The Development of an Interagency Fuels Treatment Decision Support System

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Sonoma Technology, Inc.
Air Quality Research and Innovative Solutions

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)

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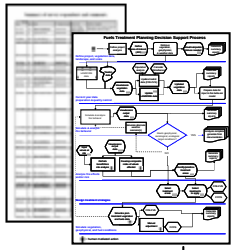
Software Engineering Institute performed strategic analysis of problem space

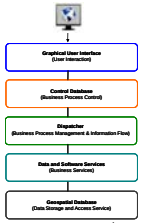
IFT-DSS Conceptual Design Document

Current Practices & Needs Assessment



Software Architecture Study

IFT-DSS Architecture Design



STS Study – Phase I — **STS Study – Phase II**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2007												2008												2009		

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

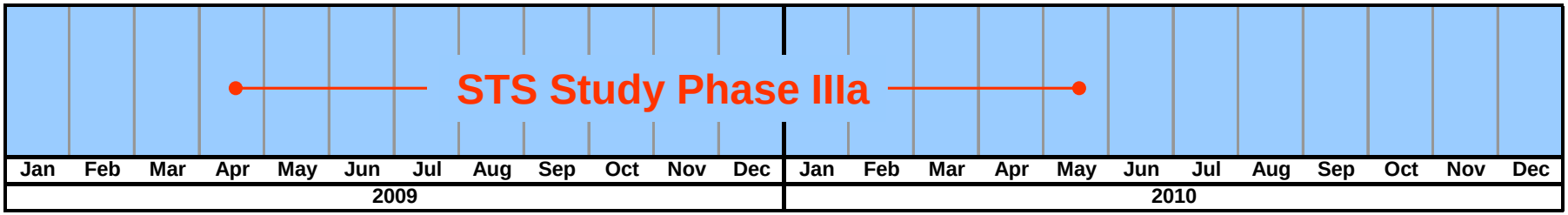
March 2009 Conclusion of Phase II of the STS Study

Introduction and Background
Software Tools and Systems (STS) Study (2 of 2)

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**

IFT-DSS prototype development



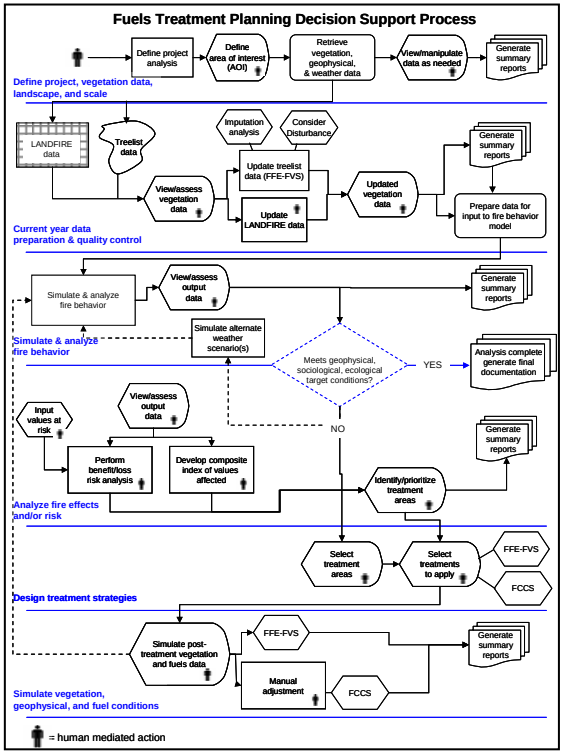
Current State of the Fuels Treatment Community (1 of 4)

- 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

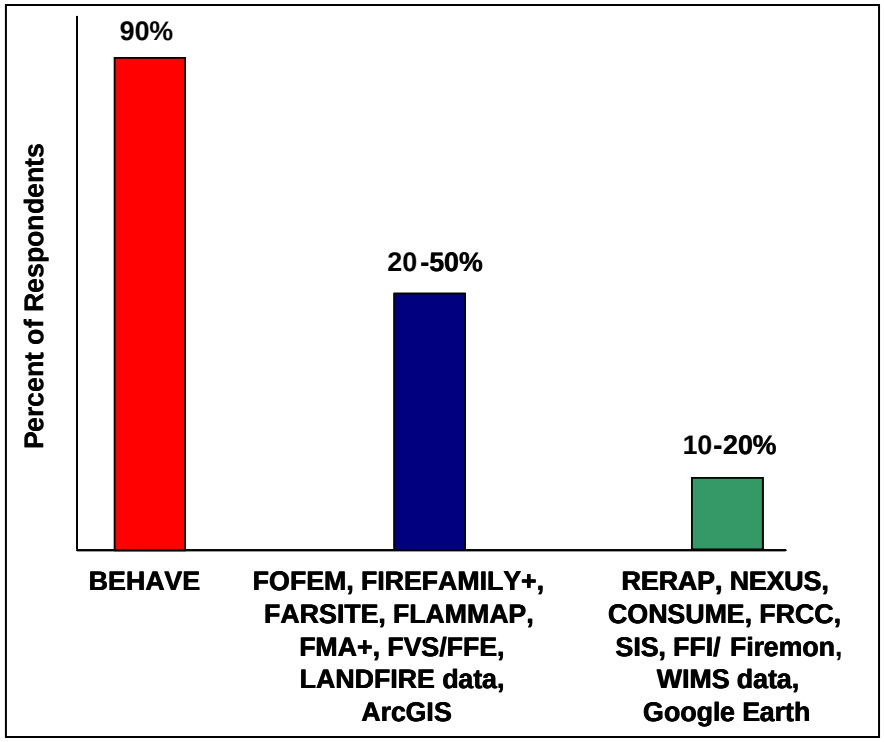
1. Define project, vegetation, landscape, and scale
2. Prepare and quality assure vegetation data
3. Simulate and analyze fire behavior
4. Analyze fire effects and/or risk
5. Design treatment strategies
6. Simulate treated vegetation, geophysical, and fuel conditions



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.

