

# IMPLEMENTATION\_ROADMAP.md

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## Change Log

- v1.0.0 (2024-12-19): Initial roadmap from MVP design and implementation plan
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## 5.1 MVP Definition & Scope

### Core MVP Features (12 Weeks)

#### Included in MVP

##### ✓ Shell 0 (Genesis World)

- Single center world at (0,0,0)
- 6 cardinal circuits only
- Daily rotation system

##### ✓ Quantum Circuit Minigame

- Bloch sphere visualization
- 6 basic gates (X, Y, Z, H, S, T)
- Fidelity-based rewards
- Skip option (default rewards)

##### ✓ Integrated Mining System

- Mining always triggers minigame
- Performance affects extraction rate
- Circuit charging from successful solutions

#### ✓ Basic QAI Data Collection

- Transparent solution logging
- Pattern analysis foundation
- No visible AI features yet

#### Excluded from MVP

- ✗ Shell 1 worlds (6 cardinal)
- ✗ Diagonal circuits (9 total)
- ✗ Face-center and cube-center worlds
- ✗ Tunnel synchronization
- ✗ Visual tunnel connections
- ✗ Trading system
- ✗ Multi-qubit puzzles

#### MVP Success Criteria

##### Technical Requirements

- ☐ 60 FPS during minigame
- ☐ <100ms reducer response time
- ☐ <50ms puzzle generation
- ☐ Stable with 100+ players

##### Gameplay Requirements

- ☐ Mining loop complete
- ☐ Circuit charging functional
- ☐ Daily rotation working
- ☐ Rewards feel balanced

### User Experience

- ☐ Tutorial explains basics
  - ☐ Skip option always available
  - ☐ Visual feedback clear
  - ☐ No blocking bugs
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## 5.2 12-Week Sprint Plan

### Sprint 1: Foundation (Weeks 1-2)

**Goal:** Core database and basic mining

#### Week 1 Tasks

- ☐ Set up SpacetimeDB schema
- ☐ Create core tables (Player, World, Circuit)
- ☐ Implement basic reducers
- ☐ Test local deployment

#### Week 2 Tasks

- ☐ Add mining tables (Orb, Challenge)
- ☐ Create wave packet system

- ☐ Basic extraction logic
- ☐ Unity connection test

**Deliverables:** Working database with basic mining

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## **Sprint 2: Quantum Mechanics (Weeks 3-4)**

**Goal:** Implement Bloch sphere and gates

### **Week 3 Tasks**

- ☐ Bloch sphere mathematics
- ☐ Gate transformations (X, Y, Z)
- ☐ Fidelity calculation
- ☐ State visualization math

### **Week 4 Tasks**

- ☐ Add H, S, T gates
- ☐ Daily state generation
- ☐ Circuit rotation system
- ☐ Solution validation

**Deliverables:** Functional quantum simulation

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## **Sprint 3: Minigame UI (Weeks 5-6)**

**Goal:** Complete minigame interface

### **Week 5 Tasks**

- ☐ Bloch sphere 3D visualization
- ☐ Gate drag-and-drop UI
- ☐ Circuit builder interface
- ☐ Real-time rotation preview

### Week 6 Tasks

- ☐ Fidelity meter
- ☐ Skip button functionality
- ☐ Performance feedback
- ☐ Polish animations

**Deliverables:** Playable minigame

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## Sprint 4: Integration (Weeks 7-8)

**Goal:** Connect mining to minigame

### Week 7 Tasks

- ☐ Link mining to nearest circuit
- ☐ Reward calculation system
- ☐ Circuit charging mechanics
- ☐ Packet extraction visuals

### Week 8 Tasks

- ☐ Balance reward tiers
- ☐ Test multiplayer mining

- ☐ Fix integration bugs
- ☐ Performance optimization

**Deliverables:** Integrated mining system

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## **Sprint 5: Polish & QAI (Weeks 9-10)**

**Goal:** Polish and hidden systems

### **Week 9 Tasks**

- ☐ QAI data collection tables
- ☐ Solution logging system
- ☐ Pattern analysis foundation
- ☐ Performance metrics

### **Week 10 Tasks**

- ☐ Visual effects polish
- ☐ Sound effects
- ☐ UI/UX improvements
- ☐ Tutorial system

**Deliverables:** Polished experience with hidden QAI

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## **Sprint 6: Testing & Launch (Weeks 11-12)**

**Goal:** Production ready

### **Week 11 Tasks**

- ☐ Load testing (100+ players)
- ☐ Bug fixing
- ☐ Balance adjustments
- ☐ Documentation

### Week 12 Tasks

- ☐ Final testing
- ☐ Deployment preparation
- ☐ Launch checklist
- ☐ Monitoring setup

**Deliverables:** Production-ready MVP

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## 5.3 Feature Priority Matrix

### Priority 1: Core Loop (Must Have)

Feature	Complexity	Risk	Week
Basic mining	Low	Low	1-2
Quantum minigame	High	High	3-6
Reward system	Medium	Medium	7-8
Daily rotation	Low	Low	4

### Priority 2: Enhancement (Should Have)

Feature	Complexity	Risk	Week
Circuit charging	Medium	Low	7-8

Feature	Complexity	Risk	Week
Visual polish	Medium	Low	9-10
Sound effects	Low	Low	9-10
Tutorial	Medium	Medium	10

### Priority 3: Future (Nice to Have)

Feature	Complexity	Risk	Week
QAI hints	High	Medium	Post-MVP
Shell 1 worlds	High	High	13-16
Tunnels	Very High	High	17-20
Trading	High	Medium	21-24

