ASMC Admin Panel - Architecture Overview

This document provides a comprehensive overview of the ASMC Admin Panel architecture, design patterns, and technical implementation details.

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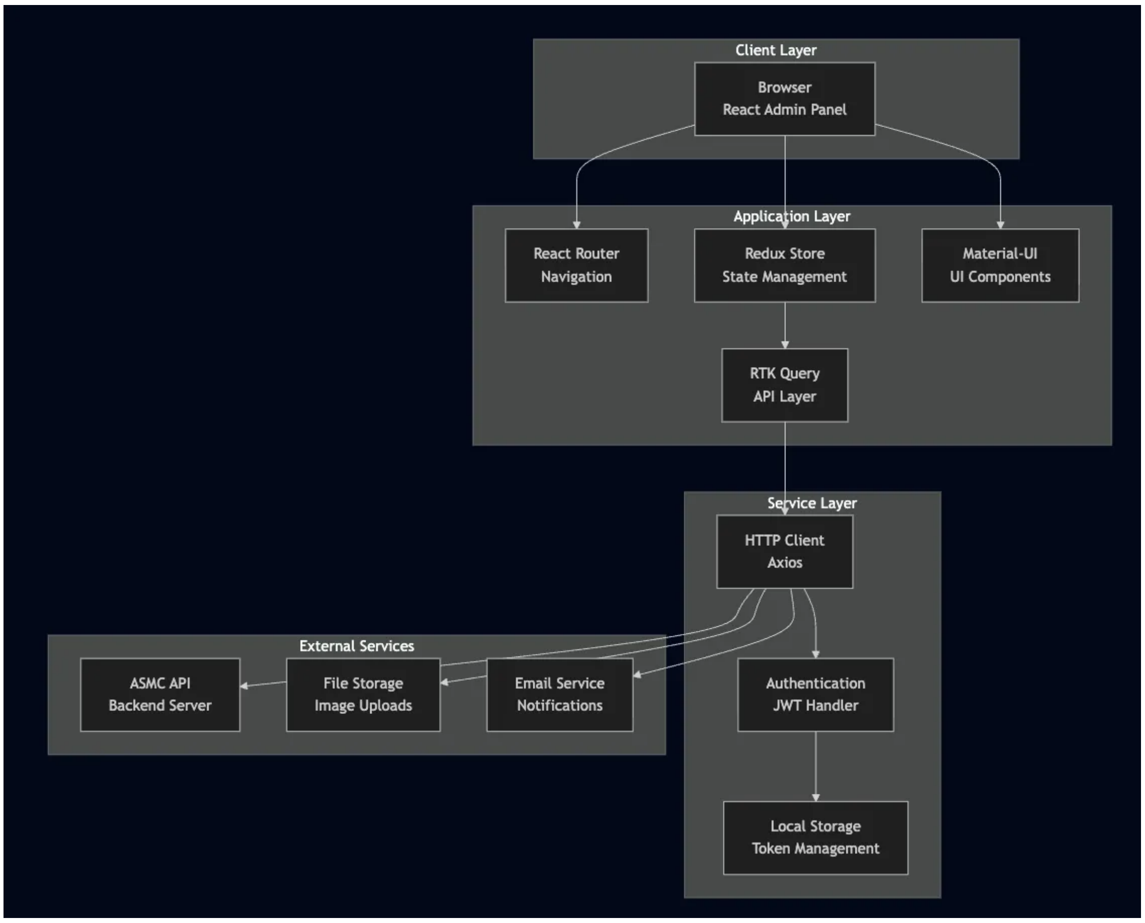
High-Level Architecture



Client Layer
Browser React Admin Panel
Application Layer
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Technology Stack

Layer	Technology	Purpose
Frontend Framework	React.js 18.2.0	Component-based UI
State Management	Redux Toolkit + RTK Query	Global state and API calls
UI Framework	Material-UI 5.13.7	Design system and components
Routing	React Router DOM 6.11.2	Client-side routing
HTTP Client	Axios 1.4.0	API communication
Form Management	Formik + Yup	Form handling and validation
Charts	Chart.js + React-Chartjs-2	Data visualization
Rich Text	CKEditor 5	Content editing
Build Tool	Create React App	Development and build

