EOSDIS Evolution Plan
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Key Points (1 of 3)

- ESDIS embarking on an EOSDIS Evolution process
  - Began in Feb 05 with goals set by HQ appointed Study Team
  - Plan based on informal responses received from EOSDIS Elements (DAACs, SIPS, ECS, Middleware)
- Changes designed to
  - Improve efficiency and introduce more autonomy, agility and scalability through infusion of newer commodity based hardware
  - Move control over processing, archive and distribution for specific science data to science teams
  - Reduce complexity of existing system through development of several DAAC-unique systems
  - Reduce annual operational costs by 15-25% within 3 years
- Changes will happen gradually over next 2-3 years and are planned to
  - Reduce risk associated with operational changes
  - Have "proof of value" periods before taking next steps
  - Continue full operations while evolving

Key Points (2 of 3)

- Lots of work to do
  - Some new interfaces
  - Some new development, integration and testing
  - Some new data flow paths
  - Some new tools

- New changes and revitalization will pave the way to the future
  - Reductions in operational costs provide available funds for new Earth Science applications, new missions, potential new Earth Science Data Records for decadal studies and applications to support measurement-based data
  - Improvements in data processing, archive and distribution can result in faster science findings and available data to serve global change studies

Key Points (3 of 3)

- **Evolution process will require more teaming, partnerships, and positive, pro-active relationships among all of us**
  - DAACs
  - SIPSs
  - ECS/EMD
  - ECHO and GCMD
  - HQ Science Mission Directorate
  - EOS Program Office

- **My office door is always open**
  - Comments, suggestions, questions, and ideas

MODAPS

Transfer responsibility for MODIS processing, archive and distribution from GES DAAC to MODAPS

Initial Step: Atmosphere data

Features:

- Processing on demand for Level 1
- All commodity-based for processing, on-line data storage and access
- Based on extension to existing MODAPS science team production systems

Benefits:

- Reduction in archive growth through on-demand processing
- Faster access to products, reduced reprocessing time from all on-line storage
- Reduced costs due to use of commodity disks, reduction in operations at DAAC
  - Resulting changes to GES DAAC include: 10% fewer products; 90% reduction in total volume and similar reductions in archive growth/day
- Closer involvement and control by science community

GES DAAC

Consolidate GES DAAC data holdings into one DAAC-unique system (S4PA)

Features:

– Transition of AIRS, HIRDLS, OMI, MLS and V0/V1 managed heritage data sets
– Phase out of ECS in FY08 timeframe
– Based on existing on-going effort (development already in progress)
– Reduction of archive volume (due to transfer of MODIS data)

Benefits:

– Reduction in operations costs due to elimination of multiple systems
– Reduction in sustaining engineering costs due to use of simpler, scalable software and reduction in dependency on COTS products
– Increased system automation due to single system, simpler operational scenarios
– Improved data access due to planned use of increased on-line storage and commodity disks/platforms
– Phased elimination provides risk mitigation for MODAPS effort

LaRC DAAC

Consolidate LaRC DAAC data holdings into one DAAC-unique system (ANGe)

Features:

- Initial Step: Transition CERES data from LaTIS heritage system to ANGe
- Based on existing on-going effort (development already in progress)

Benefits:

- Reduction in operations costs due to elimination of multiple systems
- Reduction in sustaining engineering costs due to reduction in dependency on COTS products
- Increased system automation due to single system, simpler operational scenarios
- Improved data access due to planned use of increased on-line storage and commodity disks/platforms (from ECS simplification plan)

Future Steps (contingent on success of Initial Step) include transition of MISR, MOPITT, TES and Phase out of ECS in FY08 timeframe

ECS/SDPS

Rearchitect ECS to simplify sustaining engineering and automate operations

Features:

- Simplify software architecture (eliminate 15 components & 750K SLOC)
- Move towards disk-based archive
- Leverage new hardware technology (e.g., commodity-based systems; shared storage) to reduce hardware maintenance costs

Benefits:

- Low risk approach based on proven data pool technology
- Increased system automation; simplified hardware/software configuration
- Reduction in operational costs at ECS DAACs
- Improved data access due to increased on-line storage and commodity disks/platforms
- Provides risk mitigation for GES DAAC and LaRC DAAC ECS phase out efforts