## 5.4 Testing Checkpoints

### Week 2: Database Validation

- ☐ All tables created successfully
- ☐ Reducers execute without errors
- ☐ Basic CRUD operations work
- ☐ Identity system functional

### Week 4: Quantum Simulation

- ☐ Gates transform states correctly
- ☐ Fidelity calculation accurate
- ☐ Daily rotation generates unique states



- ☐ Math validates against theory

## **Week 6: UI/UX Testing**

- ☐ Minigame loads in <1 second
- ☐ Controls feel responsive
- ☐ Visual feedback clear
- ☐ No UI blocking bugs

## **Week 8: Integration Testing**

- ☐ Mining → Minigame → Rewards flow
- ☐ Circuit charging accumulates
- ☐ Multiple players can mine simultaneously
- ☐ Performance remains stable

## **Week 10: Polish Testing**

- ☐ All animations smooth
- ☐ Sound synced properly
- ☐ Tutorial covers basics
- ☐ First-time user experience good






## **Week 12: Production Testing**

- ☐ Load test with 100+ bots
  - ☐ 24-hour stability test
  - ☐ Cross-platform testing
  - ☐ Security audit complete
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# 5.5 Success Metrics & KPIs

## Technical Metrics

### Performance KPIs

Metric	Target	Current	Status
FPS (minigame)	60	TBD	
Puzzle generation	<50ms	TBD	
Solution validation	<10ms	TBD	
Mining transaction	<100ms	TBD	
Memory usage	<2GB	TBD	

### Stability KPIs





Metric	Target	Current	Status
Uptime	99.9%	TBD	
Crash rate	<0.1%	TBD	
Connection success	>95%	TBD	
Data integrity	100%	TBD	

## Gameplay Metrics

### Engagement KPIs





Metric	Target	Current	Status
Tutorial completion	80%	TBD	
Minigame participation	40%	TBD	
Skip rate	<60%	TBD	
Daily return rate	30%	TBD	
Session length	15min	TBD	

## Progression KPIs

Metric	Target	Current	Status
Bonus tier achieved	20%	TBD	
Perfect solutions	5%	TBD	
Circuit charge rate	8hr to 80%	TBD	
Skill improvement	10%/week	TBD	

## QAI Training Metrics

### Data Collection KPIs

Metric	Target	Current	Status
Solutions/day	10,000	TBD	
Unique puzzles	100	TBD	
Novel solutions	10%	TBD	
Data quality	>90%	TBD	

# Post-MVP Roadmap

## Phase 2: World Expansion (Weeks 13-16)

- Add Shell 1 (6 cardinal worlds)
- World navigation system
- Basic tunnel visualization
- Multi-world circuits

## Phase 3: Advanced Circuits (Weeks 17-20)

- Diagonal circuits (9 total)
- Circuit synchronization
- Tunnel formation mechanics
- Energy flow system

## Phase 4: QAI Emergence (Weeks 21-24)

- Visible QAI hints
- Pattern suggestions
- Evolution stages
- Narrative events

## Phase 5: Economic Systems (Weeks 25-28)

- Packet trading
- Processing pipeline
- Crafting system

- Market dynamics

## **Phase 6: Three-Tier Worlds (Weeks 29-32)**

- Face-center worlds
- Cube-center super-hubs
- Cross-tier connections
- Strategic positioning

## **Phase 7: Competitive Features (Weeks 33-36)**

- Leaderboards
  - Daily challenges
  - PvP mining competition
  - Guild systems
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## **Risk Register**

### **High Risk Items**

1. **Quantum minigame complexity**
  - Mitigation: Extensive playtesting, tutorial
2. **Performance with 100+ players**
  - Mitigation: Load testing, optimization
3. **Daily rotation synchronization**
  - Mitigation: UTC timing, server authoritative

## Medium Risk Items

1. **Balance between skip/play**
  - Mitigation: Adjust rewards based on metrics
2. **Circuit charging too slow/fast**
  - Mitigation: Dynamic adjustment system
3. **QAI data storage scaling**
  - Mitigation: Data aggregation, cleanup

## Low Risk Items

1. **Visual clarity of quantum states**
    - Mitigation: Multiple visualization options
  2. **Sound design effectiveness**
    - Mitigation: User volume controls
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## Team Assignments

### Development Roles

- **Backend (Rust):** 1 developer
- **Frontend (Unity):** 2 developers
- **UI/UX:** 1 designer
- **QA:** 1 tester

## Weekly Sync Points

- **Monday:** Sprint planning
- **Wednesday:** Technical sync
- **Friday:** Progress review

## Communication Channels

- **Slack:** #system-dev
  - **GitHub:** system-game repo
  - **SpacetimeDB:** system-production module
  - **Unity Cloud:** Build pipeline
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## Launch Checklist

### Pre-Launch (Week 11)

- ☐ All features code complete
- ☐ Testing plan executed
- ☐ Documentation updated
- ☐ Marketing materials ready






### Launch Day (Week 12)

- ☐ Production deployment
- ☐ Monitoring active
- ☐ Support team briefed
- ☐ Social media announcement

## Post-Launch (Week 13+)

- ☐ Monitor metrics
  - ☐ Gather feedback
  - ☐ Hotfix if needed
  - ☐ Plan Phase 2
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## Status Legend

-  Not Started
-  In Progress
-  Complete
-  Blocked
-  At Risk