

AI Knowledge System

Overview

The Sports Bar AI Assistant now includes a powerful knowledge base system that has learned from **all system documentation**. This allows the AI to provide accurate, context-aware assistance for troubleshooting, system understanding, and optimization suggestions.

Knowledge Base Statistics

- **Total Document Chunks**: 559
- **PDF Documents**: 60 (equipment manuals, configuration guides)
- **Markdown Files**: 65 (system documentation, implementation guides)
- **Total Content**: 1,471,423 characters of technical documentation

Documentation Included

Equipment Manuals

- Atlas IED Audio Processor (AZM4/AZM8) Documentation
 - User Manual (ATS006332)
 - Data Sheets
 - 3rd Party Control Guide
 - Atmosphere Signal Processor
- Wolf Pack HDMI Matrix Switcher
- Global Cache iTach IR Control
- DirecTV Control API
- Fire TV Integration

System Configuration

- Matrix control configuration and setup
- Audio zone management
- TV input/output mapping
- Device discovery and CEC control
- Network configuration

Implementation Guides

- AI enhancements and device insights
- Sports guide integration
- NFHS streaming setup
- Bartender remote interface
- Smart scheduler system
- Soundtrack integration
- Backup and restore procedures

Development Documentation

- API reference
- Database schema
- Component architecture
- Styling standards
- GitHub synchronization
- Update procedures

How It Works

1. Document Processing

The system processes all PDFs and Markdown files:

- Extracts text from PDFs using pdf-parse
- Reads and indexes markdown documentation
- Chunks large documents for efficient retrieval
- Maintains metadata (source, title, section)

2. Knowledge Search

When you ask a question:

- The system searches for relevant document chunks
- Ranks results by relevance using keyword matching
- Selects the top 5 most relevant sources
- Builds context from the documentation

3. AI Response Generation

The AI (Ollama) receives:

- Your question
- Relevant documentation context
- Source citations

This allows the AI to provide:

- Accurate technical information
- Specific configuration details
- Troubleshooting steps based on manuals
- System optimization suggestions

Using the AI Assistant

Access

Navigate to: `http://192.168.1.25:3001/ai-assistant`

Or click "AI Assistant" from the main menu.

Features

Knowledge Base Toggle

- **Enabled** (Recommended): Uses documentation for system-specific questions
- **Disabled**: General AI responses without documentation context

Question Examples

Equipment Configuration:

- "How do I configure the Atlas audio processor for the main bar zone?"
- "What are the IR commands for DirecTV channel control?"
- "Explain the Wolf Pack matrix input/output configuration"

Troubleshooting:

- "TV 8 is showing no signal, how do I troubleshoot?"
- "The audio in the pavilion isn't working, what should I check?"
- "DirecTV box on input 5 isn't responding to commands"

System Understanding:

- "What devices are connected to the video matrix?"
- "How does the CEC TV power control work?"
- "Explain the bartender remote interface layout"

Optimization:

- "How can I improve audio quality in the VIP area?"
- "What are best practices for matrix input management?"
- "Suggest improvements for the sports guide system"

Response Features

- **Contextual Answers**: Based on actual system documentation
- **Source Citations**: Shows which documents were referenced
- **Technical Accuracy**: Uses official manuals and guides
- **Real-time**: Powered by local Ollama AI (no cloud dependency)

Rebuilding the Knowledge Base

When to Rebuild

- After uploading new equipment manuals
- When documentation is updated
- After system configuration changes
- New features are documented

How to Rebuild

From the UI:

1. Go to AI Assistant page
2. Click the refresh icon next to Knowledge Base stats
3. Wait for rebuild to complete

From Command Line:

```
``bash
cd /home/ubuntu/Sports-Bar-TV-Controller
./build-knowledge-base.sh
``
```

Automatic Updates

The knowledge base automatically includes:

- All PDFs in project root and uploads/
- All .md files (excluding node_modules)
- Newly added documentation

Technical Details

Architecture

```

graph TD
    User[User Query] --> Search[Search]
    Search --> Relevance[Relevance]
    Relevance --> Ranking[Ranking]
    Ranking --> Results[Results]
```

The architecture follows a linear flow from User Query to Results, passing through Search, Relevance, and Ranking stages.

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### File Locations

- **Knowledge Base**: `/data/ai-knowledge-base.json``
- **Build Script**: `/scripts/build-knowledge-base.ts``
- **Search Library**: `/src/lib/ai-knowledge.ts``
- **API Endpoints**:
  - `/api/ai/knowledge-query`` - KB stats and search
  - `/api/ai/enhanced-chat`` - AI chat with knowledge
  - `/api/ai/rebuild-knowledge-base`` - Rebuild KB

### Performance

- **Search Speed**: < 100ms for most queries
- **Context Building**: < 50ms
- **AI Response Time**: 2-10 seconds (depends on question complexity)
- **Memory Usage**: ~100MB for knowledge base
- **Cache Duration**: 5 minutes for KB in memory

## Best Practices

### Asking Questions

- Do:**
- Be specific: "Configure Atlas zone 3 for patio"
  - Include context: "TV 8 shows no signal when switching to DirecTV"
  - Ask about documentation: "What does the Atlas manual say about EQ settings?"
- Don't:**
- Be too vague: "Help with audio"
  - Ask non-system questions: "What's the weather?"
  - Expect real-time status: "Is TV 8 currently on?" (use remote interface for this)

### Managing Documentation

- Add New Manuals:**
1. Upload PDF to `/uploads/`` or project root
  2. Rebuild knowledge base
  3. AI will now have access to that information
- Update Existing Docs:**
1. Modify .md files as needed
  2. Rebuild knowledge base
  3. Changes reflected immediately
- Remove Outdated Info:**
1. Delete or archive old PDFs/MD files
  2. Rebuild knowledge base
  3. AI will no longer reference removed content

## Troubleshooting

- ### "No relevant documentation found"
- Rebuild the knowledge base
  - Check if the topic is covered in uploaded docs
  - Try rephrasing your question

- ### Slow responses
- Check Ollama service status: `systemctl status ollama``
  - Verify system resources: `htop``
  - Consider using a smaller AI model

- ### Inaccurate responses
- Enable knowledge base toggle
  - Rebuild KB to ensure latest docs are included
  - Be more specific in your question

### ### "Ollama connection error"

- Verify Ollama is running: `systemctl start ollama`
- Check Ollama URL: `http://localhost:11434`
- Review AI configuration in `/ai-config`

## ## Future Enhancements

### ### Planned Features

- [ ] Vector embeddings for semantic search
- [ ] Multi-modal support (images from PDFs)
- [ ] Conversation memory/context
- [ ] Export Q&A to documentation
- [ ] Integration with troubleshooting system
- [ ] Automated KB updates on document upload
- [ ] Voice input/output for hands-free use
- [ ] Mobile-optimized interface

### ### Integration Opportunities

- Link with device monitoring for status-aware responses
- Connect to scheduler for automated suggestions
- Integrate with error logging for proactive help
- Add to bartender interface for quick help

## ## Support

For issues or questions about the AI Knowledge System:

1. Check this documentation
2. Review log files in `/logs/`
3. Test with simple queries first
4. Verify Ollama service is running
5. Rebuild knowledge base if needed

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**\*\*Version\*\*:** 1.0

**\*\*Last Updated\*\*:** October 1, 2025

**\*\*Compatible With\*\*:** Ollama, llama3.2:3b (or any compatible model)