Plan Summary

- In EOSDIS Evolution 1st Step, four EOSDIS elements are affected:
  - GES DAAC
  - LaRC DAAC
  - MODAPS
  - ECS/SDPS
- Minimal or no impact to other elements at this time
  - Some interface changes
- Evolution will a continuing process
  - Continue to work with HQ Study team to plan future steps
- Today’s presentation is focused on Step 1
  - Charts available at : http://eosdis-evolution.gsfc.nasa.gov/

Key Benefits of Evolution Plan

- **Maximize Science Value**
  - Data access easier and data products quickly available to science community
  - MODIS data more closely integrated with science community
  - Pathfinder for migration of other data into science communities
- **Manageable Risk**
  - Minimizes software development efforts
  - Builds upon existing systems – no “blank paper” new development
  - Utilizes steps within plan as proof of value before proceeding
  - GES DAAC provides risk mitigation for MODAPS development effort
  - Reduced footprint for ECS provides fallback for GES and LaRC development efforts, support for NSIDC and LP DAAC, commodity hardware for DAAC-unique solutions
- **Substantial Cost Savings**
  - Expected savings of 10-25% annually beginning in 3rd year

Next Steps

- **Begin detailed work planning with affected elements**
  - **establish baseline, develop implementation plans, detailed integrated schedule**
  - **Reporting mechanism to track progress**

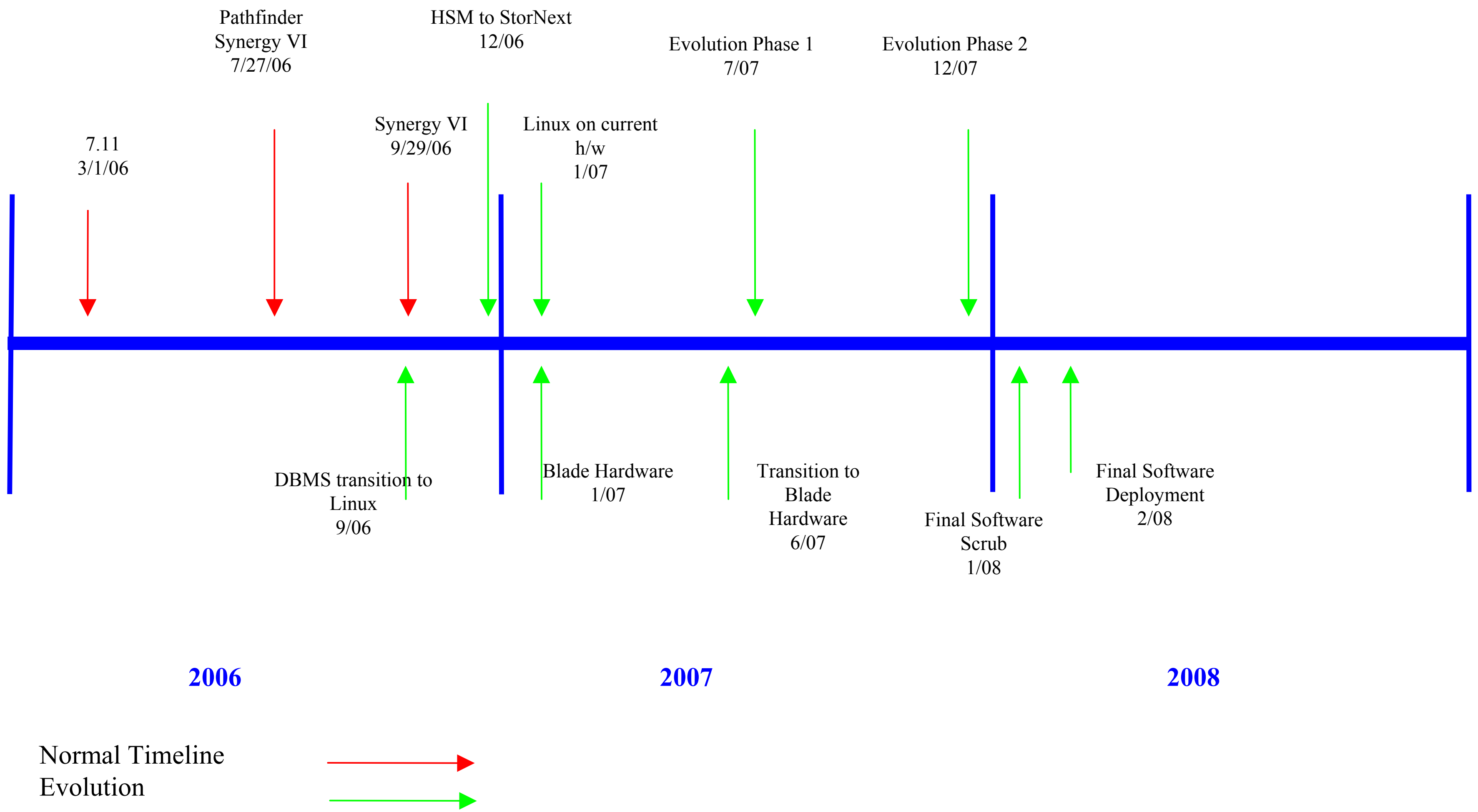
- **Address ESDIS Project level concerns:**
  - **Ensure smooth transition for users**
  - **Minimize disruption at EOSDIS elements**
  - **Coordinate interfaces and other inter-element issues**
  - **Ensure sustaining engineering for areas that are not covered in new changes (i.e. networks, configuration management, ICDs, etc.)**

