QCaller Studio

Comprehensive Features Documentation

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Author: QCaller Studio Development Team

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Introduction

QCaller Studio is a comprehensive VoIP (Voice over Internet Protocol) communication platform specifically designed for broadcast environments. It enables seamless audio communication between various roles in a broadcasting studio while integrating with radio automation, playout, and media management systems. The platform supports multiple studio environments with different color themes and is compatible with any SIP provider for maximum flexibility.

This documentation provides a detailed overview of all features and capabilities of the QCaller Studio system, to help users maximize their experience with the platform.

System Overview

QCaller Studio is an integrated solution for broadcast facilities that brings together multiple communication, automation, and management tools under a single interface. The system coordinates studio communications, audio playout, media management, and scheduling in real-time, providing a centralized solution for broadcast operations.

Key aspects of the system include:

  Real-time communication: SIP-based VoIP system for studio communication
  Role-based interfaces: Different views for producers, talent, admins, and technical staff
  Multi-studio support: Support for Studio A, Studio B, RE Studio, and Tech environments with distinct color schemes
  Radio automation: Comprehensive playlist management and scheduling
  Traffic management: Client, campaign, and advertisement management with invoicing
  AI-powered features: Track analysis, playlist generation, and audio processing

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User Roles

QCaller Studio supports the following user roles, each with a customized interface:

Admin

- Full system access
- User management
- System configuration
- Access to all features and settings
- Complete monitoring and reporting

Producer

- Studio management
- Timer and countdown control
- Call line management
- Show rundown control
- Communication with talent

Talent

- On-air interface
- Timer and countdown visibility
- Communication with producers
- Audio control
- Buzzer functionality

Remote

- Remote participation
- Limited communication access
- Timer visibility
- Basic controls

Tech

- Technical monitoring
- System diagnostics
- Audio processing controls
- Transmitter monitoring
- Configuration settings

Each role has access to specific features and functions tailored to their responsibilities within the broadcast environment.

Studio Environments

QCaller Studio supports multiple studio environments, each with a dedicated color theme for easy visual identification:

Studio A (Orange: #F28C28/D28D2D)

Primary studio environment with all features enabled. The orange color scheme provides a warm, energetic feel appropriate for main studio operations.

Studio B (Green)

Secondary studio environment with equivalent functionality to Studio A. The green color scheme provides visual differentiation for simultaneous operations.

RE Studio (Red)

Remote engagement studio for external connections and remote talent. The red color scheme signifies the external nature of this environment.

Tech (Purple)

Technical operations environment for system monitoring and configuration. The purple color scheme denotes the technical nature of this workspace.

All color schemes are implemented consistently across component borders, buttons, and interface elements to maintain clear visual separation between studio environments.

Technical Architecture

QCaller Studio is built on a modern web application stack with:

Frontend

  React with TypeScript: For type-safe component development
  Tailwind CSS: For responsive styling and theming
  WebSocket: For real-time communication
  SIP.js: For VoIP implementation
  Shadow DOM components: For encapsulated UI elements

Backend

  Express.js: API server for all backend operations
  Socket.IO: For real-time messaging
  Drizzle ORM: For database operations
  PostgreSQL: For persistent data storage
  Authentication middleware: For secure access

Integration Points

  SIP providers: For VoIP communication
  Audio processing: For sound enhancement and normalization
  Media encoding/decoding: For supporting multiple audio formats
  Streaming servers: For internet radio broadcasting

The architecture follows a microservices approach with dedicated components for each major system feature, allowing for scalability and maintainability.

Features

VoIP Communication System

The core of QCaller Studio is its VoIP communication system, providing reliable audio communication between all users in the broadcast environment.

Key Features:

  SIP Protocol Support: Compatible with any SIP provider
  Call Line Management: Handle multiple incoming and outgoing calls
  Audio Quality Control: Audio processing and enhancement for optimal sound
  Call Recording: Record and store conversations for later use
  Visual Call Status: Clear visual indicators for call status
  Multi-participant Calls: Support for conference calls with multiple participants
  Secure Communication: Encrypted audio transmission

Call Management Interface Producers can manage call lines with:

  Call status monitoring
  Caller information display
  Call duration tracking
  One-click call control (answer, hold, hang up)
  Caller priority settings
  Prescreen notes
  History tracking

Studio Management

QCaller Studio provides comprehensive tools for managing studio operations across multiple environments.

