The Development of an Interagency Fuels Treatment Decision Support System

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Overview

- Introduction and background
- Current state of the fuels treatment community
- Vision for the future
- IFT-DSS Development Plan
  - Software system development
  - Stakeholder community development
  - Governance community development
Introduction and Background
Software Tools and Systems (STS) Study (1 of 2)

Sonoma Technology, Inc.

Software Engineering Institute performed strategic analysis of problem space

STS Study – Phase I

STS Study – Phase II

February 2007 Initiation of Phase I of the STS Study
February 2008 Conclusion of Phase I of the STS Study
June 2008 Initiation of Phase II of the STS Study
March 2009 Conclusion of Phase II of the STS Study
STS Study Phase III:

- Expected to span 3 years
- Phase IIIa (2009) IFT-DSS prototype development
- Phase IIIb (2010) full system implementation
- Phase IIIc (2011) refinements & enhancements
- 2012 transition to hosting agency
Current State of the Fuels Treatment Community (1 of 4)

- Fuels treatment planners are responsible for managing vegetation

Planning and the decision support process center around modeling vegetation disturbances

Six Steps in the Decision Support Process

1. Define project, vegetation, landscape, and scale
2. Prepare and quality assure vegetation data
3. Simulate and analyze fire behavior
4. Analyze fire effects and/or risk
5. Design treatment strategies
6. Simulate treated vegetation, geophysical, and fuel conditions
Current State of the Fuels Treatment Community (2 of 4)

• What does this mean for the user community?

– Use what they know
– Use the most simple, user-friendly tools
– May not know that other tools exist
– Have little guidance on which tools to use
– Spend a lot of time “stringing” tools together for specific purposes
– Spend a lot of time acquiring and preparing data

IFT-DSS must facilitate the most difficult and time-consuming tasks to ensure success.
Current State of the Fuels Treatment Community (3 of 4)

• What about the existing comprehensive systems that “string” models together?

ArcFuels, INFORMS, LANDFIRE-IFP, Starfire = VERY USEFUL SCIENCE

– Some are inaccessible
– Some require “expert” knowledge
– Do not address all fuels treatment use cases

User groups are small. Systems are not widely adopted. Do not facilitate collaboration.
Current State of the Fuels Treatment Community (4 of 4)

• Where are we now?
  Assortment of tools
    – Difficult to access and use efficiently
    – Difficult to use for custom, or situation-specific, analyses

• Where do we go?
  Develop a framework to support:
    – Organization and accessibility of tools
    – Multiple issues and use cases
    – Community collaboration
Vision for the Fuels Treatment Community  (1 of 5)

Fuels treatment planners have a need and they use what they know

Scientists and data providers create tools
Vision for the Fuels Treatment Community (2 of 5)

Scientists and data providers create tools

New technologies allow existing tools to be wrapped (standard interfaces)
Scientists and data providers create tools

New technologies allow existing tools to be wrapped (standard interfaces)

Standardized interfaces allow users to mix and match “string” tools to fit their need

Inter-system connections
Vision for the Fuels Treatment Community  (4 of 5)

Scientists and data providers create tools

Standardized interfaces also allow inter-system communication

e.g., BlueSky

e.g., WFDSS

Scientists and data providers create tools
Vision for the Fuels Treatment Community (5 of 5)

User communities

Integrated Systems
(IFT-DSS, BlueSky, WFDSS, WFAS)

Common Interface Standards
(allow for connections)

Capabilities
(algorithms, models, data)

Scientists and data providers create tools

Governance
Vision for the Future

• Develop a software architecture framework and system that supports the needs of the community
• Confirm use cases with user and development community
• Develop a stakeholder community
  – Fuels treatment specialists (main users)
  – Scientists (provide science to the system)
  – Software application & data providers (tools)
• Develop strong governance
  – IT compliance, hosting, long-term maintenance
Develop Software Architecture and System (1 of 4)
Develop Software Architecture and System (2 of 4)

IFT-DSS Strategic View

- **Graphical User Interface** (User Interaction)
- **Control Database** (Business Process Control)
- **Process Controller** (Business Process Management & Information Flow)
- **Data and Software Services** (Business Services)
- **Geospatial Database** (Data Storage and Access Service)

