# CHEP06, Mumbai, India

CMS Software Distribution on the LCG and OSG Grids

Stefano Argiro, CERN
Shaun Ashby, CERN
Volker Buege, FZK/University of Karlsruhe
Marco Corvo, CERN/Padova
Nikolay Darmenov, SOFIA-INRNE/CERN
Ramzy Darwish, FERMILAB
David Evans, FERMILAB
Burt Holzman, FERMILAB

Bockjoo Kim, University of Florida
Shahzad Muzaffar, Northeastern University
Andreas Nowack, RWTH Aachen
Klaus Rabbertz, University of Karlsruhe
Natalia Ratnikova, FERMILAB
Michael Thomas, CALTECH
Joanna Weng, CERN/University of Karlsruhe
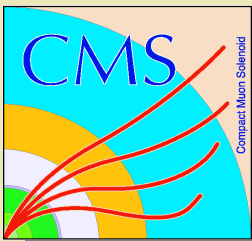Tony Wildish, Princeton
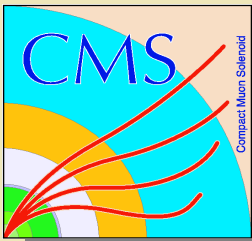
Outline

The Scope

The Task

View on existing Implementations

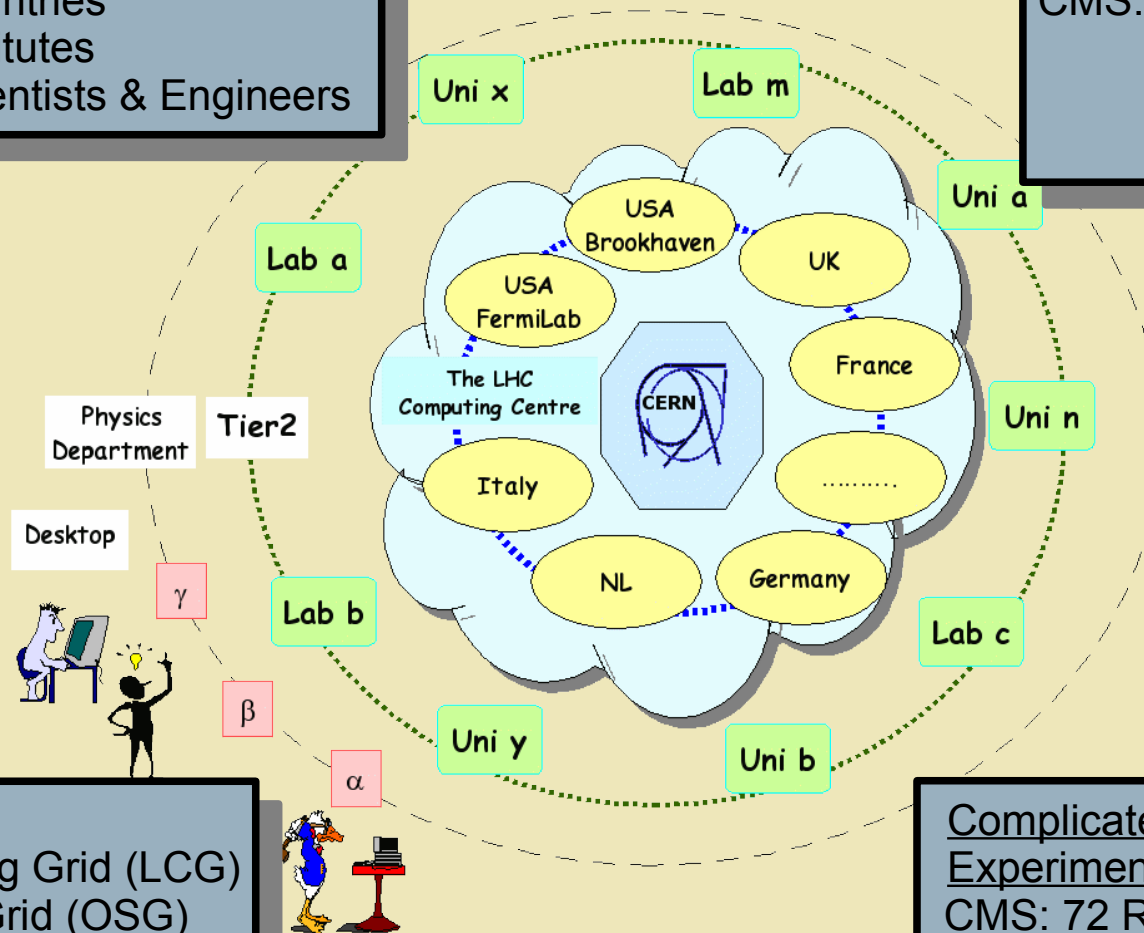Some Details on selected Components

Annoyances

