

SPEC-04: Alice Module

1. Background

The **Alice** module delivers adaptive conversational intelligence within Hearthlink. It manages dynamic chat sessions, builds a **Cognitive Behavior Profile (CBP)** from user interactions, and exposes context-aware actions. Alice powers user-facing chat UIs, automations via the Project Command framework, and informs personalization across the platform.

2. Requirements (MoSCoW)

Must have

- Stateful chat sessions with context window management
- Text and voice input support with transcription
- **CBP Panel** capturing sentiment, engagement, and behavioral metrics
- Inline actions & quick commands (Diagnostics, Observatory)
- Secure API with OAuth2 scopes: `alice.session.*`, `alice.message.*`, `alice.cbp.*`

Should have

- Persistent session history in Vault for auditing and analysis
- Editable persona traits via quick trait editor
- Settings panel for conversation preferences and LLM backend selection

Could have

- Multi-language support with locale-based models
- Customized voice activation phrases per user

Won't have (this increment)

- External workflow connectors beyond Project Command
- Extensive analytics dashboards (handled by Core Services)

3. Method

3.1 Architecture Diagram

```
@startuml
package "Alice Frontend" {
    [ChatUI] --> [Alice API]
    [CBPPanel] --> [Alice API]
    [SettingsPanel] --> [Alice API]
}
```

```

package "Alice Backend" {
  [API Service] --> [Session Store]
  [API Service] --> [CBP Engine]
  [API Service] --> [LLM Backend]
  [API Service] --> [Vault]
}
[ChatUI] -> [Session Store] : GET/POST messages
[CBP Engine] --> [CBP Store]
[LLM Backend] -> [API Service]
@enduml

```

3.2 Data Schema

```

@startuml
table Session {
  + session_id : UUID [PK]
  + user_id    : UUID
  + persona_id : UUID
  + created_at : TIMESTAMP
  + updated_at : TIMESTAMP
}

table Message {
  + msg_id      : UUID [PK]
  + session_id  : UUID [FK]
  + sender      : ENUM('user','assistant')
  + content     : TEXT
  + timestamp   : TIMESTAMP
}

table CBPProfile {
  + profile_id : UUID [PK]
  + session_id : UUID [FK]
  + sentiment  : FLOAT
  + engagement : FLOAT
  + metrics    : JSON
  + updated_at : TIMESTAMP
}
@enduml

```

4. UI Components & Wireframes

4.1 Chat Interface Panel

```
+-----+
| Alice Chat – Session <ID>                               |
| [Message History Scrollable Area]                       |
|                                                         |
| [TextInput][Send][VoiceToggle]                         |
+-----+
```

Component	Function	API/Data Call
MessageHistory	Displays messages with sender styling	<code>GET /v1/sessions/{id}/messages?limit=50</code>
TextInputField	Captures user text	N/A
SendButton	Sends user message	<code>POST /v1/sessions/{id}/messages</code>
VoiceToggle	Toggles voice input and transcription	Browser Web Speech API → POST message
TypingIndicator	Shows assistant typing status	<code>GET /v1/sessions/{id}/typing</code>

4.2 CBP Panel

```
+-----+
| Cognitive Behavior Profile                               |
| [Summary Cards: Sentiment, Engagement, Rhythm]          |
| [History Timeline View]                                 |
| [Configure Triggers] [Export Profile]                   |
+-----+
```

Component	Function	API/Data Call
SummaryCards	Shows current CBP metrics	<code>GET /v1/sessions/{id}/cbp/summary</code>
TimelineView	Displays metric history over session	<code>GET /v1/sessions/{id}/cbp/timeline</code>
ConfigureTriggersBtn	Opens modal to set adaptive triggers	N/A
ExportProfileBtn	Exports CBP JSON	<code>GET /v1/sessions/{id}/cbp/export</code>

4.3 Settings Panel

```
+-----+
| Alice Settings                               |
| [LLM Backend ▼] [Model ▼] [Response Timeout] |
| [Default Persona ▼] [Language ▼]           |
| [Save] [Cancel]                           |
+-----+
```

Component	Function	API/Data Call
BackendDropdown	Select LLM backend (OpenAI/Claude/Local)	<code>GET /v1/settings</code> , <code>PUT /v1/settings</code>
ModelDropdown	Choose model for selected backend	
TimeoutInput	Set max response latency	
PersonaDropdown	Select default persona	
LanguageDropdown	Choose locale	
SaveSettingsButton	Persist settings	<code>PUT /v1/settings</code>

5. API Endpoints

Method	Path	Description	Auth Scope
POST	<code>/v1/sessions</code>	Create or resume a session	<code>alice.session.write</code>
GET	<code>/v1/sessions/{id}</code>	Retrieve session metadata	<code>alice.session.read</code>
GET	<code>/v1/sessions/{id}/messages</code>	Fetch recent messages	<code>alice.message.read</code>
POST	<code>/v1/sessions/{id}/messages</code>	Post user message	<code>alice.message.write</code>
GET	<code>/v1/sessions/{id}/typing</code>	Get typing status	<code>alice.message.read</code>
GET	<code>/v1/sessions/{id}/cbp/summary</code>	Fetch CBP summary	<code>alice.cbp.read</code>
GET	<code>/v1/sessions/{id}/cbp/timeline</code>	Fetch CBP history	<code>alice.cbp.read</code>
GET	<code>/v1/sessions/{id}/cbp/export</code>	Export full CBP profile	<code>alice.cbp.read</code>
GET	<code>/v1/settings</code>	Retrieve user-specific Alice settings	<code>alice.settings.read</code>

