Fire Modeling Services Framework (FMSF) July 2021

Application Overview

The Fire Modeling Services Framework (FMSF) supports users (through decision support systems) to access hosted models/tools services with modeling results and operations. The FMSF is organized as part of a Service Oriented Architecture (SOA) using Model as a Service (MaaS) with cloud computing and hosted models and tools (figure 1). Users of other wildland fire systems/applications [such as Wildland Fire Decision Support System (WFDSS) / Interagency Fuel Treatment Decision Support System (IFTDSS)] do not directly interact with the FMSF and the hosted models and tools (figure 1 & table 1) but rather through the system/application where they are doing assessments, analyses, or scenario planning. These systems/applications (e.g. WFDSS, IFTDSS) connect to the FMSF Representational State Transfer (REST) Application Programming Interface (API) to provide input information/parameters and receive outputs from the models/tools within the FMSF. Outputs currently generated from the models/tools in the FMSF provide information such as fire behavior flame lengths, rates of spread, fire progression, etc.

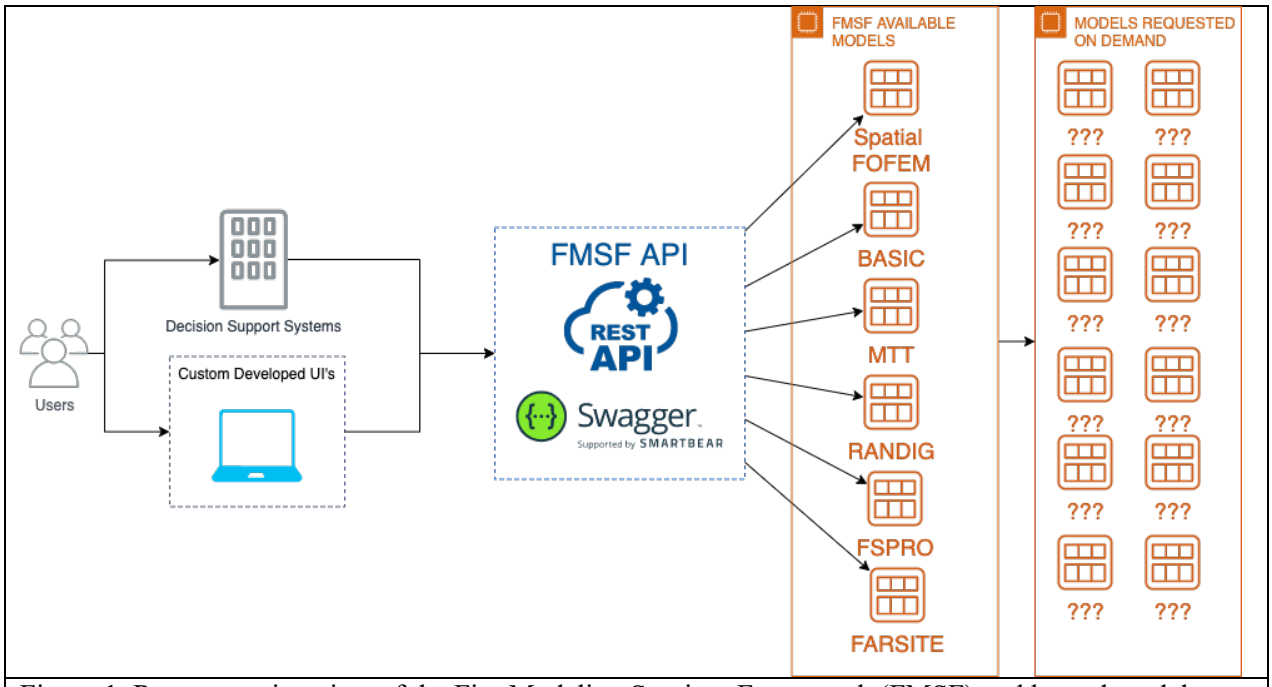

Figure 1. Representative view of the Fire Modeling Services Framework (FMSF) and hosted models or tools.

The Fire Modeling Services Framework is scheduled for a 2022 release initially available to IFTDSS and the Wildland Fire Decision Support System (WFDSS) followed by access to other applications.

The FMSF release will include various wildland fire models (table 1) used in current Decision Support Systems (DSS).

