RIS Client Documentation

Table of Contents

Overview

The RIS (Remote Integrated Services) Client is a lightweight, secure agent that enables remote management and task execution across distributed environments. It serves as the intelligent endpoint in the RIS ecosystem, communicating with the central RIS Server to execute tasks, manage Docker services, and provide real-time status updates.

Key Features

- **Real-time Communication**: WebSocket-based persistent connection with the RIS Server
- **Task Execution**: Support for HTTP requests, system commands, and Docker operations

- **Service Management**: Comprehensive Docker container and service lifecycle management
- **Security**: TLS encryption, authentication, and secure credential management
- **Network Intelligence**: Automatic network discovery and adaptation
- **Health Monitoring**: Continuous health checks and status reporting
- **Multi-tenant Support**: Isolated execution environments for different tenants

System Requirements

Minimum Requirements

- **Operating System**: Linux (Ubuntu 18.04+, CentOS 7+, RHEL 7+)
- **CPU**: 1 vCore
- **Memory**: 512 MB RAM
- **Storage**: 1 GB available disk space
- **Network**: Outbound HTTPS/WSS connectivity

Recommended Requirements

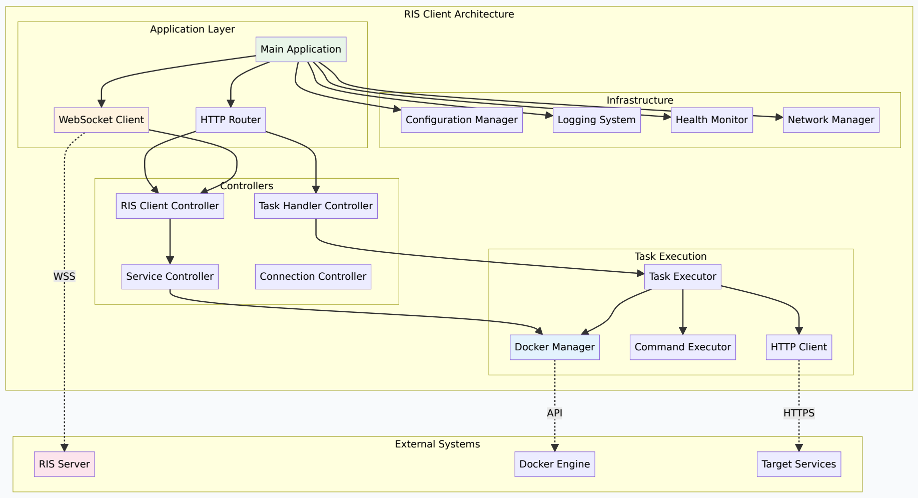
- **Operating System**: Linux (Ubuntu 20.04+, CentOS 8+, RHEL 8+)
- **CPU**: 2 vCores
- **Memory**: 2 GB RAM
- **Storage**: 5 GB available disk space
- **Network**: High-speed internet connection

Dependencies

- **Docker**: Version 20.10+ (for service management features)
- **Go Runtime**: Version 1.19+ (for development)
- **TLS Certificates**: Valid certificates for secure communication

Architecture

Component Overview



Core Components

1. Application Framework

- **Main Application (`App`)**: Central orchestration and lifecycle management
- **HTTP Router**: RESTful API endpoint handling
- **WebSocket Client**: Persistent server communication
- **Configuration Manager**: Dynamic configuration management

2. Task Execution Engine

- **Task Handler Controller**: Task routing and execution coordination
- **HTTP Client**: External API communication
- **Command Executor**: System command execution

- **Docker Manager**: Container and service management

3. Infrastructure Services

- **Health Monitor**: System and service health tracking
- **Network Manager**: IP detection and connectivity management
- **Logging System**: Structured logging and audit trails
- **Security Manager**: Authentication and encryption

Installation & Setup

Docker Installation (Recommended)

