**Video Meet - Enhanced API Specifications & Communication Protocols**

**1. API Architecture Overview**

**1.1 Multi-Protocol Communication Stack**

**HTTP/REST APIs - Traditional cloud-based operations WebSocket - Real-time communication and signaling Local Network Protocols - Direct device-to-device communication File Transfer Protocol - Local network file sharing mDNS/Bonjour - Service discovery and device announcement**

**1.2 API Endpoint Categories**

* **Cloud APIs (/api/v2/) - Server-mediated operations**
* **Local APIs (/local/v1/) - Desktop application local server**
* **Hybrid APIs (/hybrid/v1/) - Cross-network operations**
* **Device APIs (/device/v1/) - Device management and discovery**

**2. Enhanced REST API Endpoints**

**2.1 Authentication Endpoints (/api/v2/auth)**

**POST /api/v2/auth/register Purpose: Create new user account with device support Request Body:**

**{**

**"email": "user@example.com",**

**"username": "johndoe",**

**"firstName": "John",**

**"lastName": "Doe",**

**"password": "securePassword123",**

**"deviceInfo": {**

**"deviceId": "device-uuid-123",**

**"deviceName": "John's MacBook Pro",**

**"platform": "macos",**

**"appVersion": "2.0.0"**

**},**

**"networkPreferences": {**

**"allowLocalDiscovery": true,**

**"autoAcceptLocalInvites": false,**

**"preferLocalConnections": true,**

**"maxLocalParticipants": 10**

**}**

**}**

**Response: User object + JWT token + device registration confirmation Status Codes: 201 (Created), 400 (Validation Error), 409 (User/Device Exists)**

**POST /api/v2/auth/device-login Purpose: Authenticate desktop application with device credentials Request Body:**

**{**

**"deviceId": "device-uuid-123",**

**"deviceKey": "encrypted-device-key",**

**"cloudUserId": "user-cloud-id",**

**"localUserData": {**

**"displayName": "John Doe",**

**"lastSyncVersion": 42**

**}**

**}**

**Response: Device session token + sync requirements Status Codes: 200 (Success), 401 (Invalid Device), 409 (Sync Required)**

**POST /api/v2/auth/guest-session Purpose: Create guest session for local network access Request Body:**

**{**

**"guestName": "John Guest",**

**"deviceId": "temp-device-123",**

**"networkScope": "local",**

**"invitationCode": "INVITE-123"**

**}**

**Response: Temporary guest token + local session info**

**2.2 Device Management (/api/v2/devices)**

**POST /api/v2/devices/register Purpose: Register new desktop application instance Headers: Authorization Bearer token Request Body:**

**{**

**"deviceName": "John's MacBook Pro",**

**"platform": "macos",**

**"architecture": "arm64",**

**"appVersion": "2.0.0",**

**"capabilities": {**

**"supportsP2P": true,**

**"supportsFileSharing": true,**

**"supportsScreenShare": true,**

**"maxParticipants": 50**

**},**

**"networkInterfaces": [**

**{**

**"name": "Wi-Fi",**

**"ipAddress": "192.168.1.100",**

**"subnetMask": "255.255.255.0",**

**"isActive": true,**

**"allowDiscovery": true**

**}**

**]**

**}**

**Response: Device registration object with device ID and keys**

**GET /api/v2/devices Purpose: Get user's registered devices Headers: Authorization Bearer token Response: Array of device objects with online status**

**PUT /api/v2/devices/:deviceId Purpose: Update device information and settings Headers: Authorization Bearer token + Device session token Request Body: Updated device fields Response: Updated device object**

**DELETE /api/v2/devices/:deviceId Purpose: Unregister device Headers: Authorization Bearer token Response: Success message with sync cleanup info**

**POST /api/v2/devices/:deviceId/heartbeat Purpose: Update device online status and network info Headers: Device session token Request Body:**

**{**

**"status": "online",**

**"currentNetwork": {**

**"ipAddress": "192.168.1.100",**

**"networkId": "wifi-home-network",**

**"connectionQuality": {**

**"latency": 15,**

**"bandwidth": 100,**

**"packetLoss": 0.1**

**}**

**},**

**"activeConnections": 3,**

**"systemResources": {**

**"cpuUsage": 25.5,**

**"memoryUsage": 45.2,**

**"availableBandwidth": 85.0**

**}**

**}**

**Response: Server acknowledgment + network topology updates**

**2.3 Enhanced Meeting Management (/api/v2/meetings)**

**POST /api/v2/meetings Purpose: Create meeting with local network support Headers: Authorization Bearer token Request Body:**

