

RIS Server Documentation

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Overview

The RIS (Remote Integrated Services) Server is the central command and control hub for the distributed RIS ecosystem. It provides unified management, orchestration, and monitoring capabilities for multiple remote RIS clients across different environments. The server implements a sophisticated hub-and-spoke architecture with enterprise-grade security, scalability, and reliability features.

Key Features

- **Centralized Management:** Unified control plane for all remote RIS clients
- **Real-time Communication:** WebSocket-based persistent connections with clients
- **Multi-Tenant Support:** Complete tenant isolation with secure data separation
- **Task Orchestration:** Intelligent task routing and execution across clients
- **High Availability:** Clustered deployment with automatic failover
- **Security:** End-to-end encryption, authentication, and comprehensive audit logging
- **Scalability:** Horizontal scaling supporting 1000+ concurrent client connections
- **Monitoring:** Real-time monitoring, metrics collection, and alerting

System Requirements

Minimum Requirements

- **Operating System:** Linux (Ubuntu 20.04+, CentOS 8+, RHEL 8+)
- **CPU:** 2 vCores
- **Memory:** 4 GB RAM
- **Storage:** 20 GB SSD
- **Network:** High-speed internet with static IP

Recommended Requirements

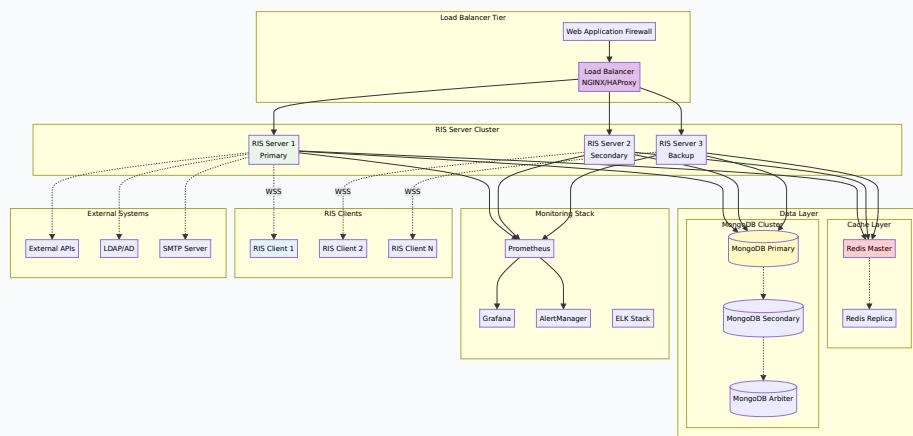
- **Operating System:** Linux (Ubuntu 22.04+, CentOS 9+, RHEL 9+)
- **CPU:** 8 vCores
- **Memory:** 16 GB RAM
- **Storage:** 100 GB SSD NVMe
- **Network:** Dedicated network with load balancer

Dependencies

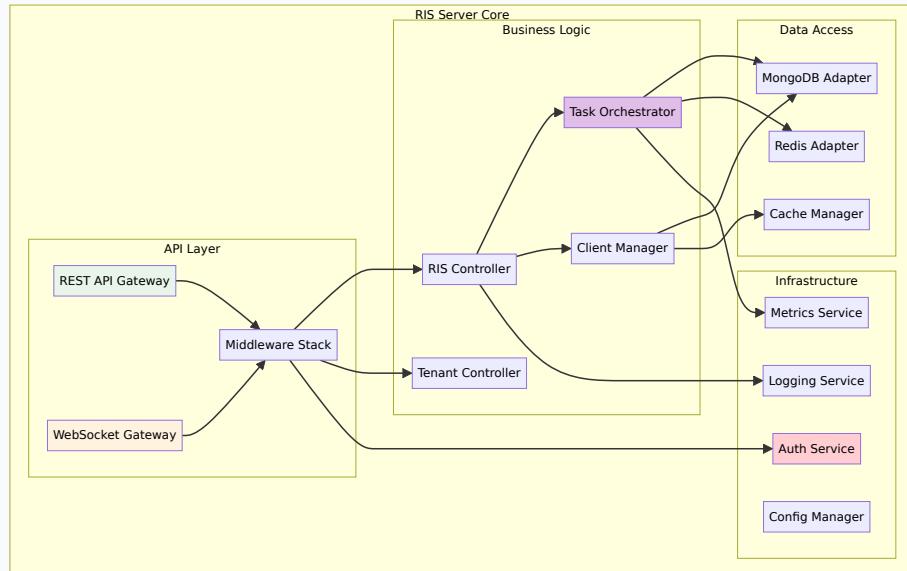
- **MongoDB**: Version 6.0+ (Primary database)
- **Redis**: Version 7.0+ (Caching and session management)
- **Docker**: Version 20.10+ (Containerization)
- **Go Runtime**: Version 1.19+ (for development)
- **TLS Certificates**: Valid certificates for HTTPS/WSS

Architecture

High-Level Architecture



Component Architecture



Detailed Component Design

1. API Gateway Layer

- **REST API Gateway:** HTTP/HTTPS endpoint management
- **WebSocket Gateway:** Real-time client communication
- **Middleware Stack:** Authentication, authorization, logging, rate limiting
- **Request Router:** Intelligent request routing and load balancing

2. Business Logic Layer

- **RIS Controller:** Client lifecycle and status management
- **Tenant Controller:** Multi-tenant data and operation isolation
- **Task Orchestrator:** Task routing, execution, and monitoring

- **Client Manager:** Connection management and health monitoring

3. Data Management Layer

- **MongoDB Integration:** Primary data persistence
- **Redis Integration:** Caching and session management
- **Cache Manager:** Intelligent caching strategies
- **Data Access Objects:** Abstracted data access patterns

Installation & Setup

Docker Deployment (Recommended)