Component Architecture

Component Hierarchy

```
App
├── Router
│   ├── PublicRoutes
│   │   └── LoginPage
│   └── AdminRoutes
│       └── LayoutContainer
│           ├── Header
│           ├── Sidebar
│           │   └── MenuList
│           └── MainContent
│               ├── DashboardPage
│               ├── MembersManager
│               ├── BookingManager
│               ├── EventsManager
│               ├── FacilityManager
│               ├── StaffManager
│               ├── PaymentManager
│               └── DocumentationManager
```

Component Patterns

1. Container-Component Pattern

```
// Container (Business Logic)
const MembersContainer = connect(mapStateToProps, mapDispatchToProps)
(MembersComponent);

// Component (Presentation)
const MembersComponent = ({ members, loading, onEdit, onDelete }) => {
    return (
        <Box>
            <MembersTable
                data={members}
                onEdit={onEdit}
                onDelete={onDelete}
                loading={loading}
            />
        </Box>
    );
};
```

2. Higher-Order Components (HOCs)

```
// withNavigate HOC
const withNavigate = (WrappedComponent) => {
    return (props) => {
        const navigate = useNavigate();
        return <WrappedComponent {...props} navigate={navigate} />;
    };
};

// withPermission HOC
const withPermission = (permission) => (WrappedComponent) => {
    return (props) => {
        const hasPermission = usePermission(permission);
        return hasPermission ? <WrappedComponent {...props} /> : <AccessDenied />;
    };
};
```

3. Custom Hooks Pattern

```
// Custom hook for member management
const useMembers = () => {
    const dispatch = useDispatch();
    const members = useSelector(selectMembers);
    const loading = useSelector(selectMembersLoading);

    const fetchMembers = useCallback(
        (params) => {
            dispatch(fetchMembersAsync(params));
        },
        [dispatch],
    );

    const createMember = useCallback(
        (memberData) => {
            dispatch(createMemberAsync(memberData));
        },
        [dispatch],
    );

    return {
        members,
        loading,
        fetchMembers,
        createMember,
    };
};
```

State Management Architecture

Redux Store Structure

```
// Store configuration
export const store = configureStore({
    reducer: {
        // Feature-based slices
        common: commonSlice, // Global app state
        members: membersSlice, // Member management
        booking: bookingSlice, // Booking management
        events: eventsSlice, // Event management
        facility: facilitySlice, // Facility management
        staff: staffSlice, // Staff management
        documentation: documentationSlice, // Documentation

        // RTK Query APIs
        membersApi: membersApis, // Members API
        commonApi: commonApis, // Common API
        bookingApi: bookingApis, // Booking API
        eventsApi: eventsApis, // Events API
        facilityApi: facilityApis, // Facility API
        staffApi: staffApis, // Staff API
        documentationApi: documentationApi, // Documentation API
    },
    middleware: (getDefaultMiddleware) =>
        getDefaultMiddleware({
            serializableCheck: {
                ignoredActions: [FLUSH, REHYDRATE, PAUSE, PERSIST, PURGE, REGISTER],
            },
        }).concat([
            membersApis.middleware,
            commonApis.middleware,
            bookingApis.middleware,
            eventsApis.middleware,
            facilityApis.middleware,
            staffApis.middleware,
            documentationApi.middleware,
        ]),
});
```

State Slice Architecture

```
// Example: Members slice
const membersSlice = createSlice({
    name: 'members',
    initialState: {
        list: [],
        selectedMember: null,
        filters: {
            status: 'all',
            search: '',
            page: 1,
            limit: 10,
        },
        loading: false,
        error: null,
    },
    reducers: {
        setMembers: (state, action) => {
            state.list = action.payload;
        },
        setSelectedMember: (state, action) => {
            state.selectedMember = action.payload;
        },
        updateFilters: (state, action) => {
            state.filters = { ...state.filters, ...action.payload };
        },
        setLoading: (state, action) => {
            state.loading = action.payload;
        },
        setError: (state, action) => {
            state.error = action.payload;
        },
    },
    extraReducers: (builder) => {
        builder
            .addCase(fetchMembersAsync.pending, (state) => {
                state.loading = true;
                state.error = null;
            })
            .addCase(fetchMembersAsync.fulfilled, (state, action) => {
                state.loading = false;
                state.list = action.payload.data;
            })
            .addCase(fetchMembersAsync.rejected, (state, action) => {
                state.loading = false;
                state.error = action.error.message;
            });
    },
});
```