Using Docker Compose

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```yaml
version: '3.8'
services:
  ris-client:
    image: securaa/ris-client:latest
    container_name: ris-client
    restart: unless-stopped
    environment:
      - RIS_SERVER_HOST=https://your-ris-server.com
      - RIS_CLIENT_NAME=client-001
      - RIS_TENANT_CODE=your-tenant
    volumes:
      - ./config:/app/config
      - ./logs:/app/logs
      - /var/run/docker.sock:/var/run/docker.sock
    ports:
      - "9000:9000"
    networks:
      - ris-network
    cap_add:
      - NET_ADMIN
    security_opt:
      - no-new-privileges:true

networks:
  ris-network:
    driver: bridge
```

Using Docker Run

```
docker run -d \
  --name ris-client \
  --restart unless-stopped \
  -e RIS_SERVER_HOST=https://your-ris-server.com \
  -e RIS_CLIENT_NAME=client-001 \
  -e RIS_TENANT_CODE=your-tenant \
  -v ./config:/app/config \
  -v ./logs:/app/logs \
  -v /var/run/docker.sock:/var/run/docker.sock \
  -p 9000:9000 \
  --cap-add NET_ADMIN \
  --security-opt no-new-privileges:true \
  securaa/ris-client:latest
```

Binary Installation

Download and Install

```
# Download the latest release
wget https://github.com/securaa/ris-client/releases/latest/download/ris-client-linux-amd64.tar.gz

# Extract the binary
tar -xzf ris-client-linux-amd64.tar.gz

# Move to system path
sudo mv ris-client /usr/local/bin/
sudo chmod +x /usr/local/bin/ris-client

# Create configuration directory
sudo mkdir -p /etc/ris-client
sudo mkdir -p /var/log/ris-client
```

Create Systemd Service

```
sudo tee /etc/systemd/system/ris-client.service << EOF
[Unit]
Description=RIS Client Service
After=network.target
Wants=network.target

[Service]
Type=simple
User=ris-client
Group=ris-client
ExecStart=/usr/local/bin/ris-client
Restart=always
RestartSec=10
Environment=CONFIG_PATH=/etc/ris-client/config.json
WorkingDirectory=/opt/ris-client

[Install]
WantedBy=multi-user.target
EOF

# Create user and directories
sudo useradd -r -s /bin/false ris-client
sudo chown -R ris-client:ris-client /etc/ris-client /var/log/ris-client

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

Copy

Source Installation

Prerequisites

```
# Install Go 1.19+
wget https://go.dev/dl/go1.21.3.linux-amd64.tar.gz
sudo tar -C /usr/local -xzf go1.21.3.linux-amd64.tar.gz
export PATH=$PATH:/usr/local/go/bin

# Install dependencies
sudo apt-get update
sudo apt-get install -y git make build-essential
```

Copy

Build from Source

```
# Clone repository
git clone https://github.com/securaa/ris-client.git
cd ris-client

# Build application
make build

# Install binary
sudo make install

# Copy configuration template
sudo cp config/config.json.template /etc/ris-client/config.json
```

