

AI-Driven Patient-Centric Healthcare Platform

Agentic System Architecture & Implementation Strategy

Board of Directors Presentation

Prepared by: Chief AI Architect

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Classification: Executive Summary & Technical Specification

Executive Summary

Vision Statement

Transform healthcare delivery through an AI-driven, patient-centric platform that empowers patients with complete data control while providing intelligent, evidence-based medical insights through autonomous AI agents.

Strategic Value Proposition

- **\$2.5B Market Opportunity** in AI-driven healthcare platforms
- **40% Cost Reduction** through intelligent automation and care optimization
- **95% Patient Satisfaction** through transparent, personalized care
- **15% Revenue Growth** via premium AI-enhanced services

Key Differentiators

1. **Patient Data Sovereignty:** Blockchain-secured, patient-controlled medical records
 2. **Multi-Agent AI Intelligence:** 24 specialized medical AI agents working collaboratively
 3. **Real-Time Decision Support:** Sub-2 second AI recommendations with 95% accuracy
 4. **Regulatory Compliance:** Built-in HIPAA/GDPR/FDA compliance automation
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1. Agentic System Overview

1.1 What is an Agentic System?

An **agentic system** consists of autonomous AI agents that can:

- **Perceive** their environment (medical data, patient context)
- **Reason** about complex medical scenarios
- **Act** independently to achieve healthcare goals
- **Collaborate** with other agents and human experts

- Learn from outcomes to improve performance

1.2 Our Healthcare Agentic Architecture

HEALTHCARE AGENTIC ECOSYSTEM

CHIEF MEDICAL AI COORDINATOR

(Meta-Agent)

- Task Orchestration
- Resource Allocation
- Quality Assurance
- Ethical Oversight

DIAGNOSTIC | TREATMENT | COORDINATION | RESEARCH |

AGENT TEAM | AGENT TEAM | AGENT TEAM | AGENT TEAM |

| | | | |

| 6 Agents | 5 Agents | 4 Agents | 4 Agents |

PATIENT ADVOCACY AGENT TEAM

(5 Agents)

- Ethics
- Bias Detection
- Preference Learning

TOTAL: 24 SPECIALIZED AGENTS

2. System Architecture: Agents, Tasks, and Tools

2.1 Agent Classification Framework

Tier 1: Meta-Agent (1 Agent)

Chief Medical AI Coordinator

- Purpose:** Strategic oversight and orchestration
- Responsibilities:** Task delegation, resource optimization, quality assurance
- Authority Level:** System-wide decision making

Tier 2: Domain Specialist Teams (19 Agents)

2.1.1 Diagnostic Agent Team (6 Agents)

Agent Name	Specialized Domain	Primary Tasks	Key Tools
Radiology Analysis Agent	Medical Imaging	<ul style="list-style-type: none">CT/MRI/X-ray analysisAbnormality detectionReport generation	<ul style="list-style-type: none">CNN Models (ResNet-50)DICOM Processors3D Visualization Tools
Pathology Intelligence Agent	Lab Results & Biopsies	<ul style="list-style-type: none">Lab result interpretationTrend analysisCritical value alerts	<ul style="list-style-type: none">Time-series AnalyticsPattern RecognitionAlert Systems
Clinical Assessment Agent	Symptom Analysis	<ul style="list-style-type: none">Symptom pattern recognitionDifferential diagnosisRisk stratification	<ul style="list-style-type: none">NLP Models (BioBERT)Clinical Decision TreesRisk Calculators
Genomics Agent	Genetic Analysis	<ul style="list-style-type: none">Variant interpretationPharmacogenomicsHereditary risk assessment	<ul style="list-style-type: none">Variant DatabasesGWAS Analysis ToolsGenetic Risk Models
Vital Signs Monitoring Agent	Real-time Monitoring	<ul style="list-style-type: none">Continuous monitoringAnomaly detectionEmergency alerts	<ul style="list-style-type: none">IoT Device IntegrationsStream ProcessingAlert Engines
Diagnostic Integration Agent	Data Synthesis	<ul style="list-style-type: none">Multi-modal data fusionDiagnostic confidence scoringReport coordination	<ul style="list-style-type: none">Data Fusion AlgorithmsConfidence MetricsReport Generators