IFT-DSS Structural View

Diagram showing the integration of various components:
- **Graphical User Interface**
- **Control Database**
- **Data and Software Services**
- **Geospatial Database**

Diagram also includes network connections and data flow through various modules like Analytical Collaboration Engine, Scientific Collaboration Database, Project Planning Tool, and Geo Data Visualization & Editing Tool.
Develop Software Architecture and System (3 of 4)

• Keys for success
  – Confirm use cases
  – Begin with a functional prototype to demonstrate early success and usefulness and to build community
  – Community development activities must occur in parallel with software development activities
  – Governance development activities must occur in parallel with software and community development activities
Develop Software Architecture and System (4 of 4)

- Development of a functional prototype
  - Serve most common use case
  - Demonstrate early progress and usefulness
  - Engage stakeholder communities early
Stakeholder Community Development (1 of 3)

- Stakeholder community development should occur in parallel with software development
  - **Fuels treatment specialists**: engage throughout the process; actively seek and respond to feedback
  - **Scientific community**: engage and develop tools to promote collaboration
  - **Service and data providers**: Collaborate with the goal of ultimately leveraging overlapping services and interests; work closely with WFDSS and BlueSky teams during development
Stakeholder Community Development  (2 of 3)

**Fire Information**

Size: 100 acres

Location:
- Longitude: -85.315
- Latitude: 39.977
- Decimal Degrees

Ignition Date: 01/12/03

Ignition Time: 1 AM PST

1. Enter basic information about your fire (or select defaults).
2. Select Next Step to see Fuel Load options or Run All to accept current values for all steps and go straight to results.

Advanced Options
Stakeholder Community Development (3 of 3)

- Scientific community and service/data providers
  - Develop standards for collaboration
  - Provide incentives for the scientific community (recognition, usage statistics, etc.)
  - Develop guidelines and tools to make collaboration easier
Governance Community Development

• Use the IFT-DSS prototype as a test of the IT Investment Process
  – Compliance with the National Wildland Fire Enterprise Architecture (NWFEA) goals and requirements

• Work with the governance community to establish:
  – Long-term hosting agency
  – Decision support center and user support
  – Operations and maintenance plan
## Overview of STS Phase III Plan

### 2009 Development Schedule

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<thead>
<tr>
<th>Task</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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</thead>
<tbody>
<tr>
<td>Implement IFT-DSS functional prototype (hosted at STI)</td>
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<tr>
<td>Full IFT-DSS implementation (hosted at STI)</td>
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<tr>
<td>Enhancements and fine-tuning (transition to hosting agency at end of 2011)</td>
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### Milestones

- **Developer Meetings**
- **Validate Prototype**
- **GUI Mock-up**
- **Collaboration Standards**
- **Interim Release**
- **Collaboration Guidance**
- **Testing Release**
- **Prototype Release**

### Governance development

- **Work with science community, WFDSS, and BlueSky development teams throughout**

### Community development

- **Initiate IT Investment Process**
Development Approach

• Rapid prototyping
  – Develop, test, share components early; obtain user feedback early

• Parallel development
  – System can be built in pieces then connected; reduces overall dependencies

• Leverage past experience and intellectual property
  – Experience developing other systems (i.e., the BlueSky Framework, AirNow)
Acknowledgments

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- Erik Christiansen (NIFCG)
- JFSP Fuels Treatment Work Group (FTWG)
- STS Study Advisory Committee
- 49 field fuels treatment specialists
- ~15 software developers
- IT specialists

Documentation produced from the STS Study can be found at <http://frames.nbii.gov/JFSP/STS_Study>
The Five Communities

- Extract training & transition drivers – how are people prepared today, and how could they be tomorrow
- Extract business & operational drivers – what is the mission today, and what could the mission be tomorrow
- Extract collaboration and decision support drivers – how are operational and mitigation planning support provided today, and within what architecture framework could they be tomorrow
- Extract technical & research drivers – how are tools, systems and data created and managed, and how could they be tomorrow
- Hypothesize future drivers – what technology, climatic, budget, etc. issues could drive the wildland fire communities tomorrow

Extract management & governance priorities – how are investments & management priorities set today, and how could they best tomorrow to take account for changes in 1-5

Source: SEI presentation entitled JFSP Program Deliverables January 14, 2008