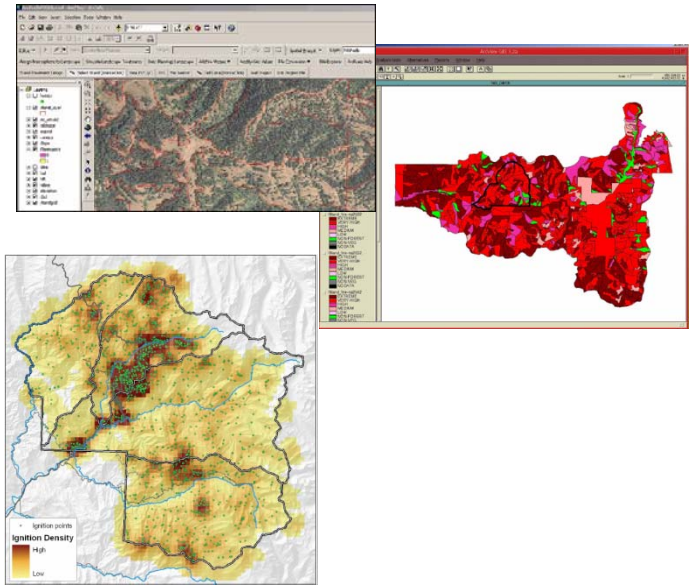


Current State of the Fuels Treatment Community (3 of 4)

- 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

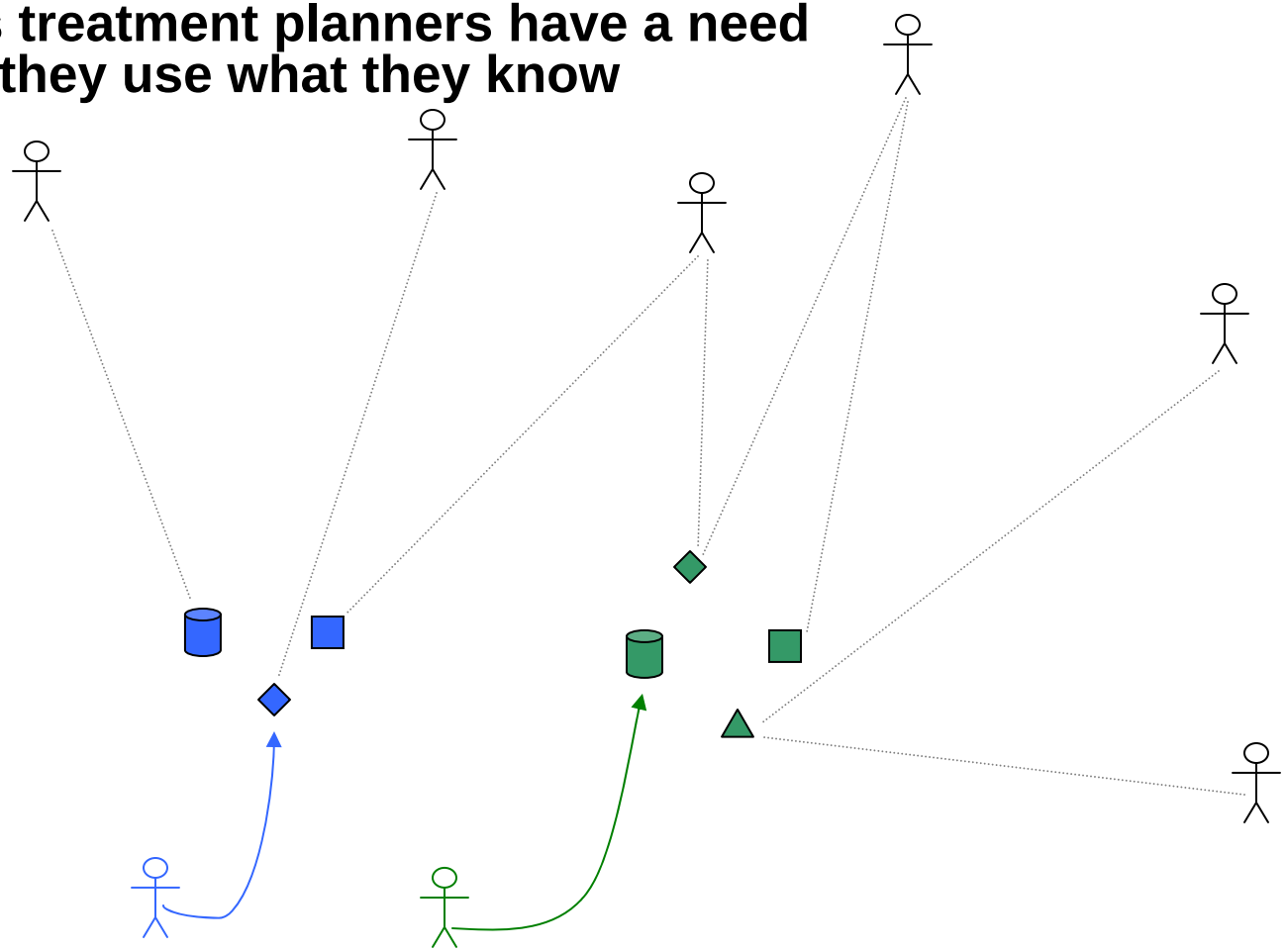
- Where do we go?