2.1.2 Treatment Agent Team (5 Agents)

Agent Name	Specialized Domain	Primary Tasks	Key Tools
Treatment Planning Agent	Care Plans	<ul style="list-style-type: none"> Treatment protocol selection
 Personalized planning
 Outcome prediction 	<ul style="list-style-type: none"> Reinforcement Learning
 Clinical Guidelines DB
 Outcome Models
Pharmacology Agent	Medication Management	<ul style="list-style-type: none"> Drug selection
 Dosage optimization
 Interaction checking 	<ul style="list-style-type: none"> Drug Interaction DB
 Pharmacokinetic Models
 Alert Systems
Surgery Planning Agent	Surgical Procedures	<ul style="list-style-type: none"> Procedure planning
 Risk assessment
 Resource scheduling 	<ul style="list-style-type: none"> 3D Modeling Tools
 Risk Assessment
 Scheduling Algorithms
Therapy Optimization Agent	Rehabilitation	<ul style="list-style-type: none"> Therapy protocols
 Progress tracking
 Adaptive planning 	<ul style="list-style-type: none"> Therapy Databases
 Progress Analytics
 Adaptation Algorithms
Treatment Coordination Agent	Care Orchestration	<ul style="list-style-type: none"> Multi-provider coordination
 Timeline management
 Communication facilitation 	<ul style="list-style-type: none"> Workflow Engines
 Communication APIs
 Timeline Optimization

2.1.3 Care Coordination Team (4 Agents)

Agent Name	Specialized Domain	Primary Tasks	Key Tools
Appointment Scheduling Agent	Scheduling	<ul style="list-style-type: none"> Multi-provider scheduling
 Resource optimization
 Conflict resolution 	<ul style="list-style-type: none"> Calendar APIs
 Optimization Algorithms
 Constraint Solvers
Resource Management Agent	Resource Allocation	<ul style="list-style-type: none"> Capacity planning
 Equipment scheduling
 Staff optimization 	<ul style="list-style-type: none"> Resource Tracking
 Capacity Models
 Allocation Algorithms
Communication Hub Agent	Information Flow	<ul style="list-style-type: none"> Provider notifications
 Patient updates
 Information routing 	<ul style="list-style-type: none"> Messaging APIs
 Notification Systems
 Communication Protocols
Care Transition Agent	Continuity of Care	<ul style="list-style-type: none"> Handoff coordination
 Information transfer
 Follow-up scheduling 	<ul style="list-style-type: none"> Transfer Protocols
 Data Mapping
 Follow-up Systems

2.1.4 Research Agent Team (4 Agents)

Agent Name	Specialized Domain	Primary Tasks	Key Tools
Literature Mining Agent	Research Analysis	<ul style="list-style-type: none"> • PubMed scanning • Evidence synthesis • Guideline updates 	<ul style="list-style-type: none"> • NLP Processing • Knowledge Extraction • Evidence Ranking
Clinical Trial Matching Agent	Trial Recruitment	<ul style="list-style-type: none"> • Patient-trial matching • Eligibility screening • Enrollment facilitation 	<ul style="list-style-type: none"> • Trial Databases • Matching Algorithms • Screening Protocols
Evidence Synthesis Agent	Knowledge Integration	<ul style="list-style-type: none"> • Meta-analysis • Systematic reviews • Recommendation generation 	<ul style="list-style-type: none"> • Statistical Analysis • Evidence Grading • Review Automation
Biomarker Discovery Agent	Pattern Discovery	<ul style="list-style-type: none"> • Biomarker identification • Pattern analysis • Predictive modeling 	<ul style="list-style-type: none"> • Machine Learning • Pattern Recognition • Predictive Analytics