Docker Compose Configuration

```
version: '3.8'

services:
  ris-server:
    image: securaa/ris-server:latest
    container_name: ris-server
    restart: unless-stopped
    ports:
      - "8057:8057"
      - "9090:9090" # Metrics
    environment:
      - RIS_ENV=production
      - MONGODB_URI=mongodb://mongo1:27017,mongo2:27017,mongo3:27017/ris?
replicaSet=rs0
    - REDIS_URI=redis://redis-master:6379
    - TLS_CERT_FILE=/app/certs/server.crt
    - TLS_KEY_FILE=/app/certs/server.key
  volumes:
    - ./config:/app/config
    - ./certs:/app/certs
    - ./logs:/app/logs
  networks:
    - ris-network
  depends_on:
    - mongodb
    - redis
  healthcheck:
    test: ["CMD", "curl", "-f", "https://localhost:8057/health"]
    interval: 30s
    timeout: 10s
    retries: 3
    start_period: 60s

  mongodb:
    image: mongo:6.0
    container_name: ris-mongo
    restart: unless-stopped
```

```

ports:
  - "27017:27017"
environment:
  - MONGO_INITDB_ROOT_USERNAME=admin
  - MONGO_INITDB_ROOT_PASSWORD=secure-password
  - MONGO_INITDB_DATABASE=ris
volumes:
  - mongodb_data:/data/db
  - ./mongo-init:/docker-entrypoint-initdb.d
networks:
  - ris-network
command: mongod --replSet rs0 --bind_ip_all

redis:
  image: redis:7.0-alpine
  container_name: ris-redis
  restart: unless-stopped
  ports:
    - "6379:6379"
  environment:
    - REDIS_PASSWORD=secure-redis-password
  volumes:
    - redis_data:/data
    - ./redis.conf:/usr/local/etc/redis/redis.conf
  networks:
    - ris-network
  command: redis-server /usr/local/etc/redis/redis.conf

nginx:
  image: nginx:alpine
  container_name: ris-nginx
  restart: unless-stopped
  ports:
    - "80:80"
    - "443:443"
  volumes:
    - ./nginx.conf:/etc/nginx/nginx.conf
    - ./certs:/etc/nginx/certs
  networks:
    - ris-network
  depends_on:
    - ris-server

networks:
  ris-network:
    driver: bridge

```

```
volumes:  
  mongodb_data:  
  redis_data:
```

Production Environment Setup

```
# Create directory structure  
mkdir -p ris-server/{config,certs,logs,data}  
cd ris-server  
  
# Download configuration templates  
curl -O https://raw.githubusercontent.com/securaa/ris-  
server/main/deployments/docker/docker-compose.yml  
curl -O https://raw.githubusercontent.com/securaa/ris-  
server/main/deployments/docker/nginx.conf  
  
# Generate TLS certificates  
openssl req -x509 -newkey rsa:4096 -keyout certs/server.key -out  
certs/server.crt -days 365 -nodes  
  
# Initialize MongoDB replica set  
docker-compose exec mongodb mongo --eval "rs.initiate()"  
  
# Start services  
docker-compose up -d  
  
# Verify installation  
curl -k https://localhost:8057/health
```

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Kubernetes Deployment

Namespace and ConfigMap

```
# namespace.yaml
apiVersion: v1
kind: Namespace
metadata:
  name: ris-system
  labels:
    name: ris-system

---
# configmap.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: ris-server-config
  namespace: ris-system
data:
  config.json: |
    {
      "server": {
        "host": "0.0.0.0",
        "port": 8057,
        "tls_enabled": true,
        "cert_file": "/app/certs/tls.crt",
        "key_file": "/app/certs/tls.key"
      },
      "database": {
        "mongodb_uri": "mongodb://ris-mongodb:27017/ris",
        "redis_uri": "redis://ris-redis:6379"
      },
      "logging": {
        "level": "info",
        "format": "json"
      }
    }
}
```

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Deployment and Service

```
# deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ris-server
  namespace: ris-system
  labels:
    app: ris-server
spec:
  replicas: 3
  selector:
    matchLabels:
      app: ris-server
  template:
    metadata:
      labels:
        app: ris-server
    spec:
      containers:
        - name: ris-server
          image: securaa/ris-server:latest
          ports:
            - containerPort: 8057
              name: https
            - containerPort: 9090
              name: metrics
          env:
            - name: CONFIG_PATH
              value: "/app/config/config.json"
          volumeMounts:
            - name: config
              mountPath: /app/config
            - name: certs
              mountPath: /app/certs
      livenessProbe:
        httpGet:
          path: /health
          port: 8057
          scheme: HTTPS
        initialDelaySeconds: 30
        periodSeconds: 10
      readinessProbe:
        httpGet:
```

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```

    path: /ready
    port: 8057
    scheme: HTTPS
    initialDelaySeconds: 5
    periodSeconds: 5
  resources:
    requests:
      memory: "512Mi"
      cpu: "250m"
    limits:
      memory: "2Gi"
      cpu: "1000m"
  volumes:
    - name: config
      configMap:
        name: ris-server-config
    - name: certs
      secret:
        secretName: ris-server-tls
  ---  

# service.yaml
apiVersion: v1
kind: Service
metadata:
  name: ris-server-service
  namespace: ris-system
  labels:
    app: ris-server
spec:
  selector:
    app: ris-server
  ports:
    - name: https
      port: 8057
      targetPort: 8057
    - name: metrics
      port: 9090
      targetPort: 9090
  type: ClusterIP
  ---  

# ingress.yaml
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:

```

```
name: ris-server-ingress
namespace: ris-system
annotations:
  nginx.ingress.kubernetes.io/ssl-passthrough: "true"
  nginx.ingress.kubernetes.io/backend-protocol: "HTTPS"
spec:
  tls:
    - hosts:
        - ris-server.example.com
      secretName: ris-server-tls
  rules:
    - host: ris-server.example.com
      http:
        paths:
          - path: /
            pathType: Prefix
        backend:
          service:
            name: ris-server-service
            port:
              number: 8057
```

Binary Installation

System Setup

```
# Create system user
sudo useradd -r -s /bin/false ris-server
Copy
sudo mkdir -p /opt/ris-server/{bin,config,logs,data}
sudo mkdir -p /etc/ris-server
sudo chown -R ris-server:ris-server /opt/ris-server /etc/ris-server

# Download and install binary
wget https://github.com/securaa/ris-server/releases/latest/download/ris-
server-linux-amd64.tar.gz
tar -xzf ris-server-linux-amd64.tar.gz
sudo mv ris-server /opt/ris-server/bin/
sudo chmod +x /opt/ris-server/bin/ris-server
```

Systemd Service

```
sudo tee /etc/systemd/system/ris-server.service << EOF
[Unit]
Description=RIS Server
After=network.target mongodb.service redis.service
Wants=network.target
Requires=mongodb.service redis.service

[Service]
Type=simple
User=ris-server
Group=ris-server
ExecStart=/opt/ris-server/bin/ris-server
Restart=always
RestartSec=10
Environment=CONFIG_PATH=/etc/ris-server/config.json
WorkingDirectory=/opt/ris-server
StandardOutput=journal
StandardError=journal
SyslogIdentifier=ris-server

