**End-to-End Technical Guide: Integration of Agent Assist Application with PBX and CRM Systems**

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### 1. Introduction

Agent Assist is an AI-driven application that supports customer service agents in real-time during customer interactions by providing knowledge suggestions, call summaries, and predictive analytics. For it to function optimally, seamless integration with both the telephony system (PBX) and the CRM is essential.

### 2. Overview of Systems

#### PBX (Private Branch Exchange)

* Manages call routing and switching.
* Interfaces: SIP, RTP, and CTI.
* Can be cloud-based or on-premise.
* Delivers call metadata and voice streams.

**Popular PBX Systems:**

* **On-Premise PBX:**
  + Cisco Unified Communications Manager (CUCM)
  + Avaya Aura
  + Mitel MiVoice Business
  + NEC UNIVERGE SV9100
  + Alcatel-Lucent OmniPCX
  + Panasonic KX-NS Series
* **CCaaS / Cloud PBX Providers:**
  + Genesys Cloud CX
  + Twilio Flex
  + Amazon Connect
  + NICE CXone
  + Five9
  + RingCentral Contact Center
  + Vonage Business Communications
  + Zoom Phone

#### CRM (Customer Relationship Management)

* Holds customer data, interaction history, tickets.
* Examples: Salesforce, Zendesk, Microsoft Dynamics.
* Integration via REST APIs or middleware connectors.

#### Agent Assist

* Natural Language Understanding (NLU) engine.
* Provides real-time transcription, recommendations, and summaries.
* Requires voice data (live or transcribed) and customer context from CRM.

### 3. Deployment Models

#### CCaaS (Contact Center as a Service)

* Cloud-hosted call handling.
* Scalability and low infrastructure maintenance.
* APIs provided for call events and recording.

#### On-Premise

* Internal PBX systems (Avaya, Cisco).
* More control, but limited flexibility and scalability.
* May require SIP trunking or CTI connectors for integration.

### 4. High-Level Architecture

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| | | | | |  
| Customer Call +----->+ PBX +----->+ CRM System |  
| | SIP | (On-Prem/Cloud) | API | |  
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 | Middleware/API +<---+  
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 | Agent Assist |  
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### 5. Detailed Component Breakdown

#### Telephony (PBX)

* **Call Routing Engine**: Directs calls to available agents.
* **Session Border Controller (SBC)**: Ensures secure SIP trunking.
* **Call Metadata**: Captures caller ID, duration, start time.
* **Integration Point**: Via SIP, CTI, or WebSocket for real-time signaling.

#### CRM Application

* **Customer Profile Service**: Retrieves full profile.
* **Interaction History**: Past tickets, notes, chat logs.
* **Case Management**: Ticket creation on call start.
* **Integration Point**: Webhooks and APIs to fetch/push data.

#### Agent Assist Engine

* **Speech Recognition**: Transcribes audio into text.
* **NLU Pipeline**: Identifies intents, entities.
* **Knowledge Base Connector**: Queries knowledge articles.
* **Recommendation Engine**: Suggests responses/actions.
* **Call Summary Generator**: Wraps up key points.

#### Middleware / Event Bus

* **WebSocket Server**: For real-time message relay.
* **Event Router**: Routes call events, customer IDs.
* **API Gateway**: Central access point for all systems.
* **Security Layer**: OAuth, SAML for auth, encryption for data.

### 6. Call Flow and Integration

#### Inbound Call Lifecycle:

1. **Call Initiation**: Customer dials number → PBX routes call.
2. **Call Metadata Capture**: SIP INVITE contains metadata.
3. **CRM Lookup**: Customer ID fetched using caller ID.
4. **Agent Screen Pop**: CRM data is displayed to agent.
5. **Agent Assist Activation**: Call audio is streamed/transcribed.
6. **Real-Time Suggestions**: Agent Assist provides prompts.
7. **Call Summary**: Generated and pushed into CRM.

#### Outbound Call Lifecycle:

1. **Agent Dials**: Through CRM or softphone.
2. **PBX Establishes Call**: SIP session setup.
3. **Agent Assist Starts**: Transcription and analysis begin.
4. **CRM Sync**: New call logged, data updated.
5. **Wrap-up**: Summary written back to CRM.

#### Data Sync & Enrichment

* Live transcription → CRM tag mapping
* CRM case topics → Assist keyword triggers
* Knowledge article usage → CRM analytics

### 7. Example Scenario

**Scenario:** A customer, John, calls his bank to ask about a recent transaction on his credit card.

**Step-by-Step Flow:**

1. **Call Arrival**: John dials the bank’s helpline. The PBX receives the call.
2. **Call Routing**: PBX identifies an available agent (Sarah) and routes the call.
3. **Caller ID Match**: PBX sends John’s number to the CRM via middleware.
4. **CRM Lookup**: CRM fetches John’s profile using his number.
5. **Screen Pop**: Sarah sees John’s details and past interaction history on her screen.
6. **Audio Streaming**: As soon as the call begins, the audio is streamed to Agent Assist.
7. **Live Transcription**: Agent Assist converts John’s voice into real-time text.
8. **Intent Recognition**: Agent Assist identifies that John is asking about a transaction.
9. **Knowledge Suggestion**: It searches and recommends a help article about transaction disputes.
10. **Agent Support**: Sarah uses the suggestion to explain the process to John.
11. **Auto-Summary**: Once the call ends, Agent Assist writes a summary: “John asked about a $300 transaction on 14th June. Agent explained the dispute process.”
12. **CRM Update**: This summary is added to John’s CRM record for future reference.

This entire flow happens in seconds, enhancing both the customer and agent experience.

### 8. Security Considerations

* **Voice Data Encryption**: TLS for signaling, SRTP for media.
* **API Security**: OAuth2, rate limiting, IP whitelisting.
* **Data Residency**: Compliance with GDPR, HIPAA.
* **Authentication**: SSO and multi-factor for agents.

### 9. Conclusion

Integrating Agent Assist with PBX and CRM transforms agent efficiency and customer satisfaction. A well-architected flow—considering real-time data streaming, secure API integrations, and context-aware automation—creates a robust ecosystem where human and machine collaboration thrives.

*Diagram Key:*

* Arrows represent direction of data or control.
* SIP: Session Initiation Protocol.
* RTP: Real-time Transport Protocol.
* CRM: Customer Relationship Management.
* API: Application Programming Interface.
* NLU: Natural Language Understanding.

**Appendix: Suggested Tools and Technologies**

* **PBX Systems:**
  + *On-Premise:* Cisco CUCM, Avaya Aura, Mitel MiVoice, NEC SV9100, Alcatel-Lucent, Panasonic NS Series
  + *CCaaS Providers:* Genesys Cloud, Twilio Flex, Amazon Connect, NICE CXone, Five9, RingCentral, Vonage, Zoom Phone
* **CRM:** Salesforce, HubSpot, Microsoft Dynamics, Zendesk, ServiceNow
* **Agent Assist:** Google Contact Center AI, AWS Contact Lens, Cognigy, Observe.AI, Cresta
* **Middleware/Event Bus:** MuleSoft, Apache Kafka, AWS EventBridge, Azure Event Grid