ServiceIQ API

Intelligent Pricing API for Airbnb Services Marketplace

One-Liner: *"A RESTful API that provides real-time, explainable pricing recommendations for Airbnb Service providers by analyzing local events, demand patterns, and market dynamics."*

Business Requirements

Market Context

Airbnb launched Services in May 2025, enabling providers to offer:

- Professional chef services
- Photography sessions
- Personal training
- Beauty services (makeup, hair, nails)
- Wellness services (massage, spa treatments)
- Catering and prepared meals

Business Needs

1. **Dynamic Pricing Intelligence**: Service providers need data-driven pricing recommendations
2. **Event Awareness**: Automatic detection and pricing adjustment for local events
3. **Market Positioning**: Understanding competitive landscape and optimal pricing
4. **Revenue Optimization**: Maximize provider earnings while maintaining bookings
5. **Trust Through Transparency**: Clear explanations for every price recommendation

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Problem Statement

Current State

Service providers are facing critical challenges:

- **No Pricing Guidance**: Providers guess at rates, leading to lost revenue

- **Event Blindness**: Missing 2-3x pricing opportunities during major events

- **Market Ignorance**: No visibility into competitor pricing or demand

- **Static Pricing**: Set-and-forget pricing misses 40% of revenue potential

- **Platform Fragmentation**: No unified API for service pricing intelligence

Impact

- Providers earning 30-50% below potential

- High provider churn due to poor earnings

- Customers overpaying or finding no availability

- Airbnb Services growth stunted by pricing friction

Our Solution: ServiceIQ API

Core Capabilities

1. Intelligent Price Calculation

```
POST /api/v1/pricing/calculate
```

- Real-time pricing based on 10+ factors

- Service-specific algorithms

- Confidence scores for each recommendation

- Natural language explanations

2. Event Detection & Impact

```
GET /api/v1/events/nearby
GET /api/v1/events/{eventId}/impact
```

- Discovers events within service radius

- Calculates service-specific impact

- Provides advance notice for planning

3. Market Intelligence

```
GET /api/v1/market/analysis
GET /api/v1/market/competitors
```

- Competitive positioning data

- Demand trends and patterns

- Seasonal insights

4. Revenue Optimization

```
GET /api/v1/analytics/projections
POST /api/v1/strategies/optimize
```

- 30/60/90 day revenue projections

- A/B testing different strategies

- Personalized optimization recommendations

How It Helps Service Providers

For Chefs & Catering

- **Event Detection**: "Art Basel starts in 30 days - premium dining demand increases 120%"
- **Smart Scheduling**: "Thursday dinners book at $180 vs lunch at $120"
- **Menu Pricing**: "Wine pairing adds 40% to base price during festivals"

For Photographers

- **Golden Hour Premium**: "6-8 AM slots command 40% premium for natural light"
- **Event Opportunities**: "Marathon this weekend - action photography in high demand"
- **Seasonal Intelligence**: "Cherry blossoms next week - portrait sessions book at 2.8x"

For Beauty Services

- **Festival Surge Pricing**: "Ultra Music Festival - makeup services at 3x normal rate"
- **Booking Patterns**: "Saturday morning weddings - early slots at premium"
- **Service Bundling**: "Hair + makeup packages increase revenue 45%"
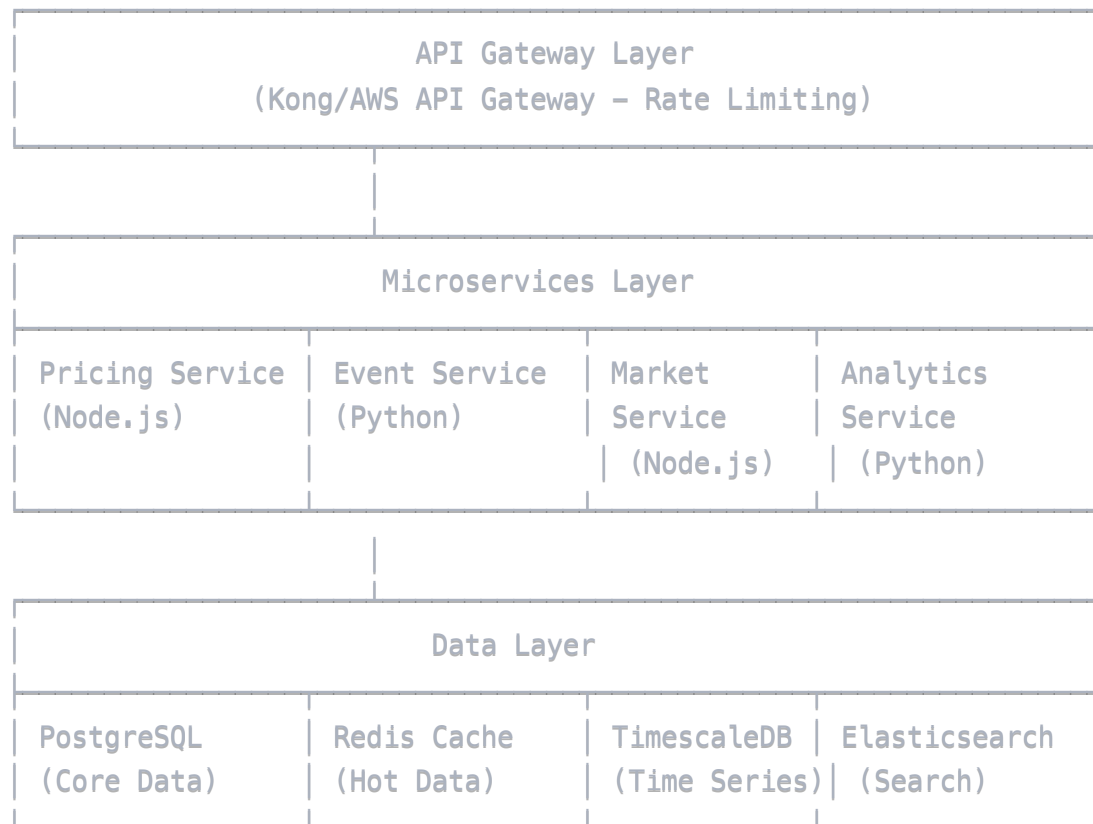
For Wellness Services

