Jonathan Gleason

DATA MANAGEMENT STATUS

Data Management Team
CERES Science Team Meeting May 1, 2012

Overview

- Organization
- Activity Since Last STM
- Data Availability
- Platform Migration Status
- FM5 data accountability
- Production Optimization / Automation Effort

Data Management Team Members

Instrument:
Denise Cooper
Thomas Grepiotis
Richard Spivak
Mark Timcoe
Dianne Snyder

Configuration Management:
Tammy Ayers
Joanne Saunders

ERBElike:
Dale Walikainen
Jeremy Lande

Convolution:
Igor Antropov

TISA Gridding:
Raja Raju

Systems/ Optimization:
Nelson Hillyer
Josh Wilkins

TISA Averaging:
Cathy Nguyen
Betty Lock

Inversion:
Victor Sothcott

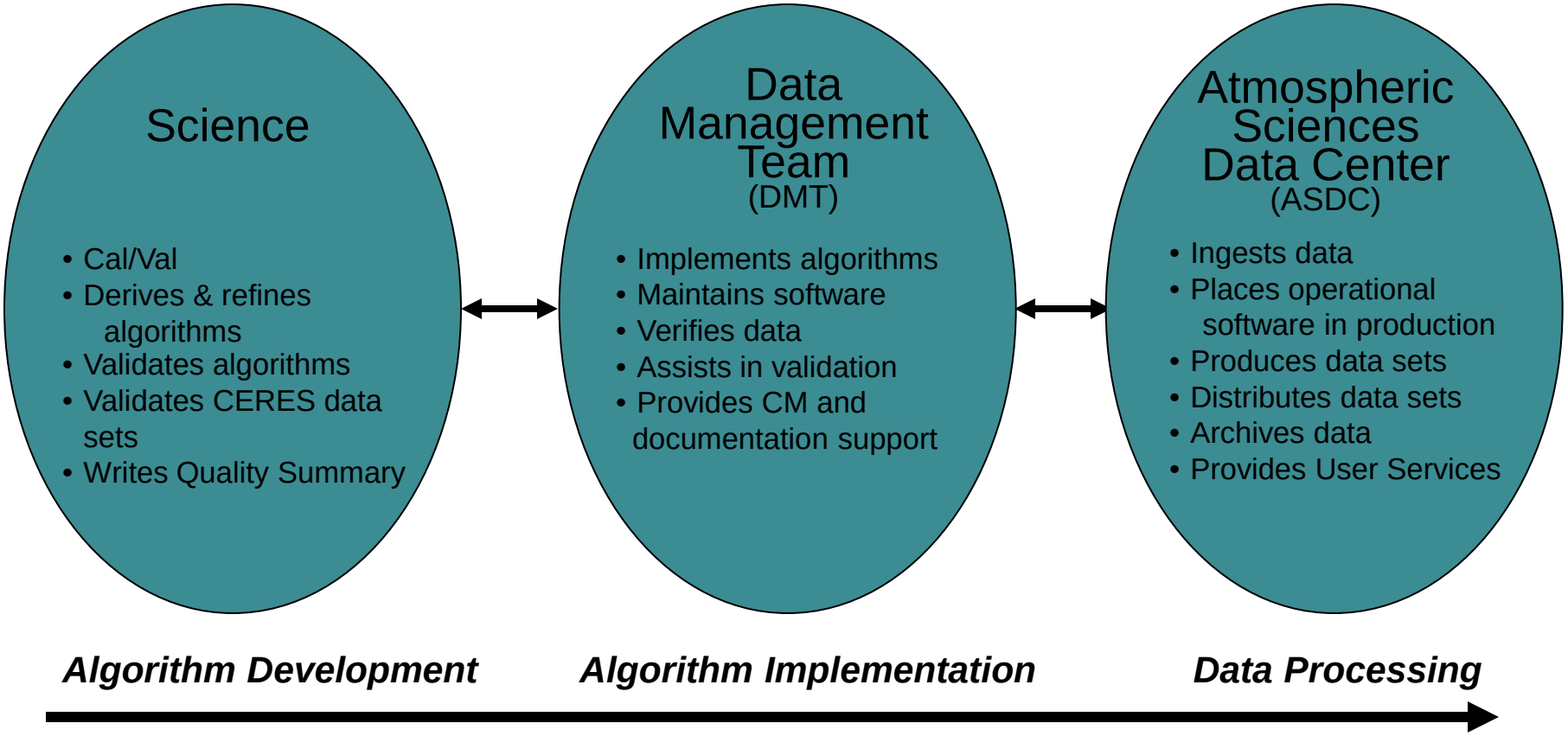
SARB:
Tom Caldwell

Production / Optimization:
Lisa Coleman
Carla Grune

Clouds:
Sunny Sun-Mack
Ricky Brown
Yan Chen
Liz Heckert
Rita Smith
Sharon Gibson

Task Manager:
Walt Miller

CERES Organization



CERES Production Software Overview

Subsystem Number	Subsystem Name	Number of PGEs	LOC (to nearest 1K)	Publicly Available Data Products	Product Frequency
1	Instrument/Pre-Processor	1	5K		
1	Instrument	5 + lib	154K	BDS	1/day
2	ERBE-like/ Inversion	5 + lib	32K	ES-8	1/day
3	ERBE-like/ TSA	2	12K	ES-9, ES-4	1/month
4.1 – 4.4	Clouds/VIIRS Subset Code	1	21K		12/hour
4.1 – 4.4	Clouds	10	351K		
4.5 – 4.6	Inversion	13	147K	SSF	1/hour
5	SARB	6	166K	CRS	1/hour
6 & 9	TISA-Gridding	13	73K	CRS1deg-Hour, SSF1deg-Hour, ISCCP-D2like-Day/Nit	60/month, 36/month, 1/month
11	GGEO	1	6K	ISCCP-D2like-GEO	1/month
7.2	Synoptic SARB	1	47K		
7.1 & 8 10	TISA-Averaging	5	184K	SSF1deg-Day, SSF1deg-Month, SYN1deg-(3Hour, M3hour, Mhour, Month)	1/day, 1/month, 1/month 5/month
12	MOA	2	14K		
	CERESlib		120K		
	Total	**65**	**1,330K**		

