Introduction to the Family of SPICE Toolkits

June 2019

(Class version)
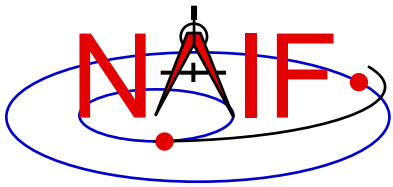
Toolkit Architecture

- **The SPICE Toolkit is officially available in Fortran, C, IDL (Interactive Data Language) and MATLAB.**
  - **https://naif.jpl.nasa.gov/naif/toolkit.html**
  - **A beta Java Native Interface version (JNISpice) is also available**
    - » **https://naif.jpl.nasa.gov/pub/naif/misc/JNISpice_N0066/**
- **The Toolkits are packaged and delivered as standalone products.**
  - **The IDL, MATLAB and JNISpice Toolkits by necessity also include the complete C Toolkit.**
- **Other people have created Python, Ruby, Swift and Julia toolkits, available from their own websites.**
  - **https://naif.jpl.nasa.gov/naif/links.html**
  - **NAIF has NOT been involved in creating, testing or documenting these. Check with their authors about functionality and details.**
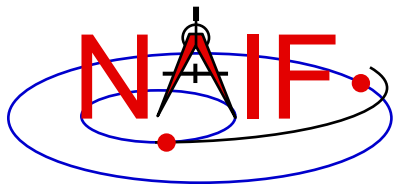
Toolkit Architecture Pictorial

Navigation and Ancillary Information Facility
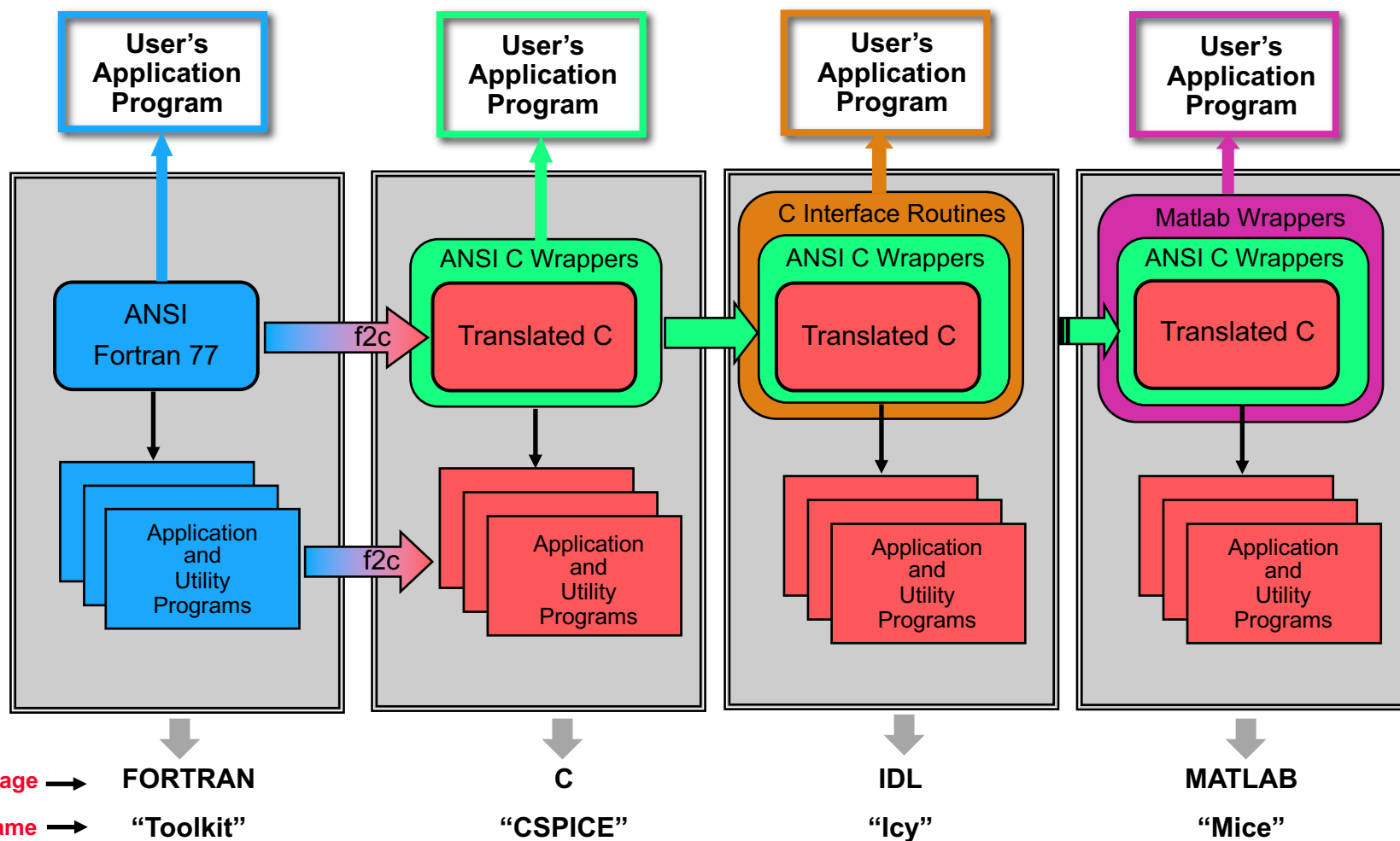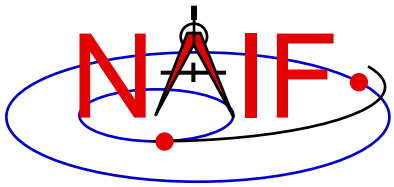
Toolkit Contents