**{**

**"title": "Team Standup",**

**"description": "Daily team meeting",**

**"meetingType": "hybrid",**

**"isScheduled": false,**

**"scheduledAt": null,**

**"password": "optional123",**

**"maxParticipants": 10,**

**"settings": {**

**"allowGuests": true,**

**"muteOnJoin": false,**

**"videoOnJoin": true,**

**"waitingRoom": false,**

**"chat": true,**

**"screenShare": true,**

**"recording": false,**

**"allowLocalParticipants": true,**

**"preferLocalConnections": true,**

**"allowFileSharing": true,**

**"maxFileSize": 100,**

**"networkQualityThreshold": 70**

**},**

**"localNetworkConfig": {**

**"broadcastToNetwork": true,**

**"allowNetworkDiscovery": true,**

**"restrictToSubnet": "192.168.1.0/24",**

**"requireDeviceAuth": false**

**}**

**}**

**Response: Meeting object + local network service registration info**

**GET /api/v2/meetings/:roomId/network-status Purpose: Get network topology and connection status for hybrid meeting Headers: Authorization Bearer token Response:**

**{**

**"topology": {**

**"totalParticipants": 8,**

**"localParticipants": 5,**

**"cloudParticipants": 3,**

**"connectionMatrix": [**

**{**

**"participantId": "p1",**

**"connectionType": "direct",**

**"latency": 12,**

**"bandwidth": 95.5**

**}**

**]**

**},**

**"networkHealth": {**

**"overallQuality": 85,**

**"avgLatency": 45,**

**"totalBandwidth": 150.5,**

**"connectionStability": 98.2**

**}**

**}**

**2.4 File Sharing (/api/v2/meetings/:roomId/files)**

**POST /api/v2/meetings/:roomId/files/upload Purpose: Upload file for sharing (cloud storage) Headers: Authorization Bearer token Request: Multipart form data Response: File metadata + sharing URLs**

**GET /api/v2/meetings/:roomId/files Purpose: Get list of shared files in meeting Headers: Authorization Bearer token Response: Array of file objects with download links**

**POST /api/v2/meetings/:roomId/files/share-local Purpose: Announce local file for P2P sharing Headers: Authorization Bearer token Request Body:**

**{**

**"filename": "presentation.pdf",**

**"fileSize": 2048576,**

**"mimeType": "application/pdf",**

**"checksum": "sha256-hash",**

**"localPath": "/local/files/123",**

**"shareMethod": "webrtc",**

**"allowedParticipants": ["p1", "p2"]**

**}**

**Response: File sharing session info + transfer URLs**

**3. Local Network APIs (Desktop Application)**

**3.1 Local Server Endpoints (/local/v1/)**

**GET /local/v1/status Purpose: Get local application status Response:**

**{**

**"version": "2.0.0",**

**"deviceId": "device-123",**

**"status": "online",**

**"discoveryEnabled": true,**

**"currentUser": {**

**"displayName": "John Doe",**

**"cloudLinked": true**

**},**

**"networkInterfaces": [...],**

**"activeMeetings": 2,**

**"discoveredDevices": 5**

**}**

**POST /local/v1/meetings Purpose: Create local-only meeting Request Body:**

**{**

**"title": "Local Team Meeting",**

**"networkScope": "subnet",**

**"maxParticipants": 8,**

**"requirePassword": false,**

**"allowFileSharing": true,**

**"announceOnNetwork": true**

**}**

**Response: Local meeting object + mDNS service registration**

**GET /local/v1/discovery/devices Purpose: Get discovered local network devices Response: Array of discovered devices with capabilities**