Activity since Fall STM

22 total deliveries since 10/4/2011

- Instrument (4)
  - 2 Bug fixes discovered with preprocessor after NPP Launch
  - 1 PCF bug fixed
  - 1 routine delivery
- ERBE-Like (1)
  - delivery associated with platform migration
- Clouds (1)
  - Redelivery Beta Edition 4 code
- Inversion (1)
  - Ed3 Inversion bug fix
- Tisa Grid (3)
  - ISCCP-D2like-Mrg delivered to AMI-P
  - 1 Ancillary input file delivery
  - 1 script delivery to handle cases where too little input data (ex: June 2001)
- Tisa Averaging (3)
  - Ed3 TSI PGEs delivered to AMI-P
  - 2 script deliveries in support of Ed3 TSI and SYN1deg processing
- Inst SARB (1)
  - 1 MATCH files Jan ‘11 – Dec ‘11
- GGEO (1)
  - Offline code delivery to CM repository
- CERESlib (2)
  - 1 Integrate new CERES standard exit codes
  - 1 Supporting Ed4 deliveries
- Perl_Lib (5)
  - 1 delivery for migration from to UGE
  - 4 deliveries adding modules and functionality to support CATALYST

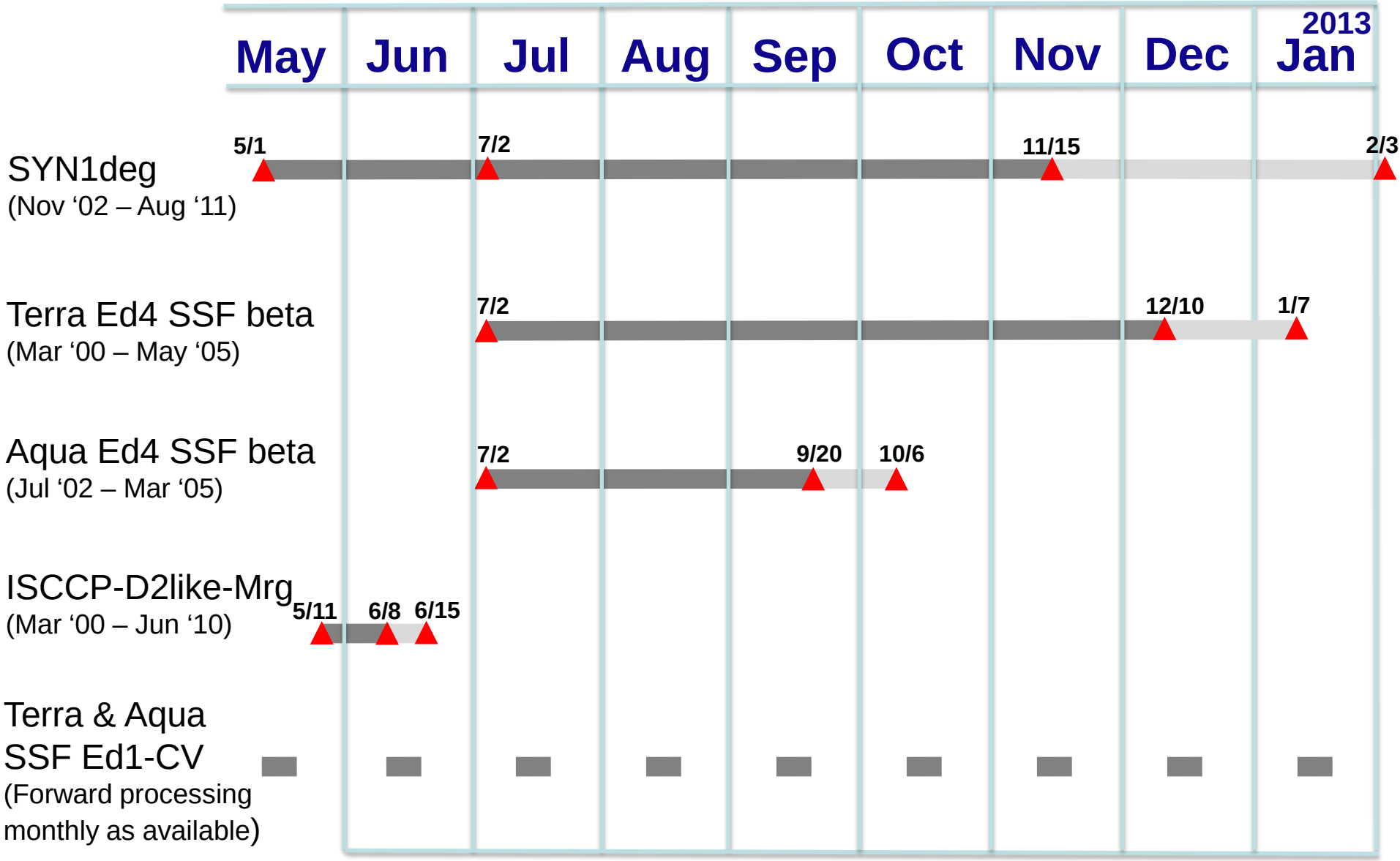
Computing Platform Migration

Warlock (SGI)	Magneto (P4)	AMI-P (P6 & x86)
• None	• Clouds Ed1-CV • Inversion Ed2 & Ed3 • TISA Gridding Ed3 • Inst. SARB Ed2 • MOA Ed2 • ISCCP-D2like-day/nit • ISCCP-D2like-GEO	• Instrument • ERBE-Like • TISA Averaging Ed3 • Synoptic SARB Ed3 • MOA Ed4 • ISCCP-D2like Merge • FLASHflux **In Testing** • Clouds Ed4 beta • Inversion Ed4 beta **In Development** • TISA Gridding Ed4 beta