# Security settings
NoNewPrivileges=yes
ProtectSystem=strict
ProtectHome=yes
ReadWritePaths=/opt/ris-server/logs /opt/ris-server/data

[Install]
WantedBy=multi-user.target
EOF

# Enable and start service
sudo systemctl daemon-reload
sudo systemctl enable ris-server
sudo systemctl start ris-server
sudo systemctl status ris-server
```

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Configuration

Master Configuration File

```
{  
  "server": {  
    "host": "0.0.0.0",  
    "port": 8057,  
    "tls": {  
      "enabled": true,  
      "cert_file": "/app/certs/server.crt",  
      "key_file": "/app/certs/server.key",  
      "ca_file": "/app/certs/ca.crt",  
      "min_version": "1.2",  
      "max_version": "1.3",  
      "cipher_suites": [  
        "TLS_AES_256_GCM_SHA384",  
        "TLS_CHACHA20_POLY1305_SHA256",  
        "TLS_AES_128_GCM_SHA256"  
      ],  
      "client_auth": "require"  
    },  
    "timeouts": {  
      "read": "30s",  
      "write": "30s",  
      "idle": "120s"  
    },  
    "cors": {  
      "enabled": true,  
      "allowed_origins": ["https://admin.example.com"],  
      "allowed_methods": ["GET", "POST", "PUT", "DELETE"],  
      "allowed_headers": ["Authorization", "Content-Type"]  
    },  
    "database": {  
      "mongodb": {  
        "uri": "mongodb://username:password@localhost:27017/ris?  
replicaSet=rs0",  
        "database": "ris",  
        "max_pool_size": 100,  
        "min_pool_size": 10,  
        "max_idle_time": "10m",  
        "connection_timeout": "10s",  
        "socket_timeout": "30s",  
        "pool_size": 100  
      }  
    }  
  }  
}
```

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```
    "server_selection_timeout": "5s"
},
"redis": {
    "uri": "redis://localhost:6379",
    "password": "secure-password",
    "database": 0,
    "max_retries": 3,
    "pool_size": 50,
    "min_idle_conns": 10,
    "idle_timeout": "5m",
    "dial_timeout": "5s",
    "read_timeout": "3s",
    "write_timeout": "3s"
}
},
"authentication": {
    "jwt": {
        "secret": "your-jwt-secret-key",
        "expiry": "24h",
        "refresh_expiry": "168h",
        "issuer": "ris-server",
        "algorithm": "HS256"
    },
    "session": {
        "duration": "8h",
        "renewal_threshold": "1h",
        "max_concurrent": 5
    },
    "ldap": {
        "enabled": false,
        "url": "ldap://ldap.example.com:389",
        "base_dn": "ou=users,dc=example,dc=com",
        "bind_dn": "cn=admin,dc=example,dc=com",
        "bind_password": "admin-password",
        "user_filter": "(uid=%s)",
        "group_filter": "(member=%s)"
    }
},
"authorization": {
    "rbac": {
        "enabled": true,
        "default_role": "readonly",
        "admin_users": ["admin@example.com"],
        "super_admin_users": ["superadmin@example.com"]
    }
}
},
```

```
"multi_tenant": {  
    "enabled": true,  
    "default_tenant": "default",  
    "tenant_isolation": "database",  
    "auto_provision": false  
},  
"task_orchestration": {  
    "max_concurrent_tasks": 1000,  
    "task_timeout": "300s",  
    "retry_policy": {  
        "max_attempts": 3,  
        "backoff_strategy": "exponential",  
        "initial_delay": "1s",  
        "max_delay": "60s"  
    },  
    "queue": {  
        "size": 10000,  
        "priority_levels": 5,  
        "dead_letter_enabled": true  
    }  
},  
"client_management": {  
    "max_clients": 1000,  
    "heartbeat_interval": "30s",  
    "connection_timeout": "60s",  
    "reconnection_policy": {  
        "max_attempts": 5,  
        "backoff_strategy": "exponential",  
        "initial_delay": "5s",  
        "max_delay": "300s"  
    }  
},  
"security": {  
    "rate_limiting": {  
        "enabled": true,  
        "requests_per_minute": 100,  
        "burst_size": 20,  
        "ip_whitelist": ["10.0.0.0/8", "172.16.0.0/12", "192.168.0.0/16"]  
    },  
    "audit": {  
        "enabled": true,  
        "events": ["authentication", "authorization", "task_execution",  
"client_management"],  
        "retention_days": 90,  
        "format": "json"  
    },  
}
```

```
"encryption": {  
    "data_at_rest": {  
        "enabled": true,  
        "algorithm": "AES-256-GCM",  
        "key_rotation_days": 90  
    },  
    "data_in_transit": {  
        "enabled": true,  
        "min_tls_version": "1.2"  
    }  
},  
"monitoring": {  
    "metrics": {  
        "enabled": true,  
        "port": 9090,  
        "path": "/metrics",  
        "interval": "15s"  
    },  
    "health_check": {  
        "enabled": true,  
        "endpoint": "/health",  
        "detailed": true  
    },  
    "alerting": {  
        "enabled": true,  
        "webhook_url": "https://alerts.example.com/webhook",  
        "thresholds": {  
            "cpu_usage": 80,  
            "memory_usage": 85,  
            "error_rate": 5,  
            "response_time": 5000  
        }  
    }  
},  
"logging": {  
    "level": "info",  
    "format": "json",  
    "output": "stdout",  
    "file": {  
        "enabled": true,  
        "path": "/app/logs/ris-server.log",  
        "max_size": "100MB",  
        "max_backups": 10,  
        "max_age": 30,  
        "compress": true  
    }  
}
```

```
},
  "audit_log": {
    "enabled": true,
    "path": "/app/logs/audit.log",
    "max_size": "100MB",
    "max_backups": 30,
    "max_age": 365
  }
},
"performance": {
  "cache": {
    "ttl": "1h",
    "max_size": "500MB",
    "eviction_policy": "lru"
  },
  "connection_pooling": {
    "max_connections": 200,
    "idle_timeout": "300s",
    "keep_alive": true
  },
  "graceful_shutdown": {
    "timeout": "30s",
    "drain_timeout": "60s"
  }
},
"features": {
  "websocket_compression": true,
  "http2_enabled": true,
  "debug_mode": false,
  "development_mode": false,
  "auto_backup": true,
  "telemetry": false
}
}
```

