SECURE COMMUNICATION PROTOCOL PATENT

Patent No. CN114567890

PATENT SPECIFICATION AND CLAIMS DOCUMENT

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Assignee: DeepShield Systems, Inc.

Inventors: Rodriguez, Elena; Morrison, James; Zhang, Wei

1. TECHNICAL FIELD

This invention relates to secure communication protocols for industrial control systems (ICS) and operational technology (OT) environments, specifically addressing the protection of data transmission in critical infrastructure networks utilizing multi-layer encryption and adaptive authentication mechanisms.

2. BACKGROUND

1 The present invention provides enhanced security for industrial automation systems, particularly in maritime and subsea infrastructure environments where traditional encryption methods prove insufficient due to unique operational constraints and heightened security requirements.

2 Prior art solutions fail to adequately address the specific challenges of securing communications in hybrid IT/OT environments while maintaining operational efficiency and real-time response capabilities.

3. SUMMARY OF INVENTION

1 The invention comprises a novel secure communication protocol implementing:

a) Dynamic key rotation mechanisms optimized for ICS environments

b) Adaptive authentication protocols with contextual awareness

c) Real-time threat detection and response integration

d) Specialized encryption layers for SCADA network protection

2 The protocol enables secure data transmission while maintaining sub-millisecond latency requirements critical for industrial control systems.

4. DETAILED DESCRIPTION

1 Protocol Architecture

The secure communication protocol implements a proprietary five-layer security architecture:

- Layer 1: Physical signal encryption
- Layer 2: Network packet protection
- Layer 3: Application data security
- Layer 4: Command validation
- Layer 5: Behavioral analysis and anomaly detection

2 Key Management System

The invention utilizes a distributed key management system incorporating:

a) Quantum-resistant encryption algorithms

b) Automated key rotation schedules

c) Hardware-based key storage

d) Emergency key revocation mechanisms

3 Authentication Framework

The authentication system comprises:

- Multi-factor authentication adapted for OT environments
- Role-based access control with granular permissions
- Context-aware authorization protocols
- Automated credential management

5. CLAIMS

1 We claim:

A method for secure communication in industrial control systems comprising:

a) Implementation of multi-layer encryption protocols

b) Real-time threat detection and response

c) Adaptive authentication mechanisms

d) Specialized protection for SCADA networks

The method of claim 1, wherein the multi-layer encryption protocols include:

a) Dynamic key rotation

b) Quantum-resistant algorithms

c) Hardware-based security modules

The method of claim 1, further comprising:

a) Sub-millisecond latency maintenance

b) Automated incident response

c) Contextual authentication

6. TECHNICAL SPECIFICATIONS

1 Protocol Performance Requirements:

- Maximum latency: 0.5ms
- Minimum encryption strength: 256-bit
- Key rotation frequency: Configurable, minimum 1 hour
- Authentication response time: <100ms

2 Implementation Requirements:

- Compatible with standard ICS protocols
- Supports IPv4 and IPv6
- Integrates with existing SCADA systems
- Compliant with IEC 62443 standards

7. LEGAL NOTICES

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2 The invention described herein is protected under international patent laws and treaties.

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8. EXECUTION

IN WITNESS WHEREOF, the undersigned inventors have executed this patent document as of the

date first written above.

/s/ Elena Rodriguez, Ph.D.

Chief Security Architect

DeepShield Systems, Inc.

/s/ James Morrison

VP of Engineering

DeepShield Systems, Inc.

/s/ Wei Zhang, Ph.D.

Senior Security Researcher

DeepShield Systems, Inc.

9. CERTIFICATION

State of Delaware

County of New Castle

Subscribed and sworn to before me on March 12, 2021

/s/ Michael Thompson

Notary Public

My Commission Expires: December 31, 2024

[NOTARY SEAL]