Architectural Design Document (ADD)

Personal Portfolio Website

Document Information

- **Project Name:** Personal Portfolio Website
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- **Program:** Information Technology
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1. Introduction

1.1 Purpose

This Architectural Design Document defines the technical architecture, system structure, and design specifications for the Personal Portfolio Website as outlined in the Software Requirements Specification (SRS) v1.0.

1.2 Scope

This document covers the complete architectural design including:

- System architecture and components
- User interface design specifications
- Data flow and interaction patterns
- Technology stack implementation
- File organization and structure
- Design patterns and methodologies

1.3 Architecture Overview

The portfolio website follows a **Static Single Page Application (SPA)** architecture using pure HTML5 and CSS3, implementing a mobile-first responsive design pattern with semantic markup and modern CSS layout techniques.

2. System Architecture

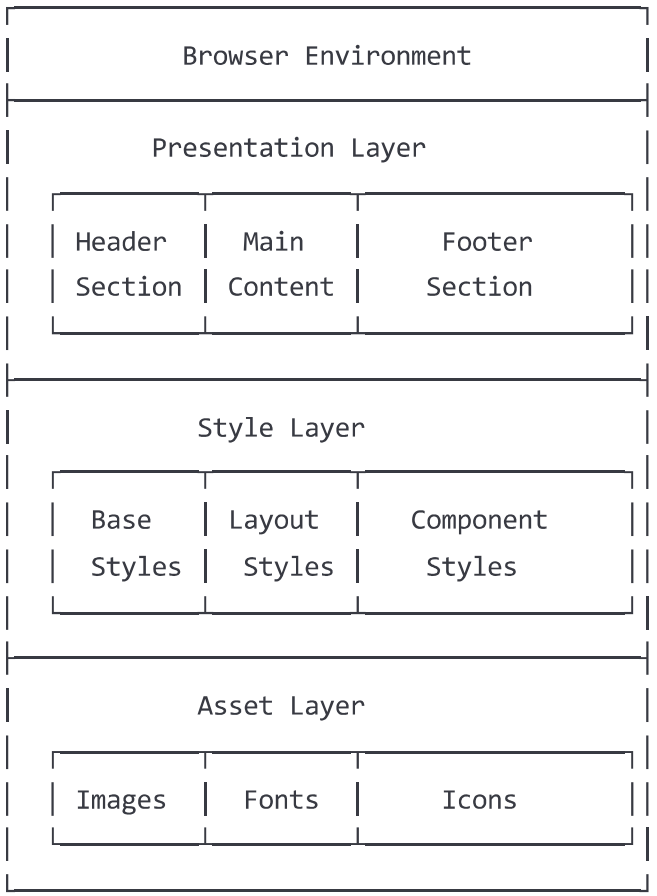
2.1 High-Level Architecture

2.1.1 Architecture Pattern

Pattern: Layered Architecture with Separation of Concerns

- **Presentation Layer:** HTML5 semantic structure
- **Style Layer:** CSS3 modular stylesheets
- **Asset Layer:** Optimized images and media files

2.1.2 System Components



2.2 Component Architecture

2.2.1 HTML Structure Components

1. **Document Head**
   - Meta tags for SEO and viewport
   - External resource links

- Semantic markup declarations

2. **Navigation Component**
   - Fixed/sticky header navigation
   - Mobile hamburger menu structure
   - Smooth scroll anchor links
3. **Content Sections**
   - Hero/Landing section
   - About section
   - Education section
   - Skills section
   - Projects section
   - Contact section
4. **Footer Component**
   - Copyright information
   - Additional contact links
   - Social media integration

2.2.2 CSS Architecture Components

1. **Base Layer**
   - CSS Reset/Normalize
   - Typography definitions
   - Color variables and themes
2. **Layout Layer**
   - Grid systems
   - Flexbox containers
   - Responsive breakpoints
3. **Component Layer**
   - Navigation styles
   - Card components
   - Button styles
   - Form elements
4. **Utility Layer**

- Helper classes
- Spacing utilities
- Display utilities

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3. Technical Design Specifications

3.1 Responsive Design Architecture

3.1.1 Breakpoint Strategy

```css
/* Mobile First Approach */
/* Base styles: 320px - 767px (Mobile) */
/* Tablet: 768px - 1023px */
/* Desktop: 1024px - 1440px */
/* Large Desktop: 1441px+ */
```

3.1.2 Layout Systems

- **Primary:** CSS Grid for main page layout
- **Secondary:** Flexbox for component-level layouts
- **Tertiary:** Float fallbacks for older browser support