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Configuration

Configuration File Structure

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```
{
  "server": {
    "host": "https://ris-server.example.com",
    "port": 8057,
    "websocket_path": "/pingpong",
    "api_version": "v1",
    "timeout": 30,
    "retry_attempts": 3,
    "retry_delay": 5
  },
  "client": {
    "name": "ris-client-001",
    "unique_id": "auto-generated-uuid",
    "tenant_code": "default",
    "port": 9000,
    "host_type": "auto",
    "external_ip": "auto",
    "internal_ip": "auto"
  },
  "security": {
    "tls": {
      "enabled": true,
      "cert_file": "/etc/ris-client/certs/client.crt",
      "key_file": "/etc/ris-client/certs/client.key",
      "ca_file": "/etc/ris-client/certs/ca.crt",
      "verify_server": true,
      "cipher_suites": ["TLS_AES_256_GCM_SHA384",
"TLS_CHACHA20_POLY1305_SHA256"]
    },
    "authentication": {
      "method": "certificate",
      "token_refresh_interval": 3600
    }
  },
  "docker": {
    "enabled": true,
    "socket": "/var/run/docker.sock",
    "api_version": "1.41",
    "timeout": 60,
    "registry": {
      "url": "registry.example.com",
      "username": "",
      "password": ""
    }
  },
  "logging": {
    "level": "info",
    "format": "json",
    "output": "file",
    "file": {
      "path": "/var/log/ris-client/client.log",
      "max_size": 100,
      "max_backups": 5,
      "max_age": 30,
      "compress": true
    },
    "audit": {
      "enabled": true,
      "file": "/var/log/ris-client/audit.log"
    }
  },
  "monitoring": {
    "enabled": true,
    "interval": 30,
    "health_check": {
      "endpoint": "/health",
      "timeout": 10
    },
    "metrics": {
      "enabled": true,
      "port": 9001,
      "path": "/metrics"
    }
  },
  "features": {
    "task_execution": true,
    "service_management": true,
    "health_monitoring": true,
    "auto_update": false,
    "debug_mode": false
  }
}
```

Environment Variables

The RIS Client supports configuration through environment variables:

VARIABLE	DESCRIPTION	DEFAULT
`RIS_SERVER_HOST`	RIS Server URL	`https://localhost:8057`
`RIS_CLIENT_NAME`	Client identifier	`ris-client`
`RIS_CLIENT_PORT`	Client listening port	`9000`
`RIS_TENANT_CODE`	Tenant identifier	`default`
`RIS_LOG_LEVEL`	Logging level	`info`
`RIS_TLS_ENABLED`	Enable TLS	`true`
`RIS_DOCKER_ENABLED`	Enable Docker management	`true`
`CONFIG_PATH`	Configuration file path	`/etc/ris-client/config.json`

Network Configuration

Host Type Detection

The client automatically detects its network environment:

- `auto`: Automatic detection (recommended)
- `private`: Private network environment
- `public`: Public-facing environment
- `nat`: Behind NAT/firewall

IP Address Configuration

```
{
  "client": {
    "ip_detection": {
      "method": "auto",
      "external_ip_services": [
        "https://api.ipify.org",
        "https://checkip.amazonaws.com",
        "https://icanhazip.com"
      ],
      "timeout": 10,
      "fallback_ip": "127.0.0.1"
    }
  }
}
```

API Reference

REST API Endpoints

Health Check

```
GET /health
```

Response:

```
{
  "status": "healthy",
  "version": "1.0.0",
  "uptime": 3600,
  "connections": {
    "server": "connected",
    "docker": "available"
  },
  "resources": {
    "cpu_usage": 25.5,
    "memory_usage": 512,
    "disk_usage": 75.2
  }
}
```

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Task Execution

```
POST /runtask/
Content-Type: application/json

{
  "method": "GET",
  "resturl": "https://api.example.com/status",
  "headers": "{\"Authorization\": \"Bearer token\"}",
  "authtype": "bearer",
  "bearertoken": "jwt-token"
}
```

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Response:

```
{
  "success": true,
  "data": {
    "status_code": 200,
    "headers": {},
    "body": "response data"
  },
  "execution_time": 1250,
  "timestamp": "2025-10-07T10:30:00Z"
}
```

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Service Management

```
POST /manageservices/
Content-Type: application/json

{
  "action": "deploy",
  "service_name": "web-app",
  "image": "nginx:latest",
  "replicas": 3,
  "ports": [
    {
      "containerPort": 80,
      "hostPort": 8080
    }
  ],
  "environment": {
    "ENV": "production"
  }
}
```

Copy

Response:

```
{
  "success": true,
  "service_id": "service_web-app_123",
  "status": "deployed",
  "message": "Service deployed successfully"
}
```

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WebSocket Communication

Connection Establishment

```
const ws = new WebSocket('wss://client-ip:9000/pingpong');

ws.onopen = function(event) {
    console.log('Connected to RIS Client');

    // Send registration
    ws.send(JSON.stringify({
        type: 'register',
        client_id: 'client-001',
        capabilities: ['task_execution', 'service_management']
    }));
};
```

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Message Types

Registration Message:

