The Ecosystem Management Decision Support System

Latest features of version 7.0

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EMDS 7.0 – the basics

- First production release in February 1997
  - Version 7.0 just released
- A general application framework for designing and implementing knowledge-based decision support applications for environmental analysis and planning at any geographic scale or scales.
- Integrates GIS as well as knowledge-based reasoning and decision modeling technologies to provide decision support for a substantial portion of the adaptive management process of ecosystem management.

Applications to date

- Some major examples
  - Ecological site classification, UK Forestry Commission
  - Timber suitability, Tongass NF
  - Aquatic/Riparian Effectiveness Monitoring Program , USFS Region 6
  - Spotted owl dispersal habitat, WA DNR
  - North Coast Watershed Assessment, State of CA
  - Soil impacts associated with logging and wildfire, Okanogan-Wenatchee NF
  - Integrated resource restoration and protection, USFS Region 1
  - Roads analysis for wildlife habitat, Tahoe NF
  - Wildland fuels, USFS WO and Regions, BLM, BIA, FWS, NPS
  - Managing critical loads associated with atmospheric S deposition in the southern Appalachians, US EPA
  - Integrated landscape restoration, Okanogan-Wenatchee NF
  - National terrestrial condition assessment, USFS national and Regions
- Many other applications from around the world
  - http://en.wikipedia.org/wiki/EMDS

EMDS platforms at version 7

- ArcMap
- QGIS
- MapWindow
- DotSpatial
- On the horizon
  - A web-based enterprise edition (Azure Government Cloud)

Databases supported

- Currently
  - SQLITE
  - SQL Server
  - Oracle
- On the horizon
  - Azure SQL Server
  - Postgres

Engines for core analytical tasks

- NetWeaver – logic processing
  - Supports design of very large, complex, abstract models
- CDP – multicriteria decision analysis
  - Supports strategic and tactical planning
- VisiRule – prolog-based decision trees
- GeNIe – Bayesian networks
- Workflows allow invoking any sequence of these engines

Architecture of an EMDS project

- Multiple assessments
  - Defined by the set of layers and spatial extent
- Multiple analyses within an assessment
- Multiple scenarios within analyses (NW)
- Analyses and scenarios can be compared with a change detection utility

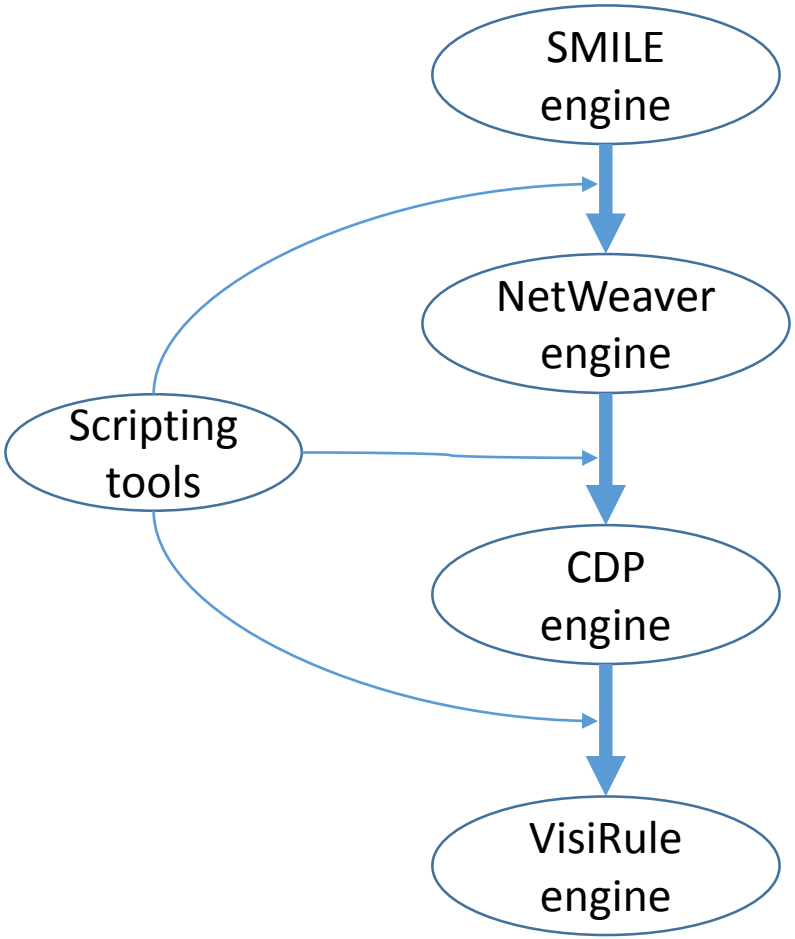
Scripting tools

- R
- Java
- Python
- C#
- Tasks for these can be inserted anywhere in a sequence of analytical tasks (Windows Workflow)
  - Data analysis and summarization
  - Data transformation between analytical tasks

