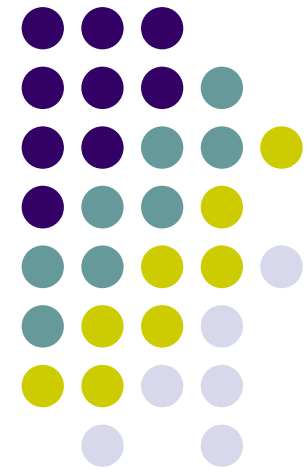


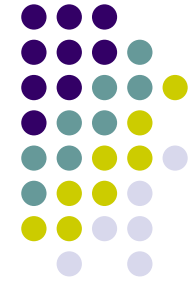
# ATLAS Data Quality Monitoring Framework: DQM Database Editor GUI

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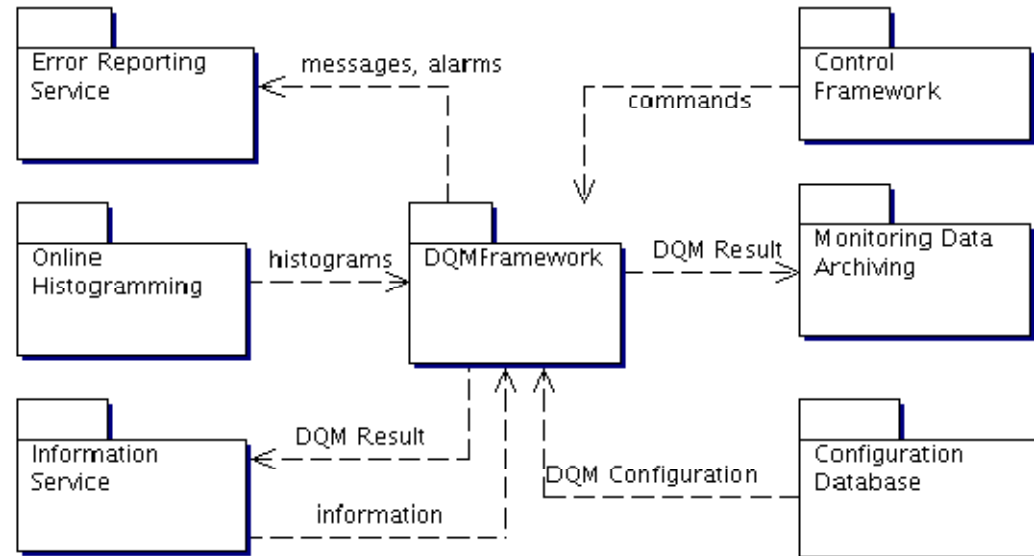
# Data Quality Monitoring Framework (DQMF)



- Online framework for performing data quality assessment.
- Analyses monitoring data through user defined algorithms during run.
- Relays a summary of the results to shift personnel and stores to conditions database.



# DQMFramework: Structure



- Main Idea:

- Read in histograms and values.
- Run algorithms.
- Publish results.