Tier 3: Cross-Cutting Specialist Teams (4 Agents)

2.1.5 Patient Advocacy Team (5 Agents)

Agent Name	Specialized Domain	Primary Tasks	Key Tools
Patient Preference Agent	Preference Learning	<ul style="list-style-type: none"> • Preference modeling • Decision support • Choice optimization 	<ul style="list-style-type: none"> • Preference Models • Decision Trees • Optimization Algorithms
Ethics Compliance Agent	Medical Ethics	<ul style="list-style-type: none"> • Ethical review • Compliance monitoring • Ethics reporting 	<ul style="list-style-type: none"> • Ethics Frameworks • Compliance Checkers • Audit Systems
Bias Detection Agent	Fairness Monitoring	<ul style="list-style-type: none"> • Bias identification • Fairness metrics • Mitigation strategies 	<ul style="list-style-type: none"> • Fairness Algorithms • Bias Metrics • Mitigation Tools
Cost Transparency Agent	Financial Clarity	<ul style="list-style-type: none"> • Cost analysis • Price comparison • Financial counseling 	<ul style="list-style-type: none"> • Cost Databases • Comparison Tools • Financial Models
Patient Rights Agent	Rights Protection	<ul style="list-style-type: none"> • Rights monitoring • Advocacy coordination • Legal compliance 	<ul style="list-style-type: none"> • Legal Frameworks • Rights Tracking • Advocacy Tools

3. Agent Integration and Communication Framework

3.1 Inter-Agent Communication Protocol

python

```

# Healthcare Agent Communication Protocol (HACP)
class HealthcareAgentMessage:

    message_id: str
    sender_agent: str
    recipient_agent: str
    message_type: MessageType # REQUEST, RESPONSE, NOTIFICATION, ALERT
    priority: Priority # CRITICAL, HIGH, MEDIUM, LOW
    patient_context: PatientContext
    medical_data: MedicalData
    timestamp: datetime
    encryption_key: str
    digital_signature: str

```

3.2 Agent Collaboration Patterns

3.2.1 Sequential Collaboration

Patient Query → Diagnostic Agents → Treatment Agents → Coordination Agents → Patient Response

3.2.2 Parallel Collaboration

Patient Data → [Multiple Diagnostic Agents] → Data Fusion → Integrated Assessment

3.2.3 Hierarchical Collaboration

Chief Coordinator → Domain Teams → Specialist Agents → Task Execution

3.3 Communication Infrastructure

Component	Technology	Purpose
Message Bus	Apache Kafka	Agent-to-agent messaging
Service Mesh	Istio	Service discovery and routing
API Gateway	Kong	External communication
Event Store	Event Sourcing	Message persistence
Monitoring	Jaeger	Communication tracing

4. Ontology and Knowledge Graph Construction

4.1 Medical Ontology Integration Framework

4.1.1 Core Medical Ontologies

Ontology	Domain	Purpose	Integration Method
SNOMED CT	Clinical Terminology	Standardized medical concepts	Direct API Integration
ICD-11	Disease Classification	Disease coding and classification	WHO API + Local Cache
LOINC	Laboratory Data	Lab test standardization	FHIR Code Systems
RxNorm	Medications	Drug terminology	NLM API Integration
UMLS	Unified Medical Language	Cross-ontology mapping	MetaMap Integration
Gene Ontology	Genetics	Genetic function annotation	OBIG Format Integration
HPO	Human Phenotypes	Phenotype descriptions	API + Local Storage
ChEBI	Chemical Entities	Chemical compound data	EBI API Integration

4.1.2 Knowledge Graph Construction Pipeline

KNOWLEDGE GRAPH PIPELINE

Step 1: Data Ingestion

EHR Data | Literature | Ontologies | Clinical Trials ||
(FHIR) | (PubMed) | (Multiple) | (ClinicalTrials) |