Table 1. FMSF Current Models/Tools		
Basic (aka Flammap)	MTT (Minimum Time Travel)	FARSITE (Fire Area Simulator)
RANDIG (Random Ignition)	FSPro (Fire Spread Probability	Spatial FOFEM (First Order Fire Effects Model)

The FMSF is not an application in typical sense as its targeted user audience isn't users through a Graphical User Interface (GUI) but rather applications and developers who are familiar with using various programming languages. The FMSF provides access via RESTful architecture and provides a Swagger Interface for prototyping and service(s) exploration (figure 2).

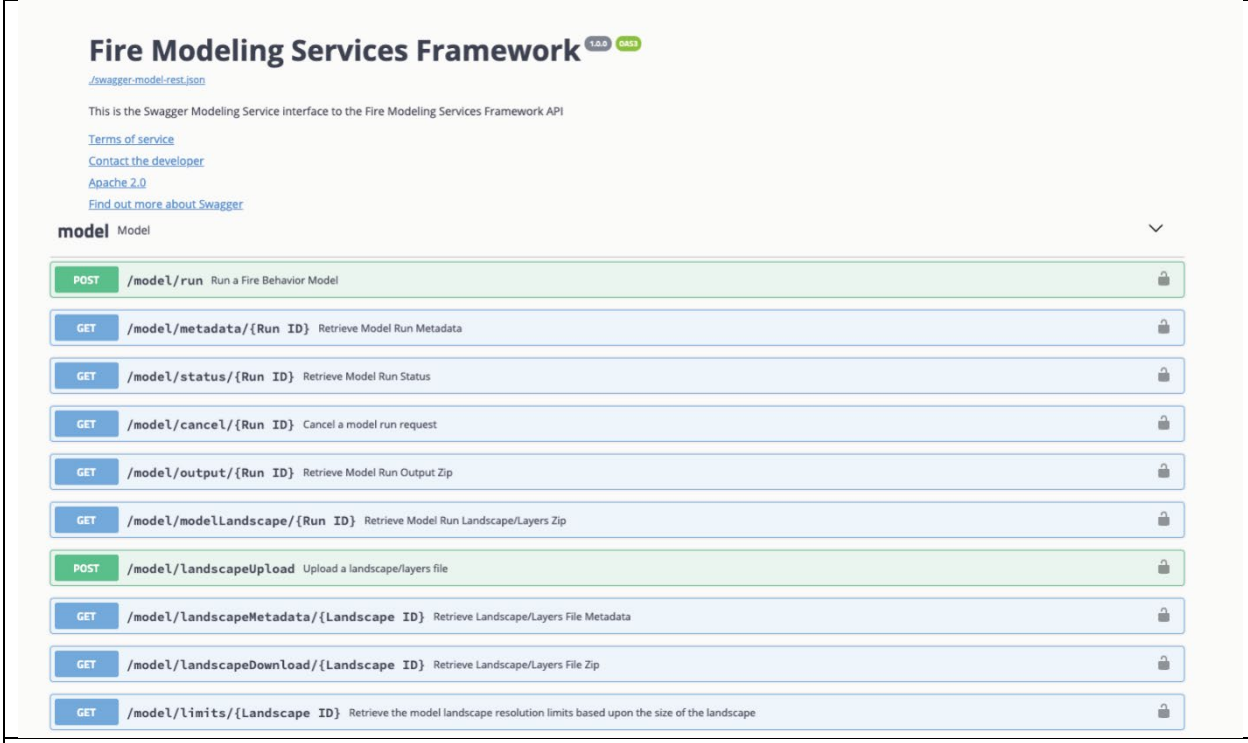

Figure 2. Fire Modeling Services Framework (FMSF) Application Programming Interface

The FMSF allows for faster innovation in the wildland fire applications and IT development space by allowing applications to utilize a service dedicated to managing, running and processing wildland fire behavior models and tools in an integrated framework instead of separate applications. The FMSF supports user needs by leveraging the best available science and information through the integration of models and tools where they can focus more time and attention on model outputs and impacts instead of on gathering data, processing data information in one model or tool to then have to take those results and run them through another model or tool to get desired results.

The FMSF now allevaites system/application(s) independently building, maintaining, or hosting the same fire models/tools within each of their systems. This approach reduces development time and costs across IT system/application(s). There is also, less downtime and more rapid development of enhancements and interface improvements within these applications as they focus on core capabilities instead of models and tools to meet their desired functionality. This enables faster and more efficient work to occur across IT and also ensures that all applications

are using the most current and latest updates of models or tools, without needing to manage or deal with these updates or upgrades separately or independently. This decreases maintenance and development costs where more funding and time is focused on Development, Modernization and Enhancements (DME) workflows in their systems. This approach provides users with improved performance, consistent data, faster analyses, and better results. Both IFTDSS and WFDSS are organized to access and leverage modeling results from the FMSF via Application Programming Interfaces (APIs) with services (figure 3) and other applications may connect in the future.