```
{
  "type": "register",
  "client_id": "client-001",
  "version": "1.0.0",
  "capabilities": ["task_execution", "service_management"],
  "timestamp": "2025-10-07T10:30:00Z"
}
```

Copy

Task Execution Message:

```
{
  "type": "execute_task",
  "task_id": "task-123",
  "payload": {
    "method": "POST",
    "url": "https://api.example.com/endpoint",
    "data": "request data"
  }
}
```

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Status Update Message:

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```json
{
  "type": "status_update",
  "status": "running",
  "services": [
    {
      "name": "web-app",
      "status": "running",
      "replicas": 3
    }
  ],
  "resources": {
    "cpu": 25.5,
    "memory": 512,
    "disk": 75.2
  }
}
```

Task Execution

Supported Task Types

HTTP Requests

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```json
{
  "method": "POST",
  "resturl": "https://api.example.com/users",
  "headers": "{\"Content-Type\": \"application/json\"}",
  "data": "{\"name\": \"John Doe\", \"email\": \"john@example.com\"}",
  "authtype": "bearer",
  "bearertoken": "jwt-token-here",
  "timeout": 30
}
```

System Commands

```
{
  "type": "command",
  "command": "systemctl status nginx",
  "timeout": 10,
  "environment": {
    "PATH": "/usr/local/bin:/usr/bin:/bin"
  }
}
```

Docker Operations

```
{
  "type": "docker",
  "operation": "container_list",
  "filters": {
    "status": "running"
  }
}
```

Authentication Methods

Bearer Token

```
{
  "authtype": "bearer",
  "bearertoken": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9..."
}
```

Basic Authentication

```
{
  "authtype": "basic",
  "username": "admin",
  "password": "secure-password"
}
```

Custom Headers

```
{
  "authtype": "custom",
  "headers": "{\"X-API-Key\": \"api-key-value\", \"X-Client-ID\":
\"client-123\"}"
}
```

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Error Handling

Task Execution Errors

```
{
  "success": false,
  "error": "connection_timeout",
  "message": "Request timed out after 30 seconds",
  "error_code": "TIMEOUT_001",
  "details": {
    "url": "https://api.example.com/endpoint",
    "timeout": 30,
    "retry_count": 3
  },
  "timestamp": "2025-10-07T10:30:00Z"
}
```

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Retry Logic

```
{
  "retry_policy": {
    "max_attempts": 3,
    "backoff_strategy": "exponential",
    "initial_delay": 1000,
    "max_delay": 30000,
    "retry_conditions": [
      "network_error",
      "timeout",
      "server_error_5xx"
    ]
  }
}
```

Copy

Docker Service Management

Service Deployment

Basic Deployment

```json
{
  "action": "deploy",
  "service_name": "web-server",
  "image": "nginx:1.21-alpine",
  "replicas": 2,
  "ports": [
    {
      "containerPort": 80,
      "hostPort": 8080,
      "protocol": "TCP"
    }
  ],
  "environment": {
    "NGINX_HOST": "localhost",
    "NGINX_PORT": "80"
  },
  "volumes": [
    {
      "host_path": "/var/www/html",
      "container_path": "/usr/share/nginx/html",
      "mode": "ro"
    }
  ],
  "networks": ["web-network"],
  "restart_policy": "unless-stopped"
}
```

Advanced Deployment with Health Checks

Copy

```
{
  "action": "deploy",
  "service_name": "api-server",
  "image": "myapp/api:v1.2.3",
  "replicas": 3,
  "deploy_config": {
    "update_strategy": "rolling",
    "max_replicas_unavailable": 1,
    "health_check": {
      "test": ["CMD", "curl", "-f", "http://localhost:8080/health"],
      "interval": "30s",
      "timeout": "10s",
      "retries": 3,
      "start_period": "60s"
    }
  },
  "resources": {
    "limits": {
      "memory": "512m",
      "cpu": "0.5"
    },
    "reservations": {
      "memory": "256m",
      "cpu": "0.25"
    }
  },
  "secrets": [
    {
      "name": "db-password",
      "target": "/run/secrets/db_password"
    }
  ],
  "configs": [
    {
      "name": "app-config",
      "target": "/etc/app/config.yml"
    }
  ]
}
```

Service Operations

Scale Service