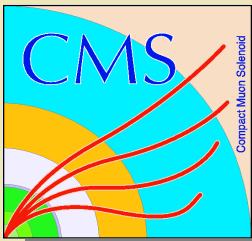Outlook

The Challenge

Large International Collaborations:
CMS: 37 Countries
        160 Institutes
        2000 Scientists & Engineers

Huge Amounts of Data:
CMS: Event size: 1.5 MB
     Event rate: 150 events/sec.
     Events/year: 1 billion
     Total raw data/year: 1,500 TB

Uni x   Lab m

Uni a

Lab a

USA
Brookhaven   UK

USA
FermiLab

The LHC
Computing Centre   CERN   France

Physics
Department   Tier2   Uni n

Desktop

Italy

γ

Lab b   NL   Germany   Lab c

β

α   Uni y   Uni b

Many Grids:
- LHC Computing Grid (LCG)
- OpenScienceGrid (OSG)
- NorduGrid, ...

Complicated rapidly developing
Experiment Software:
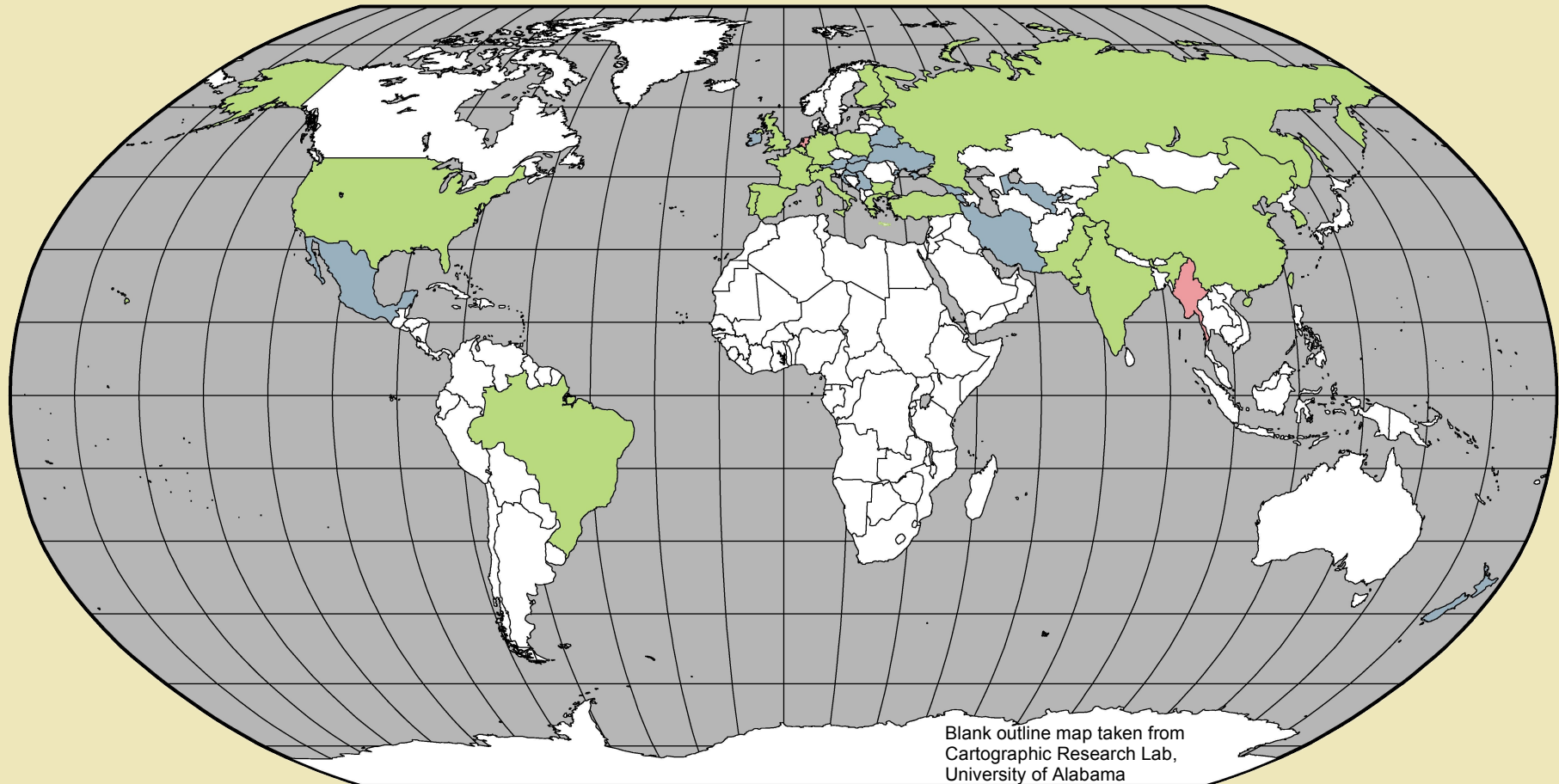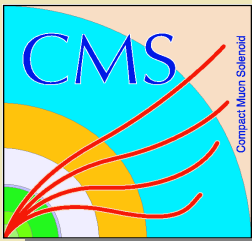CMS: 72 RPM packages of 1.5 GB in total
     Unpacked: 4 GB of disk space

