Feature #2: AI-Powered Home Profile Generator

Overview

Operators and Admins can now generate professional, AI-powered descriptions and highlights for assisted living homes with a single click. This feature uses OpenAI's GPT-4 to create compelling, accurate profiles based on the home's existing data.

Implementation Date

December 16, 2024

Components Added/Modified

1. Database Schema Updates

File: `prisma/schema.prisma`
- Added to `AssistedLivingHome` model:
- `aiGeneratedDescription String? @db.Text` - Stores AI-generated description
- `highlights String[]` - Array of key highlights
- `lastProfileGenerated DateTime?` - Timestamp of last generation

Migration: `prisma/migrations/20251216000001_add_ai_profile_fields/migration.sql`
- Idempotent migration that safely adds fields
- Creates index on `lastProfileGenerated` for performance

2. AI Profile Generator Service

File: `src/lib/profile-generator/home-profile-generator.ts`
- **Function:** `generateHomeProfile(homeData)` - Main generation function
- **Function:** `validateHomeData(data)` - Validates input data
- **Function:** `generateFallbackProfile(data)` - Fallback when OpenAI unavailable
- Uses OpenAI GPT-4 API (same pattern as matching explainer)
- Generates:
- Professional 2-3 paragraph description (200-300 words)
- 3-5 key highlights/bullet points
- Graceful fallback if API key missing or API call fails

3. API Endpoint

File: `src/app/api/operator/homes/[id]/generate-profile/route.ts`
- **Method:** POST
- **Path:** `/api/operator/homes/[id]/generate-profile`
- **Authentication:** Required (Operator or Admin only)
- **Authorization:** Operators can only generate profiles for their own homes
- **Process:**
1. Authenticates user
2. Verifies ownership

3. Fetches home data

4. Calls AI generator

5. Saves to database

6. Creates audit log

7. Returns generated profile

4. Frontend UI (Edit Page)

File: `src/app/operator/homes/[id]/edit/page.tsx`

- Added "Generate Profile with AI" button below description field
- Features:
- Loading state with animated spinner
- Preview modal showing generated content
- "Apply to Description" button to use AI content
- "Regenerate" button for new version
- Last generated timestamp display
- Professional gradient design with icons

5. Display Integration

File: `src/app/operator/homes/[id]/page.tsx`

- Shows "AI-Enhanced Profile" badge when AI description exists
- Displays AI-generated description (fallback to manual if not available)
- Shows key highlights in attractive card with checkmarks
- Blue/indigo gradient design for AI content

User Flow

For Operators/Admins:

1. Navigate to home edit page (`/operator/homes/[id]/edit`)

2. Click "Generate Profile with AI" button

3. AI generates description and highlights (10-30 seconds)

4. Review generated content in preview modal

5. Options:
   - **Apply to Description:** Replaces current description
   - **Regenerate:** Creates new version
   - **Cancel:** Dismisses without applying

6. Save changes to persist

Viewing Generated Profiles:

- **Home detail page:** Shows AI badge and highlights
- **Matching results:** AI descriptions automatically included
- **Search results:** Future integration point

Technical Details

OpenAI Integration

- Model: `gpt-4`
- Temperature: `0.7`
- Max tokens: `400` (description), `200` (highlights)

- Prompts designed for professional, warm tone
- System messages define role and requirements

Error Handling

- Graceful fallback to template-based generation
- Validates home data before generation
- Handles missing API key
- Logs errors for debugging

Security & Permissions

- RBAC enforced (Operator, Admin roles only)
- Operators restricted to their own homes
- Audit logging for all generations

Performance

- Async generation (doesn't block UI)
- Caches generated content in database
- Indexed for fast retrieval

Database Migration Instructions

The migration is idempotent and safe to run multiple times:

```
# The migration will be automatically applied on next deployment
# Or manually run:
npx prisma migrate deploy
```

Testing Checklist

- [x] Database schema updated and migration created
- [x] Prisma client regenerated
- [x] AI service created and tested
- [x] API endpoint created with authentication
- [x] Frontend UI implemented
- [x] Display integration complete
- [ ] Manual testing with demo home
- [ ] Verify RBAC enforcement
- [ ] Test fallback behavior (no API key)
- [ ] Test error handling (invalid data)
- [ ] Verify audit logs created

Demo Flow

1. Login as demo operator: `demo.operator@carelinkai.test` / `DemoUser123!`
2. Navigate to Homes list
3. Select a home or create a new one
4. Click "Edit" button

5. Scroll to description field

6. Click "Generate Profile with AI"

7. Review generated content

8. Apply to description and save

Future Enhancements

1. **Multi-language Support:** Generate profiles in multiple languages

2. **Tone Customization:** Allow operators to choose tone (formal, casual, etc.)

3. **Batch Generation:** Generate profiles for multiple homes at once

4. **Version History:** Track and compare different generated versions

5. **A/B Testing:** Test which descriptions perform better

6. **SEO Optimization:** Generate SEO-friendly descriptions

7. **Integration with Search:** Automatically use AI descriptions in search results

8. **Scheduled Regeneration:** Auto-regenerate profiles periodically

Known Limitations

1. Requires OpenAI API key (configured in environment)

2. Generation time: 10-30 seconds depending on API response

3. Rate limits apply (OpenAI API limits)

4. Quality depends on input data completeness

5. Currently English only

Monitoring & Metrics

Track these metrics for feature success:
- Number of profiles generated per day
- Generation success rate vs. fallback rate
- Average generation time
- Operator adoption rate
- Profile quality feedback (future: rating system)

Environment Variables

Required:
- `OPENAI_API_KEY` - OpenAI API key for GPT-4 access

Support & Troubleshooting

Common Issues:

1. "Failed to generate profile"
- Check OpenAI API key is set
- Verify API key has sufficient credits
- Check network connectivity

2. "Forbidden - You can only generate profiles for your own homes"

- User is trying to generate profile for home they don't own

- Verify user role and home ownership

3. Fallback profile generated instead of AI

- OpenAI API key missing or invalid

- Check logs for OpenAI API errors

- Verify API rate limits not exceeded

Debugging:

- Check server logs for `[Profile Generator]` entries
- Verify audit logs for generation attempts
- Test with `curl` to API endpoint directly

Related Files

- `src/lib/matching/openai-explainer.ts` - Similar AI integration pattern
- `src/lib/audit.ts` - Audit logging
- `prisma/schema.prisma` - Database schema
- `.env` - Environment configuration

Credits

Implemented as part of CareLinkAI Feature Development Phase 2

Follows existing OpenAI integration patterns from Feature #1 (AI Matching Engine)