```
{
  "action": "scale",
  "service_name": "web-server",
  "replicas": 5
}
```

Update Service

```
{
  "action": "update",
  "service_name": "api-server",
  "image": "myapp/api:v1.2.4",
  "update_strategy": "rolling",
  "update_config": {
    "parallelism": 1,
    "delay": "10s",
    "failure_action": "rollback",
    "monitor": "30s"
  }
}
```

Stop Service

```
{
  "action": "stop",
  "service_name": "web-server",
  "timeout": 30
}
```

Remove Service

```
{
  "action": "remove",
  "service_name": "web-server",
  "force": false
}
```

Service Monitoring

Get Service Status

```
{
  "action": "status",
  "service_name": "web-server"
}
```

Copy

Response:

```
{
  "success": true,
  "data": {
    "service_name": "web-server",
    "status": "running",
    "replicas": {
      "desired": 3,
      "running": 3,
      "ready": 3
    },
    "image": "nginx:1.21-alpine",
    "created": "2025-10-07T10:00:00Z",
    "updated": "2025-10-07T10:30:00Z",
    "tasks": [
      {
        "id": "task_123",
        "node": "worker-1",
        "status": "running",
        "current_state": "running",
        "desired_state": "running"
      }
    ]
  }
}
```

Copy

List All Services

```json
{
  "action": "list",
  "filters": {
    "status": "running"
  }
}
```

Docker Compose Support

Deploy Stack

```json
{
  "action": "deploy_stack",
  "stack_name": "webapp",
  "compose_content": "version: '3.8'\nservices:\n  web:\n    image: nginx:latest\n    ports:\n      - 80:80",
  "environment_file": ".env"
}
```

Remove Stack

```json
{
  "action": "remove_stack",
  "stack_name": "webapp"
}
```

Security Features

TLS Configuration

Certificate Management

Copy

```
{
  "security": {
    "tls": {
      "enabled": true,
      "cert_file": "/etc/ris-client/certs/client.crt",
      "key_file": "/etc/ris-client/certs/client.key",
      "ca_file": "/etc/ris-client/certs/ca.crt",
      "verify_server": true,
      "min_version": "1.2",
      "max_version": "1.3",
      "cipher_suites": [
        "TLS_AES_256_GCM_SHA384",
        "TLS_CHACHA20_POLY1305_SHA256",
        "TLS_AES_128_GCM_SHA256"
      ]
    }
  }
}
```

Certificate Rotation

Copy

```
# Automatic certificate rotation
ris-client cert rotate --ca-cert /path/to/new-ca.crt

# Manual certificate update
ris-client cert update \
  --cert /path/to/new-client.crt \
  --key /path/to/new-client.key \
  --restart
```

Access Control

Role-Based Permissions

Copy

```json
{
  "security": {
    "rbac": {
      "enabled": true,
      "roles": {
        "admin": {
          "permissions": ["*"]
        },
        "operator": {
          "permissions": [
            "task:execute",
            "service:read",
            "service:deploy",
            "service:scale"
          ]
        },
        "readonly": {
          "permissions": [
            "service:read",
            "health:read"
          ]
        }
      }
    }
  }
}
```

IP Whitelist

Copy

```json
{
  "security": {
    "network": {
      "allowed_ips": [
        "10.0.0.0/8",
        "172.16.0.0/12",
        "192.168.0.0/16",
        "203.0.113.0/24"
      ],
      "deny_all_others": true
    }
  }
}
```

Audit Logging

Audit Configuration

Copy

```json
{
  "logging": {
    "audit": {
      "enabled": true,
      "file": "/var/log/ris-client/audit.log",
      "max_size": 100,
      "events": [
        "authentication",
        "task_execution",
        "service_management",
        "configuration_change",
        "security_event"
      ],
      "format": "json",
      "include_payload": false
    }
  }
}
```

Audit Event Example