  Develop a framework to support:

  - Organization and accessibility of tools
  - Multiple issues and use cases
  - Community collaboration

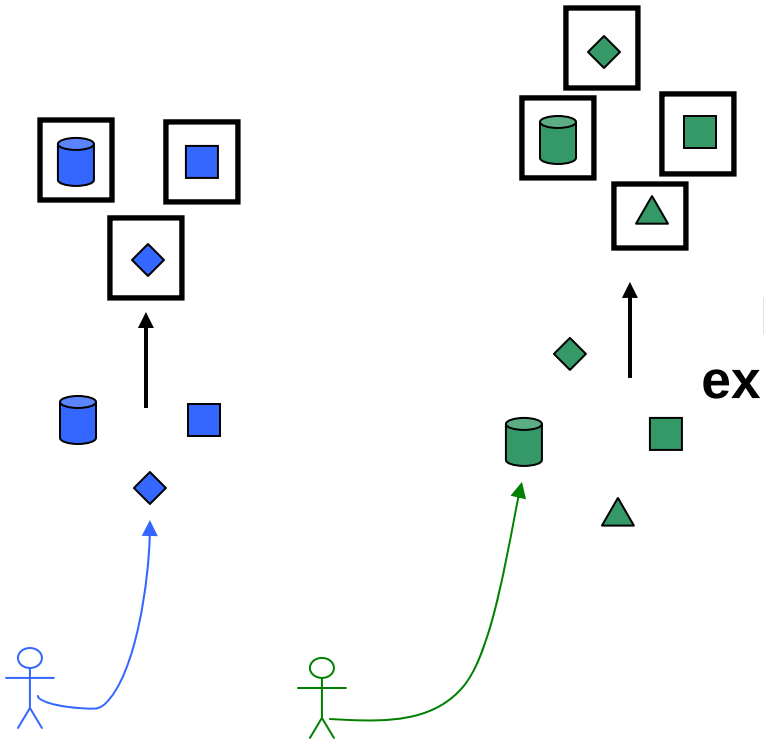
Vision for the Fuels Treatment Community (1 of 5)

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



Scientists and data providers create tools

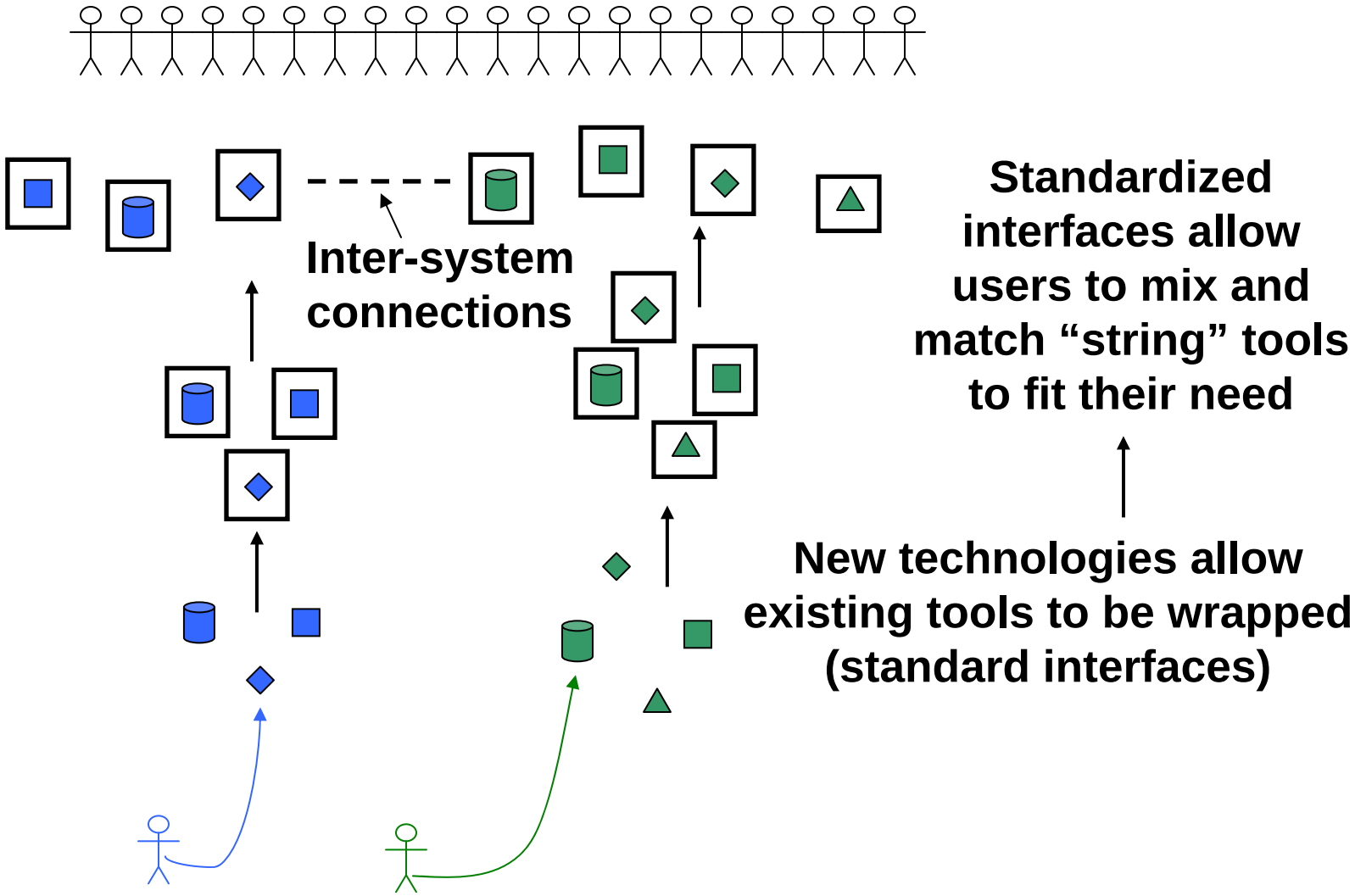
Vision for the Fuels Treatment Community (2 of 5)