- **Team work and the best efforts from all of us will maximize our ability to achieve success**

LP DAAC Impacts

- Phase 1 impacts are solely related to the ECS systems changes
- ESDIS delivered Task Proposal Request to EMD on January 27th, 2006
- EMD has 25 days to respond to the request
- When the task is approved, LP DAAC will work with NSIDC, ESDIS, and EMD on the new system
  - Support automation study
  - Evaluate DAAC Unique Extensions (DUEs)
- Final delivery is expected during the 2nd quarter of FY08

Deliveries Timeline



BACKUP

EOSDIS Evolution 2015 Vision Tenets

Vision Tenet	Vision 2015 Goals
Archive Management	▪ NASA will ensure safe stewardship of the data through its lifetime. ▪ The EOS archive holdings are regularly peer reviewed for scientific merit.
EOS Data Interoperability	▪ Multiple data and metadata streams can be seamlessly combined. ▪ Research and value added communities use EOS data interoperably with other relevant data and systems. ▪ Processing and data are mobile.
Future Data Access and Processing	▪ Data access latency is no longer an impediment. ▪ Physical location of data storage is irrelevant. ▪ Finding data is based on common search engines. ▪ Services invoked by machine-machine interfaces. ▪ Custom processing provides only the data needed, the way needed. ▪ Open interfaces and best practice standard protocols universally employed.
Data Pedigree	▪ Mechanisms to collect and preserve the pedigree of derived data products are readily available.
Cost Control	▪ Data systems evolve into components that allow a fine-grained control over cost drivers.
User Community Support	▪ Expert knowledge is readily accessible to enable researchers to understand and use the data. ▪ Community feedback directly to those responsible for a given system element.
IT Currency	▪ Access to all EOS data through services at least as rich as any contemporary science information system.