3.2 CSS Methodology

3.2.1 Naming Convention

BEM (Block Element Modifier) Methodology

```css
/* Block */
.navigation { }

/* Element */
.navigation__item { }
.navigation__link { }

/* Modifier */
.navigation__link--active { }
.navigation__item--mobile { }
```

3.2.2 File Organization Strategy

```
css/
├── base/
│   ├── reset.css
│   ├── typography.css
│   └── variables.css
├── layout/
│   ├── grid.css
│   ├── header.css
│   └── footer.css
├── components/
│   ├── navigation.css
│   ├── cards.css
│   ├── buttons.css
│   └── forms.css
├── pages/
│   └── home.css
└── utilities/
    ├── spacing.css
    └── display.css
```

3.3 Performance Optimization Strategy

3.3.1 CSS Optimization

- Minification of CSS files
- Critical CSS inlining for above-the-fold content
- Non-critical CSS lazy loading
- CSS property optimization and grouping

3.3.2 Image Optimization

- WebP format with JPEG fallbacks
- Responsive images with srcset
- Lazy loading implementation via CSS
- Optimized file sizes (max 100KB per image)

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4. User Interface Design Architecture

4.1 Design System Specifications

4.1.1 Color Palette

```css
:root {
  /* Primary Colors */
  --primary-dark: #1a1a1a;
  --primary-light: #ffffff;
  --accent-blue: #007acc;
  --accent-green: #28a745;

  /* Neutral Colors */
  --gray-100: #f8f9fa;
  --gray-200: #e9ecef;
  --gray-300: #dee2e6;
  --gray-800: #343a40;
  --gray-900: #212529;

  /* Status Colors */
  --success: #28a745;
  --warning: #ffc107;
  --error: #dc3545;
  --info: #17a2b8;
}
```

4.1.2 Typography System

```css
:root {
  /* Font Families */
  --font-primary: 'Inter', 'Segoe UI', sans-serif;
  --font-heading: 'Poppins', 'Helvetica Neue', sans-serif;
  --font-mono: 'JetBrains Mono', 'Courier New', monospace;

  /* Font Sizes */
  --text-xs: 0.75rem;    /* 12px */
  --text-sm: 0.875rem;   /* 14px */
  --text-base: 1rem;     /* 16px */
  --text-lg: 1.125rem;   /* 18px */
  --text-xl: 1.25rem;    /* 20px */
  --text-2xl: 1.5rem;    /* 24px */
  --text-3xl: 1.875rem;  /* 30px */
  --text-4xl: 2.25rem;   /* 36px */
  --text-5xl: 3rem;      /* 48px */
}
```

4.1.3 Spacing System

```css
:root {
  /* Spacing Scale */
  --space-1: 0.25rem;  /* 4px */
  --space-2: 0.5rem;   /* 8px */
  --space-3: 0.75rem;  /* 12px */
  --space-4: 1rem;     /* 16px */
  --space-5: 1.25rem;  /* 20px */
  --space-6: 1.5rem;   /* 24px */
  --space-8: 2rem;     /* 32px */
  --space-10: 2.5rem;  /* 40px */
  --space-12: 3rem;    /* 48px */
  --space-16: 4rem;    /* 64px */
  --space-20: 5rem;    /* 80px */
}
```

4.2 Component Design Specifications

4.2.1 Navigation Component

```css
.navigation {
  position: fixed;
  top: 0;
  width: 100%;
  background: rgba(255, 255, 255, 0.95);
  backdrop-filter: blur(10px);
  z-index: 1000;
  padding: var(--space-4) 0;
  transition: all 0.3s ease;
}

.navigation__container {
  max-width: 1200px;
  margin: 0 auto;
  display: flex;
  justify-content: space-between;
  align-items: center;
  padding: 0 var(--space-4);
}
```

4.2.2 Card Component

```css
.card {
  background: var(--primary-light);
  border-radius: 12px;
  box-shadow: 0 4px 6px rgba(0, 0, 0, 0.1);
  padding: var(--space-6);
  transition: transform 0.3s ease, box-shadow 0.3s ease;
}

.card:hover {
  transform: translateY(-4px);
  box-shadow: 0 8px 25px rgba(0, 0, 0, 0.15);
}
```

4.2.3 Button Component

```css
.button {
  display: inline-flex;
  align-items: center;
  justify-content: center;
  padding: var(--space-3) var(--space-6);
  border: none;
  border-radius: 6px;
  font-weight: 500;
  text-decoration: none;
  transition: all 0.2s ease;
  cursor: pointer;
}

.button--primary {
  background: var(--accent-blue);
  color: var(--primary-light);
}

.button--secondary {
  background: transparent;
  color: var(--accent-blue);
  border: 2px solid var(--accent-blue);
}
```