Environment-Specific Configurations

Development Configuration

```
{  
  "server": {  
    "host": "localhost",  
    "port": 8057,  
    "tls": {  
      "enabled": false  
    }  
  },  
  "database": {  
    "mongodb": {  
      "uri": "mongodb://localhost:27017/ris_dev"  
    },  
    "redis": {  
      "uri": "redis://localhost:6379",  
      "database": 1  
    }  
  },  
  "logging": {  
    "level": "debug",  
    "output": "stdout"  
  },  
  "features": {  
    "debug_mode": true,  
    "development_mode": true  
  }  
}
```

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Production Configuration

```
{  
  "server": {  
    "host": "0.0.0.0",  
    "port": 8057,  
    "tls": {  
      "enabled": true,  
      "cert_file": "/app/certs/server.crt",  
      "key_file": "/app/certs/server.key",  
      "client_auth": "require"  
    }  
  },  
  "database": {  
    "mongodb": {  
      "uri":  
        "mongodb://username:password@mongol:27017,mongo2:27017,mongo3:27017/ris?  
        replicaSet=rs0&ssl=true"  
    },  
    "redis": {  
      "uri": "redis://redis-cluster:6379",  
      "password": "secure-redis-password",  
      "pool_size": 100  
    }  
  },  
  "logging": {  
    "level": "info",  
    "format": "json",  
    "output": "file"  
  },  
  "security": {  
    "rate_limiting": {  
      "enabled": true,  
      "requests_per_minute": 60  
    },  
    "audit": {  
      "enabled": true,  
      "retention_days": 365  
    }  
  },  
  "features": {  
    "debug_mode": false,  
    "development_mode": false,  
    "telemetry": true  
  }  
}
```

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```
}
```

Environment Variables

VARIABLE	DESCRIPTION	DEFAULT
RIS_ENV	Environment (dev/staging/prod)	development
CONFIG_PATH	Configuration file path	/app/config/config.json
MONGODB_URI	MongoDB connection string	mongodb://localhost:27017/ris
REDIS_URI	Redis connection string	redis://localhost:6379
TLS_CERT_FILE	TLS certificate file path	/app/certs/server.crt
TLS_KEY_FILE	TLS private key file path	/app/certs/server.key
JWT_SECRET	JWT signing secret	Generated
LOG_LEVEL	Logging level	info
METRICS_PORT	Metrics server port	9090

API Reference

Authentication

JWT Token Authentication

```
POST /auth/login
Content-Type: application/json

{
  "username": "admin@example.com",
  "password": "secure-password",
  "tenant_code": "default"
}
```

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Response:

```
{  
  "success": true,  
  "data": {  
    "access_token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9...",  
    "refresh_token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9...",  
    "expires_in": 86400,  
    "token_type": "Bearer",  
    "user": {  
      "id": "user-123",  
      "email": "admin@example.com",  
      "role": "admin",  
      "tenant_code": "default"  
    }  
  }  
}
```

Copy

Token Refresh

```
POST /auth/refresh  
Content-Type: application/json  
Authorization: Bearer <refresh_token>  
  
{  
  "refresh_token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9..."  
}
```

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RIS Client Management

Get All RIS Clients

```
GET /platform/v1/ris  
Authorization: Bearer <access_token>
```

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Response:

```
{  
    "success": true,  
    "data": [  
        {  
            "id": 1,  
            "name": "client-001",  
            "description": "Production client",  
            "host": "192.168.1.100",  
            "status": "active",  
            "connection_status": "connected",  
            "version": "1.0.0",  
            "unique_client_id": "uuid-string",  
            "tenant_code": "default",  
            "created_date": 1696752000000,  
            "updated_date": 1696752000000,  
            "last_seen": "2025-10-07T10:30:00Z",  
            "capabilities": ["task_execution", "service_management"]  
        }  
    ],  
    "total": 1,  
    "page": 1,  
    "per_page": 10  
}
```

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Add New RIS Client

```
POST /platform/v1/ris  
Content-Type: application/json  
Authorization: Bearer <access_token>  
  
{  
    "name": "client-002",  
    "description": "Development client",  
    "host": "192.168.1.101",  
    "tenant_code": "dev"  
}
```

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Update RIS Client

```
PUT /platform/v1/ris
Content-Type: application/json
Authorization: Bearer <access_token>

{
  "id": 1,
  "name": "client-001-updated",
  "description": "Updated production client",
  "status": "active"
}
```

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Delete RIS Client

```
DELETE /platform/v1/ris
Content-Type: application/json
Authorization: Bearer <access_token>

{
  "id": 1
}
```

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Get Client Configuration

```
GET /platform/v1/risclient/{client-id}/{hostname}
Authorization: Bearer <access_token>
```

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Response:

```
{  
    "success": true,  
    "data": {  
        "client_config": {  
            "server_host": "https://ris-server.example.com:8057",  
            "websocket_path": "/pingpong",  
            "heartbeat_interval": 30,  
            "reconnect_policy": {  
                "max_attempts": 5,  
                "backoff_strategy": "exponential"  
            }  
        },  
        "certificates": {  
            "client_cert": "-----BEGIN CERTIFICATE-----\n...  
            "client_key": "-----BEGIN PRIVATE KEY-----\n...  
            "ca_cert": "-----BEGIN CERTIFICATE-----\n..."  
        },  
        "tenant_info": {  
            "tenant_code": "default",  
            "tenant_name": "Default Tenant",  
            "database_config": {  
                "host": "tenant-db.example.com",  
                "database": "tenant_default"  
            }  
        }  
    }  
}
```

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Task Management

Execute Task on Client

```
POST /platform/v1/task/execute
Content-Type: application/json
Authorization: Bearer <access_token>

{
  "client_id": "uuid-string",
  "task": {
    "type": "http_request",
    "method": "GET",
    "url": "https://api.example.com/status",
    "headers": {
      "Authorization": "Bearer token"
    },
    "timeout": 30
  },
  "priority": "normal",
  "async": false
}
```

Copy

Response:

```
{
  "success": true,
  "data": {
    "task_id": "task-123",
    "status": "completed",
    "result": {
      "status_code": 200,
      "headers": {},
      "body": "OK",
      "execution_time": 1250
    },
    "started_at": "2025-10-07T10:30:00Z",
    "completed_at": "2025-10-07T10:30:01Z"
  }
}
```

Copy

Get Task Status

```
GET /platform/v1/task/{task-id}  
Authorization: Bearer <access_token>
```

Copy

List Tasks