Key Features:

  Multi-studio Support: Independent management of Studio A, B, RE Studio, and Tech
  Color-coded Interfaces: Visual differentiation between studio environments
  Resource Allocation: Assign resources (microphones, lines, etc.) to specific studios
  Studio Status Monitoring: Real-time status display of all studio environments
  Quick Switching: Seamless transition between studio environments

Studio Configuration: Customizable settings for each studio
Studio Isolation: Prevent cross-talk between studio environments when needed

Each studio maintains its own state, allowing for parallel operations across multiple broadcast environments.

Radio Automation System

The integrated radio automation system handles all aspects of audio playout and scheduling.

Key Features:

Playlist Management: Create, edit, and manage multiple playlists
Track Organization: Categorize and tag audio tracks
Scheduling: Schedule playlists for automatic playback
Auto-sequencing: Intelligently sequence tracks based on rules
Real-time Control: Manual override and control during broadcast
Jingle Management: Organize and schedule station jingles and IDs
Crossfading: Smooth transitions between tracks
Event Triggering: Schedule actions based on time or events

Playout Features

Multi-format Support: Play WAV, MP3, AAC, FLAC, and other formats
Audio Visualization: Waveform display and audio level monitoring
Cue Points: Set and manage intro/outro points
Track Metadata: Display and edit track information
Search System: Quickly find tracks in the library
Hotkeys: Keyboard shortcuts for common actions
Emergency Content: Quick access to emergency announcements

Timer and Countdown System

The timer system synchronizes timing between producers and talent, ensuring smooth show pacing.

Key Features:

Multiple Timers: Independent timers for Studio A and Studio B
Role-specific Views: Different displays for producers and talent
Danger Zone Alerts: Visual warnings when time is running low
Remote Synchronization: All timers stay synchronized across devices
Preset Durations: Quickly set common time intervals
Manual Adjustment: Fine-tune timing during broadcast
Pause/Resume: Control timer flow during unexpected events
Timer Events: Trigger actions when timers reach specific points

The system uses WebSocket technology to ensure real-time updates across all connected clients, maintaining perfect synchronization between producer and talent views.

Buzzer System

The buzzer system provides immediate attention-grabbing alerts between studio personnel.

Key Features:

Visual Alerts: Flashing/blinking visual indicators
Audio Alerts: Optional sound notifications
Studio-specific Buzzers: Independent buzzers for each studio
Role-based Controls: Controls based on user role
Acknowledgment System: Confirm receipt of buzzer alerts
History Tracking: Record of buzzer activations
Priority Levels: Different urgency levels for alerts
Customizable Duration: Set how long buzzer alerts remain active

The buzzer feature is essential for non-verbal communication during live broadcasts, allowing producers to signal talent without interrupting audio feeds.

Traffic Management

The traffic management system handles commercial content scheduling and client management.

Key Features:

Client Management: Create and manage client records
  Campaign Creation: Set up advertising campaigns with goals and budgets
  Spot Scheduling: Schedule commercial spots throughout the broadcast day
  Invoicing: Generate detailed invoices for clients
  Performance Tracking: Monitor campaign performance and spot plays
  Budget Management: Track spending against campaign budgets
  Discount Management: Apply and track discounts
  VAT Calculation: Automatic tax calculations
  Report Generation: Detailed reports on campaign performance

Client Management Features

  Client Database: Store client information and history
  Contact Management: Track multiple contacts per client
  Activity History: Record of all client interactions
  Document Storage: Store contracts and other documents
  Financial Tracking: Monitor client payment history

Audio Processing

Advanced audio processing capabilities enhance sound quality throughout the system.

Key Features:

  Equalization: Multi-band EQ for sound shaping
  Compression: Dynamic range control
  Limiting: Prevent audio clipping
  Noise Reduction: Clean up audio signals
  Audio Normalization: Consistent volume levels
  Presets: Quickly apply common processing settings
  Real-time Processing: Hear changes as they're made
  Format Conversion: Convert between different audio formats
  Quality Monitoring: Visual feedback on audio quality

The audio processing system supports both real-time processing for live broadcasts and batch processing for media library content.

Internet Radio Streaming

The streaming module enables broadcasting over the internet with multiple format support.