Data Availability

Product	Instruments	Available through	Comments
BDS (Ed 3)	Terra Aqua	Sept 1, 2011 June 1, 2011	Need Input
SSF (Ed 3)	Terra Aqua	Aug 31, 2011 Jan 1, 2011	
SFC (Ed 3)	Terra & Aqua	Dec 2010	As Needed
SYN1deg (Ed 3)	Merged	Oct 2002	Currently Processing
SSF Edition 1-CV	Terra Aqua	7/1/2010 – 1/31/2012	Internal Product
ISCCP-D2like-Day ISCCP-D2like-Nite		Mar 2000 – June 2010	
ISCCP-D2like-GEO		Mar 2000 – Feb 2010	

Production Schedule



NPP Data Update

- Launched Oct 28, Power on Nov 09, Covers open Jan 26, 2012
- Only missing 140, 11 minute RDR files
- Percent Packet Loss: 14,413/2,238,561 = .64% loss (99.36% RDR accountability)
- Data Gaps
  - Total: 39 (average length 53 minutes)
  - Total >11 minutes: 18 (average length 1hr 26 minutes)

Production Optimization
via CERES AuTomAted job Loading SYSTem (CATALYST) and the Production Request Database

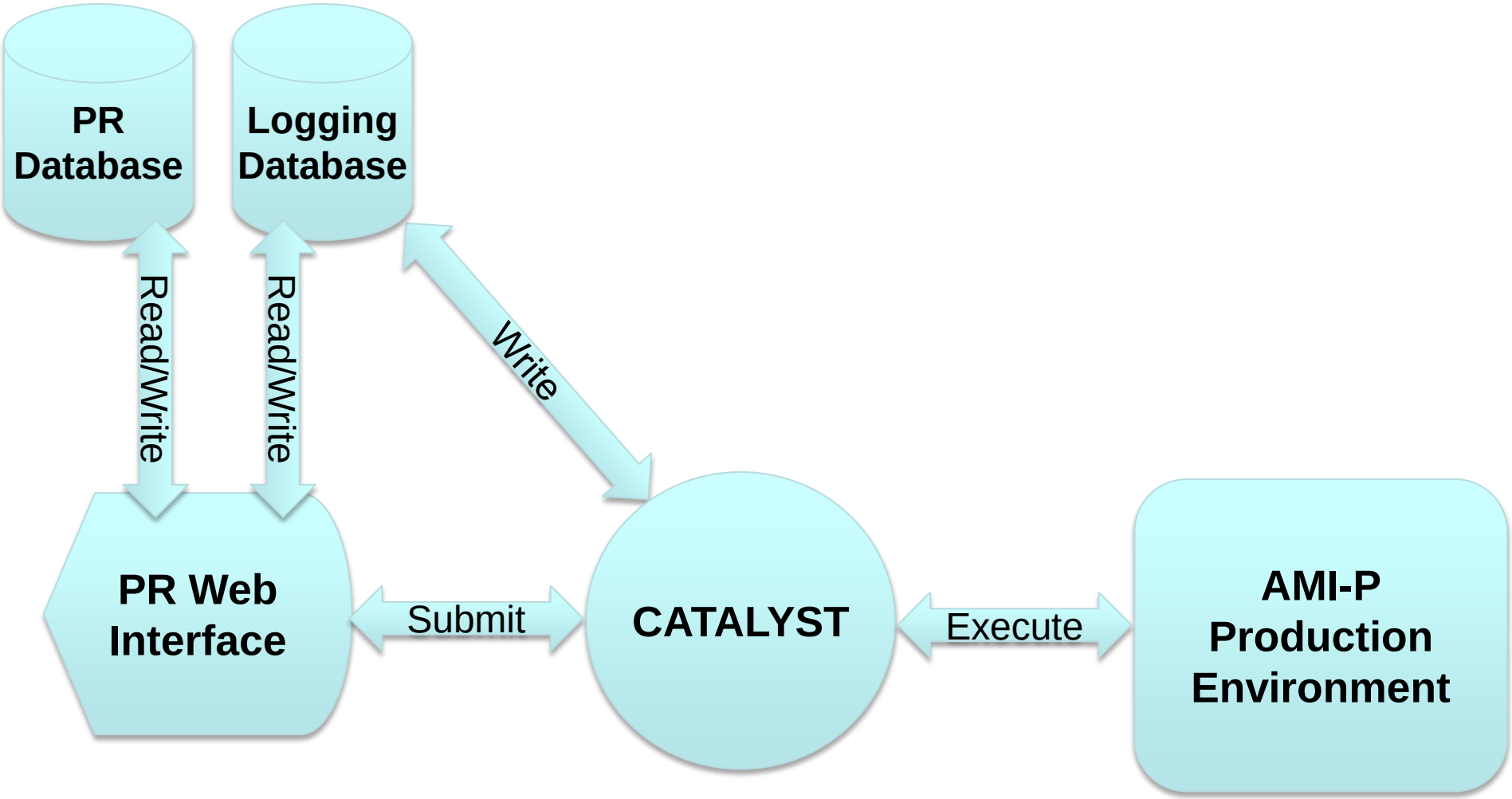
CERES Production Optimization

- January 2012 workshop with DMT, PI, and ASDC
- Goal: Review existing efforts to automate CERES production and develop a common vision for how to maximize CERES Production Throughput (Proposed in Senior Review)
- Result: Identified functional teams and responsibilities and developed plan and goal for progress moving forward
  - Requirements Team – Define cross organizational requirements
  - Operations Team – Define operational concept and use cases
  - Technical Team – Develop and implement automated job submission software
  - Steering Group – Host biweekly status meetings requiring reports from each of the above teams
- Solution: PR Database to manage PRs, Web interface to submit PRs, **C**ERES **A**u**T**om**A**ted job **L**oading **SYST**em (CATALYST) to manage processing jobs on cluster and logging results.