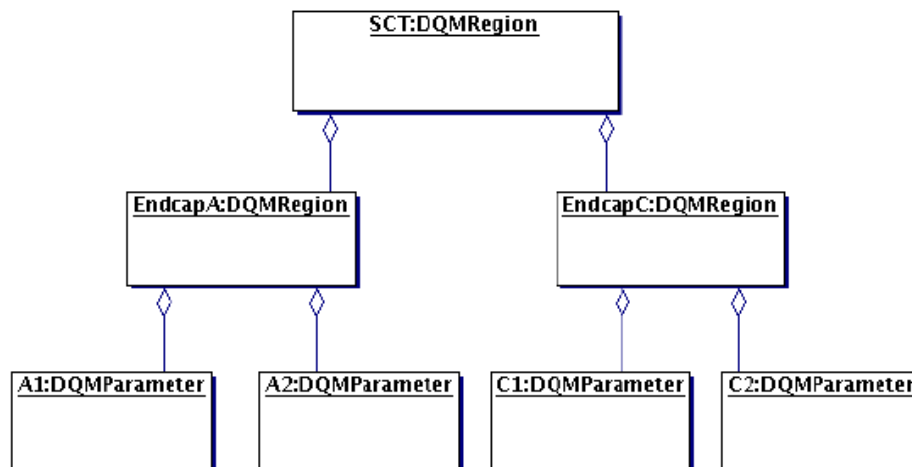
# DQMFramework: Algorithms and Results



- What are the algorithms? ... examples
  - If input is a number:
    - Is the number above / below threshold?
  - If input is a histogram:
    - Do all bins have at least one entry?
      - No reference.
    - No more than n empty bins in bin range.
      - Reference: maximum number of empty bins.
      - Parameters: bin range.
- What Is the Output?
  - OK: green
  - Warning: yellow
  - Alarm: red



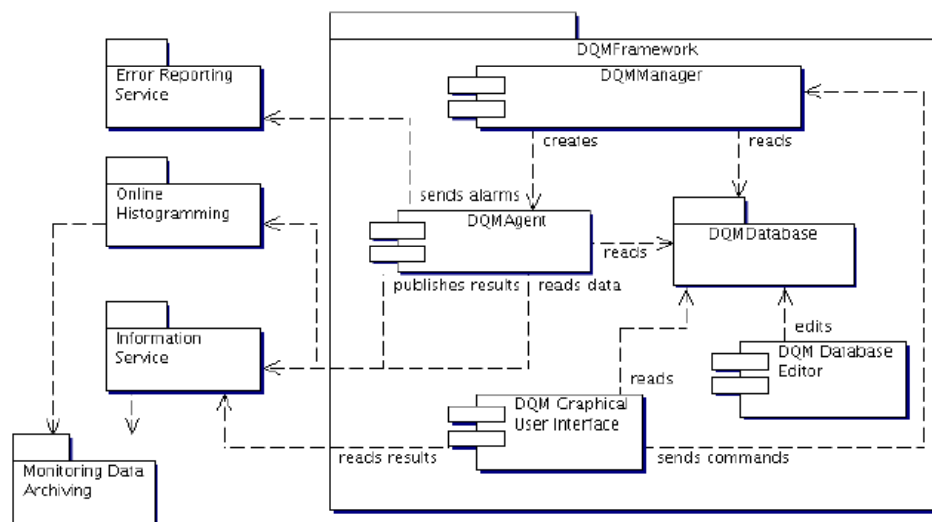
# DQMF Database Hierarchy



- DQM regions contain hierarchy.
- DQM parameters associated with single algorithms.
  - Parameters specify **input source, references, thresholds, algorithm parameters ...**



# DQM Database Editor GUI



- I constructed the DQM database editor graphical user interface.
  - Purpose: Create DQM parameters and regions.
    - Choose Algorithm.
    - Specify configuration parameters.
    - Edit thresholds and algorithm values.

# DQM Database Editor GUI: Startup and Passive Elements



- Reads in DQM hierarchy from database.
  - Displays in JTree.
- Runs Consistency check.
  - Checks database for...
    - Regions/Parameters with wrong threshold names.
    - Regions/Parameters without input data sources.
    - Region/Parameters without actions.
- For a selected parameter or region...
  - Displays configuration parameters, threshold values, and algorithm values in a table.

# DQM Database Editor GUI: Startup and Passive Elements



- **Configuration Parameters**
  - Algorithm (dqm\_config.dal.DQAlgorithm)
  - Weight (Double)
  - Input data source (String)
  - References (String[])
  - Name (String)
  - Action( String )
- **Threshold Parameters**
  - Red and Green Threshold names (String)
  - Red and Green Threshold Values (Double)
- **Algorithm Parameters**
  - Value Name (String)
  - Values (Double[])



# DQM Database Editor GUI: Startup and Passive Elements



The screenshot shows the DQM Database Editor GUI. The window title is "DQM Database Editor" and the system clock shows "Wed Aug 8, 12:39 AM". The menu bar includes "File", "Edit", "Create", and "Database".

