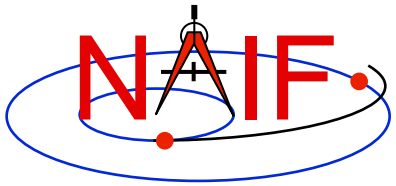
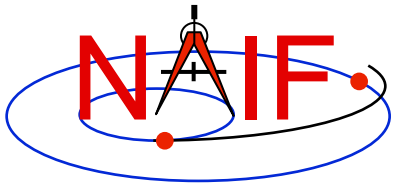


Navigation and Ancillary Information Facility

Motivation for Developing SPICE

April 2016



Why Did NAIF Build SPICE?

Navigation and Ancillary Information Facility

- **Scientists said they would like to:**
  - use common tools and methods throughout a project's lifecycle, and for all projects (national and international)
  - understand the calculations and transformations used to produce observation geometry data
  - be able to produce custom geometry calculations themselves, whenever and however they want
  - have the ability to revise the fundamental data and software tools used to produce their own observation geometry data

What Existed Prior to SPICE ?

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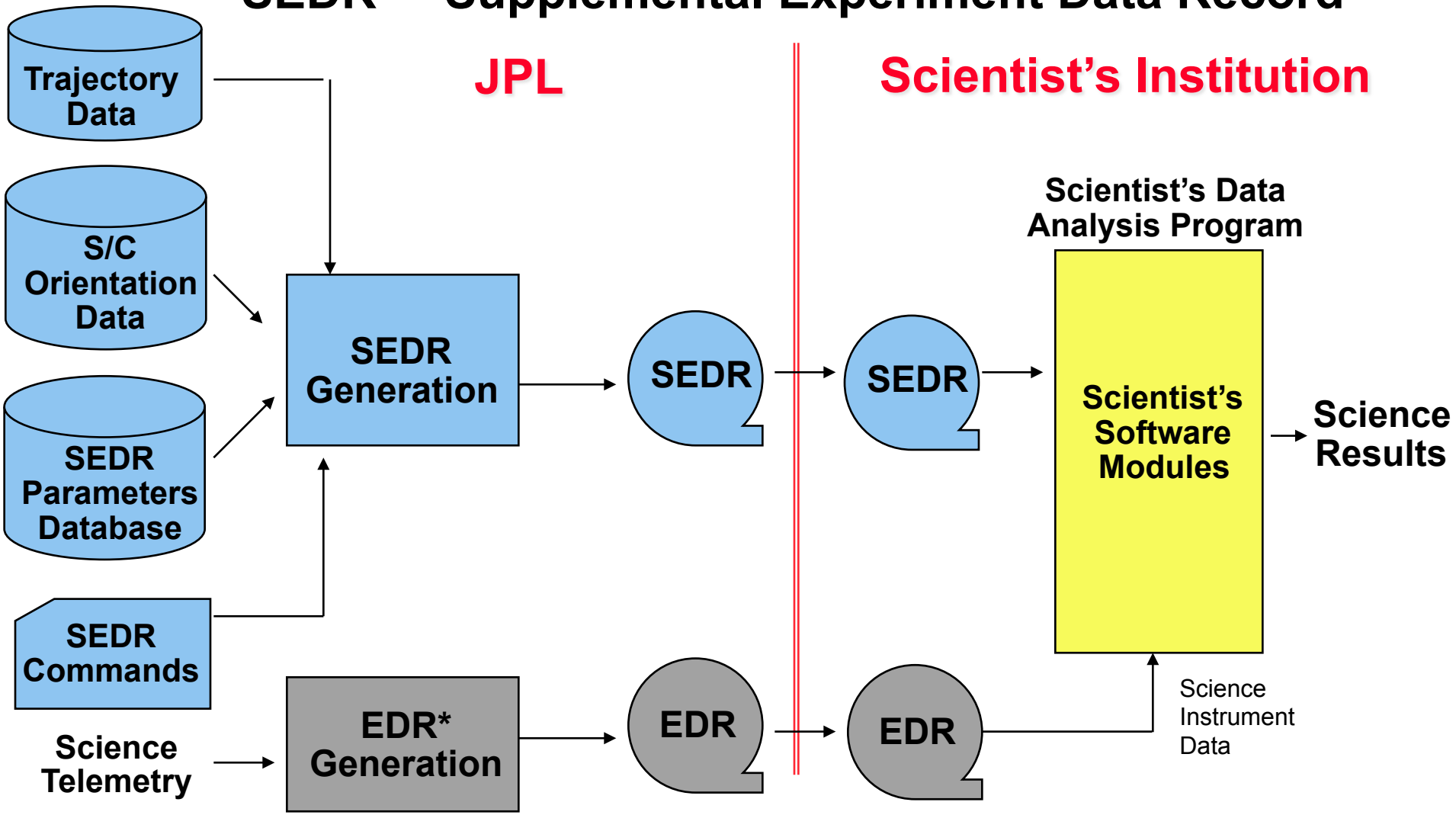
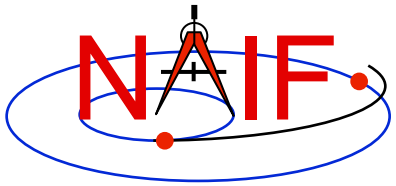
"SEDR" - Supplemental Experiment Data Record