Basic “going in” requirements

- Maximize AMI-P system throughput by partially automating job submission.
- Leverage existing software/hardware infrastructure: AMI Job Submission Scripts (AJSS), AMI-P, PR Database, etc.
- Scalable design with ability to add/modify PGEs
- Manual fallback feature for operators – can call existing AJSS manually to submit jobs
- Transparent and convenient as possible for subsystem developers

Optimization Architecture



Production Request Database

- Proposed in Senior Review process to streamline management of Production Requests (PRs): small LOE for multiple years due to funding
- Purpose: Transition PRs from paper to database format to simplify creation and approval process.
- Leverage PR database and provide interface for operators to “submit” a given PR to run on production system & provide searchable job exit status logging function
- Web Interface functionality:
  - Create (developed and tested)
  - Subsystem approval (developed and tested)
  - SIT approval (developed, testing in progress)
  - Operator submit & track (development & testing in progress)
- End-to-End testing May 22nd – June 4th
- Go-Live (use database and interface for all PR management) July 11th

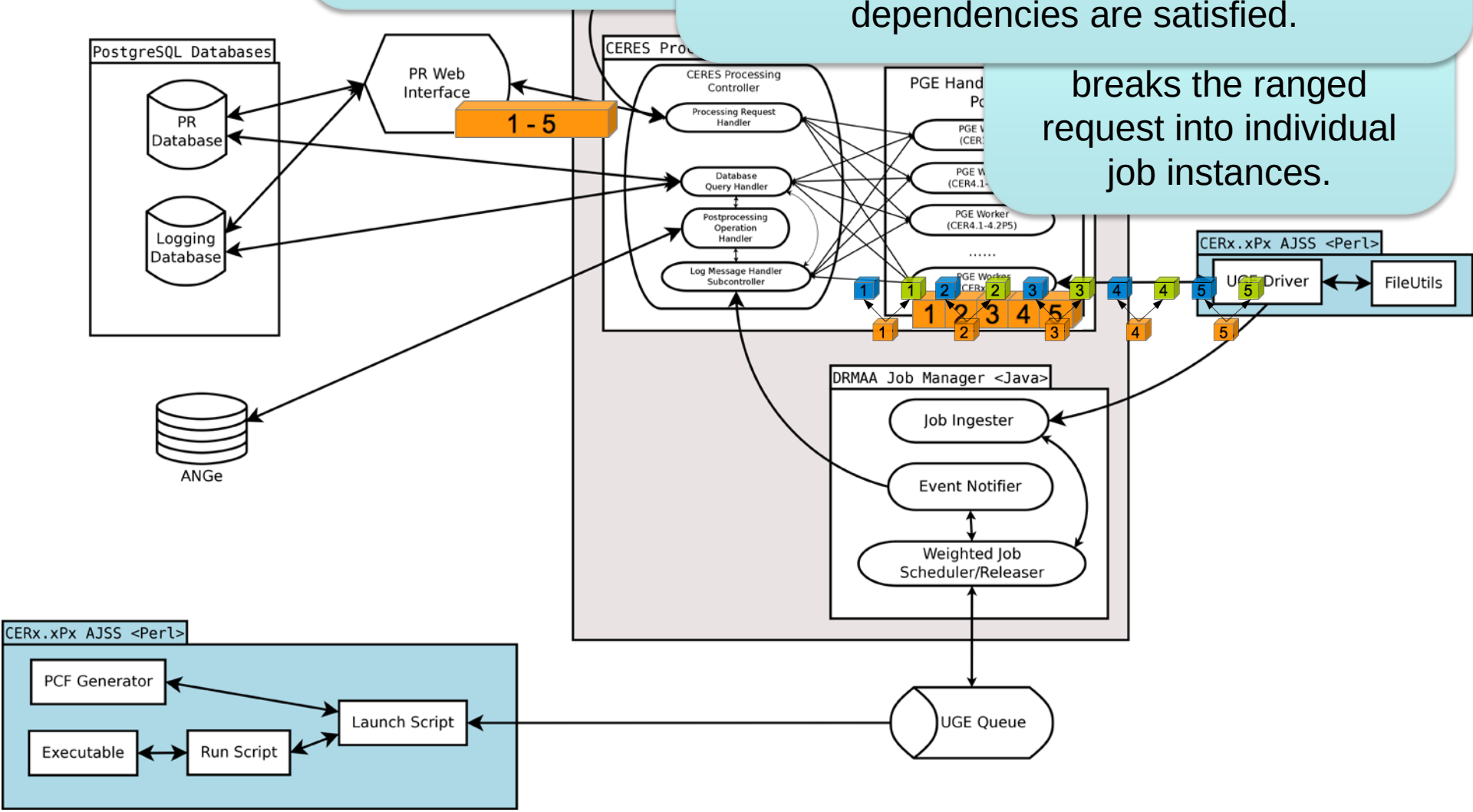
CATALYST

- Been in “pre-design” phase for last 9 months – Significant activity started post NPP launch.
- Primary Functions:
  - Accept PR and build all individual job instances
  - Monitor for dependency / precursor satisfaction
  - Submit job to Sun Grid Engine when ready
  - Throttle job submissions
  - Log job results
- Implements PGE specific logic in individual modules for each PGE. (easy to add, remove or change PGEs)
- Client/Server software model (Server on AMI-P head node, client on operator’s local machine)