- **Software**
    - **Subroutine libraries, with source code**
        - » **SPICELIB (Fortran)**
        - » **CSPICE (C)**
        - » **Icy (C)**
        - » **Mice (C and Matlab scripts)**
    - **Executable programs**
        - » **Application and utility programs**
        - » **A few example programs (called "cookbook" programs)**
    - **Installation/build scripts (normally you do NOT need to use these)**

- **Documentation**
   - **Available in plain text and HTML**

- **Example Data**
    - **Sample kernel files (supplied only for use with cookbook example programs, <u>not valid for general use</u>).**
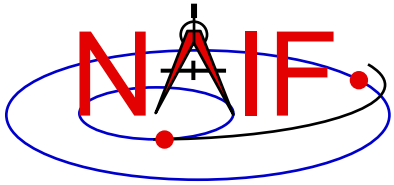
Toolkit Characteristics

- **Computations are identical in all languages.**

- **For a given computer and operating system, all Toolkits use identical kernel files.**
  - **Refer to the "Porting Kernels" tutorial for information about using kernels received from a machine different from what you are using.**

- **Code is well tested before being released to users.**

- **New Toolkits are always backwards compatible.**
  - **An application that worked when linked against an older Toolkit will link and work, without need for changes, using a new Toolkit.**
  - **Past functionality is never changed or removed, except that:**
    - » **enhancements of existing routines are allowed.**
    - » **NAIF reserves the right to fix bugs.**

- **Extensive user-oriented documentation is provided.**
  - **Includes highly documented source code.**
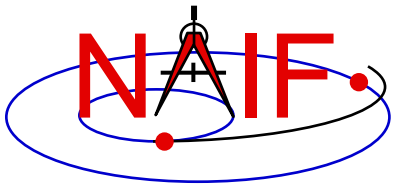
Toolkit Versions

- **Toolkit Version**
  - **SPICE Toolkits have an associated Version number**
    - » **Example: "N0066" (also written as "N66")**
  - **The version number applies to all langue implementations for all supported platforms.**

- **When does NAIF release a new SPICE Toolkit version?**
  - » **Not according to a fixed schedule**
  - » **Primarily driven by availability of significant new capabilities**
    - • **For example, addition of the digital shape kernel subsystem (DSK)**
  - » **On rare occasion a Toolkit update is released to fix bugs, improve documentation, or satisfy an urgent request from a flight project.**
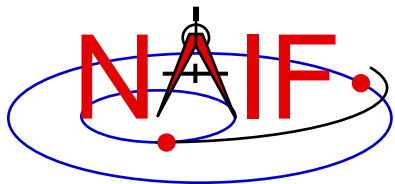
Navigation and Ancillary Information Facility

- **Toolkit libraries contain a broad set of capabilities related to the computations needed for determining "observation geometry" and time conversions.**
  - **Examples appear on the next several pages**

- **Not all functionality is present in all four language versions of the Toolkit library.**
  - **The Fortran (Toolkit) and C (CSPICE) Toolkits provide almost identical functionality.**
  - **The IDL (Icy) and MATLAB (Mice) Toolkits duplicate most but not all of the functionality available in the C Toolkits.**
    - » **We add additional interfaces as time permits.**