**Core Systems Overview**

**1. User Access Control (UAC)**

**Core Functions**:

* Centralized authentication and authorization
* User management and profiling
* Role-based access control (RBAC)
* Department organization
* Security auditing
* Cross-system notification management

**Key Integrations**:

* Integrates with all other systems for authentication and permissions
* Manages user access across all platform modules

**2. Location Management System (LMS)**

**Core Functions**:

* Water station registry and management
* Infrastructure and network management
* Geographic information system (GIS) integration
* Service area management
* District management
* Performance metrics tracking

**Key Integrations**:

* UAC: User authentication and permissions
* AMS: Equipment location tracking
* IS: Real-time station monitoring
* IMS: Location-based incident tracking

**3. Asset Management System (AMS)**

**Core Functions**:

* Equipment and device management
* Manufacturer and model management
* Calibration management
* Network configuration tracking
* Maintenance history
* Performance monitoring

**Key Integrations**:

* UAC: User authentication and permissions
* LMS: Equipment location mapping
* IS: Real-time equipment monitoring
* IMS: Equipment-related incidents
* PMS: Equipment maintenance scheduling

**4. iSCADA System (IS)**

**Core Functions**:

* Real-time data acquisition
* Equipment status monitoring
* Alert management
* Sensor integration
* Flow monitoring
* Quality checking

**Key Integrations**:

* UAC: User authentication and permissions
* LMS: Station monitoring
* AMS: Equipment monitoring
* IMS: Real-time alert generation
* PMS: Maintenance triggering

**5. Incident Management System (IMS)**

**Core Functions**:

* Incident tracking and response
* Alert management
* Problem resolution
* Status updates
* Response coordination

**Key Integrations**:

* UAC: User authentication and permissions
* LMS: Location-based incidents
* AMS: Equipment-related incidents
* IS: Alert processing
* PMS: Maintenance-related incidents

**6. Preventive Maintenance System (PMS)**

**Core Functions**:

* Maintenance scheduling
* Work order processing
* Resource management
* Equipment history tracking
* Vendor management

**Key Integrations**:

* UAC: User authentication and permissions
* LMS: Location-based maintenance
* AMS: Equipment maintenance
* IS: Condition-based maintenance triggers
* IMS: Maintenance-related incidents

**7. Reports & Analytics System (RAS)**

**Core Functions**:

* Performance reporting
* Equipment statistics
* Station analytics
* KPI tracking
* Data visualization

**Key Integrations**:

* UAC: User authentication and permissions
* All Systems: Data aggregation and analysis

**Cross-System Integration Pattern**

All systems follow a consistent integration pattern using:

* PostgreSQL Foreign Data Wrapper (FDW) for cross-database access
* Centralized authentication through UAC
* Event-driven updates
* Real-time data synchronization
* Standardized API endpoints

**Shared Infrastructure:**

* All systems use PostgreSQL 15
* ArangoDB
* Node.js 18 LTS for real-time features
* PHP 8.2/Slim for management features
* EQMX for real-time messaging
* Redis for caching
* Object storage for documents
* Quasar (Vue3)
* Redis (Cache)

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