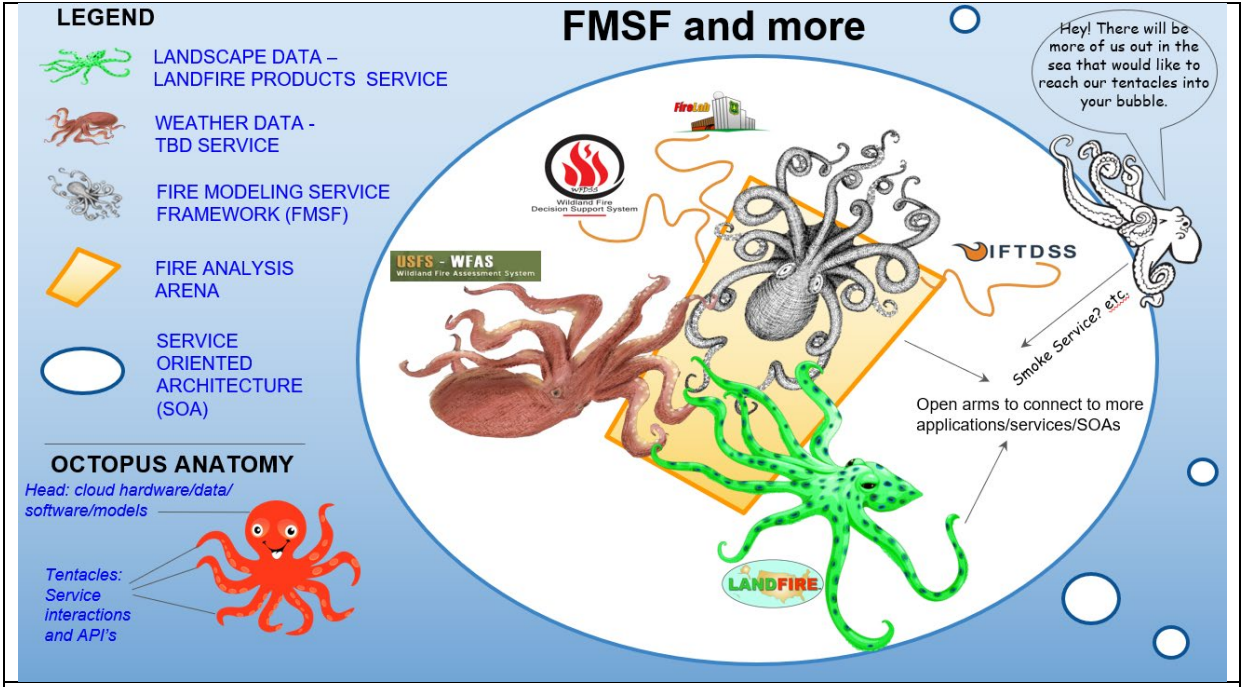

Figure 3. Representative view of the Service Oriented Architecture (SOA) and Fire Analysis Arena where "Services" (Fire Modeling, Landscape Data, and Weather) of APIs connect to support models, tools, or analyses of various applications (WFDSS, IFTDSS, etc.)

The FMSF is part of a shift to a service oriented architecture (figure 3) in wildland fire management Information Technology (IT). FMSF hosts authoratative models/tools in a central location that supports 99% uptime realiblity, fail-over capibility and zero downtime with updates and upgrades. The vision of the future for FMSF is that researchers and scientist will have a place to evaluate, refine, and test wildland fire models and tools in a cloud environment and assist with transfer of science and technology into the user community.

The FMSF is not able to do all of this modeling work by itself. The FMSF has parternered with LANDFIRE and the Fire Environment Mapping System (FEMS) to provide independent data services needed to run the models or tools available in the FMSF. FEMS will provide gridded and Remote Automated Weather Station (RAWS) weather data and landscape data is being provided through the LANDFIRE (LF) program with a LF Products service (figure 4) that provides gridded fuels and topography (as well as a whole host of other data and services).

Figure 4. LANDFIRE (LF) program landscape products provided through the LF Products Service.