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

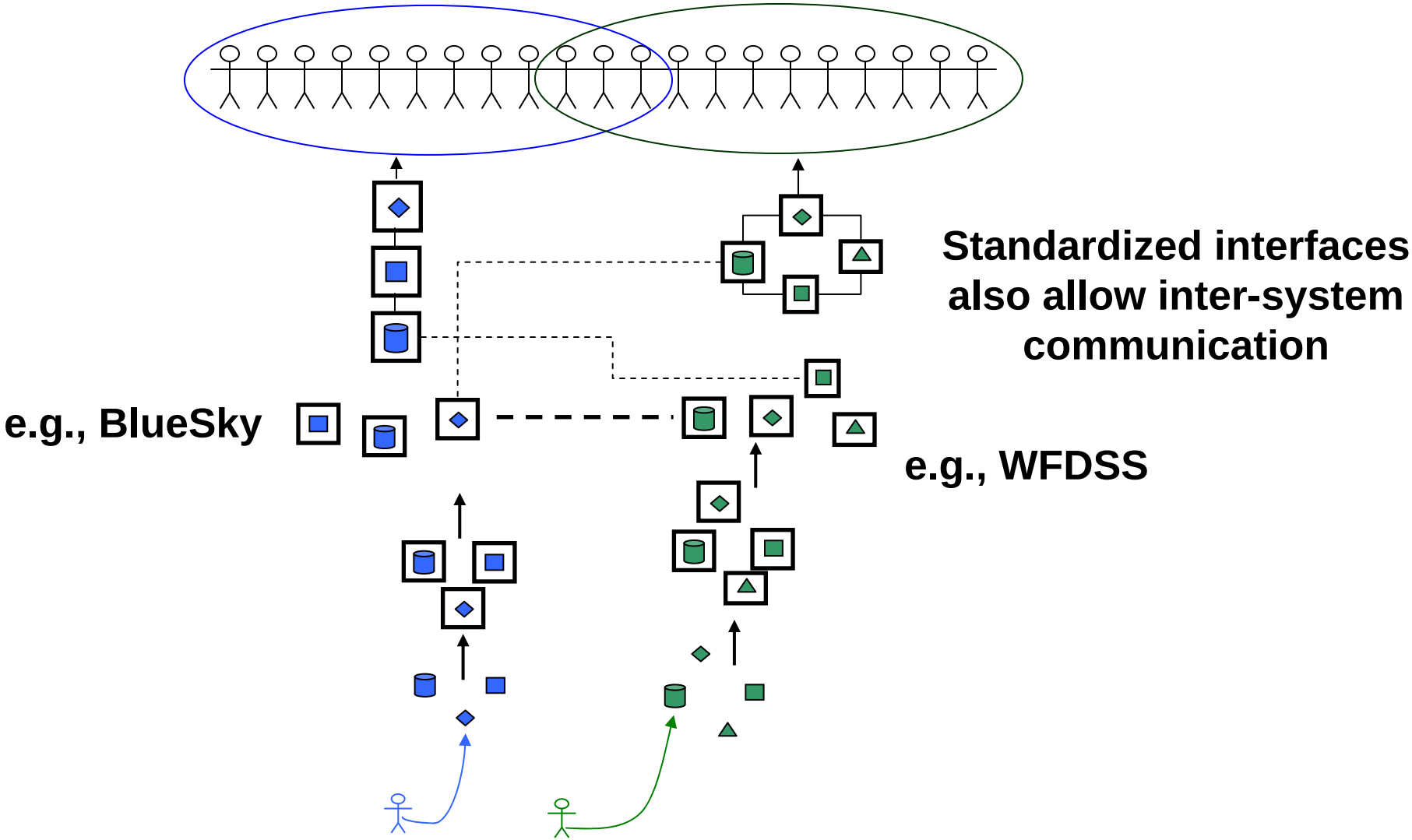
Scientists and data providers create tools

Vision for the Fuels Treatment Community (3 of 5)



Scientists and data providers create tools

Vision for the Fuels Treatment Community (4 of 5)



