ARC Database: Overview & Updates

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Overall Introduction

• **ARC work element TT1d and TT1e: Development of materials and research database**
  
  – Store information related to sources & properties of materials used in various consortium research activities.
  
  – Includes results update in form of reports, white papers or any other type of documents for each research task...
Overall Introduction

• **Challenges:**
  – No software installation
  – Flexibility (new tests, procedures...)
  – Central database
  – Multiple users
    ▪ Retrieve information (Public interface)
    ▪ Add/Delete/Edit materials information
  – Different users’ roles
  – Common materials use
  – Multiple measures for the same material
  – Ability to relate material(s) to validation sections
  – ...

Main Key Design Goals

• Create the *most flexible* system possible eliminating “hard-coded” data types

• Create a *role-based infrastructure* granting privileges to categories of users

• Create an entirely *Web-based* system
  – No software installed on client computers
Technologies Used

- Database backend is **SQL Server 2008**
- **ASP.NET** was chosen as the Web development platform
- Hardware and software platforms were chosen based on well-known and supported technologies

Role Management Infrastructure

*General Users’ Diagram*

Users belong to one or more roles
Roles dictate the actions a user can perform
New roles can be created as needed
Roles are not mutually exclusive
Getting to the Application

- Using Internet Explorer, visit http://www.business.unr.edu/mcr
- Click the Login button and enter credentials

Software Model (Materials)

- All materials have a type
  - (Aggregate, binder, etc.)
  - Material types belong to a category
- Materials have a supplier
- Materials can be created from other materials (Components)
- Materials associated with
  - work tasks
  - validation sections
  - other component materials
Materials

Material Types

- **ADDITIVE**
  - Antistrip (AS)
  - Chemical (AM)
  - Filler (FI)
  - Polymer (PM)
  - Warm-mix (WA)

- **AGGREGATE**
  - Aggregate (AG)

- **BINDER**
  - Binder (BI)

- **MIX**
  - Lab Mix
  - Lab Compacted (LL)
  - Plant Mix
  - Plant Mix Lab Compacted (PL)
  - Plant Mix Field Compacted (PF)

Software Model (Properties)

- Materials have properties
  - Properties are categorized into groups
  - Properties can be configured to have a valid range of values
    - Hard and soft limits are supported
    - Properties are categorized as qualitative or quantitative
Properties

Property Groups and Attributes

- **Property Groups**
  - **MI_DESIGN**
    - NMAS
    - ESALS
    - N_INI
    - N_DES
    - N_MAX
    - AC_OPTIMUM
    - VMA
    - VFA
  - **MI_ESTAR**
    - E_STAR_MOD_0FT
    - E_STAR_MOD_1FT
    - E_STAR_MOD_3FT
    - E_STAR_MOD_6FT
    - PHASE_ANGLE_0FT
    - PHASE_ANGLE_1FT
    - PHASE_ANGLE_3FT
    - PHASE_ANGLE_6FT
  - **BI_GRADE_PG**
    - PG_TRUE_HIGH
    - PG_TRUE_LOW
    - PG_HIGH
    - PG_LOW
    - FP_COC
    - ROT_VISC
    - MASS LOSS
    - ORIG_G*/sin(delta)
  - **AG_COARSE_BSG**
    - BSG_SSD
    - BSG_DRY
    - BSG_APP
    - ABS

- **Property Attributes**
  - VFA
  - PHASE_ANGLE_3FT
  - PHASE_ANGLE_6FT

**Software Model (Validation Sites)**

- Validation sites are used for material field tests
  - Validation sites are divided into validation sections, which are further divided into validation layers
- Ability to assign Material(s) to one or more validation layer(s)
Support Files (Introduction)

- Support files are uploaded to a user-defined hierarchical file system
- Support files can include
  - reports,
  - scanned document,
  - picture,
  - just about anything related to the ARC project
- Support files can be filtered by work items (program area, category, work element, subtask)

Final Reports

- Follow FHWA Research Report Format
- Compliant with section 508
- Owned by FHWA.
  - With the permission of FHWA final reports can be uploaded to the ARC site otherwise
  - have a link referring to the publication
Selection and Filtering Feature

- Materials (and other elements) can be selected and filtered by
  - Material type
  - Material category
  - Organization
  - Supplier
  - Work tasks
  - Validation section
  - Component materials
Selection and Filtering

Deployment of the ARC Database to Other Servers

- Two software requirements to run the system:
  - Microsoft SQL Server 2008.
  - Windows Server 2003 or 2008 with Internet Information Server.
- Microsoft Visual Studio 2008 or later will be required to continue development of the software or customize it.
- System designed such that SQL Server can be running on the same computer as the Web server.
- Size & scalability of the hardware dictated by the expected usage patterns.
Work in Progress

• Update final *Help system* items to reflect changes.
• Continue *bug fixes* resulting from broad user testing.
• Develop read-only *user interface* for non-consortium users.
  – Define public user authentication requirements
• Plan for *deployment* to other server(s)