SciDB
An Open Source Data Base Project

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Outline

- What is SciDB
- Data Model
- Query language
- Operations
- Storage and partition
- Other features
- Discussions

Why SciDB

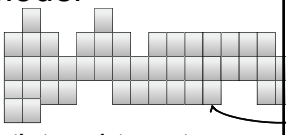
- **One thing does not fit all**
- **Tables?**
  - **Makes a few of you happy**
- **But**
  - **PanStarrs (Alex Szalay) wants arrays and scalability**
- **Nested multidimensional arrays**
- **Array values are a tuple of values and arrays**

Data Model

- **Basic Arrays:**
  - **Basic syntax:**
    - **define ArrayType ({name =Type-1}) ({dname})**
    - **define Remote (s1 = float, s2 = float, s3 = float) (I, J)**
  - **Positive integer dimensions, no gaps**
  - **Bounded or unbounded**
    - **create** My_remote **as** Remote [1024,1024]
    - **create** My_remote_2 **as** Remote [*, *]

Data Model

- **Enhanced Arrays**
  - **Irregular boundary**
  - **Co-ordinate systems**
    - **User defined functions that map integers to something else**
    - **E.g. Enhance A with Scale10**
  - **Use dimension notation to access, e.g.**
    - **A [7, 8] or A[I = 7, J = 8]**
    - **A{20, 50} or A {K = 20, L = 50}.**



SciDB Query Language

- **"Parse-tree" representation of array operations**
- **With a "binding" to:**
  - **MatLab**
  - **C++**
  - **Python**
  - **IDL**
  - **There may be more….**
- **User defined operations and data types (Postgres-style)**

SciDB Operators

- Structural-operators
  - Sjoin
  - Reshape
- Data-operators
  - filter : "select" function
  - Aggregate: aggregating a sub dimensional-array
  - Cjoin

Data Storage and Partition

- **Data Storage Model**
  - **Arrays are "chunked" in storage**
    - **Chunk size can vary or be constant**
  - **Chunks are partitioned across the grid**
  - **Go for scalability to petabytes**
- **With built-in high availability and failover**
- **And built in disaster recovery**

In Situ Processing

- **Operate on data with loading it**
- **Supported by a SciDB self-describing file format**
  - **And some number of adaptors, e.g. HDF-5, NetCDF**
  - **Or write your own**

Other Features Which Science Guys Want (These could be in RDBMS, but Aren't)

- **Uncertainty**
  - **Data has error bars**
  - **Which must be carried along in the computation (interval arithmetic)**
  - **Will look at more sophisticated error models later**

Other Features

- **Provenance**
  - **What calibration generated the data**
  - **What was the "cooking" algorithm**
  - **In general – repeatability of data derivation**
- **Supported by a command log**
  - **with query facilities (interesting research problem)**
  - **And redo**

Other Features

- **Time travel**
  - **Don't fix errors by overwrite**
  - **I.e. keep all of the data**
  - **Supported by an extra array dimension (history)**
- **Named versions**
  - **Recalibration usually handled this way**
  - **Supported by allocating an array for the new version and "diffing" against its parent**

Some discussions

- **Does SciDB have a good chance at success?**
- **How to map time points with the integer dimension values in a "history dimension"?**
- **Is "history dimension" the proper way for time travel?**
- **How to realize the provenance, uncertainty, and optimization of SciDB?**
- **Possible performance testing**

- Thanks!
- Any questions?