Step 2: Data Preprocessing & Standardization

• FHIR Validation • NLP Processing
• Concept Mapping • Entity Recognition
• Data Cleaning • Relationship Extraction

Step 3: Ontological Mapping

• Cross-Reference Mapping • Semantic Alignment
• Concept Normalization • Hierarchy Building
• Relationship Validation • Consistency Checking

Step 4: Knowledge Graph Generation

Neo4j Knowledge Graph Database

Core Entities



4.2 Data Mapping Strategy

4.2.1 Entity Mapping Framework

cypher

```
// Example: Patient-Condition-Treatment Knowledge Graph Schema
```

```
CREATE (p:Patient {  
    id: "patient_001",  
    demographics: {  
        age: 45,  
        gender: "female",  
        ethnicity: "hispanic"  
    },  
    fhir_id: "Patient/12345"  
})
```

```
CREATE (c:Condition {  
    snomed_code: "44054006",  
    name: "Type 2 Diabetes Mellitus",  
    icd11_code: "5A11",  
    severity: "moderate",  
    onset_date: date("2020-01-15")  
})
```

```
CREATE (t:Treatment {  
    id: "treatment_001",  
    protocol_name: "Standard Diabetes Management",  
    evidence_level: "A",  
    guideline_source: "ADA 2024"  
})
```

```
CREATE (m:Medication {  
    rxnorm_code: "860975",  
    name: "Metformin Hydrochloride 500mg",  
    generic_name: "metformin",  
    drug_class: "biguanide"  
})
```

```
// Relationships with properties
```

```
CREATE (p)-[:HAS_CONDITION {  
    diagnosed_date: date("2020-01-15"),  
    severity: "moderate",  
    status: "active",  
    confidence: 0.95  
}]->(c)
```

```
CREATE (c)-[:TREATED_BY {  
    start_date: date("2020-01-20"),  
    effectiveness: 0.85,  
    adherence: 0.90  
}]->(t)
```

```

CREATE (t)-[:INCLUDES_MEDICATION {
    dosage: "500mg twice daily",
    duration: "ongoing",
    sequence: 1
}]->(m)

```

4.2.2 Cross-Ontology Mapping

Source System	Target Ontology	Mapping Method	Confidence Score
Epic EHR	SNOMED CT	Direct Code Mapping	0.98
Cerner EHR	ICD-11	Semantic Similarity	0.92
Lab Results	LOINC	Standard Code Tables	0.99
Medications	RxNorm	NDC to RxNorm API	0.97
Research Papers	MeSH → SNOMED	NLP Entity Linking	0.85

5. Frontend-Backend Communication Architecture

5.1 Three-Tier Architecture

PRESENTATION TIER

Patient Interface	Provider Interface	Admin Interface	Research Interface	
React.js	React.js	React.js	Python Dash	
Mobile App	Web Portal	Dashboard	Analytics	
(React Native)	(Next.js)	(Vue.js)	Platform	

COMMUNICATION PROTOCOLS

- REST APIs (HTTPS)
- WebSocket (Live)
- Server-Sent Events
- GraphQL (Real-time)
- gRPC (High Performance)
- Message Queue (Async)

MIDDLE TIER

API GATEWAY LAYER

Kong	Istio	Ambassador		
API Gateway	Service Mesh	(Alternative)		

• Rate Limit	• Traffic	• Load Balancing
• Auth	• Routing	• SSL Termination
• Transform	• Security	• Request Routing

BUSINESS LOGIC LAYER

Patient	Treatment	Provider
Service	Service	Service
• FastAPI	• FastAPI	• Node.js Express
• FHIR	• AI Agent	• RESTful APIs
Compliance	Integration	• GraphQL
• Data	• Clinical	• Authentication
Validation	Guidelines	

Cost	Appointment	Analytics
Service	Service	Service
• Python	• Java	• Python/Spark
• ML Models	Spring	• Real-time
• Insurance	Calendar	Processing
APIs	Integration	• Business Intel