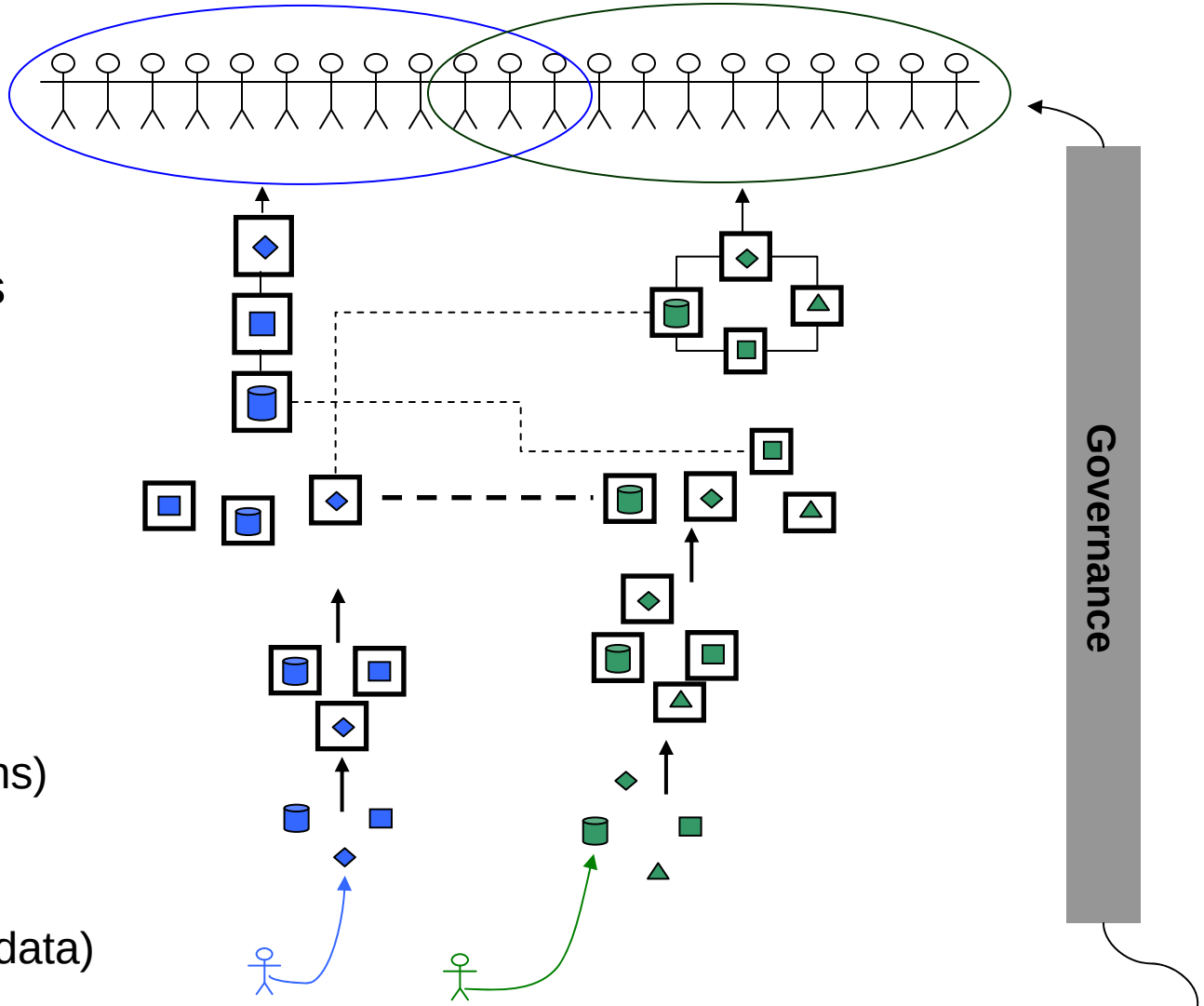
Vision for the Fuels Treatment Community (5 of 5)

User communities

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

Common Interface Standards
(allows for connections)

Capabilities
(algorithms, models, data)