Software Distribution Map

15 Countries with CMS Institutes and NO registered SW download

22 Countries with CMS Institutes and registered SW downloads

2 Countries without CMS Institute BUT registered SW download

Blank outline map taken from Cartographic Research Lab, University of Alabama
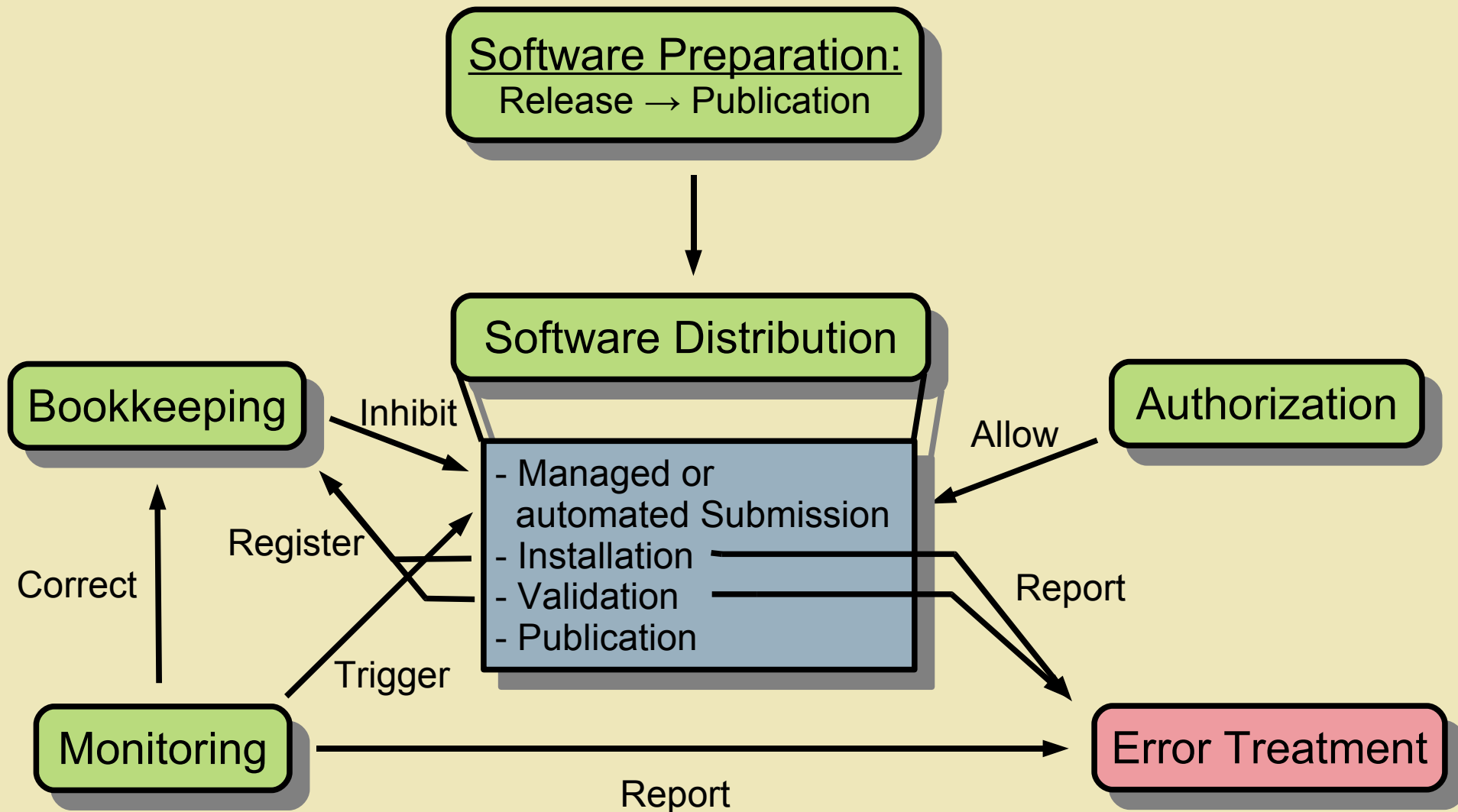
The Task