```
GET /platform/v1/tasks?status=running&client_id=uuid-string&limit=50  
Authorization: Bearer <access_token>
```

Copy

Service Management

Deploy Service to Client

```
POST /platform/v1/service/deploy  
Content-Type: application/json  
Authorization: Bearer <access_token>
```

Copy

```
{  
  "client_id": "uuid-string",  
  "service": {  
    "name": "web-app",  
    "image": "nginx:latest",  
    "replicas": 3,  
    "ports": [  
      {  
        "container_port": 80,  
        "host_port": 8080  
      }  
    ],  
    "environment": {  
      "ENV": "production"  
    },  
    "resources": {  
      "limits": {  
        "memory": "512m",  
        "cpu": "0.5"  
      }  
    }  
  }  
}
```

Scale Service

```
POST /platform/v1/service/scale
Content-Type: application/json
Authorization: Bearer <access_token>

{
  "client_id": "uuid-string",
  "service_name": "web-app",
  "replicas": 5
}
```

Copy

Get Service Status

```
GET /platform/v1/service/{client-id}/{service-name}
Authorization: Bearer <access_token>
```

Copy

Tenant Management

Get Tenant Information

```
GET /internal/v1/remotetenantclient/{tenant-uuid}
Authorization: Bearer <access_token>
```

Copy

Get Tenant Configuration

```
GET /platform/v1/remotetenantconfigdata/{tenant-id}/{hostname}
Authorization: Bearer <access_token>
```

Copy

Monitoring and Health

Server Health Check

```
GET /health
```

Copy

Response:

```
{  
    "status": "healthy",  
    "version": "1.0.0",  
    "uptime": "2h30m15s",  
    "timestamp": "2025-10-07T10:30:00Z",  
    "components": {  
        "database": {  
            "status": "connected",  
            "response_time": 12,  
            "connections": {  
                "active": 15,  
                "idle": 5,  
                "max": 100  
            }  
        },  
        "cache": {  
            "status": "connected",  
            "response_time": 2,  
            "memory_usage": "45.2%",  
            "hit_ratio": "89.5%"  
        },  
        "clients": {  
            "total": 25,  
            "connected": 23,  
            "disconnected": 2,  
            "last_heartbeat": "2025-10-07T10:29:45Z"  
        },  
        "tasks": {  
            "running": 12,  
            "queued": 3,  
            "completed_today": 1547,  
            "failed_today": 8  
        }  
    },  
    "system": {  
        "cpu_usage": 25.5,  
        "memory_usage": 65.2,  
        "disk_usage": 42.1,  
        "network_io": {  
            "bytes_in": 1048576,  
            "bytes_out": 2097152  
        }  
    }  
}
```

Readiness Check

GET /ready

Copy

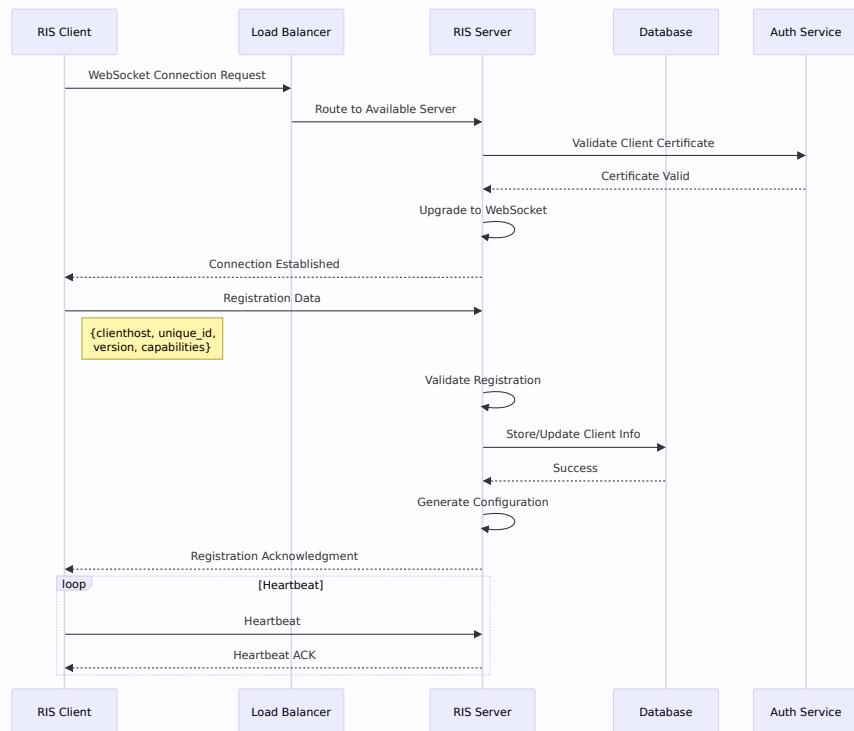
Metrics Endpoint

GET /metrics

Copy

Client Management

Client Registration Process



Client Lifecycle Management

Registration

```
type ClientRegistration struct {
    ClientHost      string `json:"clienthost"`
    UniqueClientID string `json:"unique_client_id"`
    Version         string `json:"version"`
    Capabilities   []string `json:"capabilities"`
    TenantCode      string `json:"tenantcode"`
    HostType        string `json:"host_type"`
    IsFirstPing     string `json:"isfirstping"`
    IsNetworkChanged string `json:"isnetworkchanged"`
    RISNatIP       string `json:"ris_nat_ip"`
}
```

Copy

Status Monitoring

```
type ClientStatus struct {
    ID          int     `json:"id"`
    UniqueClientID string `json:"unique_client_id"`
    Status       string  `json:"status"`
    ConnectionStatus string `json:"connection_status"`
    LastSeen     time.Time `json:"last_seen"`
    IPAddress   string  `json:"ip_address"`
    Version      string  `json:"version"`
    Capabilities []string `json:"capabilities"`
    ResourceUsage struct {
        CPU   float64 `json:"cpu"`
        Memory float64 `json:"memory"`
        Disk   float64 `json:"disk"`
    } `json:"resource_usage"`
}
```

Copy

Connection Management

```
type ConnectionManager struct {
    clients          map[string]*ClientConnection
    disconnectedCount map[string]int
    mutex            sync.RWMutex
    heartbeatInterval time.Duration
    timeoutDuration   time.Duration
}

func (cm *ConnectionManager) AddClient(clientID string, conn
*websocket.Conn) error
func (cm *ConnectionManager) RemoveClient(clientID string) error
func (cm *ConnectionManager) GetClient(clientID string)
(*ClientConnection, error)
func (cm *ConnectionManager) BroadcastToClients(message []byte) error
func (cm *ConnectionManager) GetConnectedClients() []string
```

Copy

Client Authentication and Authorization

Certificate-Based Authentication

