialized accumulator categories.

Phase 8: Secondary Coverage and Coordination

Step 41: Other Coverage Identification

If the member has secondary coverage, the coordination of benefits (COB) engin
automatically identifies other payers from eligibility records, external databases,
member-reported information. The system maintains relationships with over 3,0
other payers for coordination processing.

Step 42: Primary Payer Determination

The system applies Medicare Secondary Payer rules, workers' compensation
coordination logic, and standard COB sequencing rules to determine primary ve
secondary responsibility. Complex scenarios involving multiple coverage types r
specialized decision trees and regulatory compliance checking.

Step 43: External Payer Communication

When secondary coverage is identified, the system initiates real-time eligibility
verification calls to external payers through standardized APIs or EDI transactio
Response caching minimizes redundant inquiries while ensuring coverage
information remains current.

Step 44: COB Calculation Processing

The coordination engine calculates proper payment amounts considering primar
payer responsibilities, secondary payer obligations, and member cost-sharing
requirements. Anti-duplication rules ensure members don't receive benefits exc
100% of allowed charges.

Step 45: Subrogation Identification

The system screens claims for potential subrogation situations including auto accidents, workers' compensation cases, and third-party liability scenarios. Iden subrogation cases trigger specialized workflows for recovery processing and lega action when necessary.

Phase 9: Payment Authorization and Settlement

Step 46: Accumulator Updates

The system atomically updates member-level deductible, out-of-pocket maximu lifetime benefit accumulators across multiple database partitions using distribu locks to prevent race conditions. These updates include benefit period resets, ca over provisions, and retroactive adjustments from prior period changes.

Step 47: Payment Authorization Generation

Your payment engine generates authorized payment amounts for each service lir creating pending payment records in the general ledger system while simultaneo reserving funds in designated banking accounts. Authorization includes detailed breakdown of payment components for audit and reconciliation purposes.

Step 48: Electronic Funds Transfer Preparatio

Payment processing systems generate ACH files containing electronic fund trans instructions, grouping payments by provider banking information and applying minimum payment thresholds. EFT files undergo cryptographic signing and mu level approval workflows before transmission to banking partners.

Step 49: Check Processing Workflow

For providers not enrolled in electronic payments, check printing workflows ger payment vouchers with detailed remittance information, routing checks through

secure printing facilities with tracking and delivery confirmation capabilities.

Step 50: General Ledger Integration

All payment authorizations automatically post to appropriate general ledger acc updating medical expense reserves, provider payables, and cash flow projections time financial reporting systems provide immediate visibility into payment oblig and cash position changes.

Phase 10: Communication and Documentation

Step 51: Explanation of Benefits Generation

The EOB service pulls claim details, benefit calculations, payment information, denial reasons into standardized templates, generating both PDF documents for postal processing and structured data for member portal display. Multi-languag EOBs get generated automatically based on member communication preferences stored in the CRM system.

Step 52: Provider Remittance Processing

Your provider portal receives real-time claim status updates through webhook notifications, while EDI 835 electronic remittance advice transactions get queue batch transmission every 4 hours. The remittance includes detailed payment explanations, adjustment codes, and claim-level information for provider revenu cycle integration.

Step 53: Member Portal Updates

Real-time claim status updates flow to member self-service portals through API enabling members to track claim progress, view payment details, and access digi copies of EOBs. Mobile app push notifications alert members to significant clair events like approvals or denials.

Step 54: Provider Communication Workflows

Automated communication systems send claim processing notifications through provider-preferred channels including secure email, portal messages, and mobil alerts. Providers receive immediate notification of claim suspensions requiring additional documentation or prior authorization.

Step 55: Regulatory Notification Requirement

The system automatically generates required regulatory notifications for claims involving experimental treatments, high-cost procedures, or adverse actions, ens compliance with state insurance regulations and federal notification requiremen

Phase 11: Quality Assurance and Compliance

Step 56: Statistical Sampling for Audit

Quality assurance algorithms automatically flag 3% of processed claims for post-payment audit review using stratified sampling methodologies that ensure adequ coverage across provider types, procedure categories, payment amounts, and geographic regions. Sampling algorithms adjust selection criteria based on risk s and historical audit findings.

Step 57: Compliance Monitoring

Real-time compliance monitoring systems track adherence to regulatory require including claim processing timeframes, denial rate thresholds, and appeals proc standards. Automated alerts notify compliance teams when metrics approach regulatory thresholds or unusual patterns emerge.

Step 58: Audit Trail Generation

Every decision point, data transformation, and system interaction gets logged to immutable audit trails with cryptographic integrity verification using blockchai

hash chains. These logs support regulatory examinations, internal audits, and fo investigations while maintaining HIPAA compliance and data retention requirer

Step 59: Exception Reporting

Automated exception reporting identifies claims processing anomalies, system performance issues, and potential compliance violations for management review Exception reports include root cause analysis suggestions and recommended corrective actions based on historical patterns.

Step 60: Performance Metrics Collection

The system continuously collects performance metrics including processing late throughput rates, error frequencies, and user satisfaction scores across all adjudication components. Metrics feed into operational dashboards and executiv reporting systems for continuous improvement initiatives.