Key Features:

  Multiple Stream Formats: Support for various streaming protocols
  Bitrate Management: Configure stream quality
  Server Integration: Connect to popular streaming servers
  Listener Statistics: Monitor audience size and behavior
  Stream Recording: Archive streams for later use
  Metadata Injection: Send now-playing information to listeners
  Multi-stream Support: Broadcast multiple streams simultaneously
  Stream Health Monitoring: Ensure stable broadcasting

Stream Configuration

  Format Selection: Choose stream encoding format
  Quality Settings: Configure bitrate and quality
  Server Settings: Configure streaming server connection
  Metadata Settings: Configure track information display
  Public Page: Optional public-facing stream page

Media Library Management

The media library system organizes and manages all audio content.

Key Features:

  Track Organization: Categorize and tag audio content
  Metadata Management: Edit and organize track information
  Search System: Find content quickly with advanced search
  Batch Operations: Process multiple files simultaneously
  Format Support: Handle multiple audio formats
  Waveform Generation: Visual representation of audio
  Usage Tracking: Monitor when and how often tracks are used
  Content Rating: Rate and tag tracks for appropriate use

Upload Features

  Bulk Upload: Add multiple files at once
  Format Detection: Automatically identify file formats

Auto-tagging: Extract metadata from files
In/Out Point Detection: Automatically find optimal cue points
Level Analysis: Check and adjust audio levels
FLAC Conversion: Convert uploads to high-quality format
AI Analysis: Use AI to analyze track characteristics

Artificial Intelligence Features

AI capabilities enhance various aspects of the system.

Key Features:

  Track Analysis: Automatic analysis of audio characteristics
  Playlist Generation: AI-powered playlist creation
  Content Recommendations: Suggested tracks based on context
  Audio Enhancement: AI-assisted audio processing
  Metadata Generation: Automatically generate track metadata
  Content Classification: Categorize content by style and mood
  Audience Analytics: Analyze listener preferences and trends
  Voice Recognition: Identify speakers in recorded content

The AI system learns from usage patterns to continually improve its recommendations and analyses.

Audio Logger

The audio logger records and archives broadcast content.

Key Features:

  Multi-input Recording: Record from multiple audio sources
  24/7 Operation: Continuous recording capability
  Storage Management: Organize recordings by date and time
  Input Level Monitoring: Visual representation of input levels
  Format Options: Configure recording quality and format
  Playback Tools: Listen to archived recordings
  Export Options: Extract segments for external use

Annotation: Add notes to recorded segments
Legal Compliance: Meet broadcast archiving requirements

Archive Access Features

Calendar Navigation: Find recordings by date
Search Tools: Search archives by metadata
Segment Editing: Mark in/out points for segments
Export as MP3: Create portable versions of clips
Batch Processing: Work with multiple recordings

Playout System

The playout system handles the actual broadcasting of audio content.

Key Features:

Live Playout: Real-time audio playback
Playlist Automation: Automatic playback of scheduled content
Manual Override: Take control during live broadcasts
Instant Players: Quick access to commonly used audio
Crossfading: Smooth transitions between tracks
Next-up Display: Preview upcoming content
Play History: Record of previously played content
Emergency Interrupt: Override normal playout for urgent content

The playout system integrates with the radio automation system for seamless operation while maintaining the flexibility needed for live broadcasting.

Transmitter Monitoring

Monitor and control broadcast transmitters remotely.

Key Features:

Status Monitoring: Real-time status of transmitters
Alarm System: Visual alerts for transmitter issues

Performance Metrics: Track transmitter performance
Remote Control: Adjust transmitter settings remotely
History Logging: Record of transmitter performance
Fault Detection: Early warning of potential issues
Maintenance Scheduling: Plan maintenance based on performance

The transmitter monitoring system provides peace of mind for technical staff with clear visual indicators and proactive alerting.

User Interface

QCaller Studio features a modern, responsive user interface designed for broadcast professionals:

General UI Principles

  Role-optimized Views: Interfaces tailored to user roles
  Studio-specific Themes: Color coding by studio environment
  Responsive Design: Adapts to different screen sizes
  Dark Mode: Reduced eye strain in studio environments
  Consistent Controls: Familiar patterns across all interfaces
  Accessibility: Support for assistive technologies
  Performance Optimization: Fast loading and response times

Admin Interface

  Dashboard: System overview with key metrics
  Navigation Tabs: Consistent screen dimensions across sections
  Compact Design: Maximum information density
  Configuration Panels: Organized settings access
  User Management: Control user access and permissions