```
type ClientAuth struct {
    CertificateAuth bool `json:"certificate_auth"`
    ClientCert      string `json:"client_cert"`
    ClientKey       string `json:"client_key"`
    CAcert          string `json:"ca_cert"`
}

func ValidateClientCertificate(cert *x509.Certificate, caCert
*x509.Certificate) error {
    // Certificate validation logic
    roots := x509.NewCertPool()
    roots.AddCert(caCert)

    opts := x509.VerifyOptions{Roots: roots}
    _, err := cert.Verify(opts)
    return err
}
```

Copy

Token-Based Authentication

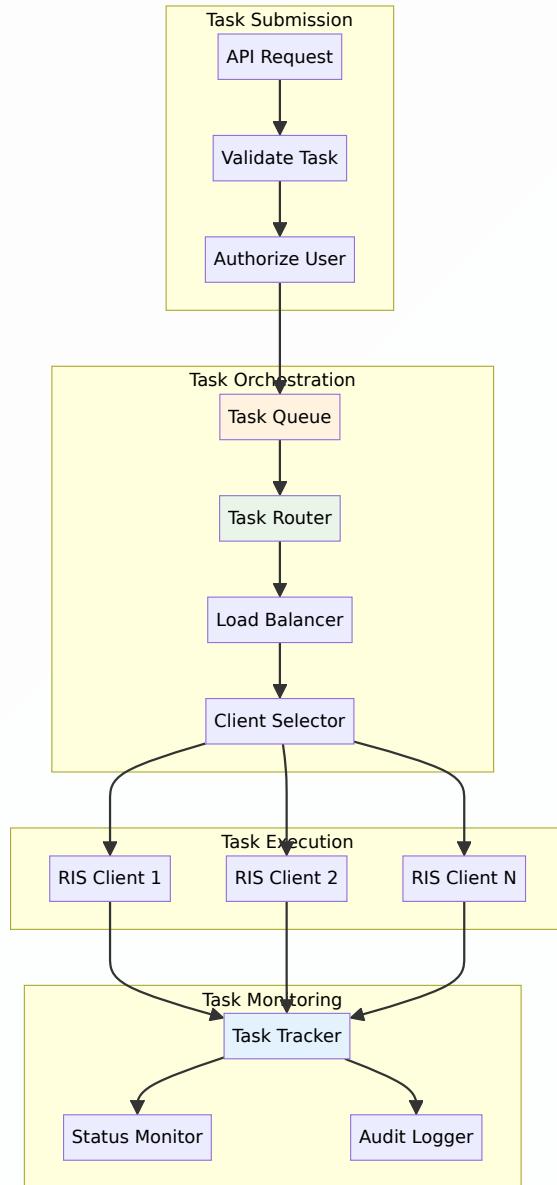
```
type ClientTokenAuth struct {
    TokenType    string      `json:"token_type"`
    AccessToken  string      `json:"access_token"`
    RefreshToken string      `json:"refresh_token"`
    ExpiresAt    time.Time   `json:"expires_at"`
}

func ValidateClientToken(token string) (*ClientClaims, error) {
    // JWT token validation
    claims := &ClientClaims{}
    _, err := jwt.ParseWithClaims(token, claims, func(token *jwt.Token)
(interface{}, error) {
        return jwtSecret, nil
    })
    return claims, err
}
```

Copy

Task Orchestration

Task Routing Engine



Task Types and Schemas

HTTP Request Task

```
type HTTPTask struct {
    TaskID      string      `json:"task_id"`
    Type        string      `json:"type"`
    Method      string      `json:"method"`
    URL         string      `json:"url"`
    Headers     map[string]string `json:"headers"`
    Body        string      `json:"body"`
    Timeout     int         `json:"timeout"`
    Retries     int         `json:"retries"`
    Auth        AuthConfig  `json:"auth"`
    Validation  ValidationConfig `json:"validation"`
}

type AuthConfig struct {
    Type        string      `json:"type"`
    Username   string      `json:"username"`
    Password   string      `json:"password"`
    BearerToken string      `json:"bearer_token"`
    APIKey     string      `json:"api_key"`
    CustomHeader string      `json:"custom_header"`
}
```

Copy

Docker Service Task

```
type DockerTask struct {
    TaskID      string      `json:"task_id"`
    Type        string      `json:"type"`
    Action       string      `json:"action"`
    ServiceName string      `json:"service_name"`
    Image        string      `json:"image"`
    Replicas     int         `json:"replicas"`
    Ports        []PortMapping `json:"ports"`
    Environment map[string]string `json:"environment"`
    Volumes      []VolumeMapping `json:"volumes"`
    Networks     []string     `json:"networks"`
    Resources    ResourceConstraints `json:"resources"`
    HealthCheck  HealthCheckConfig `json:"health_check"`
}

type PortMapping struct {
    ContainerPort int      `json:"container_port"`
    HostPort      int      `json:"host_port"`
    Protocol      string   `json:"protocol"`
}
```

Copy

System Command Task

```
type CommandTask struct {
    TaskID      string      `json:"task_id"`
    Type        string      `json:"type"`
    Command     string      `json:"command"`
    Args        []string     `json:"args"`
    WorkingDir  string      `json:"working_dir"`
    Environment map[string]string `json:"environment"`
    Timeout     int         `json:"timeout"`
    RunAsUser   string      `json:"run_as_user"`
    Privileged  bool        `json:"privileged"`
}
```

Copy

Task Execution Flow

Task Lifecycle