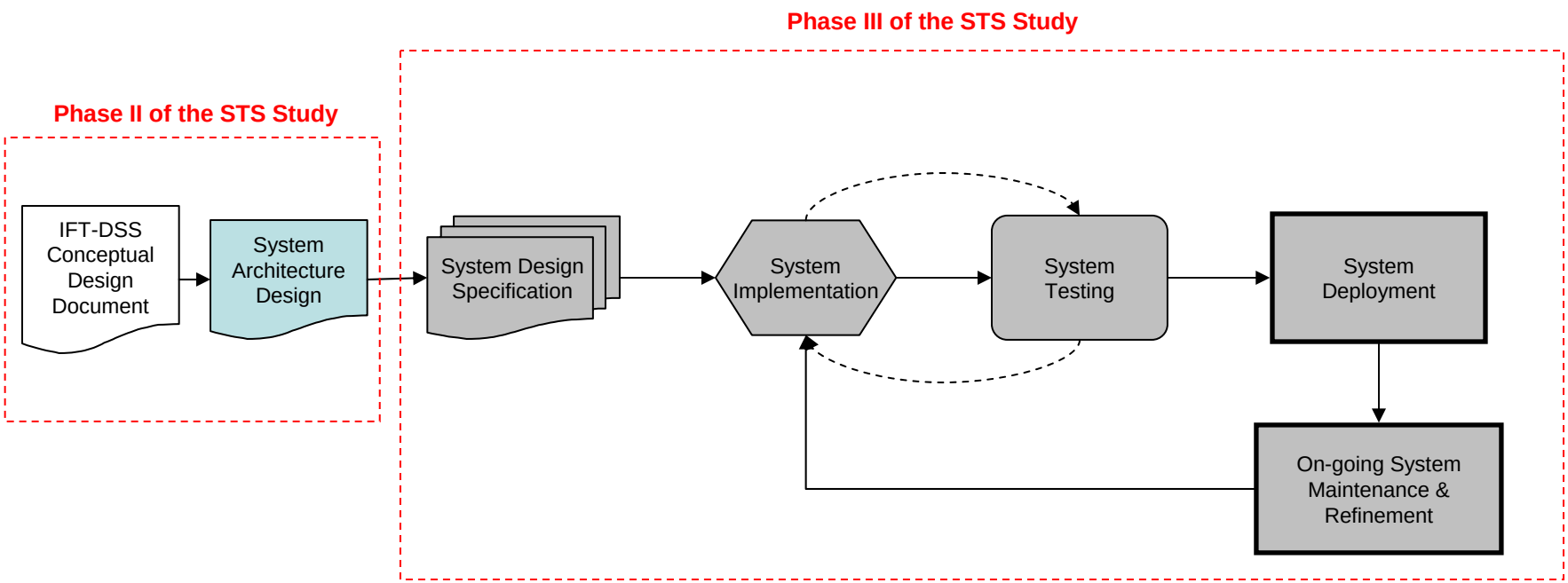


Scientists and data providers create tools

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)

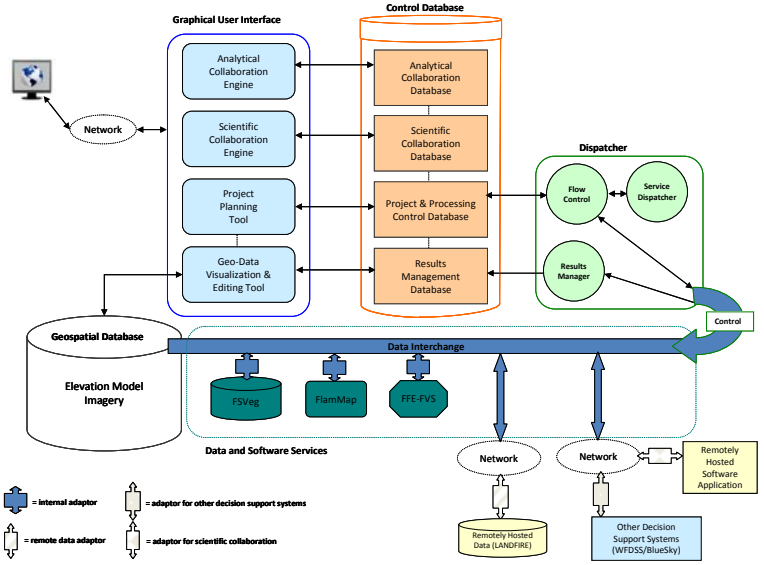
Control Database
(Business Process Control)

Process Controller
(Business Process Management & Information Flow)

Data and Software Services
(Business Services)

Geospatial Database
(Data Storage and Access Service)