AI AGENT ORCHESTRATION LAYER

CrewAI Framework

Chief Medical AI Coordinator

| Diagnostic Treatment Coord Research Advocacy | | |

| Agents Agents Agents Agents | | |

DATA TIER

Operational Databases	Knowledge Graphs	Cache Layer	Analytics Warehouse
• PostgreSQL (Patient Records)	• Neo4j (Medical Knowledge)	• Redis Cluster	• Snowflake Data Warehouse
(Memory) (Documents) Neptune (Scale) (Metrics)	(Cluster Knowledge) Hazelcast (Search) (Metrics)	• ClickHouse	• Apache Kafka
(Metrics)			

EXTERNAL DATA SOURCES

- EHR Systems (Epic, Cerner, Allscripts)
- Medical Databases (PubMed, ClinicalTrials)
- Regulatory APIs (FDA, CMS, CDC)
- Insurance Networks (Claims, Coverage)

5.2 Communication Protocols

5.2.1 Frontend-to-API Gateway Communication

Protocol	Use Case	Implementation	Performance
HTTPS REST	Standard CRUD operations	Axios/Fetch API	Good
GraphQL	Complex data queries	Apollo Client	Excellent
WebSocket	Real-time updates	Socket.io	Excellent
Server-Sent Events	One-way streaming	EventSource API	Good
gRPC-Web	High-performance calls	gRPC-Web Client	Excellent

5.2.2 API Gateway-to-Services Communication

Protocol	Use Case	Implementation	Scalability
HTTP/2	Service-to-service	Internal REST APIs	High
gRPC	High-performance calls	Protobuf-based	Very High
Message Queue	Async processing	Kafka/RabbitMQ	Very High
Service Mesh	Microservice comm	Istio/Linkerd	Very High

5.2.3 Agent-to-Agent Communication

python

```

# Healthcare Agent Communication Protocol
class AgentCommunicationFramework:

    def __init__(self):
        self.message_bus = KafkaMessageBus()
        self.service_registry = ConsulServiceRegistry()
        self.circuit_breaker = CircuitBreaker()

    async def send_agent_message(self,
                                from_agent: str,
                                to_agent: str,
                                message: HealthcareAgentMessage):
        """Send message between healthcare agents"""

    # Validate agent permissions
    if not self.validate_agent_permissions(from_agent, to_agent):
        raise PermissionError("Agent communication not authorized")

    # Add patient context and medical metadata
    enhanced_message = self.add_medical_context(message)

    # Encrypt sensitive medical data
    encrypted_message = self.encrypt_phi_data(enhanced_message)

    # Route through message bus
    await self.message_bus.publish(
        topic=f"agent.{to_agent}",
        message=encrypted_message,
        headers={
            "sender": from_agent,
            "recipient": to_agent,
            "priority": message.priority.value,
            "patient_id": message.patient_context.patient_id
        }
    )

    # Log for audit trail
    await self.audit_logger.log_agent_communication(
        from_agent, to_agent, message.message_type
    )

```

6. Implementation Roadmap

6.1 Phase-Based Delivery Strategy

Phase 1: Foundation (Months 1-6)

Objective: Establish core infrastructure and basic agent framework

Deliverables:

- Core infrastructure setup (Kubernetes, databases)
- Basic CrewAI framework with 5 essential agents
- Patient record management system
- Knowledge graph foundation with core ontologies
- Security framework (authentication, encryption)

Success Criteria:

- System handles 10,000 patients
- 3 core agent types operational
- HIPAA compliance verified
- Basic knowledge graph with 100K+ entities

Phase 2: AI Enhancement (Months 7-12)

Objective: Deploy full multi-agent system and advanced AI capabilities

Deliverables:

- All 24 specialized agents deployed
- GraphRAG and PathRAG implementation
- Real-time agent communication
- Advanced knowledge graph with 1M+ entities
- Provider interface and training system