```
type TaskStatus string
Copy

const (
    TaskStatusPending     TaskStatus = "pending"
    TaskStatusQueued      TaskStatus = "queued"
    TaskStatusRunning     TaskStatus = "running"
    TaskStatusCompleted   TaskStatus = "completed"
    TaskStatusFailed       TaskStatus = "failed"
    TaskStatusCancelled   TaskStatus = "cancelled"
    TaskStatusTimeout     TaskStatus = "timeout"
)

type Task struct {
    ID          string           `json:"id" bson:"_id"`
    Type        string           `json:"type" bson:"type"`
    Status      TaskStatus       `json:"status" bson:"status"`
    Priority    int              `json:"priority" bson:"priority"`
    ClientID   string           `json:"client_id" bson:"client_id"`
    TenantCode  string           `json:"tenant_code" bson:"tenant_code"`
    UserID      string           `json:"user_id" bson:"user_id"`
    Payload     map[string]interface{} `json:"payload" bson:"payload"`
    Result      *TaskResult      `json:"result,omitempty" bson:"result,omitempty"`
    CreatedAt   time.Time        `json:"created_at" bson:"created_at"`
    StartedAt   *time.Time       `json:"started_at,omitempty" bson:"started_at,omitempty"`
    CompletedAt *time.Time       `json:"completed_at,omitempty" bson:"completed_at,omitempty"`
    Timeout     time.Duration    `json:"timeout" bson:"timeout"`
    Retries     int              `json:"retries" bson:"retries"`
    MaxRetries  int              `json:"max_retries" bson:"max_retries"`
    Metadata    map[string]interface{} `json:"metadata" bson:"metadata"`
}
```

Task Orchestrator Implementation

```
type TaskOrchestrator struct {
    queue        TaskQueue
    router       TaskRouter
    clientManager ClientManager
    taskTracker  TaskTracker
    config       OrchestratorConfig
    metrics      MetricsCollector
    logger       Logger
}

func (to *TaskOrchestrator) SubmitTask(task *Task) error {
    // Validate task
    if err := to.validateTask(task); err != nil {
        return fmt.Errorf("task validation failed: %w", err)
    }

    // Add to queue
    if err := to.queue.Enqueue(task); err != nil {
        return fmt.Errorf("failed to queue task: %w", err)
    }

    // Start processing if not async
    if !task.Async {
        return to.processTask(task)
    }

    return nil
}

func (to *TaskOrchestrator) processTask(task *Task) error {
    // Select appropriate client
    client, err := to.selectClient(task)
    if err != nil {
        return fmt.Errorf("client selection failed: %w", err)
    }

    // Route task to client
    return to.router.RouteTask(task, client)
}
```

Copy

Priority and Queue Management

Priority Queue Implementation

```
type PriorityQueue struct {
    queues    map[int]*Queue // Priority level -> Queue
    mutex     sync.RWMutex
    maxSize   int
    metrics   *QueueMetrics
}

func (pq *PriorityQueue) Enqueue(task *Task) error {
    pq.mutex.Lock()
    defer pq.mutex.Unlock()

    priority := task.Priority
    if priority < 1 || priority > 5 {
        priority = 3 // Default priority
    }

    queue, exists := pq.queues[priority]
    if !exists {
        queue = NewQueue(pq.maxSize / 5)
        pq.queues[priority] = queue
    }

    return queue.Enqueue(task)
}

func (pq *PriorityQueue) Dequeue() (*Task, error) {
    pq.mutex.Lock()
    defer pq.mutex.Unlock()

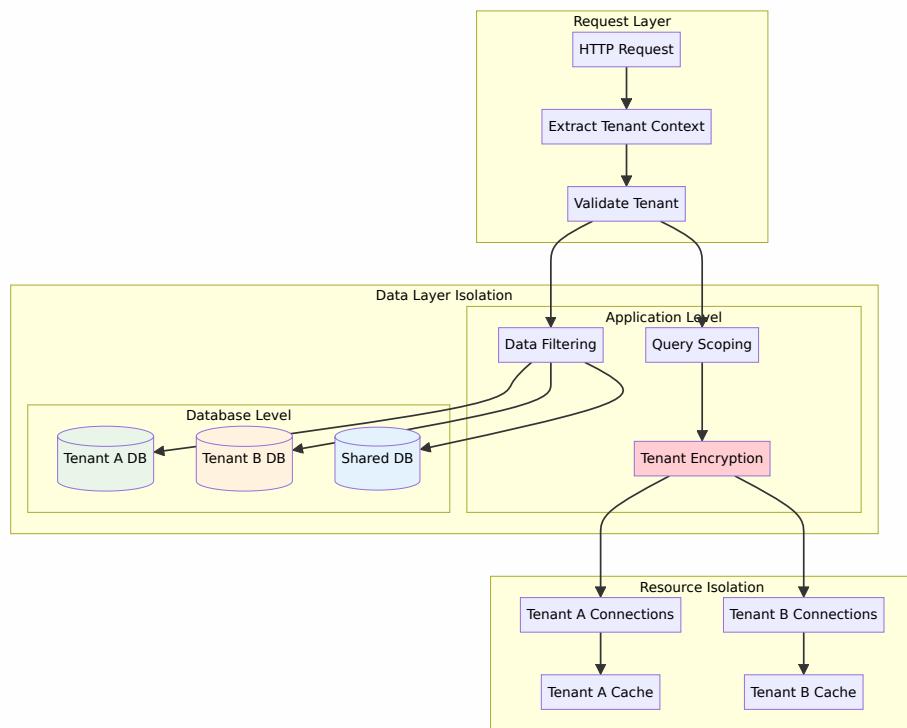
    // Process highest priority first
    for priority := 5; priority >= 1; priority-- {
        if queue, exists := pq.queues[priority]; exists {
            if task, err := queue.Dequeue(); err == nil {
                return task, nil
            }
        }
    }

    return nil, ErrQueueEmpty
}
```

Copy

Multi-Tenant Architecture

Tenant Isolation Strategies



Tenant Management

Tenant Model

```
type Tenant struct {
    ID          string      `json:"id" bson:"_id"`
    Code        string      `json:"code" bson:"code"`
    Name        string      `json:"name" bson:"name"`
    Description string      `json:"description"`
    bson:"description"`
    Status      string      `json:"status" bson:"status"`
    DatabaseInfo DatabaseInfo `json:"database_info"`
    bson:"database_info"`
    Settings   TenantSettings `json:"settings" bson:"settings"`
    Limits     ResourceLimits `json:"limits" bson:"limits"`
    CreatedAt  time.Time   `json:"created_at" bson:"created_at"`
    UpdatedAt  time.Time   `json:"updated_at" bson:"updated_at"`
    Metadata   map[string]interface{} `json:"metadata" bson:"metadata"`
}

```

Copy

```
type DatabaseInfo struct {
    Type        string `json:"type" bson:"type"`
    Host        string `json:"host" bson:"host"`
    Port        int    `json:"port" bson:"port"`
    Database   string `json:"database" bson:"database"`
    Username   string `json:"username" bson:"username"`
    Password   string `json:"password" bson:"password"`
    SSL         bool   `json:"ssl" bson:"ssl"`
    MaxPoolSize int    `json:"max_pool_size" bson:"max_pool_size"`
}

```