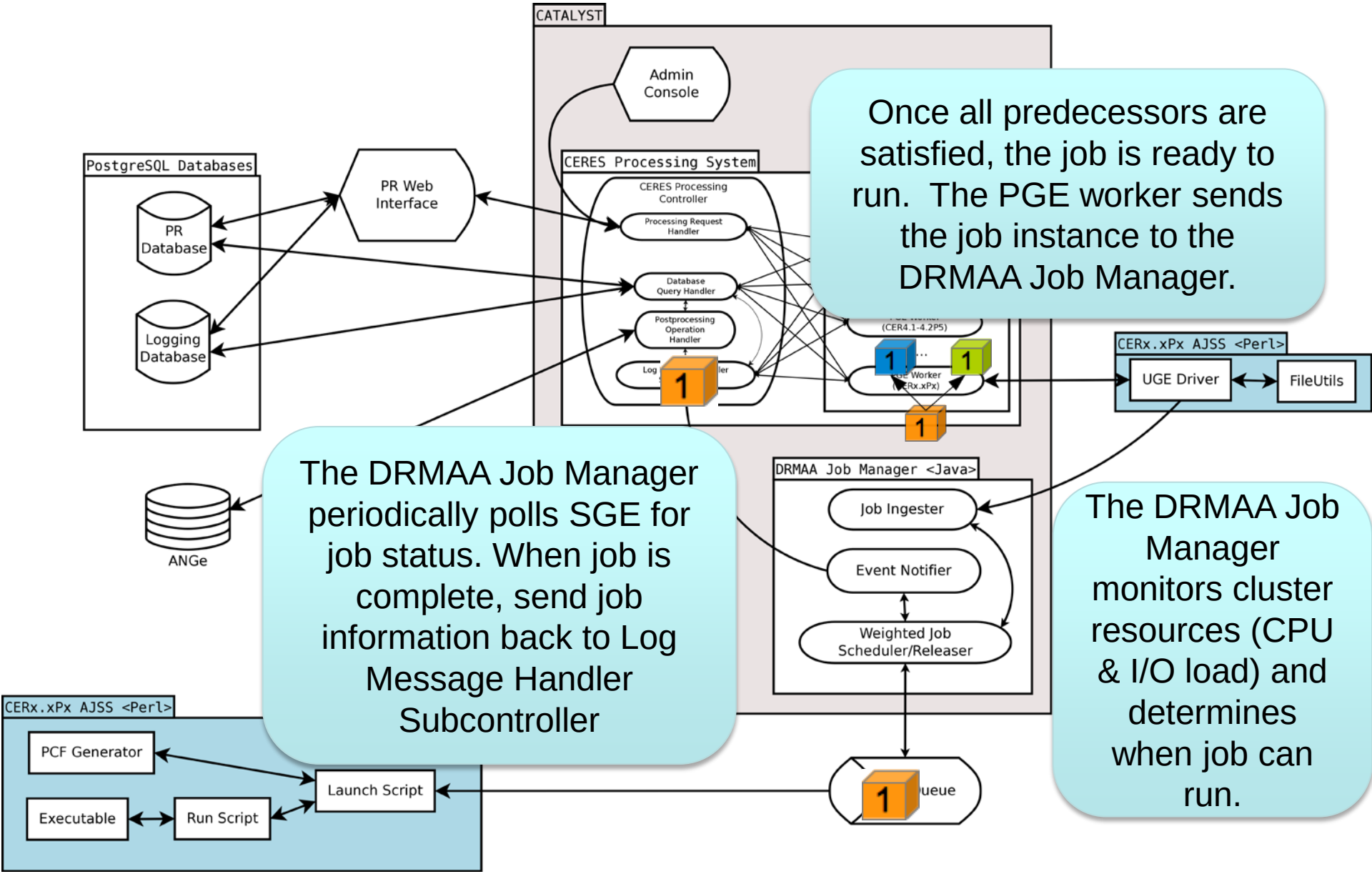
The PR Web Interfa
sends a request t
CATALSYT to run a
over a date range. (a

The PGE worker takes each individual instance and determines the immediate predecessor PGE(s) for the instance. The job instance then waits until all of its dependencies are satisfied.

breaks the ranged request into individual job instances.



CATALYST



Once all predecessors are satisfied, the job is ready to run. The PGE worker sends the job instance to the DRMAA Job Manager.

