Agenda

- Release B Capabilities
- Software CSCs
- Software CSC Status
- Progress Since IDR-B
- ESDT Design
- Design Trades
- Sybase/Illustra Benchmark Status
- High Level HW/SW Physical Design
- Detailed HW/SW Architecture
- Transition Topics
- Next Steps
- Design Topics

Schema Trade

Approaches:

- **(1) Use "pure" relational schema (Rel A Sybase + Rel B enhancements)**
  - **Requires minimal labor for (development) transition (+)**
  - **Minimizes impact to V0 transition (+)**
  - **A->B transition labor is eased (+)**
  - **Easier to revert back to Sybase, if necessary (+)**
  - **Probably lose on performance (-)**
  - **No positioning for evolution (-)**

- **(2) Use combination of Illustra ORDBMS features w/ relational schema**
  - **Reuse schema changes based on benchmark prototype (+)**
  - **Take advantage of potential performance gains (+)**
  - **Begin positioning for evolution (+)**
  - **Transition tasks require mapping Sybase & Illustra schemas (-)**
  - **During the conversion of stored procedures, more development work required (-)**

+ = Advantage
- = Disadvantage

Schema Trade (cont.)

- **(3) Maximize use of Illustra ORDBMS features, including approach to ESDTs**
  - **Positions the SDSRV for maximal use of COTS(+)**
  - **Causes rework of SDSRV code outside the DBMS Wrappers (-)**
  - **All benefits/disadvantages of previous option**

Selected approach is to use a combination of Illustra ORDBMS features with a relational schema (Option 2).

DBMS Wrapper Trade

(1) Use current approach with "traditional" C-style DBMS application program interface (API) through Illustra's LIBMI

- **retains application insulation (+)**
- **minimizes labor required to make the Sybase to Illustra transition (+)**
- **does not take advantage of COTS evolvability (-)**

(2) Change DBMS Wrapper approach to conform to COM model style of API using the Illustra C++ API

- **significant rework of Rel A code (-)**
- **impacts SDSRV code outside the wrappers (-)**
- **less code to maintain in the long run (+)**
- **easier error handling (+)**
- **more "object-oriented" than traditional C-style interface (+)**

Selected approach is to use "traditional" C-style DBMS API through Illustra's LIBMI.

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Sybase/Illustra Benchmark

Goals

Overview

Findings

Sybase/Illustra Benchmark Goals

Primary

- **To mitigate development/production risks by gaining early software, administration, and capacity experience with both Sybase SQS and Illustra products.**
- **To establish baseline performance measurements for Sybase SQS and Illustra running 2-D spatial queries against ~100 GB of metadata under both light and heavy (~100 users) load conditions.**

Secondary

- **To establish baseline measurements for metadata (initial) load times in both Sybase and Illustra.**
- **To establish baseline performance measurements for insert/update/ delete of (single) rows of metadata in both Sybase and Illustra under both light and heavy load conditions.**