EEE Study Team Members

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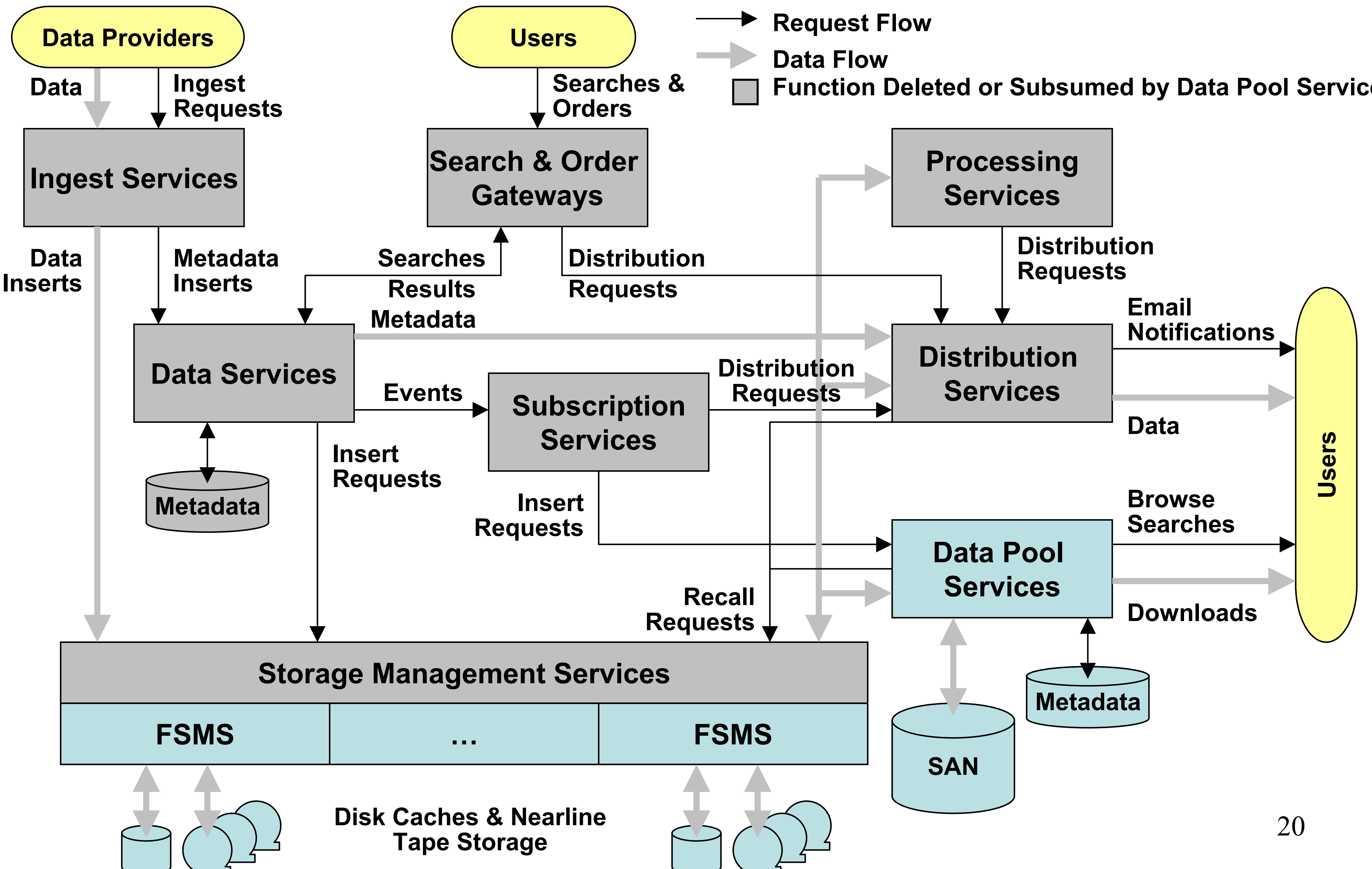
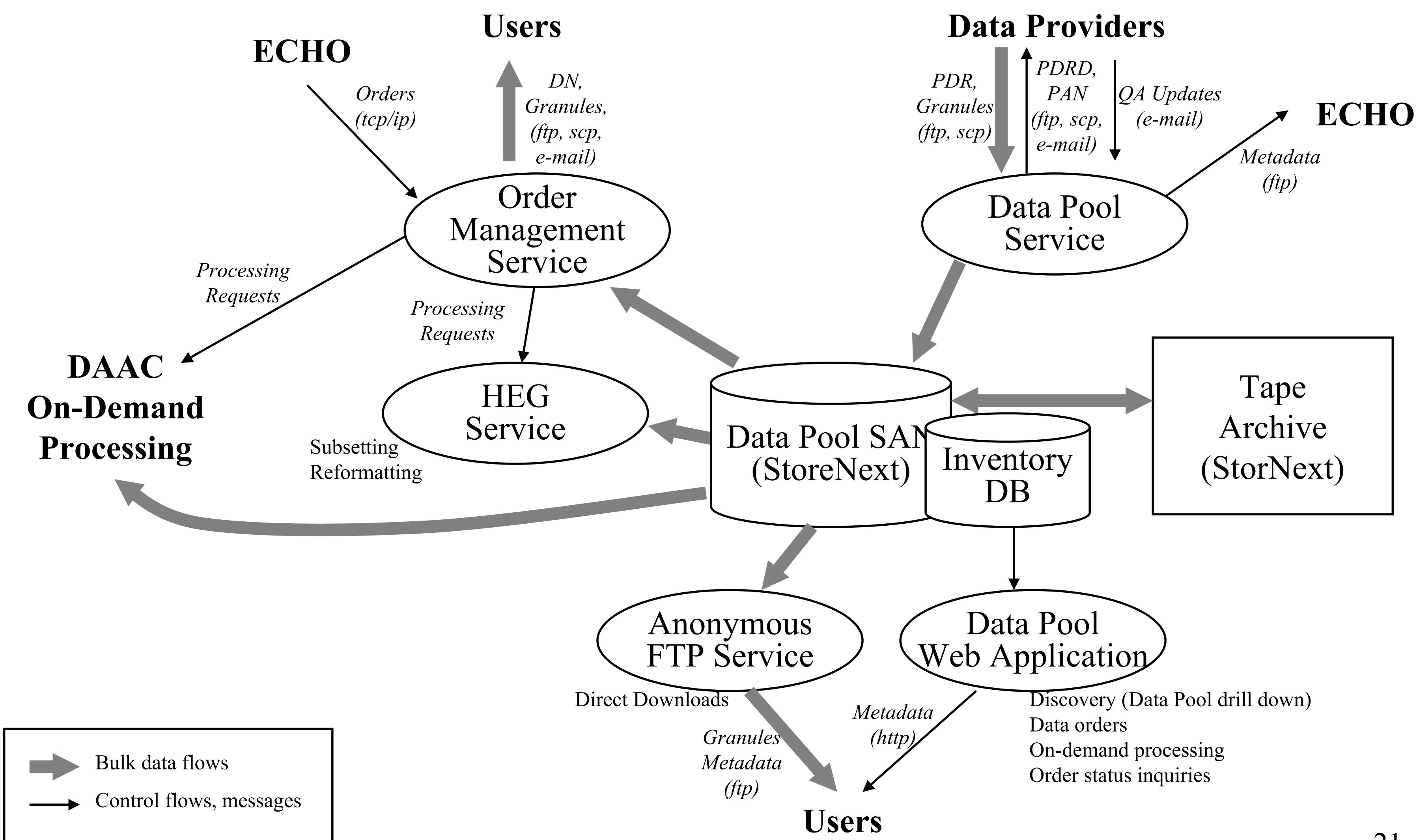
SDPS Software Evolution Roadmap