**Tree View:**

- SCT
  - EndcapA
    - EndcapA\_A1
    - EndcapA\_A2
  - EndcapC
    - EndcapC-Left
    - EndcapC-Right
    - EndcapC\_C1
    - EndcapC\_C2

**Configuration parameters**

Name	Value
weight	0.3
algorithm	Simple_gaus_Fit
input_source	Histogramming_dummy.h1
references	/home/alina/larmon_cosmics.8037.hist.root:CaloClusterVecMon/ROI/ROIDistRegion0
Action	

**Threshold Parameters**

Red Names	Red Values	Green Na...	Green Valu...
Constant	0.0	Constant	0.0
Sigma	0.0	Sigma	0.0
Mean	0.0	Mean	0.0

**Algorithm Parameters**

Name	Value
------	-------

**Log Output:**

```
Starting new consistency check at Wed Aug 08 00:29:29 CEST 2007.  
WARNING: Parameter EndcapA_A1 does not have an action  
WARNING: Region EndcapA does not have an input data source.  
WARNING: Parameter EndcapC_C1 does not have an action  
WARNING: Parameter EndcapC_C2 does not have an action  
WARNING: Region EndcapC does not have an input data source.  
WARNING: Region EndcapC does not have an action  
WARNING: Region EndcapC-Left does not have an input data source.  
WARNING: Region EndcapC-Left does not have an action  
WARNING: Region EndcapC-Right does not have an input data source.  
WARNING: Region EndcapC-Right does not have an action  
WARNING: Region SCT does not have an input data source.  
WARNING: Region SCT does not have an action  
All DQ regions and parameters have correct threshold and algorithm parameter names.  
There are no unassociated parameters  
Ending consistency check at Wed Aug 08 00:29:29 CEST 2007.
```



# DQM Database Editor GUI: Edit

- All fields except for algorithm are directly editable on the screen.
- File->Save saves all changes to the database.

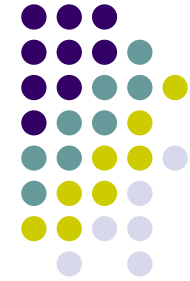
Configuration parameters			
Name	Value		
weight	0.3		
algorithm	Simple_gaus_Fit		
input source	Histogramming.dummy.h1		
references	/home/alina/larmon_cosmics.8037.hist.root:CaloClusterVecMon/ROI/ROIDistRegion0		
Action			
Threshold Parameters			
Red Names	Red Values	Green Na...	Green Valu...
Constant	0.0	Constant	0.0
Sigma	0.0	Sigma	0.0
Mean	0.0	Mean	0.0
Algorithm Parameters			
Name	Value		

# DQM Database Editor GUI: Edit



- Edit menu allows for more advanced options.
  - Change Algorithm.
  - Delete selected region or parameter.
  - Add new threshold parameter.
  - Add algorithm parameter.
  - Delete threshold/algorithm parameter.
  - Reset to default algorithm and threshold parameters.

# DQM Database Editor GUI: Edit



Applications Actions Wed Aug 8, 12:50 AM

**DQM Database Editor**

File Edit Create Database

- Change Algorithm
- Remove selected Region / Parameter
- Add Threshold
- Remove selected Threshold
- Add Algorithm Parameter
- Remove selected Algorithm Parameter
- Reset Default Algorithm and Threshold Parameters

EndcapC\_C1  
EndcapC\_C2

imeters

	Value
ple_gaus_Fit	
togramming_dummy.h1	
ome/alina/larmon_cosmics.8037.hist.root:CaloClusterVecMon/ROI/ROIDistRegion0	

**Threshold Parameters**

Red Names	Red Values	Green Na...	Green Valu...
Constant	0.0	Constant	0.0
Sigma	0.0	Sigma	0.0
Mean	0.0	Mean	0.0