Benchmark Configuration

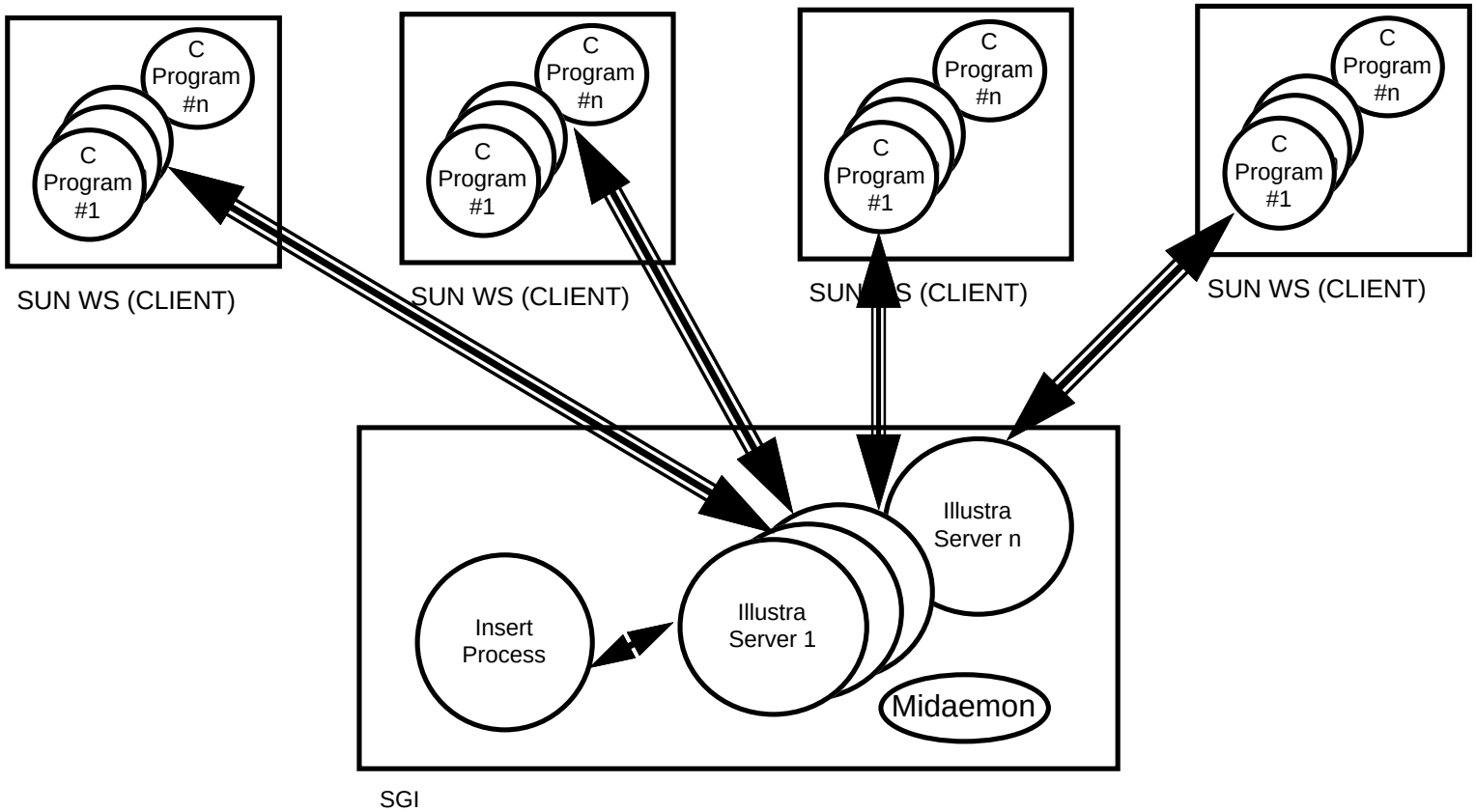
Hardware - SGI Challenge L

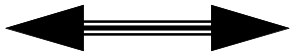
- 230 GB of RAID disk
- 512 MB
- Located in the EDF
- Connectivity to vendor machines

Software - IRIX 5.3

- Sybase SQS 2.1/Sybase 10.0.2
  - C/Open Client
- Illustra 3.2.0.21
  - C/LIBMI

Benchmark Architecture





- Represents a set of connections from a single C process to a single Illustra server process

Benchmark Transactions

2-D Spatial Queries

- **Scenarios generated by Science Office**
- **Example: "User queries ECS about the availability of the following data for the Little Washita watershed, OK-soil maps, DEM, Insitu rainfall data, Run-off data.**
  - **Little Washita watershed coordinates: 36N 98W, 36N 100W, 34N 100W, 34N 98W, 35N 99W**
  - **Selected product instances will be ASTER07B**

2-D Spatial Queries with "attributes"

Metadata Insertion Based on "Sample Ingest"

Benchmark Metadata

Goal:

Generate ~100GB of metadata

- **Roughly equal distribution of metadata around the world, i.e., no focus in a particular area of the world**
- **Include all instruments that generate products that describe a 2-D spatial area**
  - **MODIS**
  - **SAGE**
  - **ASTER**
  - **RADAR**

Benchmark Metadata (cont.)

Approach:

- **Use the "Karl Cox Orbit Model" to generate the instrument data**
  - **Period of observation from 8/17/1998 through 10/1/2002**
  - **Generating about 300 bytes/granule for prototype**
  - **"Padding" the remaining 1700 bytes/granule**
  - **Prototyping with 46,424,701 granules**
- **Store granule information only - NOT collection data**

Benchmark Metadata Composition

ASTER Products

PRODUCT Name	NO. of DB Rows
AST_L1A	1184355
AST_L1B	473742
AST_04	94748
AST_05	94748
AST_06A	473742
AST_06B	473742
AST_06C	473742
AST_07A	94748
AST_07B	94748
AST_08	94748
AST_09A	94748
AST_09B	94748
AST_09C	94748
AST_10	473742
Sub Total for ASTER	4311049

Benchmark Metadata Composition

MODIS AM Products

PRODUCT Name	NO. of DB Rows
MOD_AM01_L1A	867436
MOD_AM02_L1B	867436
MOD_AM03_L1A	867436
MOD_AM04_L2	394363
MOD_AM04_L3_DY	536135
MOD_AM04_L3_WK	76539
MOD_AM05_L2	394363
MOD_AM06_L2	867436
MOD_AM07_L2	867436
MOD_AM08_L2	867436
MOD_AM09_L3_BRDF_L3_16DY	33463
MOD_AM10_L3_DY	536134
MOD_AM11_L3_30DY	17443
MOD_AM11_L3_7DY	76539
MOD_AM14_L3_10DY	52330
MOD_AM14_L3_DY	536134
MOD_AM15_L4_10DY	52330
MOD_AM17_L4_10DY	52330
MOD_AM27_L3_DY	536134