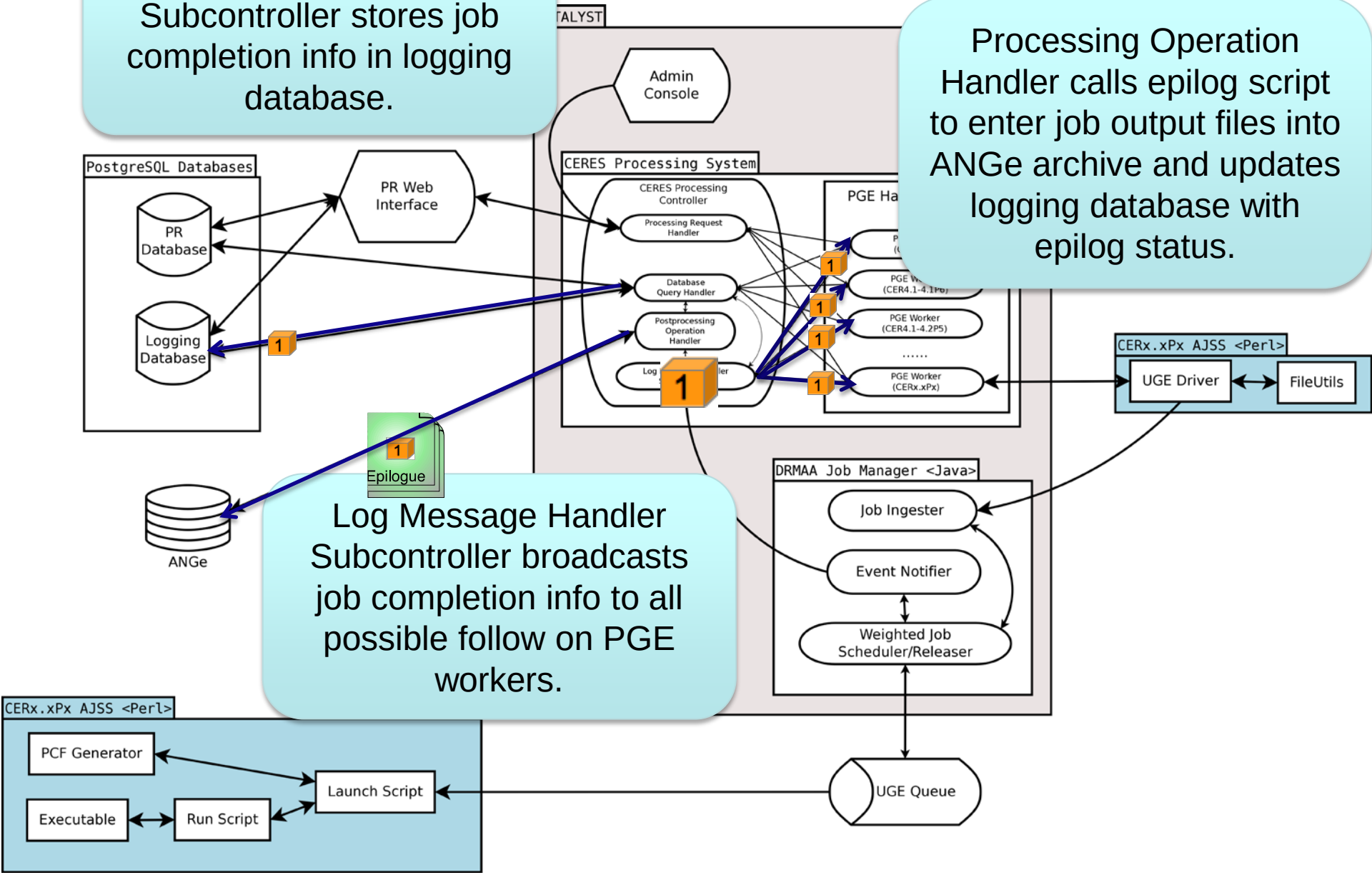
The DRMAA Job Manager periodically polls SGE for job status. When job is complete, send job information back to Log Message Handler Subcontroller

The DRMAA Job Manager monitors cluster resources (CPU & I/O load) and determines when job can run.

CATALYST

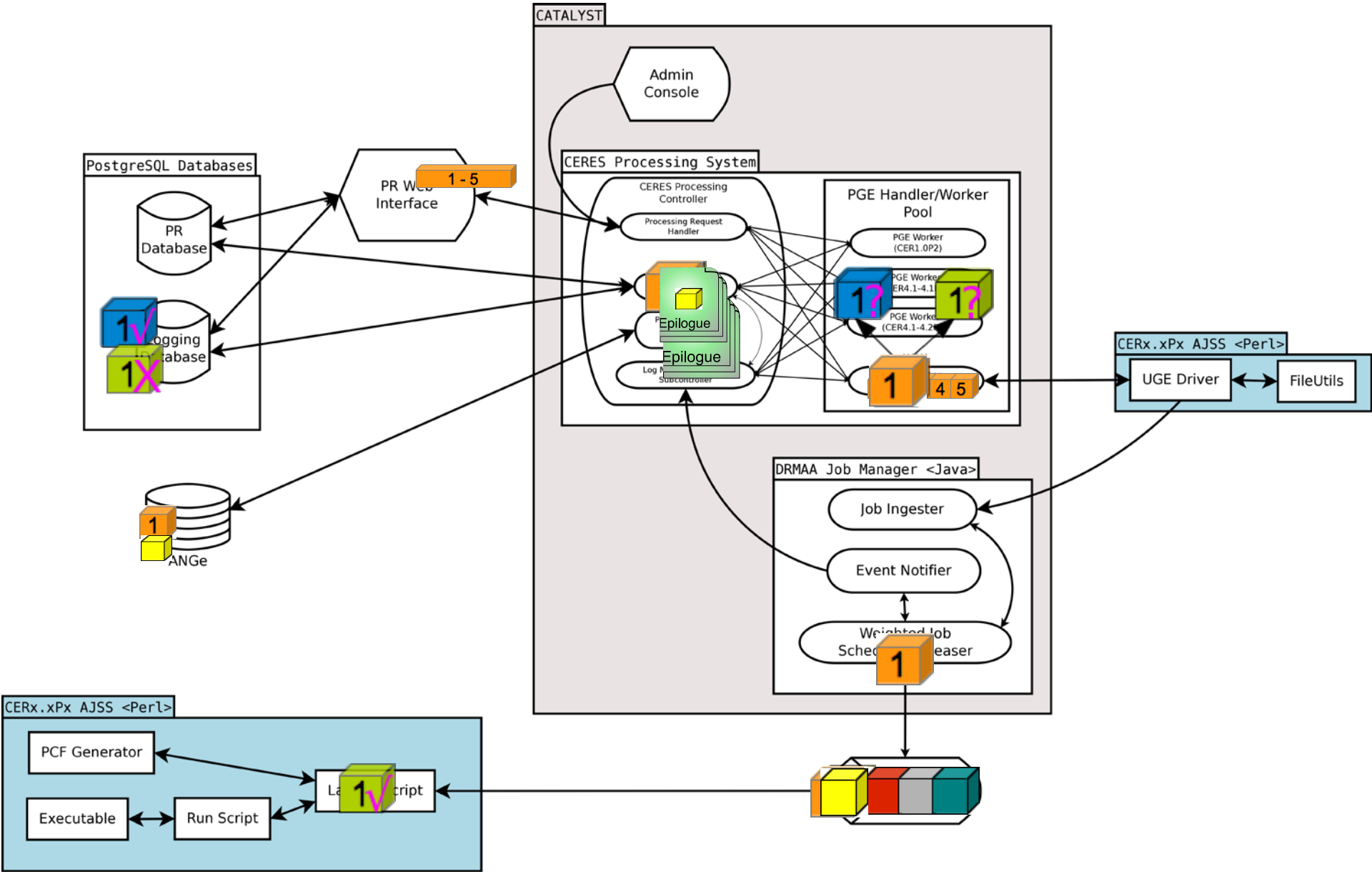
Log Message Handler Subcontroller stores job completion info in logging database.