- **Conference Recovery**: "Tech conference ending - business traveler massage demand peaks"
- **Time Optimization**: "Post-work slots (5-8 PM) book at 20% premium"
- **Package Suggestions**: "3-session packages increase retention 60%"

Technical Architecture

API Design Principles

- **RESTful**: Standard HTTP methods and status codes

- **Versioned**: `/api/v1/` for backward compatibility

- **Authenticated**: API key + OAuth 2.0 for user context

- **Rate Limited**: Tier-based limits (Free: 1000/day, Pro: 10000/day)

- **Idempotent**: Safe retry with request IDs

System Architecture

```
┌─────────────────────────────────────────────────────────────┐
│                     API Gateway Layer                        │
│             (Kong/AWS API Gateway - Rate Limiting)           │
└─────────────────────────────────────────────────────────────┘
                              │
┌─────────────────────────────────────────────────────────────┐
│                    Microservices Layer                       │
├─────────────────┬─────────────────┬─────────────┬───────────┤
│ Pricing Service │ Event Service   │ Market      │ Analytics │
│ (Node.js)       │ (Python)        │ Service     │ Service   │
│                 │                 │  (Node.js)  │ (Python)  │
└─────────────────┴─────────────────┴─────────────┴───────────┘
                              │
┌─────────────────────────────────────────────────────────────┐
│                       Data Layer                             │
├─────────────────┬─────────────────┬─────────────┬───────────┤
│ PostgreSQL      │ Redis Cache     │ TimescaleDB │Elasticsearch│
│ (Core Data)     │ (Hot Data)      │ (Time Series)│ (Search)  │
└─────────────────┴─────────────────┴─────────────┴───────────┘
```

Core API Endpoints

1. Pricing Calculation

http

```
POST /api/v1/pricing/calculate
Authorization: Bearer {token}
Content-Type: application/json

{
  "service_type": "chef",
  "base_price": 150,
  "datetime": "2024-12-02T19:00:00Z",
  "duration_minutes": 180,
  "location": {
    "latitude": 25.7617,
    "longitude": -80.1918
  },
  "party_size": 6,
  "special_requirements": ["vegan", "wine_pairing"]
}

Response:
{
  "recommended_price": 330,
  "confidence": 0.92,
  "explanation": "Art Basel brings 80,000 affluent art collectors to Miami. Premi
  "factors": [
    {
      "name": "Art Basel Miami",
      "impact_multiplier": 2.2,
      "impact_amount": 180,
      "category": "event"
    },
    {
      "name": "Dinner Hour Premium",
      "impact_multiplier": 1.3,
      "impact_amount": 45,
```

```json
        "category": "time"
      }
    ],
    "competitor_analysis": {
      "average_price": 285,
      "your_position": "premium",
      "similar_services": 12
    }
  }
}
```

2. Event Detection

```http
http

GET /api/v1/events/nearby?lat=25.7617&lng=-80.1918&radius_km=15&days=30
Authorization: Bearer {token}

Response:
{
  "events": [
    {
      "id": "evt_123",
      "name": "Art Basel Miami",
      "category": "art_festival",
      "start_date": "2024-12-01",
      "end_date": "2024-12-04",
      "expected_attendance": 80000,
      "distance_km": 2.3,
      "venue": "Miami Beach Convention Center",
      "service_impacts": {
        "chef": 2.2,
        "photography": 2.5,
        "makeup": 2.0
      }
    }
  ],
  "total_events": 8,
  "high_impact_count": 3
}
```

3. Market Analysis

```http
http

GET /api/v1/market/analysis?service_type=chef&location=miami
Authorization: Bearer {token}

Response:
{
  "market_summary": {
    "total_providers": 127,
    "average_base_price": 125,
    "price_range": {
      "min": 75,
      "p25": 100,
      "median": 125,
      "p75": 175,
      "max": 500
    },
    "demand_level": "high",
    "seasonality": "peak"
  },
  "positioning_recommendation": {
    "suggested_base_price": 150,
    "reasoning": "Your experience and reviews support premium positioning",
    "percentile": 75
  },
  "trends": [
    {
      "period": "last_30_days",
      "average_price_change": "+15%",
      "booking_volume_change": "+32%"
    }
  ]
}
```