**Algorithm Parameters**

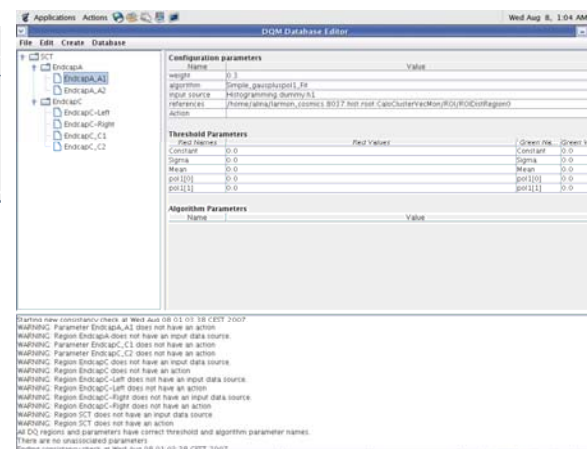
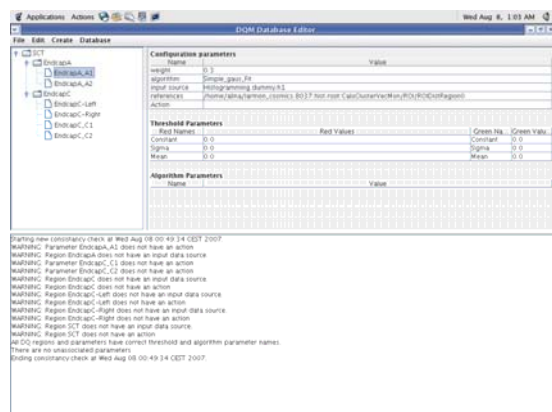
Name	Value
------	-------

Starting new consistency check at Wed Aug 08 00:49:34 CEST 2007.  
 WARNING: Parameter EndcapA\_A1 does not have an action  
 WARNING: Region EndcapA does not have an input data source.  
 WARNING: Parameter EndcapC\_C1 does not have an action  
 WARNING: Parameter EndcapC\_C2 does not have an action  
 WARNING: Region EndcapC does not have an input data source.  
 WARNING: Region EndcapC does not have an action  
 WARNING: Region EndcapC-Left does not have an input data source.  
 WARNING: Region EndcapC-Left does not have an action  
 WARNING: Region EndcapC-Right does not have an input data source.  
 WARNING: Region EndcapC-Right does not have an action  
 WARNING: Region SCT does not have an input data source.  
 WARNING: Region SCT does not have an action  
 All DQ regions and parameters have correct threshold and algorithm parameter names.  
 There are no unassociated parameters  
 Ending consistency check at Wed Aug 08 00:49:34 CEST 2007.



# DQM Database Editor GUI: Edit

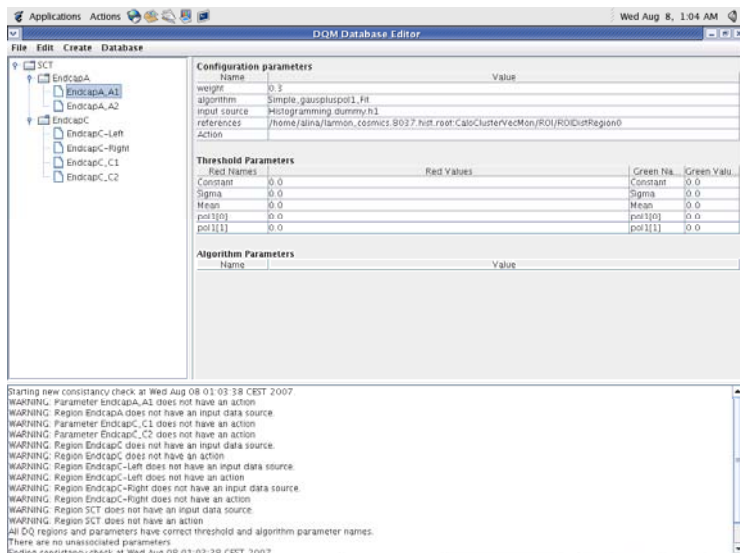
- Change Algorithm
  - Loads a list of available algorithms from database.
  - After selection automatically updates threshold and algorithm parameters.