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5. Data Flow and Interaction Design

5.1 User Interaction Flow

5.1.1 Navigation Flow

```
User Lands on Site →
Hero Section Loads →
Navigation Menu Available →
User Clicks Section Link →
Smooth Scroll to Section →
Section Content Displays →
Navigation Updates Active State
```

5.1.2 Responsive Interaction Flow

```
Page Load →
Screen Size Detection →
Appropriate Layout Applied →
Touch/Mouse Events Enabled →
Responsive Navigation Activated →
Content Reflows Dynamically
```

5.2 Content Loading Strategy

5.2.1 Progressive Enhancement

1. **Base Layer:** Core HTML content loads first
2. **Enhancement Layer:** CSS styling applies progressively
3. **Optimization Layer:** Advanced features for modern browsers

5.2.2 Critical Rendering Path

```
HTML Parse →
CSS Parse →
Render Tree Construction →
Layout Calculation →
Paint →
Composite
```

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6. File Structure and Organization

6.1 Project Directory Structure

```
portfolio-website/
├── index.html
├── css/
│   ├── main.css
│   ├── base/
│   │   ├── reset.css
│   │   ├── typography.css
│   │   └── variables.css
│   ├── layout/
│   │   ├── grid.css
│   │   ├── header.css
│   │   └── sections.css
│   ├── components/
│   │   ├── navigation.css
│   │   ├── cards.css
│   │   ├── buttons.css
│   │   └── forms.css
│   └── utilities/
│       ├── spacing.css
│       └── helpers.css
├── images/
│   ├── profile/
│   ├── projects/
│   └── icons/
├── fonts/
└── docs/
    ├── srs.md
    └── add.md
```

6.2 HTML Document Structure

```html
<!DOCTYPE html>
<html lang="en">
<head>
  <!-- Meta and Links -->
</head>
<body>
  <header class="navigation">
    <!-- Navigation Component -->
  </header>

  <main class="main-content">
    <section id="hero" class="hero-section">
      <!-- Hero Content -->
    </section>

    <section id="about" class="about-section">
      <!-- About Content -->
    </section>

    <section id="education" class="education-section">
      <!-- Education Content -->
    </section>

    <section id="skills" class="skills-section">
      <!-- Skills Content -->
    </section>

    <section id="projects" class="projects-section">
      <!-- Projects Content -->
    </section>

    <section id="contact" class="contact-section">
      <!-- Contact Content -->
    </section>
  </main>

  <footer class="footer">
    <!-- Footer Content -->
  </footer>
</body>
</html>
```

7. Security and Accessibility Design

7.1 Security Considerations

- Input sanitization for contact forms
- External link security (rel="noopener noreferrer")
- Content Security Policy headers
- No sensitive data exposure in source code

7.2 Accessibility Design

- Semantic HTML5 elements
- ARIA labels and roles
- Keyboard navigation support
- Color contrast compliance (WCAG 2.1 AA)
- Alt text for all images
- Focus management and visual indicators

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8. Performance Design Considerations

8.1 Loading Performance

- Critical CSS inlining
- Image optimization and lazy loading
- Minified CSS and HTML
- Efficient CSS selectors

8.2 Runtime Performance

- Hardware-accelerated CSS animations
- Efficient layout calculations
- Minimal DOM manipulations
- Optimized CSS painting

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9. Browser Compatibility Strategy

9.1 Progressive Enhancement Approach

1. **Base Experience:** Core functionality in all browsers

2. **Enhanced Experience:** Modern features for capable browsers
3. **Fallback Strategy:** Graceful degradation for older browsers

9.2 Compatibility Matrix

Feature	Chrome 90+	Firefox 88+	Safari 14+	Edge 90+
CSS Grid	✅	✅	✅	✅
Flexbox	✅	✅	✅	✅
Custom Properties	✅	✅	✅	✅
Backdrop Filter	✅	⚠️	✅	✅

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10. Testing Strategy

10.1 Cross-Browser Testing

- Chrome, Firefox, Safari, Edge testing
- Mobile browser testing (iOS Safari, Chrome Mobile)
- Responsive design testing across breakpoints

10.2 Accessibility Testing

- Screen reader compatibility
- Keyboard navigation testing
- Color contrast validation
- WAVE accessibility evaluation

10.3 Performance Testing

- PageSpeed Insights analysis
- Lighthouse audit scores
- Cross-device performance validation

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