IFT-DSS Structural View

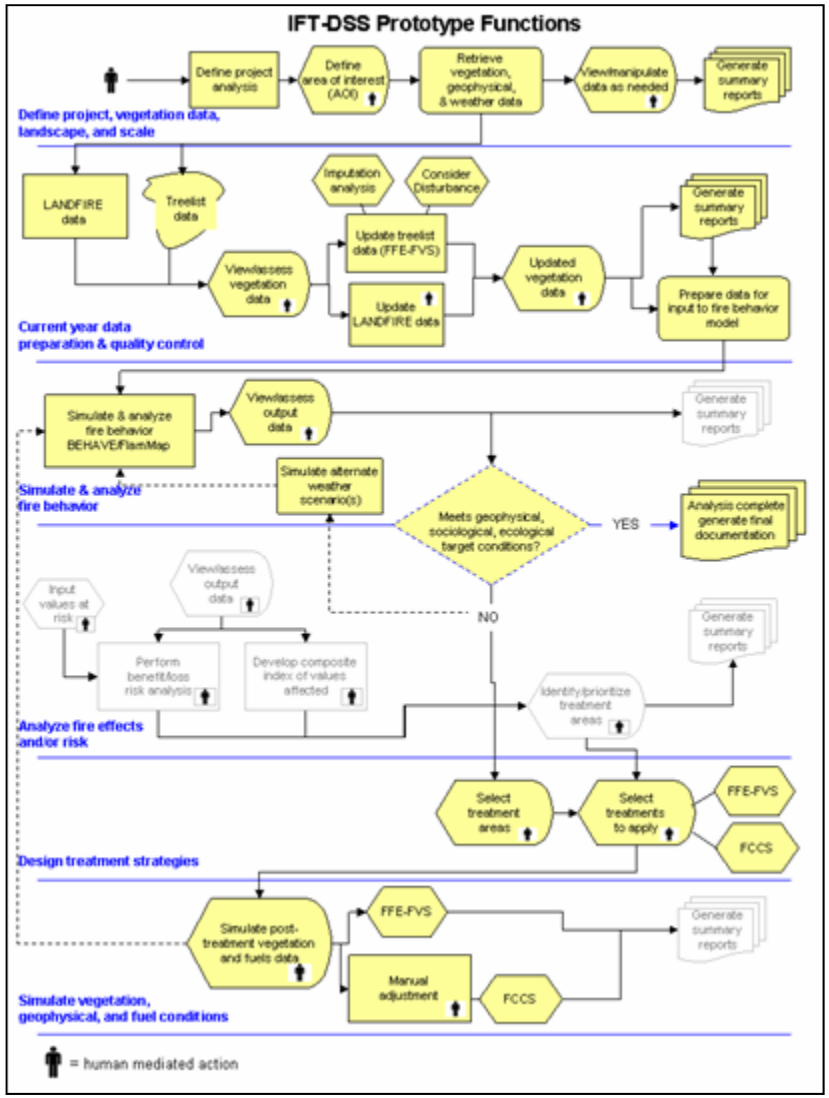


Develop Software Architecture and System (3 of 4)

- 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)

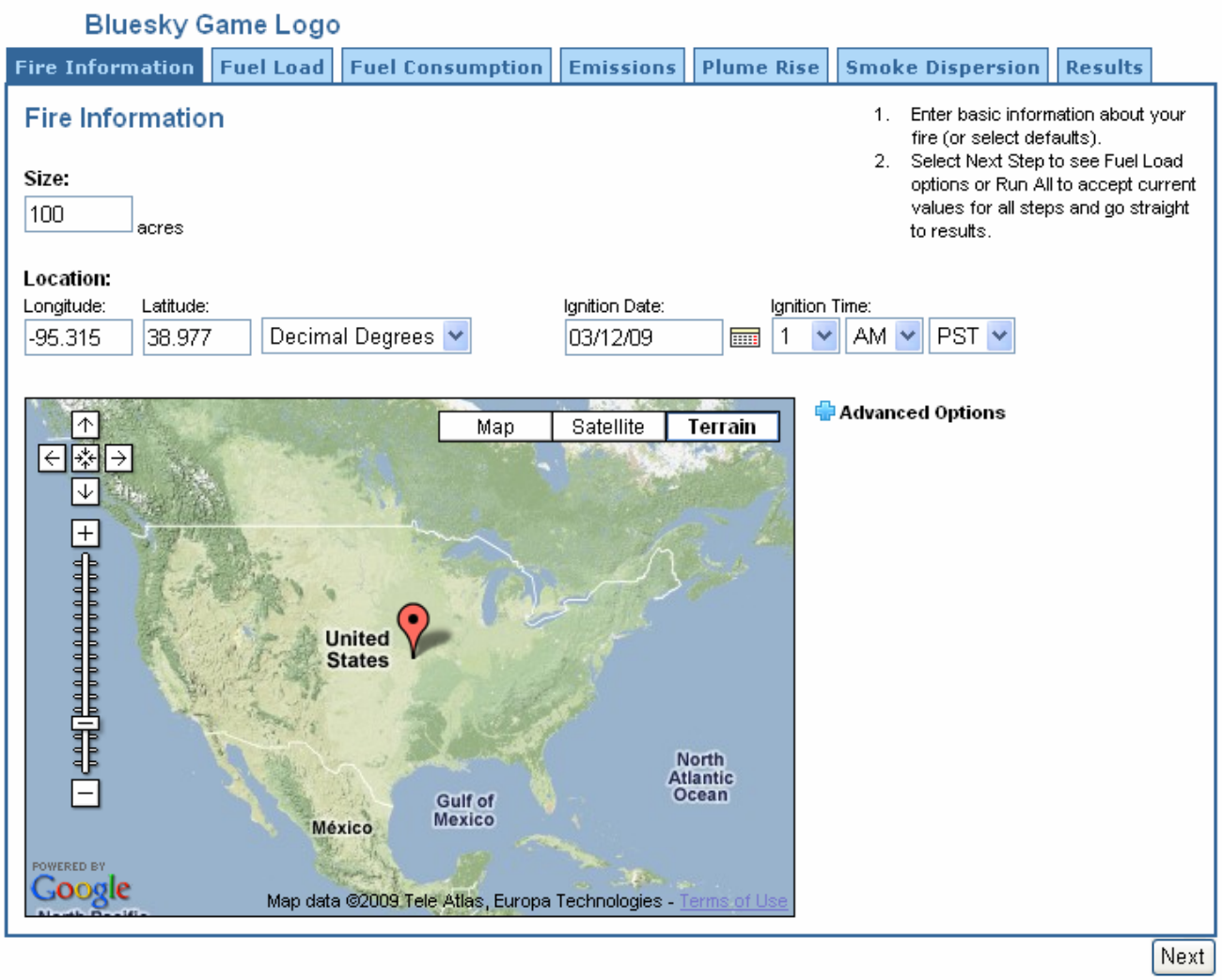
- Development of a functional prototype
  - Serve most common use case
  - Demonstrate early progress and usefulness
  - Engage stakeholder communities early