Goal:

<u>Grids-wide Deployment of CMS Software for MC Production, Data Analysis and Development</u>
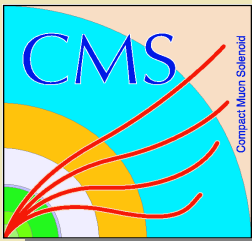
<u>Primary Requirements</u>:

➥ Robust for Production (Validation!)

➥ Transparent for Users (Avoid Support Nightmare)

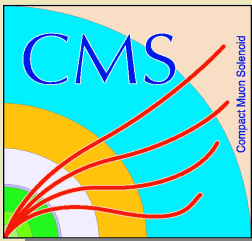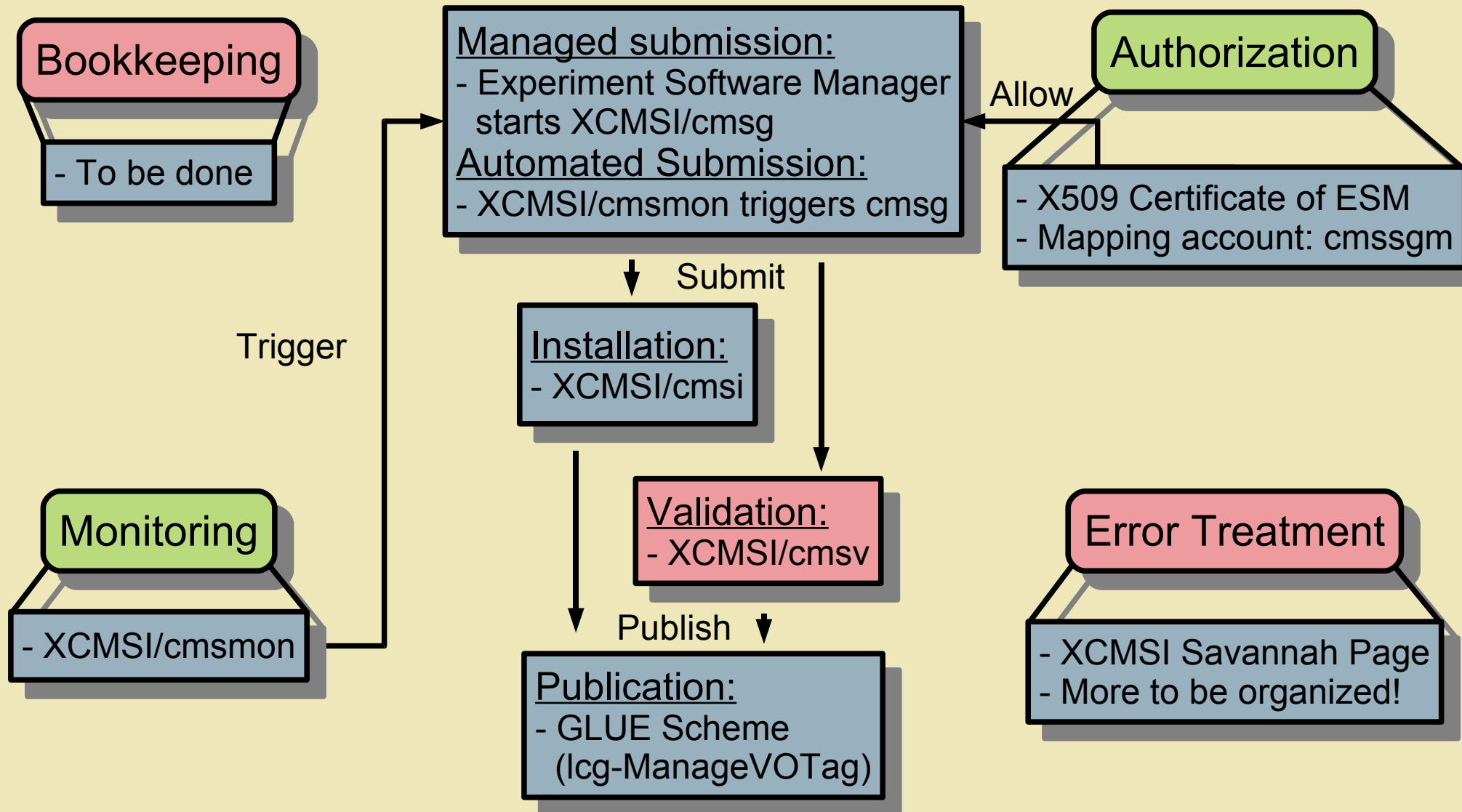➥ Fast for Developers (Nightly Builds)
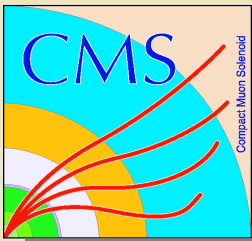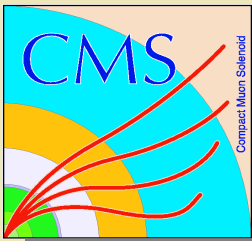
A Generic View