Processing Operation Handler calls epilog script to enter job output files into ANGe archive and updates logging database with epilog status.



Log Message Handler Subcontroller broadcasts job completion info to all possible follow on PGE workers.

CATALYST


CATALYST
Admin Console
PostgreSQL Databases
PR Database
Logging Database
PR Web Interface
1 - 5
CERES Processing System
CERES Processing Controller
Processing Request Handler
Epilogue
Epilogue
PGE Handler/Worker Pool
PGE Worker (CER1.0P2)
4 5
CERx.xPx AJSS <Perl>
UGE Driver
FileUtils
ANGe
DRMAA Job Manager <Java>
Job Ingester
Event Notifier
Weighted Job Scheduler
CERx.xPx AJSS <Perl>
PCF Generator
Executable
Run Script

CERES AuTomAted Loading sYSTem (CATALYST) Schedule
Summary View

4/27/12

Key Milestones	2Q'12			3Q'12			4Q'12			1Q'13
	Jan'12	Feb'12	Mar'12	Apr'12	May'12	Jun'12	Jul'12	Aug'12	Sep'12	Oct'12
Clouds		2/29					7/17			
Ed4 Clouds PGEs delivered to CERES CM			▲ 3/19							
Promote to Production						△ 6/26				
Inversion			3/13				7/26			
Ed4 Inversion PGEs delivered to CERES CM					△ 5/18					
Promote to Production							△ 7/11			
Documentation	1/26			4/12						
Baseline Requirements Document			▲ 3/20							
Baseline Operations Concept Document				▲ 4/12						
PR Web Interface Tool	1/26						7/11			
End-to-End Testing					5/22	6/4				
Go-Live using PR Web Interface Tool							△ 7/11			
CERES Processing System	1/26					6/4				
Build & Test Low Level Processing Controller	1/30					5/18				
Build & Test the DRMAA Interface		2/9				5/18				
Implementation of Handlers		2/22			4/27					
Command Line Operator Tool Interface		2/27				5/23				
Build & Test Command Line Operator Interface		2/27				5/14				
Testing Phase			4/4					8/9		
Test Readiness Review (TRR)							△ 7/26			
Conduct PPE Testing							7/27	8/9		
Go-Live Phase					5/24					10/4
Operational Readiness Review (ORR)								△ 8/9		
Schedule Reserve							8/10			10/2
Promote to Production										△ 10/4
Go-Live										△ 10/4

Work Effort

△ Open Milestone

▲ Completed Milestone

Special Thanks to CATALYST & PR Database / Web Interface development teams:

CATALYST Development Team

- Nelson Hillyer
- Josh Wilkins

PR Database/Web Interface Development Team

- Lisa Coleman
- Carla Grune
- Renee Keye
- Elizabeth Heckert

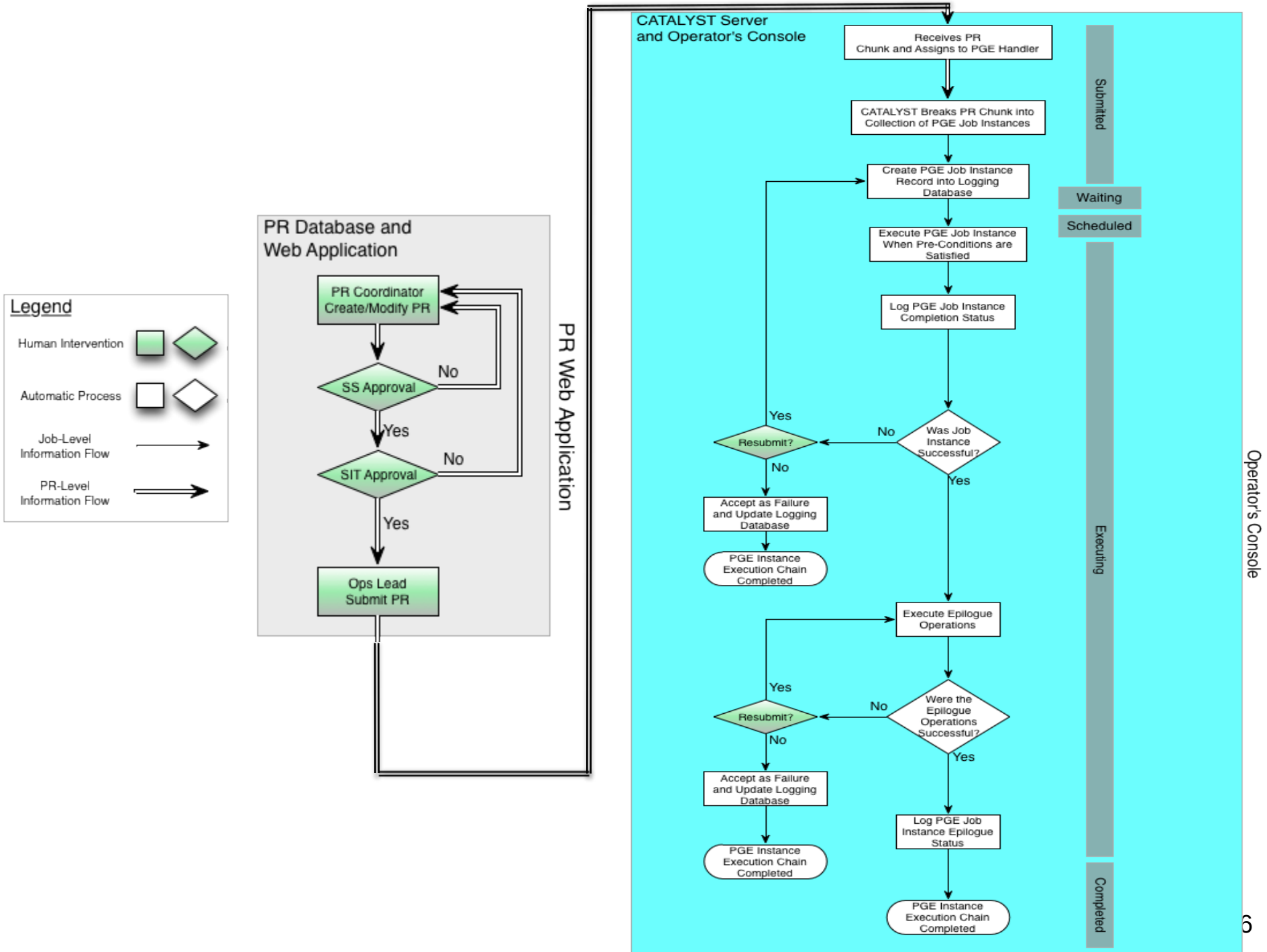
Backup Charts

Clouds Beta Ed4 Delivery

- Clouds Ed4 originally delivered three times and placed on hold and redelivered each time due to required science changes
  - March 2011
  - April 2011
  - June 2011
- Code freeze Feb 29, 2012 and delivery Mar 19, 2012
- Inconsistent AMI vs AMI-P test results in CM testing: Variable initialization bug identified & resolved, code redelivered April 11, 2012
- Current test cases show inconsistent output in very small (2.5×10^{-6}) percentage of output between AMI and AMI-P produced data

Data Sources

Type of Data	Source	Frequency / # of Files	Volume	Comments
NPP RDR	Land PEATE	131 – 134/day	186MB/day	In case of NPP, RDRs also contains spacecraft diary
VIIRS Sub-sampled Radiance and Geolocation	Land PEATE	288/day	60GB/day	CERES provided code to sub-sample at Land PEATE
VIIRS VAOT	Land PEATE	288/day	840MB/day	Produced by Land PEATE
SURFMAP (Snow/Ice)	NCAR	1/day	66 MB/mo	Used for Clouds and ERBElike Processing
SMOBA Ozone	NCEP	1/day	71MB/mo	
SURFMAP (Snow/Ice)	NOAA/NESDIS	1/day	630 MB/mo	Used for Clouds
MCIDAS Geostationary Data	University of Wisconsin	24/day/satellite	71GB/mo	5 geostationary satellites used per month
MATCH Aerosols	NCAR	2/day	164MB/mo	
Meteorological and Ozone data	GMAO	174 GB/mo	9/Day (CERESG5.2) 8/Day (CERESG5.4)	Currently receiving 2 streams G5.2 and G5.4


Legend
Human Intervention
Automatic Process
Job-Level Information Flow
PR-Level Information Flow
PR Database and Web Application
PR Coordinator Create/Modify PR
SS Approval
No
Yes
SIT Approval
No
Yes
Ops Lead Submit PR
PR Web Application
CATALYST Server and Operator's Console
Receives PR Chunk and Assigns to PGE Handler
CATALYST Breaks PR Chunk into Collection of PGE Job Instances
Create PGE Job Instance Record into Logging Database
Execute PGE Job Instance When Pre-Conditions are Satisfied
Log PGE Job Instance Completion Status
Was Job Instance Successful?
No
Yes
Resubmit?
Yes
No
Accept as Failure and Update Logging Database
PGE Instance Execution Chain Completed
Execute Epilogue Operations
Were the Epilogue Operations Successful?
No
Yes
Resubmit?
Yes
No
Accept as Failure and Update Logging Database
PGE Instance Execution Chain Completed
Log PGE Job Instance Epilogue Status
PGE Instance Execution Chain Completed
Submitted
Waiting
Scheduled
Executing
Completed
Operator's Console

CERES Subsystems

- CERES is made up of 7 Working Groups
  - Instrument
  - ERBElike
  - Clouds
  - Inversion or ADM
  - SOFA
  - SARB
  - TISA
- Code organized into 12 Subsystems
  - Each subsystem tied to 1 or more working groups
- Each Subsystem made up of 1 or more Product Generation Executives (PGEs)
  - Currently there are 73 active PGEs