Success Criteria:

- System handles 100,000 patients
- Sub-2 second AI recommendations
- 95% agent collaboration success rate
- Provider adoption rate >80%

Phase 3: Scale & Optimize (Months 13-18)

Objective: Enterprise-scale deployment and optimization

Deliverables:

- Multi-region deployment

- Advanced analytics and reporting
- Federated learning implementation
- Cost optimization features
- Mobile application launch

Success Criteria:

- System handles 1M+ patients
- 99.9% uptime achieved
- 40% cost reduction demonstrated
- Patient satisfaction >90%

Phase 4: Market Leadership (Months 19-24)

Objective: Market expansion and advanced features

Deliverables:

- Regulatory approvals (FDA clearance)
- International expansion
- Advanced research capabilities
- AI model marketplace
- Partner ecosystem integration

Success Criteria:

- 15% market share in AI healthcare
- \$100M+ revenue run rate
- Research publications and patents
- Global deployment in 5+ countries

7. Business Value and ROI Projections

7.1 Revenue Model

Revenue Stream	Year 1	Year 2	Year 3	Growth Rate
SaaS Subscriptions	\$5M	\$25M	\$75M	400% CAGR
AI Premium Services	\$2M	\$15M	\$50M	600% CAGR
Data Analytics	\$1M	\$8M	\$30M	750% CAGR
API Licensing	\$0.5M	\$5M	\$20M	900% CAGR
Total Revenue	\$8.5M	\$53M	\$175M	500% CAGR

7.2 Cost Reduction Impact

Healthcare Stakeholder	Cost Reduction	Annual Savings	Implementation Cost
Hospitals	25% operational costs	\$50M per 1000-bed hospital	\$2M setup + \$500K annual
Insurance Companies	15% claims processing	\$100M per major insurer	\$5M setup + \$1M annual
Patients	30% out-of-pocket costs	\$2,000 per patient annually	\$0 (free platform access)
Government/Medicare	20% administrative costs	\$10B annually (national scale)	\$100M infrastructure

7.3 Market Positioning

Total Addressable Market (TAM): \$350B (Global Healthcare IT)

Serviceable Addressable Market (SAM): \$45B (AI-driven Healthcare Platforms)

Serviceable Obtainable Market (SOM): \$4.5B (10% market capture in 5 years)

8. Risk Management and Mitigation

8.1 Technical Risks

Risk Category	Probability	Impact	Mitigation Strategy
AI Model Bias	Medium	High	<ul style="list-style-type: none">Continuous bias monitoringDiverse training dataFairness metrics
Data Security Breach	Low	Critical	<ul style="list-style-type: none">Zero-trust architectureEnd-to-end encryptionRegular penetration testing
System Scalability	Medium	High	<ul style="list-style-type: none">Cloud-native designAuto-scalingPerformance monitoring
Agent Coordination Failure	Low	Medium	<ul style="list-style-type: none">Redundant pathwaysFallback proceduresCircuit breakers

8.2 Regulatory Risks

Risk Category	Probability	Impact	Mitigation Strategy
FDA Approval Delays	Medium	High	<ul style="list-style-type: none">Early FDA engagementRegulatory expertisePhased approval strategy
HIPAA Compliance Issues	Low	Critical	<ul style="list-style-type: none">Compliance by designRegular auditsLegal oversight
International Regulations	Medium	Medium	<ul style="list-style-type: none">Local partnershipsRegulatory mappingAdaptive compliance

8.3 Business Risks

Risk Category	Probability	Impact	Mitigation Strategy
Market Adoption	Medium	High	<ul style="list-style-type: none">Pilot programsProvider trainingPatient education
Competition	High	Medium	<ul style="list-style-type: none">Patent protectionFirst-mover advantageContinuous innovation
Funding Requirements	Low	High	<ul style="list-style-type: none">Phased fundingRevenue milestonesStrategic partnerships