Software Preparation

Common Tasks before Deployment on Grids:

➡ Release (SCRAM, NICOS nightly builds) S. Argiro, Id 246

➡ Packaging (DAR, RpmGen) A. Nowack, Id 248; N. Ratnikova, Id 340

➡ Test Install and Validation (To be set up!)

➡ Archiving (CASTOR)

➡ Web/Grid Storage (Web Server / To be done)

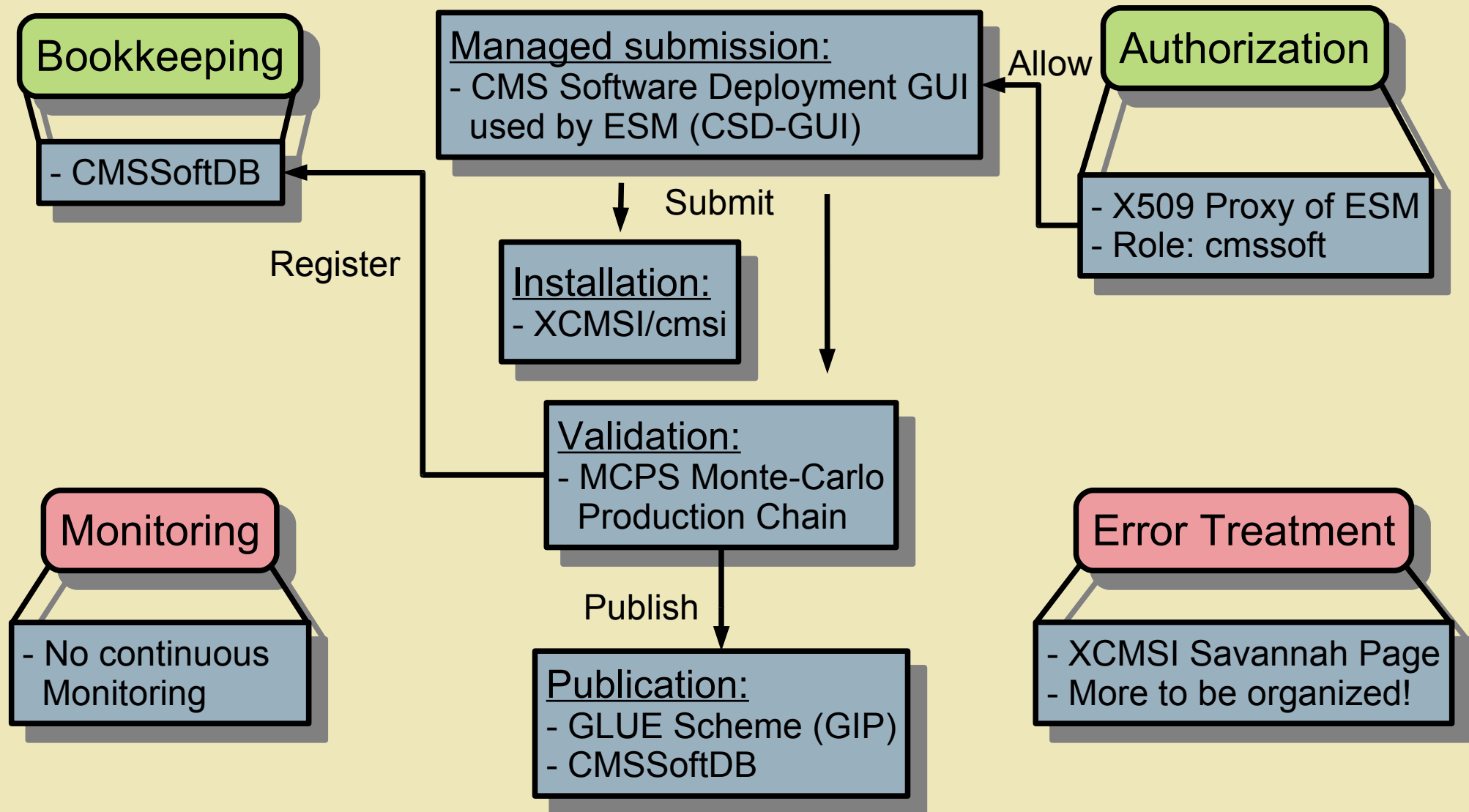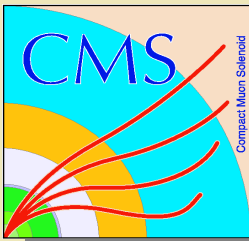➡ Publication (Web Server)