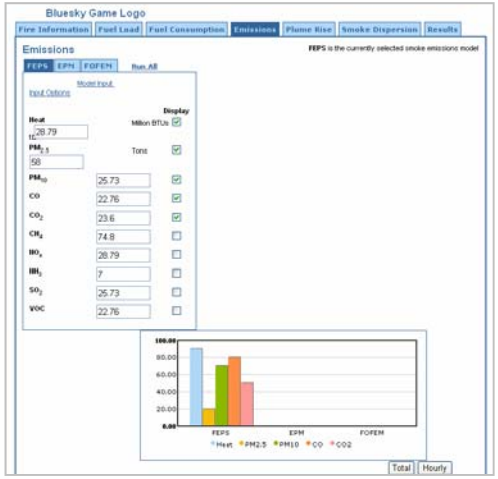


Stakeholder Community Development (1 of 3)

- 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)





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

STS Phase III - Implementation of the IFT-DSS	2009	2010	2011
Implement IFT-DSS functional prototype (hosted at STI)			
Full IFT-DSS implementation (hosted at STI)			
Enhancements and fine-tuning (transition to hosting agency at end of 2011)			

Month	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10
Task												
Validate prototype functionality												
Prototype design specification & user interface mock-ups												
IFT-DSS Implementation												
System testing & refinement												
System & user documentation												

2009 Development Schedule

◆ **Milestones**

Community development

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

Governance development

Initiate IT Investment Process

Work with science community, WFDSS, and BlueSky development teams throughout →

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Development Approach

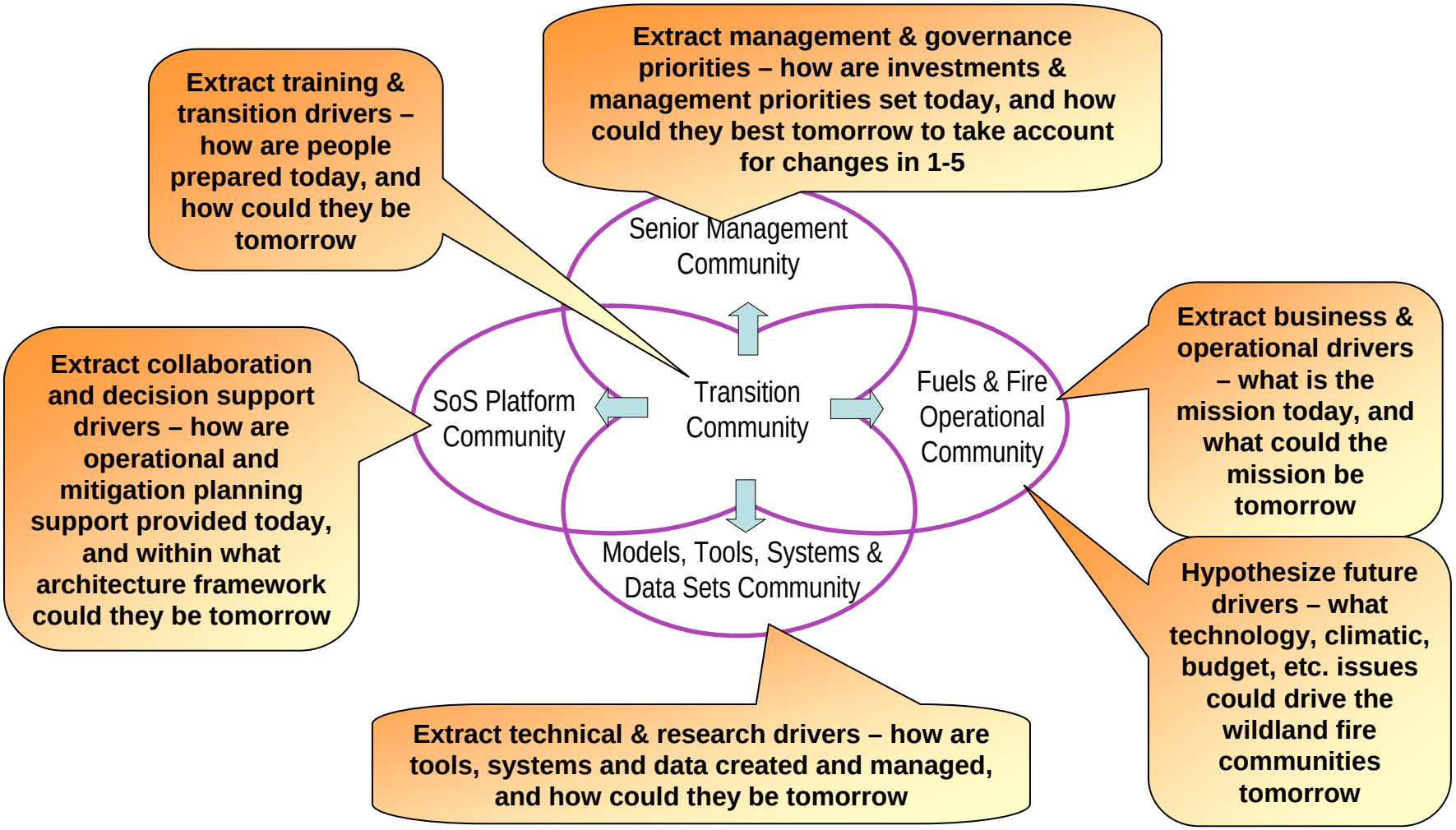
- Rapid prototyping
  - Develop, test, share components early; obtain user feedback early
- Parallel development
  - System can be built in pieces then connected; reduces overall dependencies
- Leverage past experience and intellectual property
  - Experience developing other systems (i.e., the BlueSky Framework, AirNow)

Acknowledgments

- John Cissel and Tim Swedberg (JFSP)
- 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



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