Workflows

- EMDS is built on the open source Windows Workflow Foundation
  - Supports task sequencing via Flowcharts, Sequential diagrams, and State Machines
- Leveraging Trident
  - An open source workflow solution and editor from NOAA built on Windows Workflow
  - EMDS uses several UI and provenance structures from Trident
- Workflow engines and editors
  - Activities programmed in VB or C#.
  - Call external scripts written in R, Python, or Javascript
  - KNIME and WexFlow
    - Data processing and statistics with R

Example EMDS task sequence for ecosystem restoration



Analysis activity

One or more BNs to assess population viability of keystone species

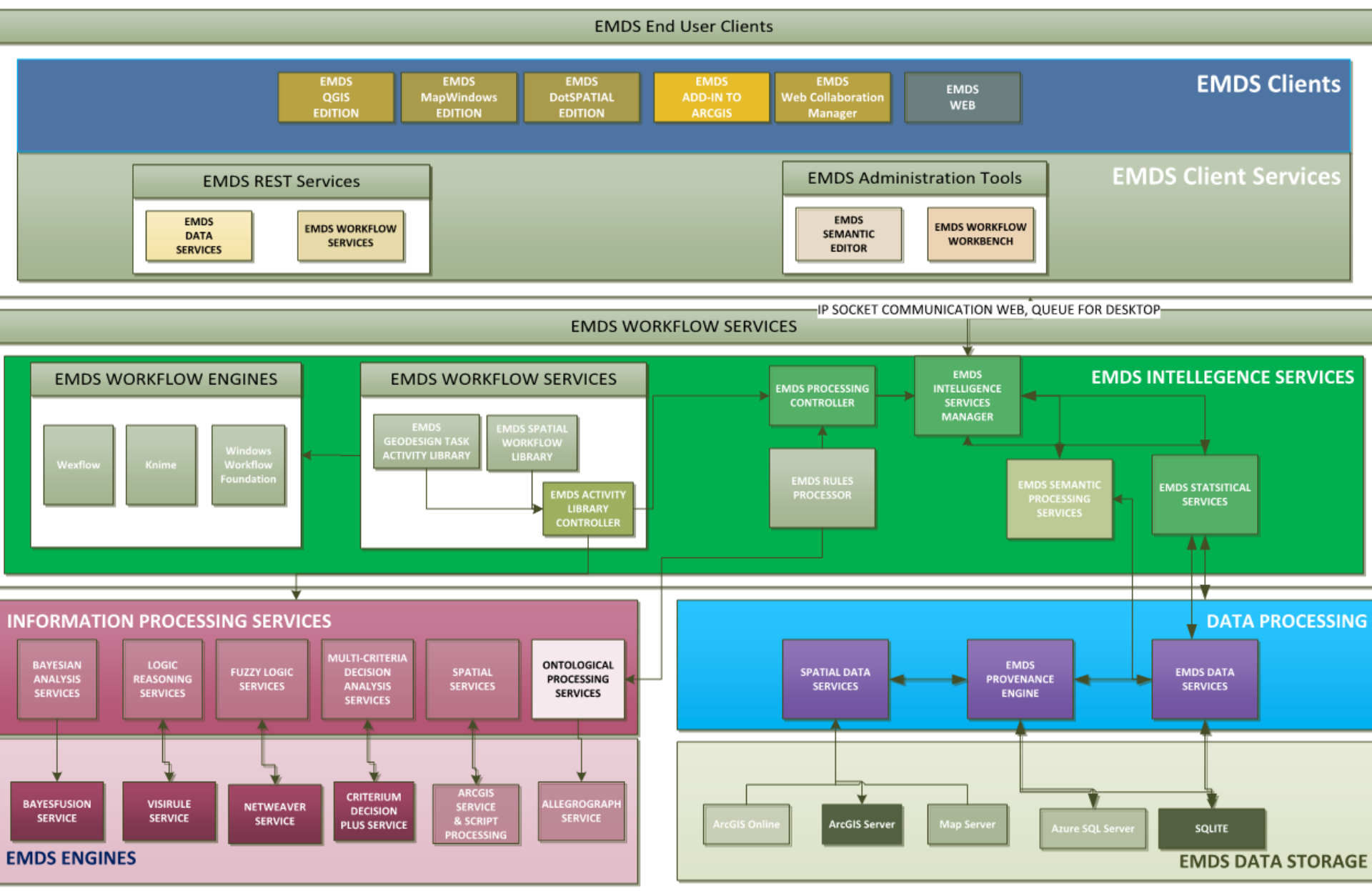
BN outputs integrated into logic-based evaluation of ecosystem integrity

Strategic decision model to ID high priority management units for restoration

Tactical decision model to ID high priority management activities for restoration

On the horizon

- Support for map publishing services
  - ArcGIS online
  - MapServer (open source)
- Web-based enterprise edition
- Semantic editor
  - For ontologies



A state-of-the-art, industrial strength, enterprise solution
for environmental analysis and planning