Method	Path	Description	Auth Scope
PUT	/v1/settings	Update user-specific Alice settings	<code>alice.settings.write</code>

6. Implementation

1. Develop React components for Chat, CBP, and Settings panels.
2. Implement WebSocket & REST API clients.
3. Build CBP Engine service to compute metrics post-message ingest.
4. Persist session and CBP data to Vault/Database.
5. Integrate voice transcription stream via Web Speech API and backend processing.
6. Write unit, E2E tests covering 95% of UI flows and API contracts.

7. Milestones

Milestone	Timeline	Owner
Chat Interface MVP	Week 1	Frontend Team
CBP Engine & Panel	Week 2	ML/Backend Team
Settings Panel & Integration	Week 3	Full-stack Team
Voice Integration	Week 4	Voice Lead
Testing & Accessibility	Week 5	QA & Accessibility

8. Gathering Results

- Session creation & messaging success rate $\geq 99.9\%$
- CBP computation latency < 200 ms per message
- Settings persist and apply correctly across reloads
- Voice transcription accuracy $\geq 90\%$ in test scenarios
- Accessibility audit passes WCAG 2.1 AA

10. Additional Enhancement Suggestions

Building on your feedback and Alice's core focus on user well-being and contextual intelligence, consider these targeted enhancements:

- **Contextual Smart Replies** \ Provide proactive suggestion chips based on CBP insights (e.g., "Would you like a summary of today's discussion?") to accelerate common tasks. *Absolutely*
- **Adaptive UI Themes (Alice Only)** \ Dynamically adjust Alice's chat interface colors or fonts based on detected user mood or time of day, leveraging CBP sentiment data. This personalization boosts engagement without affecting other modules.

- **Expressive Avatar**\ Introduce an animated avatar for Alice in the chat UI that reflects core emotions (happy, thoughtful, concerned) with minimal resource overhead (simple SVG-based animations or CSS-driven transitions).
- **Contextual Well-Being Prompts**\ Leverage CBP to send timed, empathetic reminders (e.g., “You’ve been focused for two hours—consider a short break.”) to encourage healthy behaviors. *Confirmed*
- **Session Summaries & Export**\ After conversation end, auto-generate a concise transcript summary and action-item list. Expose an “Export to Alden Tasks” button so Alden can mirror and integrate these action items into the user’s task list. *Affirmative*
- **Privacy Mode Toggle**\ Support a “Privacy Mode” where CBP recording pauses and chat data is held only in volatile memory—discarded at session end—to protect sensitive interactions. *Supported*
- **Quick Reaction Buttons**\ Replace thumbs-up/down with simple “+” and “-” buttons aligned with Alice’s minimal theme to capture immediate feedback on each assistant message, feeding back into CBP adjustments in real time.
- **Persona Switching Shortcut**\ Provide both a voice command (e.g., “Switch to [PersonaName]”) and a manual dropdown in the chat header for on-the-fly persona changes local to Alice’s session.
- **Session Rating Prompt**\ After a configurable session duration (e.g., sessions longer than X minutes, set in Alice Settings), display a casual prompt—“Do you have any feedback on how that session went?”—with a 1–5 star selector and optional text comment. This prompt respects user preference to enable/disable ratings in settings.

*Removed multi-modal input and escalation suggestions as they overlap or conflict with performance constraints and Alice’s role as the specialized diagnostic agent.**Session Rating Prompt**\ At session end, prompt the user for a one-click session satisfaction rating (e.g., 1–5 stars) and optional comment, feeding into system analytics and CBP refinement.

Removed multi-modal input and escalation suggestions as they overlap or conflict with performance constraints and Alice’s role as the specialized diagnostic agent.

11. System Amendments. System Amendments

Reflecting cross-cutting enhancements and avoiding redundancy:

- **Audit Trail Explorer**\ Enhancement to existing Vault Module (SPEC-02): extend the Audit Log Viewer to filter across Vault and Sentry events for comprehensive traceability.
- **Usage Analytics Integration**\ Enhancement to Core Services (SPEC-07): surface Alice session and CBP metrics within the Usage Analytics Dashboard to track conversational load and engagement trends.

9. References & Dependencies References & Dependencies

- **Vault Module** (SPEC-02) for session persistence and audit
- **Synapse Module** (SPEC-05) for message routing
- **Core Services** (SPEC-07) for auth, settings, and metrics
- **LLM Backend Setup**: LLM_BACKEND_SETUP.md
- **Voice Policy**: VOICE_ACCESS_POLICY.md

Need Professional Help in Developing Your Architecture?

Please contact me at sammuti.com :)