Software Changes
Target Software Architecture



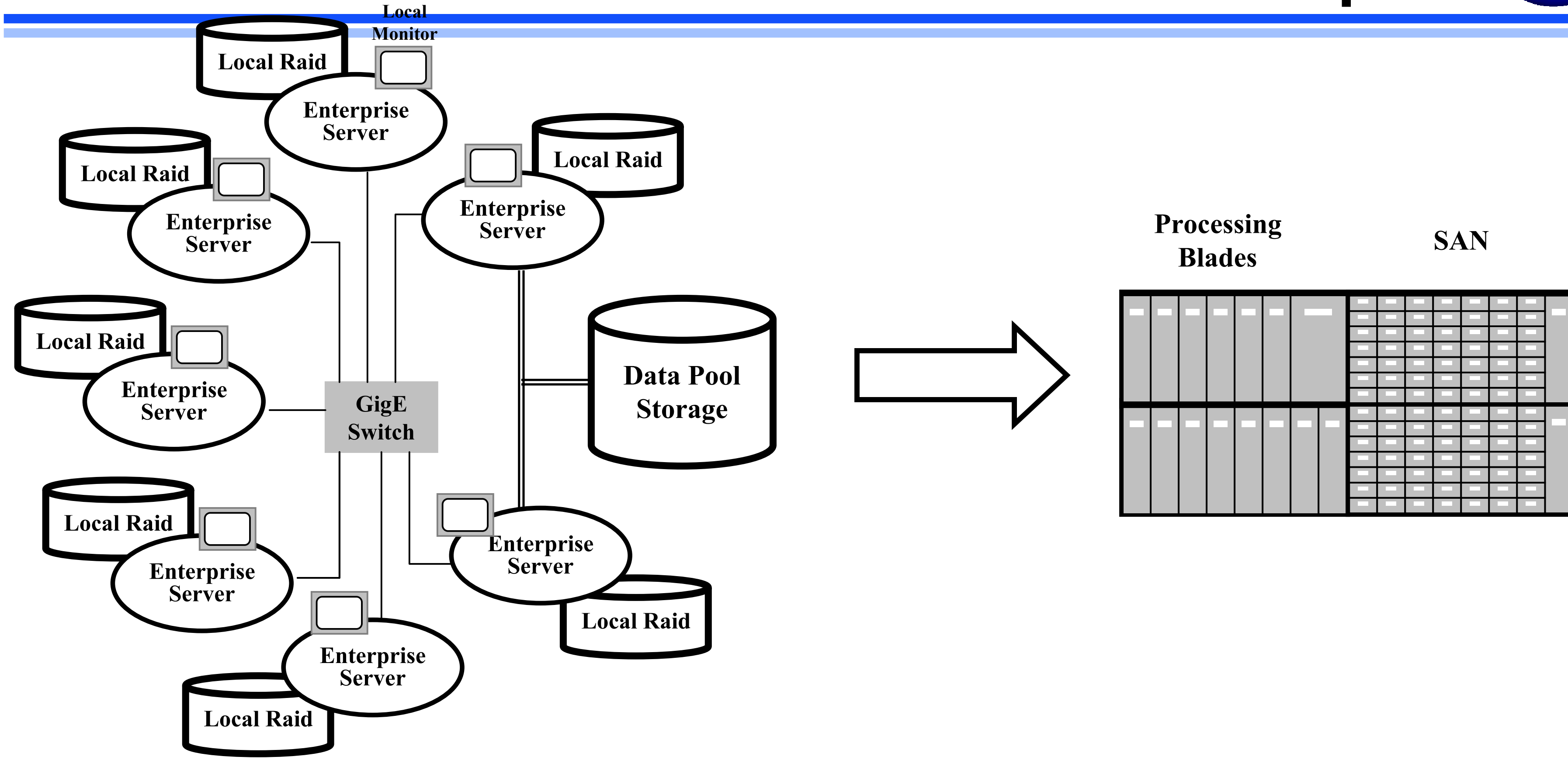
Software Changes Technical Approach

- S4P processing system is used for all processing at GES, LP, and ASDC DAACs, replacing the SDPS PDPS processing system
  - SCLI or external subsetter interface used to request processing inputs
  - SIPS interface used to return processing outputs for archiving or distribution
- ECHO provides user search, browse, and order submission functions enabling these functions to be removed from SDPS
  - Data Pool drill down search interface would be retained
- Machine-to-Machine Gateway phased out (provided through ECHO)
- ECHO clients fully replace EDG
  - External users search ECHO for collections and granules
  - External users perform browse via ECHO, including browsing MISR and AIRS collections
  - External users submit data orders via ECHO
  - DORRAN order approval at LP DAAC will occur outside of SDPS
  - V0 Gateway is not longer supported. ECHO will submit orders via a TBD interface (e.g., XML/SOAP)
  - SDPS will no longer support
    - Returning packaging and processing options
    - Returning cost estimates
    - Exporting lists of valid values for science metadata in ODL (export via XML will continue)
    - Performing access control checks for user orders

Software Changes
Technical Approach

- Media ingest and ingest via TCP/IP (only used by Landsat) no longer supported
- Distribution, ingest and archiving moved to the Data Pool service
- Support for media ingest is dropped (not currently used)
- Additional automation is added (based on joint DAAC-EMD analysis)
- Results
  - Current custom code baseline is 1,260,000 lines of C++/Java code
  - Resulting custom code baseline is 400,000 lines of C++/Java code
  - About 750,000 lines of existing (complex) C++ code is removed
  - 63,500 lines of new code must be developed
  - 32,500 lines of existing code must be reworked
  - Elapsed time to implement ~24 months