```
{
  "timestamp": "2025-10-07T10:30:00Z",
  "event_type": "task_execution",
  "user": "admin@example.com",
  "source_ip": "192.168.1.100",
  "action": "execute_http_task",
  "resource": "https://api.example.com/users",
  "result": "success",
  "duration": 1250,
  "metadata": {
    "task_id": "task-123",
    "method": "GET",
    "status_code": 200
  }
}
```

Copy

Monitoring & Logging

Health Monitoring

Health Check Endpoint

```
GET /health
```

Copy

Response:

```
{
  "status": "healthy",
  "version": "1.0.0",
  "uptime": "2h30m15s",
  "components": {
    "server_connection": {
      "status": "connected",
      "last_ping": "2025-10-07T10:29:45Z",
      "latency": 45
    },
    "docker": {
      "status": "available",
      "version": "20.10.17",
      "containers_running": 12
    },
    "filesystem": {
      "status": "healthy",
      "usage": {
        "total": "100GB",
        "used": "75GB",
        "available": "25GB"
      }
    },
    "memory": {
      "status": "healthy",
      "usage": {
        "total": "8GB",
        "used": "2GB",
        "available": "6GB"
      }
    }
  }
}
```

Metrics Endpoint

```
GET /metrics
```

Prometheus Format Response:

```
# HELP ris_client_uptime_seconds Total uptime in seconds
# TYPE ris_client_uptime_seconds counter
ris_client_uptime_seconds 9015

# HELP ris_client_tasks_total Total number of tasks executed
# TYPE ris_client_tasks_total counter
ris_client_tasks_total{status="success"} 1250
ris_client_tasks_total{status="error"} 23

# HELP ris_client_services_running Number of running services
# TYPE ris_client_services_running gauge
ris_client_services_running 8

# HELP ris_client_memory_usage_bytes Memory usage in bytes
# TYPE ris_client_memory_usage_bytes gauge
ris_client_memory_usage_bytes 536870912
```

Logging Configuration

Structured Logging

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```json
{
  "logging": {
    "level": "info",
    "format": "json",
    "output": "file",
    "file": {
      "path": "/var/log/ris-client/client.log",
      "max_size": 100,
      "max_backups": 5,
      "max_age": 30,
      "compress": true
    },
    "console": {
      "enabled": true,
      "level": "error"
    },
    "fields": {
      "service": "ris-client",
      "version": "1.0.0",
      "environment": "production"
    }
  }
}
```

Log Example

Copy

```json
{
  "timestamp": "2025-10-07T10:30:00Z",
  "level": "info",
  "message": "Task executed successfully",
  "service": "ris-client",
  "version": "1.0.0",
  "task_id": "task-123",
  "method": "GET",
  "url": "https://api.example.com/status",
  "duration": 1250,
  "status_code": 200,
  "correlation_id": "req-456"
}
```

Monitoring Integration

Prometheus Integration

```yaml
# prometheus.yml
scrape_configs:
  - job_name: 'ris-client'
    static_configs:
      - targets: ['client-1:9001', 'client-2:9001']
    scrape_interval: 30s
    metrics_path: /metrics
```

Copy

Grafana Dashboard

```json
{
  "dashboard": {
    "title": "RIS Client Monitoring",
    "panels": [
      {
        "title": "Task Execution Rate",
        "type": "graph",
        "targets": [
          {
            "expr": "rate(ris_client_tasks_total[5m])",
            "legendFormat": "{{status}}"
          }
        ]
      },
      {
        "title": "Service Status",
        "type": "stat",
        "targets": [
          {
            "expr": "ris_client_services_running",
            "legendFormat": "Running Services"
          }
        ]
      }
    ]
  }
}
```

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Troubleshooting

Common Issues

Connection Issues

Problem: Client cannot connect to RIS Server

```
# Check network connectivity
curl -k https://ris-server.example.com:8057/health

# Verify certificates
openssl s_client -connect ris-server.example.com:8057 -cert client.crt -key client.key

# Check client logs
tail -f /var/log/ris-client/client.log | grep -i error
```

Solution: 1. Verify server URL and port 2. Check firewall rules 3. Validate TLS certificates 4. Review network configuration