Phase 12: Appeals and Grievance Preparation

Step 61: Appeal Documentation Preparation

The system automatically generates appeal-ready documentation packages for ar claim that might face future challenges, including clinical rationale, benefit interpretations, regulatory compliance evidence, and decision audit trails. Documentation packages get stored in content management systems with appro retention policies and quick retrieval capabilities.

Step 62: Grievance Tracking Integration

Claims data integrates with member grievance systems to provide complete cont for member complaints and appeals, enabling customer service representatives t access full claim histories and processing decisions during member interactions.

Step 63: Legal Hold Processing

When claims become subject to legal proceedings or regulatory investigations, automated legal hold processes preserve all related data and prevent routine del while maintaining chain of custody documentation for potential evidence requirements.

Phase 13: Data Analytics and Machine Learning

Step 64: Data Warehouse Population

Claim adjudication events stream into your enterprise data warehouse through Apache Kafka message queues, feeding business intelligence dashboards, actuar analysis systems, and predictive modeling platforms. Real-time data pipelines en analytics systems have immediate access to claim outcomes for decision support.

Step 65: Machine Learning Model Updates

Continuous learning algorithms analyze adjudication outcomes to improve futu processing accuracy, updating fraud detection models, clinical appropriateness algorithms, and operational efficiency optimizations. Model performance metric tracked through MLOps pipelines with automated retraining when performance degrades.

Step 66: Predictive Analytics Processing

Advanced analytics engines use claim data to predict member health risks, provi utilization patterns, and cost trend forecasting. Predictive models support popul health management, provider contracting decisions, and actuarial reserve calcul

Step 67: Business Intelligence Integration

Processed claims feed into executive dashboards showing real-time operational metrics, financial performance indicators, and clinical quality measures. Interac analytics platforms enable business users to drill down into claim patterns and identify improvement opportunities.

Phase 14: Financial Settlement and Reconciliation

Step 68: Daily Settlement Processing

End-of-day settlement processes aggregate all approved payments by provider, generating electronic fund transfers and updating cash flow forecasting models. Settlement files undergo multi-level reconciliation against payment authorizatio ensure accuracy before transmission to banking partners.

Step 69: Bank Reconciliation

Automated bank reconciliation systems verify that payment amounts match authorization records within acceptable variance thresholds, identifying and researching discrepancies through exception workflows. Daily cash position rep provide treasury teams with real-time visibility into payment obligations and ava funds.

Step 70: Financial Reporting Integration

Payment data automatically flows into financial reporting systems, updating inc statements, balance sheets, and regulatory financial reports. Month-end close processes include automated claim accrual calculations and reserve adjustments on claim processing patterns.

Phase 15: Continuous Monitoring and Optimization

Step 71: Real-Time Performance Monitoring

Comprehensive monitoring dashboards track processing latency, throughput rat error frequencies, and system resource utilization across all adjudication compo Alert systems trigger automated scaling of microservices when processing volun exceed normal thresholds or when error rates spike.

Step 72: Capacity Planning Analytics

Predictive analytics forecast processing capacity requirements based on seasonal patterns, enrollment growth, and utilization trends. Automated scaling policies computing resources to maintain processing SLAs while optimizing infrastructu costs.

Step 73: System Health Monitoring

Application performance monitoring tools track database response times, API la message queue depths, and cache hit ratios across the entire adjudication platfo Proactive alerting enables operations teams to address performance issues befor impact claim processing.

Step 74: Security Monitoring

Continuous security monitoring systems track access patterns, data flows, and potential security threats across the adjudication platform. Behavioral analytics identify unusual access patterns that might indicate security breaches or insider threats.

Step 75: Process Optimization

Continuous improvement algorithms analyze processing patterns to identify bottlenecks, redundancies, and optimization opportunities. Process mining techniques visualize actual claim flows compared to designed processes, highligl areas for automation and efficiency gains.

The Complete Journey: Real-Time Processing at Scale

From EDI transaction receipt to final settlement authorization, this entire 75-ste adjudication process completes in an average of 2.3 seconds for straightforward claims requiring no manual intervention. Complex claims requiring clinical revi fraud investigation, or manual coding correction might take days or weeks to

complete, but the automated pipeline successfully handles 87% of submissions without human intervention.

Your adjudication platform processes over 2.1 million claims daily across your e health plan operation, with peak processing rates reaching 50,000 transactions p second during busy periods. The system maintains 99.97% uptime through redu infrastructure, automated failover capabilities, and comprehensive disaster reco procedures.

The end-to-end process touches 47 different microservices, queries 23 databases generates over 300 audit events per claim while maintaining strict HIPAA compl and regulatory requirements. Modern adjudication platforms represent some of most complex real-time processing systems in enterprise software, combining cl knowledge, financial calculations, fraud detection, and regulatory compliance in seamless automated workflows that process billions of healthcare transactions annually.

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Stuart Miller Haverin about... Jul 20, 2025

Love this Trey...and then they wonder where all the money in healthcare goes and so expensive in the US Healthcare system. LOL!!!

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