# Garibaldi: KDC

Key Management System

Garibaldi, developed by **PCItek**, is an advanced Key Distribution and Management Center (KDC) designed to provide secure, standards-based cryptographic key (and related policies) management for modern digital substations and critical infrastructure networks. Built around IEC 61850 and IEC 62351 standards, Garibaldi delivers strong mutual authentication, encryption, and automated key lifecycle management to protect multicast messaging, including GOOSE, R-GOOSE, and Sampled Values.

## Empowering the Secure Digital Grid

As the electric power industry transitions to distributed, data-driven operations, the security of real-time communication becomes paramount. Garibaldi enables utilities to safeguard critical control and monitoring communications across substations, control centers, and field devices. It forms the backbone of a cyber-resilient infrastructure capable of scaling from single substations to national grid architectures.

By integrating directly with IEC 61850 systems, Garibaldi ensures compliance with global standards for secure communication, including IEC 62351-6 for GOOSE/Sampled Values and IEC 62351-9 for Group Domain of Interpretation (GDOI) key management. The system offers both centralized and decentralized deployment options to meet varying security and availability needs.

## Key Capabilities and Features

- Standards-based: IEC 61850-8-1, IEC 61850-9-2, IEC 62351-6, and IEC 62351-9 compliant.
- Policy-based key rotation and authentication via GDOI protocol.
- Role-Based Access Control (RBAC) with Radius and certificate-based user authentication.
- Built-in redundancy and failover for high availability.
- HTML5-based management interface with HTTPS support.
- Database flexibility: supports both SQL Server and SQLite.
- OCSP, Syslog, and audit-ready security logging integration
- Redundancy
- Full interoperability with major vendors: GE, Siemens, Schneider, Toshiba, and more.
- Coming Soon: Multi-domain security management supporting centralized or mesh architectures.

Garibaldi combines strong cryptography with real-world engineering practicality—configurations can be completed in minutes using a streamlined, web-based interface. Its architecture supports rapid deployment in test, pilot, or production-scale environments.

## Use Cases Across the Power Ecosystem

- Secure R-GOOSE Messaging: Delivers authenticated, encrypted multicast control for fault isolation, transfer trip, and load shedding applications.
- Remedial Action Schemes: Enable rapid, secure coordination between monitoring and mitigation devices to prevent cascading failures.
- Inverter-Based Resource Security: Provides large-scale key management for distributed renewable assets, ensuring authenticated control and status data exchange.
- Demand Side Management: Scalable to millions of endpoints, supporting low-latency, secure communications for demand response control.
- Garibaldi integrates seamlessly with existing SCADA masters, Certificate Authorities, and RADIUS authentication servers. It supports interaction with syslog-based security monitoring and can operate as a standalone KDC, redundant pairs, or within multi-domain enterprise architectures.

## Future-Ready Design

Garibaldi continues to evolve alongside international standards. Future releases will extend support to managing IEEE 1815 (DNP3) Secure Authentication v6 using the Authority Management Protocol (AMP) and IEEE C37.238 (Precision Time Protocol Security). These developments ensure Garibaldi remains a strategic platform for long-term grid modernization initiatives.

By leveraging IEC 61850 engineering principles, Garibaldi allows security to be expressed within Substation Configuration Language (SCL) files, enabling a unified approach to configuration, deployment, and lifecycle management. Its key rotation, audit, and verification mechanisms bring operational transparency and compliance readiness to critical infrastructure operators.

## Why Choose Garibaldi?

- Proven GDOI technology for secure, resilient multicast communication.
- Scalable to handle thousands of substations.
- Enables interoperability across diverse vendor ecosystems.
- Reduces configuration time—security setup, for IEC 61850, can be in under 5 minutes.
- Strengthens compliance posture with IEC and NERC-CIP frameworks.

Garibaldi represents a cornerstone for the secure, digital substation of the future—providing utilities with confidence that every control signal, measurement, and status update is protected by design. With its flexible deployment models and robust key management, it's not just a security solution—it's a foundation for trustworthy grid operations in an interconnected world.

For more information, visit www.PCITek.com.