API Integration Architecture

RTK Query Setup

```
// Base API configuration
const baseApi = createApi({
    reducerPath: 'baseApi',
    baseQuery: fetchBaseQuery({
        baseUrl: process.env.REACT_APP_API_BASE_URL,
        prepareHeaders: (headers, { getState }) => {
            const token = selectAuthToken(getState());
            if (token) {
                headers.set('authorization', `Bearer ${token}`);
            }
            headers.set('content-type', 'application/json');
            return headers;
        },
    }),
    tagTypes: ['Members', 'Bookings', 'Events', 'Facilities', 'Staff'],
    endpoints: () => ({}),
});
```

Feature-Specific APIs

```
// Members API
export const membersApi = baseApi.injectEndpoints({
    endpoints: (builder) => ({
        getMembers: builder.query({
            query: (params) => ({
                url: '/members',
                params: {
                    page: params.page,
                    limit: params.limit,
                    search: params.search,
                    status: params.status,
                },
            }),
            providesTags: ['Members'],
        }),
        getMember: builder.query({
            query: (id) => `/members/${id}`,
            providesTags: (result, error, id) => [{ type: 'Members', id }],
        }),
        createMember: builder.mutation({
            query: (memberData) => ({
                url: '/members',
                method: 'POST',
                body: memberData,
            }),
            invalidatesTags: ['Members'],
        }),
        updateMember: builder.mutation({
            query: ({ id, ...memberData }) => ({
                url: `/members/${id}`,
                method: 'PUT',
                body: memberData,
            }),
            invalidatesTags: (result, error, { id }) => [
                { type: 'Members', id },
                'Members',
            ],
        }),
        deleteMember: builder.mutation({
            query: (id) => ({
                url: `/members/${id}`,
                method: 'DELETE',
            }),
            invalidatesTags: ['Members'],
        }),
    }),
});
```

API Error Handling

```
// Global error handling
const apiErrorHandler = (error, { dispatch, getState }) => {
    if (error.status === 401) {
        // Token expired - redirect to login
        dispatch(logout());
        window.location.href = '/login';
    } else if (error.status === 403) {
        // Access denied
        dispatch(
            setNotification({
                type: 'error',
                message:
                    'Access denied. You do not have permission to perform this
action.',
            }),
        );
    } else if (error.status >= 500) {
        // Server error
        dispatch(
            setNotification({
                type: 'error',
                message: 'Server error. Please try again later.',
            }),
        );
    }
};
```

Authentication Architecture

JWT Token Management

```
    }
}
```

```javascript
// Authentication service
class AuthService {
    static getToken() {
        return localStorage.getItem('authToken');
    }

    static setToken(token) {
        localStorage.setItem('authToken', token);
    }

    static removeToken() {
        localStorage.removeItem('authToken');
        localStorage.removeItem('refreshToken');
    }

    static getRefreshToken() {
        return localStorage.getItem('refreshToken');
    }

    static setRefreshToken(token) {
        localStorage.setItem('refreshToken', token);
    }

    static isTokenExpired(token) {
        try {
            const decoded = jwt.decode(token);
            return decoded.exp < Date.now() / 1000;
        } catch {
            return true;
        }
    }

    static async refreshToken() {
        const refreshToken = this.getRefreshToken();
        if (!refreshToken) return null;

        try {
            const response = await axios.post('/api/auth/refresh', {
                refreshToken,
            });

            const { token, refreshToken: newRefreshToken } = response.data;
            this.setToken(token);
            this.setRefreshToken(newRefreshToken);

            return token;
        } catch (error) {
            this.removeToken();
            return null;
        }
    }
}
```

