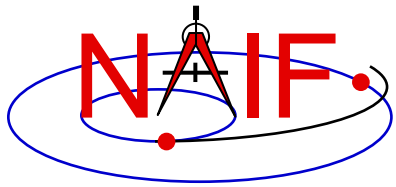


Navigation and Ancillary Information Facility

Porting Kernels

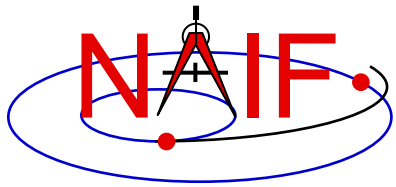
January 2020



Porting Issues - 1

Navigation and Ancillary Information Facility

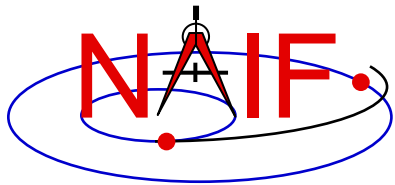
- **Data formats vary across platforms, so data files created on platform “X” may not be usable on platform “Y.”**
 - **Binary formats:** different platforms use different bit patterns to represent numbers (and possibly characters).
 - **Text formats:** different platforms use different mechanisms to represent “lines” in text files.
 - Usually a “line terminator character sequence” indicates end-of-line.
- **We say two platforms have “compatible” binary or text formats if they use the same binary or text data representations.**
- **We say that a file is “native” if its format is the same as that of the computer you are using.**



Porting Issues - 2

Navigation and Ancillary Information Facility

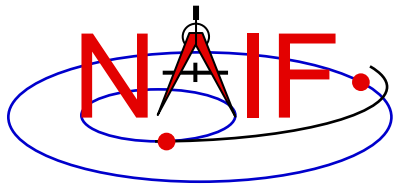
- Toolkit software can **usually** read kernels obtained from an incompatible platform
 - Binary SPK, CK, PCK and DSK kernels from one system can always be read on an incompatible system
 - Text kernels from one system can be read on an incompatible system only when using a C, IDL, MATLAB or JNI: not when using Fortran
- See later charts for compatibility matrix



Porting Issues - 3

Navigation and Ancillary Information Facility

- **When conversion to native format is required to make the kernel usable (see a later chart), several options are available.**
 - Use *bingo* for both binary and text kernels
 - Available only from the NAIF website; not provided in Toolkit packages
 - For text kernels, doing your file download using ftp in ASCII mode will perform the required format conversion on the fly
 - Web browsers often do text format conversion
 - However ASCII mode may not be available – sftp clients usually don't provide it. In such cases other tools such as freeware *dos2unix* and *unix2dos*, or *bingo* from the SPICE utilities page, must be used.
 - For binary kernels, the SPICE *toxfr* and *tobin* tools may be used to convert files to and from SPICE transfer format
 - This is an ASCII-based format that may be transferred in the same way as other ASCII files.



Compatible Environments for Text Kernels

Navigation and Ancillary Information Facility

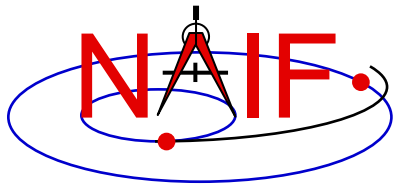
Since text kernels are only text files...

	<u>Groupings of Text Compatible Environments</u>	<u>End of line indicator</u>
1	PC using Windows or N T	<CR><LF>
2	Unix PC with LINUX Macintosh OSX (Motorola or Intel chip)	<LF>

On a Unix/Linux/OSX box you can easily see what kind of line terminator is being used in a text file using the Unix “cat -et” command on your text file.

<CR> tokens will appear as “^M”

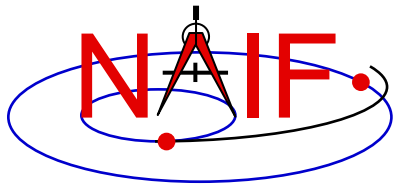
<LF> tokens will appear as “\$”



Compatible Environments for Binary Kernels

Navigation and Ancillary Information Facility

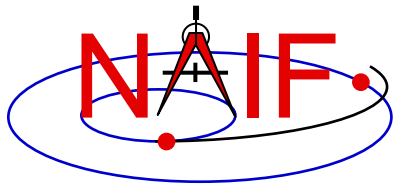
	<u>Groupings of Binary Compatible Environments</u>	<u>Binary Representation</u>
1	PC/ Windows PC/Linux Mac Pro (Intel chip)	IEEE - Little endian
2	Sun Mac Power PC (Motorola chip, discontinued after 2005)	IEEE - Big endian



Caution Using Email

Navigation and Ancillary Information Facility

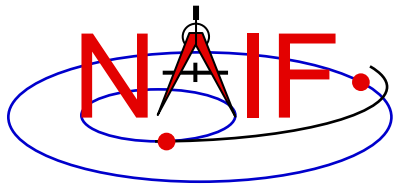
- **NAIF recommends against the use of email to transfer kernels unless previous tests have already proven successful using the same conditions/computers intended for current use. Possible causes of problems are:**
 - incompatible binary or text representations (as already discussed).
 - an attachment size limit somewhere in the e-mail chain.
 - the sender's or recipient's mail client modifies the kernel based on file name or presumed content.
- **When you must email kernels, compress them either with zip, or gzip (or stuffit), then send the compressed file as an email attachment.**



Binary Kernels - Caveats

Navigation and Ancillary Information Facility

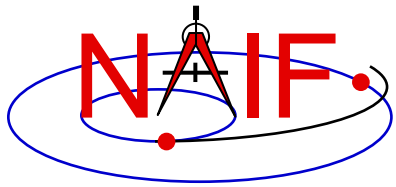
- If the kernel you are using is a non-native binary kernel you can read this file but you may not write data to this file.
 - You **can read** most non-native binary kernels using the automatic run-time conversion capability found in the APIs of modern Toolkits.
 - » Exception: non-native DAS-based files (ESQ) created before 2001 cannot be read. They must first be converted to native format.
 - You **cannot write** information into the comment area, or delete information from the comment area.
 - You **cannot append** additional data to the kernel.



Binary Kernels Allowed Operations

Navigation and Ancillary Information Facility

- You may “load” and read both non-native and native binary kernels in the same runtime instance
- You may merge similar native and non-native files—the resultant, merged file will be in native format.
 - SPKs: using SPKMERGE or DAFCAT
 - CKs: using DAFCAT
 - DSKs: using DLACAT



Text Kernels - Caveats

Navigation and Ancillary Information Facility

- **Cutting/pasting complete, or pieces of, data assignments or `\begindata` or `\begintext` markers into a text kernel can cause a problem**
 - It may result in insertion of non-printing characters or incorrect end-of-line terminations
 - This is not a problem for comments, but it is probably best to treat all portions of a text kernel the same
- **If creating a text kernel by editing an existing one:**
 - first save a backup copy
 - be sure you are starting with a file in native format for the computer you are using: either Unix/Linux/Mac or Windows
 - be sure to insert a final end-of-line marker at the end of your last line of data or text
 - » Press “return”