Docker Issues

Problem: Docker service management fails

```
# Check Docker daemon
systemctl status docker

# Verify Docker socket permissions
ls -la /var/run/docker.sock

# Test Docker API
docker version
```

Solution: 1. Ensure Docker daemon is running 2. Check socket permissions 3. Verify Docker API version compatibility 4. Review Docker configuration

Task Execution Failures

Problem: HTTP tasks timing out

```
# Check network connectivity
curl -v https://target-api.example.com/endpoint

# Review task configuration
cat /etc/ris-client/config.json | jq '.task_execution'

# Monitor client logs
tail -f /var/log/ris-client/client.log | grep -i timeout
```

Solution: 1. Increase timeout values 2. Check target service availability 3. Verify authentication credentials 4. Review network configuration

Debugging Tools

Enable Debug Mode

```
{
  "features": {
    "debug_mode": true
  },
  "logging": {
    "level": "debug"
  }
}
```

Health Check Script

Copy

```bash
#!/bin/bash
# health-check.sh

echo "=== RIS Client Health Check ==="

# Check service status
if systemctl is-active --quiet ris-client; then
    echo "✓ Service is running"
else
    echo "✗ Service is not running"
    exit 1
fi

# Check server connectivity
if curl -sf http://localhost:9000/health > /dev/null; then
    echo "✓ Client is responding"
else
    echo "✗ Client is not responding"
    exit 1
fi

# Check Docker connectivity
if docker version > /dev/null 2>&1; then
    echo "✓ Docker is available"
else
    echo "✗ Docker is not available"
fi

# Check logs for errors
if grep -q "ERROR" /var/log/ris-client/client.log; then
    echo "⚠ Errors found in logs"
    grep "ERROR" /var/log/ris-client/client.log | tail -5
else
    echo "✓ No recent errors in logs"
fi

echo "=== Health Check Complete ==="
```

Log Analysis

```
# Find connection issues
grep -i "connection" /var/log/ris-client/client.log | tail -20

# Find task failures
grep -i "task.*failed" /var/log/ris-client/client.log | tail -10

# Monitor real-time activity
tail -f /var/log/ris-client/client.log | jq '.message'
```

Performance Tuning

Resource Optimization

```
{
  "performance": {
    "max_concurrent_tasks": 10,
    "task_queue_size": 100,
    "connection_pool_size": 20,
    "memory_limit": "512m",
    "gc_threshold": 50
  }
}
```

Network Optimization

```
{
  "network": {
    "keepalive": true,
    "keepalive_interval": 30,
    "tcp_nodelay": true,
    "buffer_size": 8192,
    "compression": true
  }
}
```

Best Practices

Security Best Practices

1. **Use Strong Certificates**
2. Generate certificates with 2048-bit or higher RSA keys
3. Use proper certificate chains
4. Implement certificate rotation
5. **Network Security**
6. Use firewall rules to restrict access
7. Implement IP whitelisting
8. Use VPN for remote access
9. **Access Control**
10. Implement least privilege principle
11. Use role-based access control
12. Regular access reviews
13. **Audit and Monitoring**
14. Enable comprehensive audit logging
15. Monitor security events
16. Set up alerting for suspicious activities

Operational Best Practices

1. **Configuration Management**
2. Use version control for configurations
3. Implement configuration validation
4. Use environment-specific configurations
5. **Monitoring and Alerting**

6. Monitor key metrics and health indicators
7. Set up proactive alerting
8. Implement log aggregation
9. **Backup and Recovery**
10. Regular configuration backups
11. Test recovery procedures
12. Document recovery processes
13. **Updates and Maintenance**
14. Regular security updates
15. Planned maintenance windows
16. Rollback procedures

Development Best Practices

1. **Code Quality**
2. Follow Go coding standards
3. Implement comprehensive testing
4. Use static code analysis
5. **Error Handling**
6. Implement graceful error handling
7. Provide meaningful error messages
8. Use structured logging
9. **Performance**
10. Optimize resource usage
11. Implement proper caching
12. Use connection pooling