Permission-Based Access Control

```
// Permission system
const usePermission = (permission) => {
    const userPermissions = useSelector(selectUserPermissions);
    return userPermissions.includes(permission);
};

// Permission wrapper component
const RequirePermission = ({ permission, children, fallback }) => {
    const hasPermission = usePermission(permission);

    if (!hasPermission) {
        return fallback || <AccessDenied />;
    }

    return children;
};

// Usage
<RequirePermission permission="members:write">
    <CreateMemberButton />
</RequirePermission>;
```

Routing Architecture

Route Configuration

```
// Admin routes
const AdminRoutes = () => {
    return (
        <Routes>
            <Route path="/" element={<LayoutContainer />}>
                <Route index element={<DashboardPage />} />

                {/* Member Management */}
                <Route path="members" element={<MembersManager />} />
                <Route path="members/create" element={<CreateMemberPage />} />
                <Route path="members/:id/edit" element={<EditMemberPage />} />

                {/* Booking Management */}
                <Route path="bookings" element={<BookingManager />} />
                <Route path="bookings/create" element={<CreateBookingPage />} />

                {/* Event Management */}
                <Route path="events" element={<EventsManager />} />
                <Route path="events/create" element={<CreateEventPage />} />

                {/* Facility Management */}
                <Route path="facilities" element={<FacilityManager />} />
                {/* Staff Management */}
                <Route path="staff" element={<StaffManager />} />

                {/* Documentation */}
                <Route path="documentation" element={<DocumentationManager />} />

                {/* Catch-all route */}
                <Route path="*" element={<NotFoundPage />} />
            </Route>
        </Routes>
    );
};
```

Protected Routes

```
// Route protection
const ProtectedRoute = ({ children, requiredPermission }) => {
    const isAuthenticated = useSelector(selectIsAuthenticated);
    const hasPermission = usePermission(requiredPermission);

    if (!isAuthenticated) {
        return <Navigate to="/login" replace />;
    }

    if (requiredPermission && !hasPermission) {
        return <AccessDenied />;
    }

    return children;
};
```

UI Architecture

Material-UI Theme System

```
// Theme configuration
const theme = createTheme({
    palette: {
        primary: {
            main: '#1976d2',
            light: '#42a5f5',
            dark: '#1565c0',
        },
        secondary: {
            main: '#dc004e',
            light: '#ff5983',
            dark: '#9a0036',
        },
        background: {
            default: '#f5f5f5',
            paper: '#ffffff',
        },
    },
    typography: {
        fontFamily: '"Roboto", "Helvetica", "Arial", sans-serif',
        h1: {
            fontSize: '2.5rem',
            fontWeight: 500,
        },
        h2: {
            fontSize: '2rem',
            fontWeight: 500,
        },
    },
    components: {
        MuiButton: {
            styleOverrides: {
                root: {
                    textTransform: 'none',
                    borderRadius: 8,
                },
            },
        },
        MuiCard: {
            styleOverrides: {
                root: {
                    borderRadius: 12,
                    boxShadow: '0 2px 8px rgba(0,0,0,0.1)',
                },
            },
        },
    },
});
```

Component Library Structure

```
components/
├── Common/                # Reusable components
│   ├── Input.jsx         # Form inputs
│   ├── Button.jsx        # Buttons
│   ├── Table.jsx         # Data tables
│   ├── Modal.jsx         # Modal dialogs
│   ├── Select.jsx        # Select dropdowns
│   └── DatePicker.jsx    # Date pickers
├── admin/                # Admin-specific components
│   ├── members-manager/  # Member management
│   ├── booking-manager/  # Booking management
│   ├── events-manager/   # Event management
│   └── ...
└── layout/               # Layout components
    ├── Header.jsx        # App header
    ├── Sidebar.jsx       # Navigation sidebar
    └── Footer.jsx        # App footer
```

Performance Architecture

Code Splitting

```
// Lazy loading for routes
const DashboardPage = lazy(() => import('../pages/admin/DashboardPage'));
const MembersManager = lazy(() => import('../pages/admin/MembersManager'));
const BookingManager = lazy(() => import('../pages/admin/BookingManager'));

// Suspense wrapper
const AppRoutes = () => (
    <Suspense fallback={<LoadingSpinner />}>
        <Routes>
            <Route path="/" element={<DashboardPage />} />
            <Route path="/members" element={<MembersManager />} />
            <Route path="/bookings" element={<BookingManager />} />
        </Routes>
    </Suspense>
);
```

