Comprehensive Messaging Application Class Diagram

User
+UUID userId
+String name
+String email
+String passwordHash
+String status
+DateTime lastSeen

+register()
+login()
+logout()
+updateProfile()
+getContacts()

AuthService
+login(email, password)
+register(userData)
+logout()

User —"authenticates with"→ AuthService

AIAgentChat
+UUID sessionId

+startSession()
+sendQuery(query)
+receiveResponse()

User —"initiates"→ AIAgentChat

AIService
+grammarCorrect(text)
+enhanceClarity(text)
+summarizeText(text)
+generateLongDraft(prompt)

AIAgentChat —"uses"→ AIService

DatabaseService
+saveMessage(message)
+fetchMessages(chatId)
+syncRealtime()

AIService —"logs queries"→ DatabaseService

WebRTCSession
+UUID sessionId

+startAudioCall()
+startVideoCall()
+endCall()

User —"initiates call"→ WebRTCSession

SignalProtocol
+encrypt(message)
+decrypt(message)
+generateSessionKeys()

WebRTCSession —"secures stream"→ SignalProtocol

Chat
+UUID chatId
+String chatType // single/group
+List~User~ participants
+DateTime createdAt

+addParticipant(User)
+removeParticipant(User)
+getMessages()

User —participates in→ Chat

WebSocketManager
+connect()
+sendMessage(message)
+receiveMessage()

Chat —"uses"→ WebSocketManager

WebSocketManager —"persists"→ DatabaseService

Message
+UUID messageId
+String content
+DateTime timestamp
+Boolean isRead
+MessageType type // text, media, AI

+send()
+edit()
+delete()

Chat —contains→ Message

Message —secured by→ SignalProtocol

Multimedia
+UUID mediaId
+String fileType
+String url

+upload()
+download()

Message —may include→ Multimedia