**POST /local/v1/discovery/scan Purpose: Trigger network device discovery scan Request Body:**

**{**

**"scanTimeout": 5000,**

**"includeInactive": false,**

**"networkScope": "subnet"**

**}**

**Response: Scan results + updated device list**

**POST /local/v1/invitations/send Purpose: Send direct invitation to local device Request Body:**

**{**

**"targetDeviceId": "device-456",**

**"meetingId": "local-meeting-123",**

**"message": "Join our team standup",**

**"priority": "normal"**

**}**

**Response: Invitation delivery status**

**3.2 Device-to-Device Communication**

**POST /device/v1/invitations/receive Purpose: Receive meeting invitation from another device Request Body:**

**{**

**"fromDeviceId": "device-123",**

**"meetingInfo": {**

**"title": "Team Standup",**

**"hostName": "John Doe",**

**"participantCount": 3,**

**"requiresPassword": false**

**},**

**"invitationId": "inv-789",**

**"expiresAt": "2024-01-15T11:00:00Z"**

**}**

**Response: Invitation acknowledgment**

**POST /device/v1/invitations/respond Purpose: Respond to meeting invitation Request Body:**

**{**

**"invitationId": "inv-789",**

**"response": "accept",**

**"guestName": "Jane Smith",**

**"deviceCapabilities": {**

**"supportsVideo": true,**

**"supportsAudio": true,**

**"supportsScreenShare": true**

**}**

**}**

**Response: Meeting join instructions + connection details**

**4. Enhanced WebSocket Events**

**4.1 Connection and Discovery Events**

**device\_discovery\_update Direction: Local Server → Client Purpose: Notify about network device changes Payload:**

**{**

**"eventType": "device\_discovered",**

**"device": {**

**"deviceId": "device-456",**

**"deviceName": "Alice's iMac",**

**"userName": "Alice Johnson",**

**"ipAddress": "192.168.1.105",**

**"capabilities": {**

**"maxParticipants": 20,**

**"supportsFileSharing": true**

**},**

**"status": "available",**

**"lastSeen": "2024-01-15T10:30:00Z"**

**}**

**}**

**network\_topology\_changed Direction: Server → All Clients Purpose: Update network connection topology Payload:**

**{**

**"meetingId": "meeting-123",**

**"topology": {**

**"connections": [**

**{**

**"fromParticipant": "p1",**

**"toParticipant": "p2",**

**"connectionType": "direct",**

**"quality": {**

**"latency": 25,**

**"bandwidth": 50.5,**

**"stability": 95**

**}**

**}**

**],**

**"optimalPaths": {**

**"p1": ["p2", "p3"],**

**"p2": ["p1", "p4"]**

**}**

**}**

**}**

**local\_invitation\_received Direction: Local Server → Client Purpose: Notify about incoming local meeting invitation Payload:**

**{**

**"invitationId": "inv-123",**

**"fromDevice": {**

**"deviceId": "device-456",**

**"deviceName": "John's MacBook",**

**"userName": "John Doe"**

**},**

**"meeting": {**

**"title": "Quick Discussion",**

**"estimatedDuration": "15 minutes",**

**"participantCount": 2**

**},**

**"expiresAt": "2024-01-15T10:35:00Z"**

**}**

**4.2 File Sharing Events**

**file\_share\_offered Direction: Client → Server → Target Clients Purpose: Offer file for P2P sharing Payload:**

**{**

**"fileId": "file-123",**

**"filename": "document.pdf",**

**"fileSize": 1048576,**

**"mimeType": "application/pdf",**

**"senderId": "participant-456",**

**"senderName": "John Doe",**

**"transferMethod": "webrtc",**

**"estimatedTime": "30 seconds",**

**"previewUrl": "data:image/jpeg;base64,..."**

**}**

**file\_transfer\_progress Direction: Bidirectional Purpose: Update file transfer progress Payload:**

**{**

**"fileId": "file-123",**

**"transferId": "transfer-789",**

**"progress": 65.5,**

**"transferredBytes": 686080,**

**"transferSpeed": 102400,**

**"estimatedTimeRemaining": 8,**

**"status": "transferring"**

**}**

**file\_transfer\_completed Direction: Bidirectional Purpose: Notify file transfer completion Payload:**

**{**

**"fileId": "file-123",**

**"transferId": "transfer-789",**

**"status": "completed",**

**"localPath": "/downloads/document.pdf",**

**"verificationStatus": "verified",**

**"finalSize": 1048576**

**}**

**4.3 Connection Management Events**

**connection\_optimization Direction: Server → Clients Purpose: Optimize connection paths for better performance Payload:**

**{**

**"meetingId": "meeting-123",**

**"optimizations": [**

**{**

**"participantId": "p1",**

**"recommendation": "switch\_to\_direct",**

**"reason": "better\_latency",**

**"expectedImprovement": {**

**"latencyReduction": 40,**

**"bandwidthIncrease": 25.5**

**}**

**}**

**]**

**}**

**network\_quality\_alert Direction: Server → Clients Purpose: Alert about network quality issues Payload:**

**{**

**"alertType": "poor\_connection",**

**"severity": "warning",**

**"affectedParticipants": ["p1", "p2"],**

**"metrics": {**

**"avgLatency": 250,**

**"packetLoss": 5.2,**

**"bandwidth": 15.5**

**},**

**"recommendations": [**

**"switch\_to\_audio\_only",**

**"reduce\_video\_quality",**

**"check\_network\_connection"**

**]**

**}**

**4.4 Hybrid Meeting Events**

**hybrid\_participant\_joined Direction: Server → All Clients Purpose: Notify when participant joins via different connection type Payload:**