Memoization Strategy

```
// Component memoization
const MembersTable = memo(({ members, onEdit, onDelete }) => {
    return (
        <Table>
            {members.map((member) => (
                <MemberRow
                    key={member.id}
                    member={member}
                    onEdit={onEdit}
                    onDelete={onDelete}
                />
            ))}
        </Table>
    );
});

// Callback memoization
const MembersContainer = () => {
    const dispatch = useDispatch();

    const handleEdit = useCallback(
        (memberId) => {
            dispatch(editMember(memberId));
        },
        [dispatch],
    );

    const handleDelete = useCallback(
        (memberId) => {
            dispatch(deleteMember(memberId));
        },
        [dispatch],
    );

    return <MembersTable onEdit={handleEdit} onDelete={handleDelete} />;
};
```

Bundle Optimization

```
// Webpack bundle analyzer configuration
const BundleAnalyzerPlugin = require('webpack-bundle-analyzer').BundleAnalyzerPlugin;

module.exports = {
    plugins: [
        new BundleAnalyzerPlugin({
            analyzerMode: 'static',
            openAnalyzer: false,
        }),
    ],
};
```

Security Architecture

Input Validation

```
// Form validation schema
const memberValidationSchema = yup.object({
    name: yup
        .string()
        .required('Name is required')
        .min(2, 'Name must be at least 2 characters')
        .max(50, 'Name must be less than 50 characters'),
    email: yup.string().email('Invalid email format').required('Email is required'),
    phone: yup
        .string()
        .matches(/^[0-9]{10}$/, 'Phone must be 10 digits')
        .required('Phone is required'),
});
```

XSS Protection

```
// Sanitize user input
const sanitizeInput = (input) => {
    return DOMPurify.sanitize(input, {
        ALLOWED_TAGS: [],
        ALLOWED_ATTR: [],
    });
};

// Safe HTML rendering
```

```
const SafeHTML = ({ content }) => {
    const sanitizedContent = useMemo(() => sanitizeInput(content), [content]);

    return (
        <div
            dangerouslySetInnerHTML={{
                __html: sanitizedContent,
            }}
        />
    );
};
```

CSRF Protection

```
// CSRF token handling
const getCSRFToken = () => {
    const token = document.querySelector('meta[name="csrf-token"]');
    return token ? token.getAttribute('content') : null;
};

// Axios interceptor for CSRF
axios.interceptors.request.use((config) => {
    const csrfToken = getCSRFToken();
    if (csrfToken) {
        config.headers['X-CSRF-Token'] = csrfToken;
    }
    return config;
});
```

Deployment Architecture

Build Process

```
# Development build
npm run start

# Production build
npm run build

# Build analysis
npm run analyze
```

Static File Serving

```
# Nginx configuration
server {
    listen 80;
    server_name admin.asmc.com;
    root /var/www/html/build;
    index index.html;
    # Handle client-side routing
    location / {
        try_files $uri $uri/ /index.html;
    }

    # Cache static assets
    location /static/ {
        expires 1y;
        add_header Cache-Control "public, immutable";
    }

    # API proxy
    location /api {
        proxy_pass http://localhost:7055;
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
    }
}
```

Docker Configuration

```
# Multi-stage build
FROM node:18-alpine as build

WORKDIR /app
COPY package*.json ./
RUN npm ci --only=production

COPY . .
RUN npm run build

FROM nginx:alpine
COPY --from=build /app/build /usr/share/nginx/html
COPY nginx.conf /etc/nginx/nginx.conf

EXPOSE 80
CMD ["nginx", "-g", "daemon off;"]
```

Summary

The ASMC Admin Panel follows modern React.js best practices with a well-structured architecture that includes:

- **Component-based architecture** with clear separation of concerns
- **Redux-based state management** with RTK Query for API integration
- **Material-UI design system** for consistent UI/UX
- **Permission-based access control** for security
- **Performance optimizations** including code splitting and memoization
- **Comprehensive error handling** and validation
- **Production-ready deployment** configuration

This architecture ensures scalability, maintainability, and excellent user experience for the administrative staff managing the ASMC system.

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