Development Guide

Setting Up Development Environment

Prerequisites

```
# Install Go 1.19+
go version

# Install development tools
go install github.com/golangci/golangci-lint/cmd/golangci-lint@latest
go install github.com/goreleaser/goreleaser@latest

# Install Docker
docker --version
```

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Clone and Build

```
# Clone repository
git clone https://github.com/securaa/ris-client.git
cd ris-client

# Install dependencies
go mod download

# Run tests
make test

# Build for development
make build-dev

# Run locally
./bin/ris-client -config config/dev.json
```

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Project Structure

```
ris-client/
├── cmd/
│   └── ris-client/
│       └── main.go
├── internal/
│   ├── app/
│   │   ├── app.go
│   │   └── router.go
│   ├── controllers/
│   │   ├── task_handler.go
│   │   ├── ris_client.go
│   │   └── service.go
│   ├── models/
│   │   ├── task.go
│   │   ├── client.go
│   │   └── response.go
│   ├── services/
│   │   ├── docker.go
│   │   ├── network.go
│   │   └── websocket.go
│   └── utils/
│       ├── config.go
│       ├── logger.go
│       └── http.go
├── pkg/
│   ├── common/
│   └── types/
├── config/
│   ├── config.json.template
│   └── dev.json
├── deployments/
│   ├── docker/
│   └── kubernetes/
├── docs/
├── scripts/
├── tests/
└── Makefile
```

Adding New Features

1. Create Controller

```
// internal/controllers/new_feature.go
package controllers

import (
    "net/http"
    "github.com/gorilla/mux"
)

type NewFeatureController struct{}

func (nfc NewFeatureController) HandleNewFeature(w http.ResponseWriter, r
*http.Request) {
    // Implementation here
}

func (nfc NewFeatureController) RegisterRoutes(router *mux.Router) {
    router.HandleFunc("/new-feature",
nfc.HandleNewFeature).Methods("POST")
}
```

2. Add Service

```go
// internal/services/new_service.go
package services

type NewService struct {
    config Config
    logger Logger
}

func NewNewService(config Config, logger Logger) *NewService {
    return &NewService{
        config: config,
        logger: logger,
    }
}

func (ns *NewService) ProcessRequest(request Request) (*Response, error)
{
    // Service logic here
    return &Response{}, nil
}
```

3. Update Configuration

```json
{
  "new_feature": {
    "enabled": true,
    "option1": "value1",
    "option2": 123
  }
}
```

Testing

Unit Tests

Copy

```
// internal/controllers/task_handler_test.go
package controllers

import (
    "testing"
    "net/http/httptest"
    "github.com/stretchr/testify/assert"
)

func TestTaskHandlerController_RunTask(t *testing.T) {
    // Setup
    controller := TaskHandlerController{}
    req := httptest.NewRequest("POST", "/runtask/", nil)
    w := httptest.NewRecorder()

    // Execute
    controller.RunTask(w, req)

    // Assert
    assert.Equal(t, 200, w.Code)
}
```

Integration Tests

```go
// tests/integration/api_test.go
package integration

import (
    "testing"
    "net/http"
    "github.com/stretchr/testify/suite"
)

type APITestSuite struct {
    suite.Suite
    client *http.Client
    baseURL string
}

func (suite *APITestSuite) TestHealthCheck() {
    resp, err := suite.client.Get(suite.baseURL + "/health")
    suite.NoError(err)
    suite.Equal(200, resp.StatusCode)
}

func TestAPITestSuite(t *testing.T) {
    suite.Run(t, new(APITestSuite))
}
```

Building and Releasing

Build Commands

```
# Development build
make build-dev

# Production build
make build

# Build for all platforms
make build-all

# Run tests
make test

# Code quality checks
make lint

# Generate documentation
make docs
```

Release Process

```
# Tag release
git tag -a v1.0.0 -m "Release v1.0.0"
git push origin v1.0.0

# Build release
goreleaser release --clean

# Docker release
make docker-build
make docker-push
```

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Comprehensive RIS Client Documentation