➡ Mirroring (Would be nice to have)

Implementation within LCG

Bookkeeping

- To be done

Managed submission:
- Experiment Software Manager
  starts XCMSI/cmsg
Automated Submission:
- XCMSI/cmsmon triggers cmsg

Allow

Authorization

- X509 Certificate of ESM
- Mapping account: cmssgm

Trigger

Submit

Installation:
- XCMSI/cmsi

Monitoring

- XCMSI/cmsmon

Validation:
- XCMSI/cmsv

Error Treatment

- XCMSI Savannah Page
- More to be organized!

Publish

Publication:
- GLUE Scheme
  (lcg-ManageVOTag)

Implementation within OSG

Bookkeeping
- CMSSoftDB

Managed submission:
- CMS Software Deployment GUI used by ESM (CSD-GUI)

Allow

Authorization
- X509 Proxy of ESM
- Role: cmssoft

Register

Submit

Installation:
- XCMSI/cmsi

Validation:
- MCPS Monte-Carlo Production Chain

Monitoring
- No continuous Monitoring

Publish

Publication:
- GLUE Scheme (GIP)
- CMSSoftDB

Error Treatment
- XCMSI Savannah Page
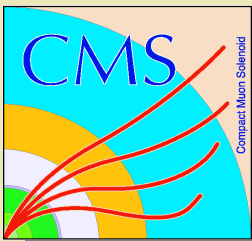- More to be organized!

Comparison

The general Setups are very similar!

➡ A lot has been achieved since Data Challenge 04

➡ Some Components still need to be developed or adopted

Two primary Tasks not yet in good Shape:

➡ Proper Validation Procedures:

    – Technical Validation for every SW Component

    – "Physical" Validation for the whole Chain (MCPS?)

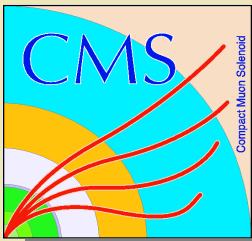➡ Error Handling: Escalation Procedure, Contacts

Monitoring with XCMSI

CMS SW specific Monitoring: Runs short test job on CMS CEs

- Architecture, SW Installation Directory, RPM Database, Local Catalogs, SCRAM database in comparison with GLUE tags

- Access to express queue needed (dteam Integration, Roles in VOMS?)

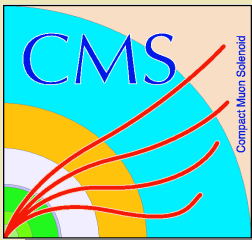- Bookkeeping missing (Use of CMSSoftDB, MonaLisa?)