4. Revenue Projections

http

```
GET /api/v1/analytics/projections?service_id=svc_456&days=30
Authorization: Bearer {token}

Response:
{
  "projections": {
    "with_optimization": {
      "estimated_revenue": 8750,
      "estimated_bookings": 28,
      "average_price": 312.50,
      "occupancy_rate": 0.78
    },
    "without_optimization": {
      "estimated_revenue": 5250,
      "estimated_bookings": 35,
      "average_price": 150,
      "occupancy_rate": 0.65
    },
    "improvement": {
      "revenue_increase": "+66.7%",
      "additional_earnings": 3500
    }
  },
  "key_opportunities": [
    {
      "date": "2024-12-02",
      "event": "Art Basel",
      "potential_revenue": 990,
      "recommended_price": 330
    }
  ]
}
```

Data Models

Service Model

```json
{
  "id": "svc_789",
  "provider_id": "usr_123",
  "service_type": "chef",
  "base_price": 150,
  "currency": "USD",
  "duration_minutes": 180,
  "location": {
    "latitude": 25.7617,
    "longitude": -80.1918,
    "address": "Miami, FL",
    "service_radius_km": 15
  },
  "availability": {
    "schedule": "flexible",
    "advance_notice_hours": 24
  },
  "ratings": {
    "average": 4.9,
    "count": 47
  },
  "specialties": ["vegan", "italian", "wine_pairing"],
  "created_at": "2024-01-15T10:00:00Z"
}
```

API Security

1. **Authentication Layers**
   - API Keys for application identification
   - OAuth 2.0 for user context
   - JWT tokens with 1-hour expiry

2. **Rate Limiting**
   - Free: 1,000 requests/day
   - Pro: 10,000 requests/day
   - Enterprise: Custom limits

3. **Data Protection**
   - TLS 1.3 for all communications
   - PII encryption at rest
   - GDPR/CCPA compliant
   - Request/response logging (no PII)

Performance Specifications

- **Response Time**: p95 < 200ms, p99 < 500ms
- **Availability**: 99.9% uptime SLA
- **Throughput**: 10,000 requests/second
- **Cache Hit Rate**: >80% for pricing calculations
- **Data Freshness**: Events updated hourly, prices real-time

Integration Patterns

SDK Support

```javascript
// JavaScript SDK Example
import { ServiceIQ } from '@serviceiq/sdk';

const client = new ServiceIQ({ apiKey: 'your-api-key' });

const pricing = await client.pricing.calculate({
  serviceType: 'chef',
  basePrice: 150,
  datetime: new Date('2024-12-02T19:00:00'),
  location: { lat: 25.7617, lng: -80.1918 }
});

console.log(`Recommended: $${pricing.recommendedPrice}`);
console.log(`Reason: ${pricing.explanation}`);
```

Webhook Events

```json
{
  "event_type": "price.optimization.available",
  "service_id": "svc_123",
  "timestamp": "2024-11-15T10:00:00Z",
  "data": {
    "current_price": 150,
    "recommended_price": 275,
    "event": "Ultra Music Festival",
    "confidence": 0.94
  }
}
```

Monitoring & Analytics

- **Metrics**: Latency, error rate, API usage, cache performance

- **Logging**: Structured logs with request IDs

- **Tracing**: Distributed tracing with OpenTelemetry

- **Alerting**: PagerDuty integration for critical issues

- **Analytics**: Usage patterns, popular endpoints, error analysis

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Implementation Roadmap

Phase 1: Core API (Week 1-2)

- Basic pricing calculation endpoint

- Simple event detection

- Mock data for testing

- API key authentication

Phase 2: Intelligence Layer (Week 3-4)

- ML model integration

- Real event data sources

- Competitive analysis

- Advanced explanations

Phase 3: Platform Features (Week 5-6)

- Webhook system

- SDK development

- Analytics dashboard

- Enterprise features

Phase 4: Scale & Optimize (Week 7-8)

- Performance optimization

- Global expansion

- Advanced caching

- Multi-region deployment

Success Metrics

1. **API Adoption**: 1,000+ developers in first month

2. **Revenue Impact**: 30% average increase for users

3. **API Performance**: <200ms p95 latency

4. **Developer Satisfaction**: 4.5+ star rating

5. **Platform Growth**: 10,000+ service providers using API

Conclusion

ServiceIQ API provides the missing intelligence layer for Airbnb's Services marketplace. By offering transparent, explainable pricing recommendations through a simple REST API, we enable service providers to maximize earnings while maintaining trust. This creates a virtuous cycle: providers earn more → better service quality → more customers → platform growth → Airbnb Services success.

The Bottom Line: Just as Stripe simplified payments, ServiceIQ simplifies dynamic pricing for the service economy.