```
type TenantSettings struct {
    TimeZone    string      `json:"timezone"`
    bson:"timezone"`
    Language    string      `json:"language"`
    bson:"language"`
    Features    []string    `json:"features"`
    bson:"features"`
    SecurityPolicy SecurityPolicy `json:"security_policy"`
    bson:"security_policy"`
    NotificationConfig NotificationConfig `json:"notification_config"`
    bson:"notification_config"`
}

```

```
type ResourceLimits struct {
```

```
    MaxClients      int `json:"max_clients" bson:"max_clients"`
    MaxTasks       int `json:"max_tasks" bson:"max_tasks"`
    MaxStorageGB   int `json:"max_storage_gb" bson:"max_storage_gb"`
    MaxBandwidthMBs int `json:"max_bandwidth_mbs"
                      bson:"max_bandwidth_mbs"`
}
```

Tenant Context Management

```
type TenantContext struct {
    TenantID      string            `json:"tenant_id"`
    TenantCode    string            `json:"tenant_code"`
    UserID        string            `json:"user_id"`
    Permissions   []string          `json:"permissions"`
    Settings     TenantSettings    `json:"settings"`
    Limits       ResourceLimits    `json:"limits"`
    DBSession    database.Session  `json:"-"`
    CacheClient  cache.Client      `json:"-"`
    Metadata     map[string]interface{} `json:"metadata"`
}

type TenantManager struct {
    tenantRepo    TenantRepository
    dbManager     DatabaseManager
    cacheManager  CacheManager
    encryptionSvc EncryptionService
    mutex         sync.RWMutex
    tenantCache   map[string]*TenantContext
}

func (tm *TenantManager) GetTenantContext(tenantCode string) (*TenantContext, error) {
    // Check cache first
    if ctx, exists := tm.tenantCache[tenantCode]; exists {
        return ctx, nil
    }

    // Load from database
    tenant, err := tm.tenantRepo.GetByCode(tenantCode)
    if err != nil {
        return nil, fmt.Errorf("tenant not found: %w", err)
    }

    // Create database session
    dbSession, err :=
        tm.dbManager.CreateTenantSession(tenant.DatabaseInfo)
    if err != nil {
        return nil, fmt.Errorf("failed to create DB session: %w", err)
    }

    // Create cache client
    cacheClient, err := tm.cacheManager.CreateTenantClient(tenantCode)
}
```

```
if err != nil {
    return nil, fmt.Errorf("failed to create cache client: %w", err)
}

ctx := &TenantContext{
    TenantID:    tenant.ID,
    TenantCode:  tenant.Code,
    Settings:   tenant.Settings,
    Limits:     tenant.Limits,
    DBSession:  dbSession,
    CacheClient: cacheClient,
}

// Cache context
tm.tenantCache[tenantCode] = ctx

return ctx, nil
}
```

Database Isolation

Tenant-Specific Database Connections

```
type DatabaseManager struct {
    defaultDB      database.Database
    tenantDBs     map[string]database.Database
    poolManager   ConnectionPoolManager
    encryptionSvc EncryptionService
    mutex         sync.RWMutex
}

func (dm *DatabaseManager) CreateTenantSession(dbInfo DatabaseInfo)
(database.Session, error) {
    tenantKey := fmt.Sprintf("%s:%s", dbInfo.Host, dbInfo.Database)

    // Check if tenant DB connection exists
    db, exists := dm.tenantDBs[tenantKey]
    if !exists {
        // Create new connection
        var err error
        db, err = dm.createTenantConnection(dbInfo)
        if err != nil {
            return nil, fmt.Errorf("failed to create tenant connection: %w", err)
        }

        dm.mutex.Lock()
        dm.tenantDBs[tenantKey] = db
        dm.mutex.Unlock()
    }

    // Create session with tenant context
    session := db.NewSession()
    session.SetTenantContext(dbInfo.Database)

    return session, nil
}

func (dm *DatabaseManager) createTenantConnection(dbInfo DatabaseInfo)
(database.Database, error) {
    // Decrypt database credentials
    password, err := dm.encryptionSvc.Decrypt(dbInfo.Password)
    if err != nil {
        return nil, fmt.Errorf("failed to decrypt password: %w", err)
    }
}
```

```
}

// Build connection URI
uri := fmt.Sprintf("mongodb://%s:%s@%s:%d/%s",
    dbInfo.Username, password, dbInfo.Host, dbInfo.Port,
dbInfo.Database)

// Configure connection options
opts := &database.Options{
    MaxPoolSize:    dbInfo.MaxPoolSize,
    ConnectTimeout: 30 * time.Second,
    SocketTimeout:  60 * time.Second,
    SSL:            dbInfo.SSL,
    ReplicaSet:     "", // Configure if using replica set
}

return database.Connect(uri, opts)
}
```

Data Encryption per Tenant

Copy

```
type TenantEncryption struct {
    keyManager    KeyManager
    encryptionSvc EncryptionService
    tenantKeys    map[string][]byte
    mutex         sync.RWMutex
}

func (te *TenantEncryption) EncryptTenantData(tenantCode string, data []byte) ([]byte, error) {
    key, err := te.getTenantKey(tenantCode)
    if err != nil {
        return nil, fmt.Errorf("failed to get tenant key: %w", err)
    }

    return te.encryptionSvc.Encrypt(data, key)
}

func (te *TenantEncryption) DecryptTenantData(tenantCode string, encryptedData []byte) ([]byte, error) {
    key, err := te.getTenantKey(tenantCode)
    if err != nil {
        return nil, fmt.Errorf("failed to get tenant key: %w", err)
    }

    return te.encryptionSvc.Decrypt(encryptedData, key)
}

func (te *TenantEncryption) getTenantKey(tenantCode string) ([]byte, error) {
    te.mutex.RLock()
    if key, exists := te.tenantKeys[tenantCode]; exists {
        te.mutex.RUnlock()
        return key, nil
    }
    te.mutex.RUnlock()

    // Generate or retrieve tenant-specific key
    key, err := te.keyManager.GetTenantKey(tenantCode)
    if err != nil {
        return nil, err
    }

    te.mutex.Lock()
```

```
    te.tenantKeys[tenantCode] = key  
    te.mutex.Unlock()  
  
    return key, nil  
}
```

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Comprehensive RIS Server Documentation