**{**

**"participant": {**

**"id": "participant-789",**

**"name": "Alice Johnson",**

**"connectionType": "local",**

**"deviceInfo": {**

**"deviceName": "Alice's iMac",**

**"platform": "macos",**

**"ipAddress": "192.168.1.105"**

**},**

**"capabilities": {**

**"canReceiveDirectFiles": true,**

**"preferredVideoQuality": "1080p",**

**"bandwidthLimit": 100**

**}**

**}**

**}**

**bridge\_connection\_established Direction: Server → All Clients Purpose: Notify about bridge connection between local and cloud participants Payload:**

**{**

**"bridgeId": "bridge-123",**

**"bridgeParticipant": "participant-456",**

**"localParticipants": ["p1", "p2"],**

**"cloudParticipants": ["p3", "p4"],**

**"bridgeQuality": {**

**"stability": 95,**

**"latency": 45,**

**"bandwidth": 75.5**

**}**

**}**

**5. mDNS/Bonjour Service Discovery**

**5.1 Service Registration**

**Service Type: \_videomeet.\_tcp.local Service Name: {UserName}'s {DeviceName}.\_videomeet.\_tcp.local**

**TXT Record Format:**

**version=2.0**

**user=John Doe**

**device=macbook-pro-123**

**status=available**

**participants=3**

**maxparticipants=10**

**capabilities=video,audio,screenshare,fileshare**

**secure=true**

**port=8080**

**protocol=webrtc**

**meeting=local-meeting-456**

**5.2 Service Discovery Protocol**

**Discovery Query:**

* **Query Type: PTR**
* **Query Name: \_videomeet.\_tcp.local**
* **Response: List of available Video Meet services**

**Service Resolution:**

* **Query Type: SRV + TXT**
* **Query Name: {ServiceName}.\_videomeet.\_tcp.local**
* **Response: IP address, port, and service metadata**

**6. Error Handling and Status Codes**

**6.1 Enhanced HTTP Error Responses**

**{**

**"error": {**

**"code": "NETWORK\_DISCOVERY\_FAILED",**

**"message": "Unable to discover devices on local network",**

**"details": {**

**"networkInterface": "Wi-Fi",**

**"errorType": "permission\_denied",**

**"suggestion": "Check network permissions in system settings"**

**},**

**"retryable": true,**

**"retryAfter": 30**

**}**

**}**

**6.2 Local Network Error Codes**

* **DEVICE\_NOT\_FOUND - Target device not discoverable**
* **NETWORK\_PERMISSION\_DENIED - Insufficient network permissions**
* **P2P\_CONNECTION\_FAILED - Direct connection establishment failed**
* **FILE\_TRANSFER\_INTERRUPTED - File transfer was interrupted**
* **MDNS\_SERVICE\_UNAVAILABLE - mDNS service not available**
* **NETWORK\_BRIDGE\_FAILED - Bridge between local and cloud failed**

**6.3 WebSocket Error Events**

**local\_network\_error Direction: Server → Client Purpose: Report local network-specific errors Payload:**

**{**

**"errorCode": "P2P\_CONNECTION\_TIMEOUT",**

**"message": "Failed to establish direct connection",**

**"context": {**

**"targetDevice": "device-456",**

**"networkType": "wifi",**

**"attemptedMethods": ["direct", "stun", "turn"]**

**},**

**"fallbackOptions": [**

**"relay\_via\_server",**

**"audio\_only\_mode"**

**],**

**"autoRetry": true,**

**"retryDelay": 5000**

**}**

**7. Rate Limiting and Security**

**7.1 Enhanced Rate Limits**

**Local Network Operations:**

* **Device discovery scans: 10 per minute per device**
* **Local invitations: 20 per hour per device**
* **File sharing: 5 concurrent transfers per device**
* **mDNS queries: 100 per minute per device**

**Hybrid Operations:**

* **Bridge connections: 5 per meeting per participant**
* **Network topology updates: 60 per minute per meeting**
* **Connection optimizations: 10 per minute per participant**

**7.2 Security Considerations**

**Device Authentication:**

* **Certificate-based device identity verification**
* **Secure key exchange for P2P connections**
* **Network-based access control lists**

**Local Network Security:**

* **Encrypted P2P communication (DTLS/SRTP)**
* **File transfer integrity verification (SHA-256)**
* **Network discovery opt-in permissions**

**This enhanced API specification provides comprehensive support for desktop applications, local network discovery, and hybrid cloud-local meetings while maintaining security and performance standards.**