* EDR = Experiment Data Record = "raw" science instrument data



SEDR System Characteristics

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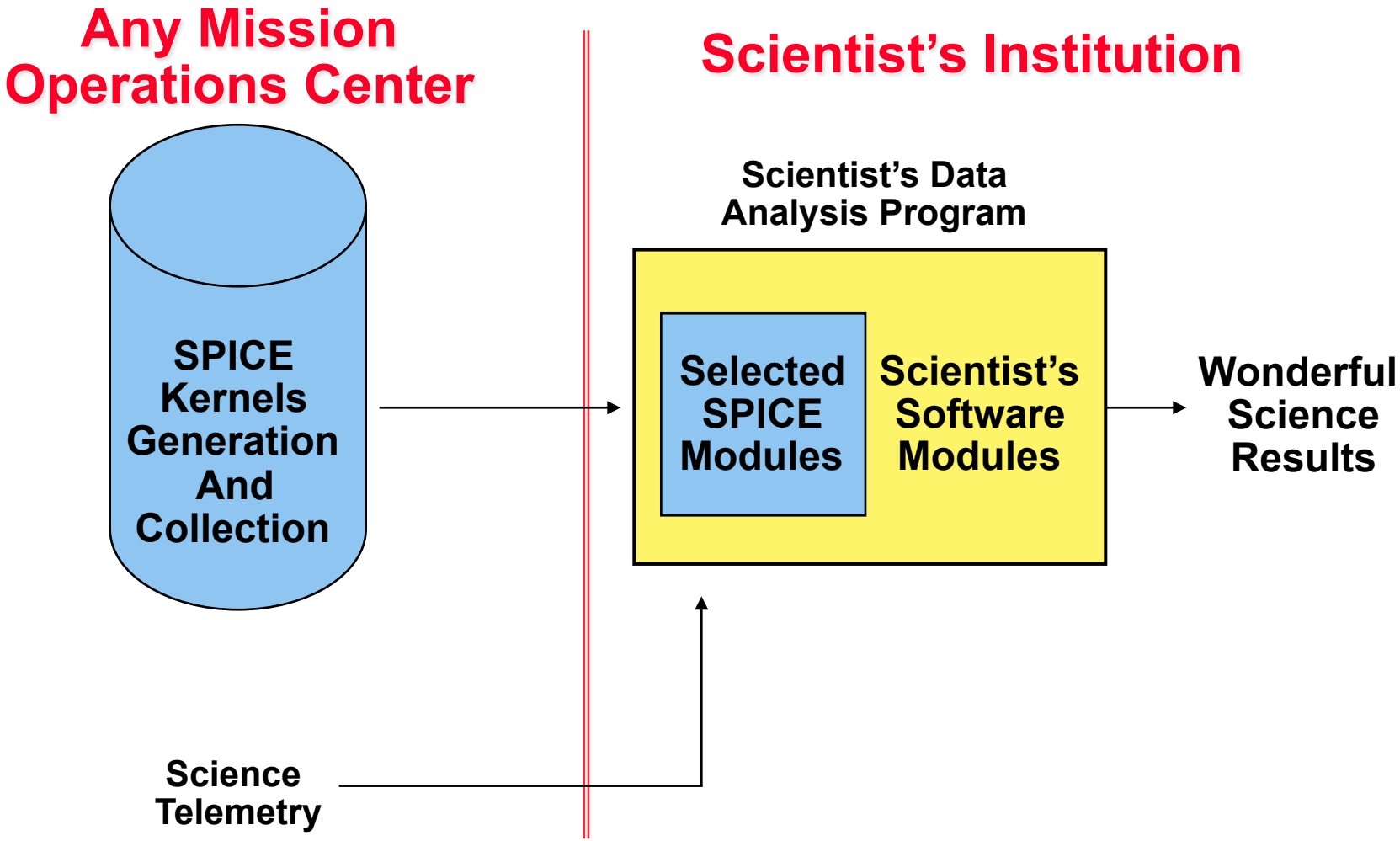
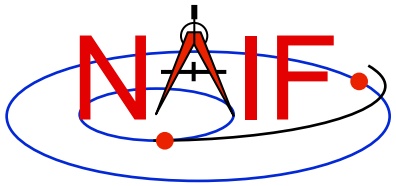
- The SEDR Generation program was built and operated at JPL
  - Scientist's requirements on SEDR had to be provided long before launch
    - » Late or post-launch updates were hard/expensive to accommodate
      - Difficult to change WHAT gets computed
      - Difficult to change HOW items are computed (algorithms, parameters)
      - Difficult to change the TIMEs at which items get computed
  - Generally only one SEDR file would be produced for each period of time
    - » Result: the scientist can't get better ancillary data if/when better inputs (e.g. spacecraft trajectory or orientation) are determined
  - SEDR generation was done "in the blind"
    - » Operators were not familiar with processes used to make the inputs
    - » Operators were not familiar with scientist's processing schemes
    - » Result: SEDR may not fully meet science team's expectations
  - The SEDR system was not exportable to other institutions

The SPICE Idea

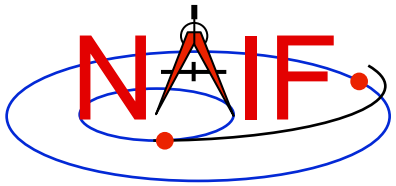
Navigation and Ancillary Information Facility





SPICE Benefits vs. SEDR

- **The customer has great flexibility in deciding:**
  - what observation geometry parameters are computed
  - at what times or at what frequency these parameters are computed
  - for what time span these parameters are computed
  - electing if/when to re-do parameter computations using new (better) or otherwise different data as inputs
- **The customer also has:**
  - common tools and methods that can be reused on many tasks
  - good visibility into algorithms and data used in geometry calculations
- **The flight project operations center can:**
  - concentrate on producing better ancillary data, rather than on producing lots of SEDRs and frequently updating the SEDR software
- **The SPICE process may be replicated anywhere**



SPICE Detriments vs. SEDR

- End users ("consumers") must do some non-trivial programming to read SPICE data and compute whatever is needed
- If the mission operations center is other than JPL, the appropriate project people need to learn how to produce SPICE data
- In some areas of SPICE the offering of choices to allow correct handling of different situations may present complexity that is unwarranted for “simple” problems