9. Conclusion and Next Steps

9.1 Strategic Advantages

Our AI-driven patient-centric healthcare platform represents a **paradigm shift** in healthcare delivery:

- First-to-Market:** Comprehensive multi-agent AI system specifically designed for healthcare
- Patient Empowerment:** True data sovereignty and transparent care coordination
- Provider Enhancement:** AI augmentation rather than replacement of medical expertise
- Scalable Architecture:** Cloud-native design supporting millions of patients
- Regulatory Leadership:** Built-in compliance with healthcare regulations

9.2 Immediate Action Items

Board Approval Required:

- Funding Authorization:** \$50M Series A for 18-month development
- Strategic Partnerships:** Approve partnerships with major EHR vendors
- Regulatory Strategy:** Authorize FDA pre-submission meetings
- Talent Acquisition:** Approve hiring of 50+ AI and healthcare experts

Executive Team Actions:

- Technical Architecture:** Finalize technical specifications (30 days)
- Regulatory Roadmap:** Complete FDA strategy development (60 days)
- Partnership Pipeline:** Initiate discussions with Epic, Cerner (45 days)
- Pilot Customer Identification:** Secure 3 pilot healthcare systems (90 days)

9.3 Success Metrics (Next 12 Months)

Metric	Target	Measurement
Technical Milestones	24 agents deployed	Agent performance dashboard
Customer Acquisition	10 pilot customers	Signed pilot agreements
Regulatory Progress	FDA pre-submission complete	FDA correspondence
Market Validation	95% user satisfaction	User feedback surveys
Financial Performance	\$5M ARR	Revenue tracking

Appendix A: Technical Specifications

A.1 Agent Technical Requirements

Computational Requirements per Agent Type:

Agent Category	CPU Cores	Memory (GB)	GPU Memory (GB)	Storage (TB)
Diagnostic Agents	8-16	32-64	16-32	2-5
Treatment Agents	4-8	16-32	8-16	1-2
Coordination Agents	2-4	8-16	N/A	0.5-1
Research Agents	4-8	16-32	8-16	5-10
Advocacy Agents	2-4	8-16	N/A	0.5-1

Total Infrastructure Requirements:

- CPU Cores:** 240-480 cores across all agents
- Memory:** 960-1920 GB RAM
- GPU Memory:** 256-512 GB (NVIDIA A100/H100)
- Storage:** 50-100 TB SSD storage
- Network:** 100 Gbps redundant connectivity

A.2 Knowledge Graph Schema

```
cypher
```

```
// Core Healthcare Entities Schema

(:Patient)-[:HAS_CONDITION]->(:Condition)
(:Patient)-[:TAKES_MEDICATION]->(:Medication)
(:Patient)-[:RECEIVES_TREATMENT]->(:Treatment)
(:Patient)-[:VISITS_PROVIDER]->(:Provider)

(:Condition)-[:TREATED_BY]->(:Treatment)
(:Condition)-[:MANAGED_WITH]->(:Medication)
(:Condition)-[:CLASSIFIED_AS]->(:DiseaseCategory)

(:Treatment)-[:INCLUDES_PROCEDURE]->(:Procedure)
(:Treatment)-[:REQUIRES_RESOURCE]->(:Resource)
(:Treatment)-[:FOLLOWS_PROTOCOL]->(:ClinicalGuideline)

(:Medication)-[:INTERACTS_WITH]->(:Medication)
(:Medication)-[:CONTRAINDEDICATED_FOR]->(:Condition)
(:Medication)-[:HAS_SIDE_EFFECT]->(:SideEffect)

(:Provider)-[:SPECIALIZES_IN]->(:Specialty)
(:Provider)-[:AFFILIATED_WITH]->(:HealthcareOrganization)
(:Provider)-[:CERTIFIED_FOR]->(:Procedure)
```

This documentation provides the comprehensive foundation for board-level decision making and technical implementation of our transformative AI-driven healthcare platform.