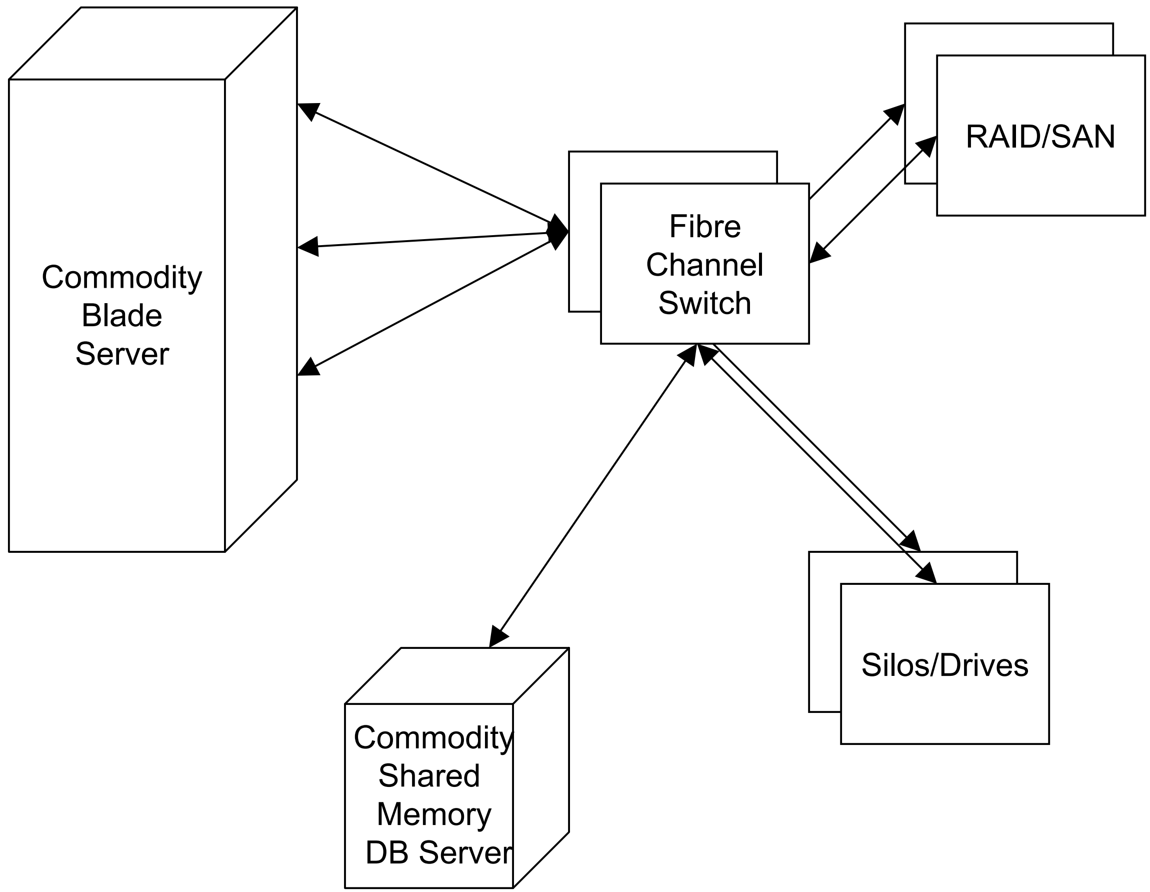
SDPS Hardware Evolution Roadmap



TODAY:
- Server platforms with local RAID
- Solaris or Irix OS
- Switched GigE Network
- Some platforms connected to SAN

FUTURE:
- Rack mounted blades
- Linux OS
- Rack mounted SAN
- Optical fiber network infrastructure
- All platforms connected to SAN

Hardware Changes
Target Hardware Architecture



Commodity Blade Server

Commodity-Based
Shared Memory
DB Server

Shared SAN with
Shared Filesystem

Hardware Changes
Technical Approach

- Replace existing SGI and Sun servers with Linux-based commodity blade server
- Consolidate DBMS servers. Replace existing SGI and Sun servers with single large-shared memory commodity server
- Transition from AMASS to StorNext Storage Manager (SNSM)
  - SNSM will run on expanded SNFS metadata server
  - SNSM can read AMASS written tapes so no data migration is needed