CE-Name	Last test	Architecture	VO_SW_DIR	rpmDB	Local Catalogue	SW OK	SW Problems	PU-Tags
CE.pakgrid.org.pk	2006/02/05_14:02 Aborted	VO-cms-slc3_ia32_gcc323	OK, read-write	-	-	0	0	-
a01-004-128.gridka.de	2006/02/05_18:10 Time out	VO-cms-slc3_ia32_gcc323	OK, read-write	OK	OK	19	5	-
a01-004-164.gridka.de	2006/02/05_18:10 Time out	VO-cms-slc3_ia32_gcc323	OK, read-write	OK	OK	0	21	-
alexander.it.uom.gr	2006/02/05_12:41 OK	VO-cms-slc3_ia32_gcc323	OK, read-write	-	-	1	2	-
antaeus.hpcc.ttu.edu	2006/02/05_18:10 Disapp. from LDAP	-	-	-	-	0	0	-
atlasce01.na.infn.it	2006/02/05_12:07 OK	VO-cms-slc3_ia32_gcc323	OK, read-write	-	-	4	0	-

Automated Installation

XCMSI/cmsmon can be run in passive (Monitoring) and active Mode (Simple Fault Recovery, Installation Trigger)

➡ E.g. Setting of CMS Architecture Tag

➡ Can trigger SW Installation or Validation

➡ GLUE Tags provide simple Control (s. also: Exp. SW Installation in LCG-2)

- VO-CMS-SW_i_j_k-request-install   => triggers Installation
- VO-CMS-SW_i_j_k-processing-install => blocks concurr. Submission
- VO-CMS-SW_i_j_k-running-install   => blocks concurr. Installation
- VO-CMS-SW_i_j_k-to-be-validated   => triggers Validation

➡ Prototype exists

CSD-GUI

Bookkeeping with CMSSoftDB

Software Installation Table: Provides i.a. comprehensive overview of CMS SW Installation Status on the OSG

➡ Employs a MySQL Database

➡ No continuous Crosscheck with Monitoring

Annoyances

- Differences in Linux Flavors

- Problems with different Shared File Systems (AFS, NFS, GPFS, IBRIX, ...)

- (Too?) Restrictive Site Policies:
  - No outbound Network Connection
  - Missing Client Tools like Perl Modules, wget (even gcc sometimes)
  - Delayed Updates of faulty Programs, e.g. RPM 4.3.3
  - Low home quotas of cmssgm for temporary Storage of RPMs

- LCG Command Misbehaviours (Disappearing GLUE Tags)

- SCRAM or RPM Database Corruptions
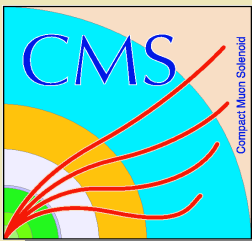
- Missing 64 Bit Support
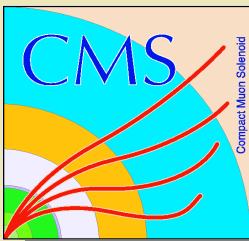
Outlook

A lot of Improvements have been achieved since Data Challenge 04!

CMS can deploy Software, distribute and analyze Data as well as monitor the Activities on the Grids!

There is Room for Improvement concerning the overall Grid-Stability!

Issues left:

- Validation Procedures

- Error Handling

- Software De-Installation

- Dedicated CPU/Time Slots on LCG for ESM Role

- More consistent Look/Information for LCG & OSG Users

Backup: Acronymitis

In Order of Appearance:

CMS: Compact Myon Solenoid

LHC: Large Hadron Collider

LCG: LHC Computing Grid

OSG: OpenScienceGrid

MB/GB/TB: Mega-, Giga-, TeraBytes

RPM: RedHat Package Manager

SW: Software

MC: Monte Carlo

SCRAM: Software Configuration, Release and Management

NICOS: Nightly Control System

DAR: Distribution After Release

RpmGen: CMS Packaging Project

CASTOR: CERN Advanced Storage Manager

XCMSI: CMS Software Installation Project

GLUE: Grid Laboratory Uniform Environment

VO: Virtual Organization

ESM: Experiment Software Manager

GUI: Graphical User Interface

CSD: CMS Software Deployment

MCPS: Monte Carlo Processing Service

GIP: Generic Information Provider

DB: Database

DC04: Data Challenge 04

CE: Compute Element

VOMS: Virtual Organization Membership Service