PRODUCT Name	NO. of DB Rows
MOD_AM27_L3_DY	536134
MOD_AM27_L3_WK	76539
MOD_AM28_L3_DY	536134
MOD_AM28_L3_WK	76539
MOD_AM29_L3_DY	76539
MOD_AM30_L2	867436
MOD_AM33_L3_7DY	76539
MOD_AM34_L3_10DY	52330
MOD_AM35_L2	867436
MOD_AM38_L2	867436
MOD_AM40_L3_DY	536134
MOD_AMOCCLR_L3_DY	536134
MOD_AMOCCLR_L3_WK	76539
SUB10_MOD_AM09_13_L2	394363
SUB14_MOD_AM14_L2	867436
SUB18_MOD_AM41_L2	394363
SUB25_MOD_AM10_L2	394363
SUB28_MOD_AM29_L2	394363
Sub Total for MODIS AM	15589476

Benchmark Metadata Composition

MODIS PM Products

PRODUCT Name	NO. of DB Rows
MOD_PM01_L1A	350759
MOD_PM02_L1B	350759
MOD_PM03_L1A	350759
MOD_PM04_L2	159937
MOD_PM04_L3_DY	216803
MOD_PM04_L3_WK	30971
MOD_PM05_L2	159937
MOD_PM06_L2	350759
MOD_PM07_L2	350759
MOD_PM08_L2	350759
MOD_PM09_L3_BRDF_L3_16DY	13527
MOD_PM10_L3_DY	216803
MOD_PM11_L3_30DY	7119
MOD_PM11_L3_7DY	30971
MOD_PM14_L3_10DY	21359
MOD_PM14_L3_DY	216803
MOD_PM15_L4_10DY	21359
MOD_PM17_L4_10DY	21359

PRODUCT Name	NO. of DB Rows
MOD_PM27_L3_DY	216803
MOD_PM27_L3_WK	30971
MOD_PM28_L3_DY	216803
MOD_PM28_L3_WK	30971
MOD_PM29_L3_DY	216803
MOD_PM30_L2	350759
MOD_PM33_L3_7DY	30971
MOD_PM34_L3_10DY	21359
MOD_PM35_L2	350759
MOD_PM38_L2	350759
MOD_PM40_L3_DY	216803
MOD_PMOCCLR_L3_DY	216803
MOD_PMOCCLR_L3_WK	30971
SUB10_MOD_PM09_13_L2	159937
SUB14_MOD_PM14_L2	350759
SUB18_MOD_PM41_L2	159937
SUB25_MOD_PM10_L2	159937
SUB28_MOD_PM29_L2	159937
Sub Total for MODIS PM	6493544

Benchmark Metadata Composition

SAGE Products

PRODUCT Name	NO. of DB Rows
sag3_m2_gei	29631
sag3_m2_nd	29631
sag3_m2_nt	29631
sag3_m2_o3	29631
sag3_m2_oclo	29631
sag3_m2_tp	29631
sag3_m2_wv	29631
sag3_s1_t1020	30128
sag3_s1_t1550	30128
sag3_s1_t290	30128
sag3_s1_t385	30128
sag3_s1_t440	30128
sag3_s1_t525	30128
sag3_s1_t600	30128

PRODUCT Name	NO. of DB Rows
sag3_s1_t760	30128
sag3_s1_t940	30128
sag3_s2_a1020	30128
sag3_s2_a1550	30128
sag3_s2_a290	30128
sag3_s2_a385	30128
sag3_s2_a440	30128
sag3_s2_a525	30128
sag3_s2_a760	30128
sag3_s2_a940	30128
sag3_s2_gei	30128
sag3_s2_nd	30128
sag3_s2_o3	30128
sag3_s2_tp	30128
sag3_s2_wv	30128
Sub Total for SAGE	870233

Benchmark Metadata Composition

Radar Products

PRODUCT Name	NO. of DB Rows
RADAR1	9580031
RADAR2	9580368
Sub Total for RADAR	19160399

Benchmark Findings

Confirmed:

- **Robustness of load procedures for both products**
- **Ability to load large volumes of data**
- **Stability of LIBMI and SQS APIs**

Will brief at CDR:

- **Load times for both products**
- **Query times for Illustra**

WIll brief at 3-DR:

- **Query times for Sybase**

Benchmark Continuation

Timeframe: September through October 1996

Purpose: Benchmark “final” versions of Sybase SQS and Illustra

- **Sybase SQS 2.2**
- **Illustra 3.3**
- **Beta UDS**

Hardware Configuration: Identical to March 1996 benchmark

Data: Current plus 3-D data

Transactions: Same plus 3-D spatial queries

Schema: Release B version modified to handle 3-D spatial queries