Producer Interface

  Focus on Production: Only production-relevant content
  Timer Controls: Prominent countdown management
  Call Line Management: Clear call status displays
  Communication Tools: Direct access to talent communication
  Show Rundown: Track show elements and timing

Talent Interface

  Distraction-free Design: Only essential elements
  Timer Display: Clear countdown visualization
  Communication Status: See who is connected
  Simple Controls: One-click access to common functions
  Audio Monitoring: Visual feedback on audio status

Internationalization (i18n)

QCaller Studio supports full internationalization across all interfaces:

Language Support

  Complete translation of all text and labels
  Support for right-to-left languages
  Language selection in user preferences
  Regional format support (dates, times, numbers)

Implementation

  React-i18next framework
  Language resource files for all supported languages
  Dynamic language switching without page reload
  Fallback mechanisms for missing translations

Installation and Configuration

System Requirements

  Server: Modern server with multi-core CPU
  Memory: Minimum 8GB RAM
  Storage: SSD storage for optimal performance
  Network: Reliable network connection
  Database: PostgreSQL database
  OS: Linux-based operating system

Installation Process

1. System preparation and dependency installation 2. Database setup and initialization 3. Application deployment 4. Configuration file setup 5. Initial user creation 6. SIP provider configuration 7. System testing

Configuration Options

  General Settings: Application name, organization details
  Audio Settings: Default formats, quality settings
  Network Settings: Connection parameters, timeouts
  Security Settings: Authentication options, session management
  Backup Settings: Automated backup configuration
  Logging Settings: Log level and retention policies

Security Features

QCaller Studio implements comprehensive security measures:

Authentication & Authorization

  Role-based Access Control: Granular permissions by role
  Secure Password Storage: Cryptographic password protection
  Session Management: Secure session handling
  Failed Login Protection: Prevent brute force attacks
  Account Recovery: Secure account recovery process

Data Protection

  Encrypted Communication: Secure data transmission
  Database Security: Protected database connections
  Input Validation: Prevent injection attacks
  Output Sanitization: Prevent XSS vulnerabilities
  File Upload Security: Safe handling of uploaded files

Audit & Compliance

  Activity Logging: Track user actions
  System Monitoring: Detect unusual behavior
  Regular Updates: Security patches and improvements
  Compliance Features: Support for regulatory requirements
  Backup & Recovery: Data protection and disaster recovery

Technical Specifications

Frontend Technology

  Framework: React with TypeScript
  State Management: React Context API
  Real-time Updates: WebSocket and Socket.IO
  Styling: Tailwind CSS
  Audio Processing: Web Audio API
  VoIP Implementation: SIP.js

Backend Technology

  Server: Node.js with Express
  Database: PostgreSQL with Drizzle ORM
  Authentication: Passport.js
  WebSockets: Socket.IO and native WebSockets
  API Structure: RESTful architecture
  Media Processing: FFmpeg integration

Performance Metrics

  Response Time: <100ms for standard operations
  Concurrent Users: Support for 100+ simultaneous users
  Media Library: Support for 100,000+ tracks
  Audio Quality: Up to 320kbps MP3, 24-bit FLAC
  Call Quality: HD Voice support (where available)
  Streaming Quality: Up to 320kbps AAC

Troubleshooting

Common Issues and Solutions

Connection Problems

  Symptom: Unable to connect to the system
  Solution: Check network connection, verify server status, clear browser cache

Audio Issues

  Symptom: No audio or poor audio quality
  Solution: Check microphone settings, verify audio device connections, adjust audio processing settings

Timer Synchronization

  Symptom: Timers not synchronized between users
  Solution: Check network latency, refresh browser, verify WebSocket connection

Database Errors

  Symptom: Unable to save or retrieve data
  Solution: Verify database connection, check disk space, restart database service if necessary

Performance Issues

  Symptom: Slow system response
  Solution: Clear browser cache, check server load, optimize database queries

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Glossary

VoIP: Voice over Internet Protocol, technology for voice communication over the internet

SIP: Session Initiation Protocol, signaling protocol for controlling multimedia communication sessions

Playout: The actual broadcasting of audio content

Traffic: Management of commercial content and advertising

Automation: System for automatic sequencing and playback of content

Buzzer: Alert system for communication between studio roles

Logger: System for recording and archiving broadcast content

Transmitter: Equipment that broadcasts radio signals to listeners

i18n: Internationalization, the process of designing software for multiple languages

WebSocket: Technology for real-time, bidirectional communication between clients and servers