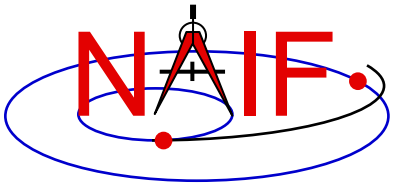
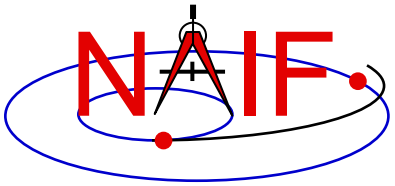


Navigation and Ancillary Information Facility

Time Conversion and Time Formats

January 2017



Time Systems and Kernels

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- Time inputs to and outputs from user's programs are usually strings representing epochs in these three time systems:
  - Ephemeris Time (*ET*, also referred to as Barycentric Dynamical Time, *TDB*)
  - Coordinated Universal Time (*UTC*)
  - Spacecraft Clock (*SCLK*)
- Time stamps in kernel files, and time inputs to and outputs from SPICE routines reading kernel data and computing derived geometry, are double precision numbers representing epochs in these two time systems:
  - Numeric Ephemeris Time (TDB), expressed as ephemeris seconds past J2000
  - Encoded Spacecraft Clock, expressed as clock ticks since the clock start
- SPICE provides routines to convert between these string and numeric representations.
- A time string used as an argument in a SPICE API must be provided in quotes.
  - Fortran, Matlab and IDL: use single quotes
  - C: use double quotes

Converting Time Strings

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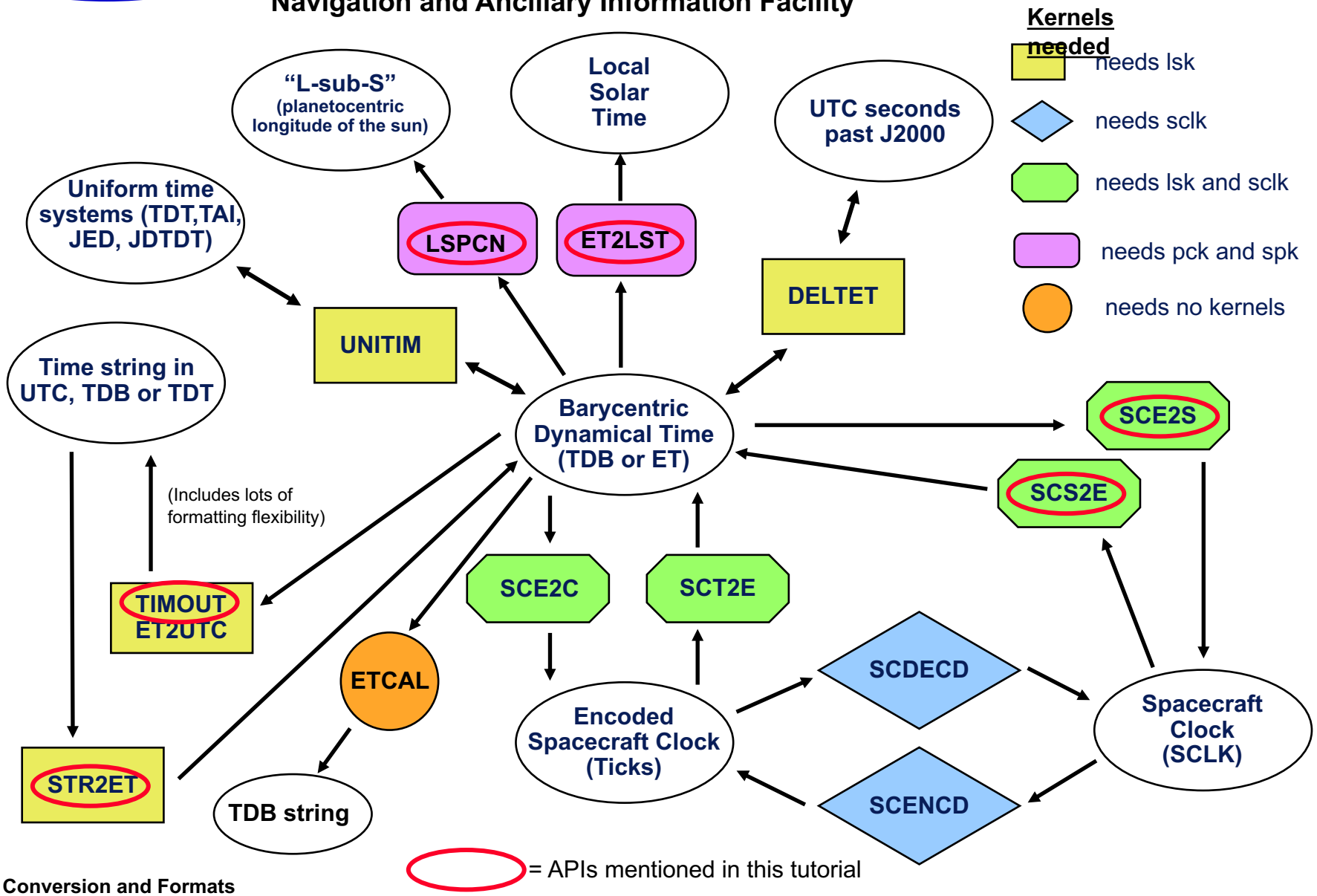
- **UTC, TDB, or TDT (TT) String to numeric Ephemeris Time**
  - **STR2ET (*string*, ET)**
    - » **Converts virtually any time string format known to the SPICE Time subsystem, excepting SCLK. For example:**

      '1996-12-18T12:28:28' **'1978/03/12 23:28:59.29'** **'Mar 2, 1993 11:18:17.287 p.m. PDT'**

      '1995-008T18:28:12' **'1993-321//12:28:28.287'**

      '2451515.2981 JD' **' jd 2451700.05 TDB'**

      '1988-08-13, 12:29:48 TDB' **'1992 June 13, 12:29:48 TDT'**
    - » **Requires the LSK kernel**
- **Spacecraft Clock String to numeric Ephemeris Time**
  - **SCS2E (*scid*, *string*, ET)**
    - » **Converts SCLK strings consistent with SCLK parameters. For example: '5/65439:18:513' (VGR1), '946814430.172' (MRO), '1/0344476949-27365' (MSL)**
    - » **Requires a SCLK kernel and the LSK kernel**

Principal Time System Interfaces

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