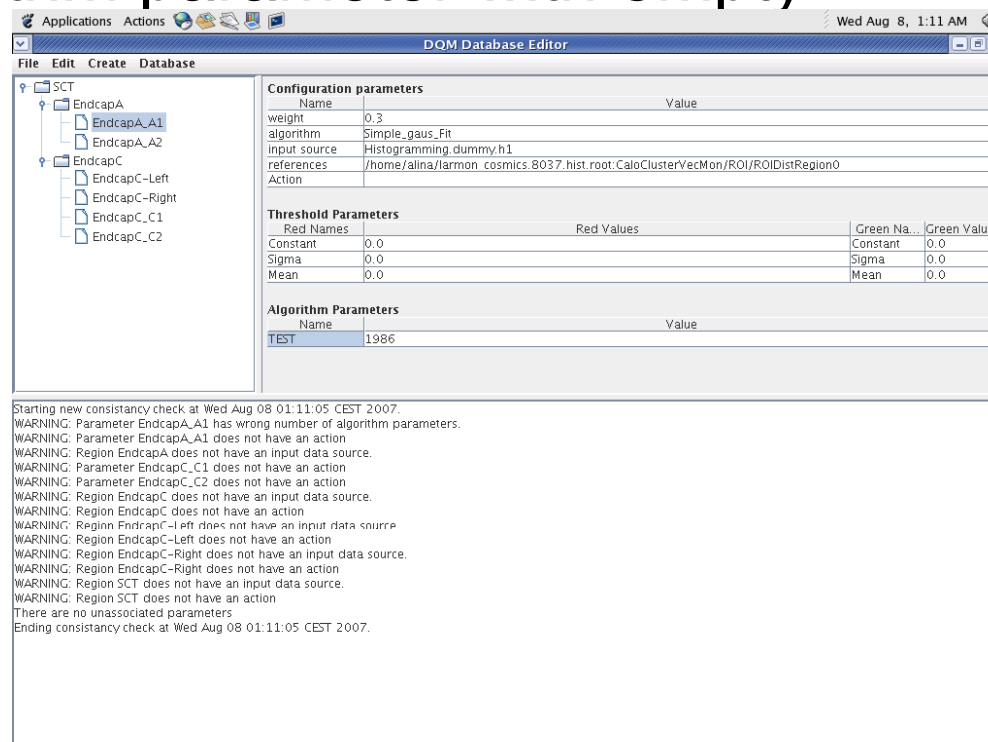


# DQM Database Editor GUI: Edit

- Add Algorithm Parameter:
  - Creates new algorithm parameter with empty name and value.



8/8/2007



Safdi

# DQM Database Editor GUI: Consistency Checker



- Now, running Database->consistency checker will tell us that EndcapA\_A1 has the wrong number of algorithm parameters.

```
Starting new consistency check at Wed Aug 08 01:16:02 CEST 2007.  
WARNING: Parameter EndcapA_A1 has wrong number of algorithm parameters.  
WARNING: Parameter EndcapA_A1 does not have an action  
WARNING: Region EndcapA does not have an input data source.  
WARNING: Parameter EndcapC_C1 does not have an action
```

- Consistency checker also looks for wrong threshold / algorithm parameter names.

# DQM Database Editor GUI: Create



- Editor can create both regions and parameters.
  - Must specify algorithm and configuration parameters.
- Editor can create multiple parameters at the same time.
  - For this feature threshold and algorithm parameter values can also be specified ahead of time.



# DQM Database Editor GUI: Create



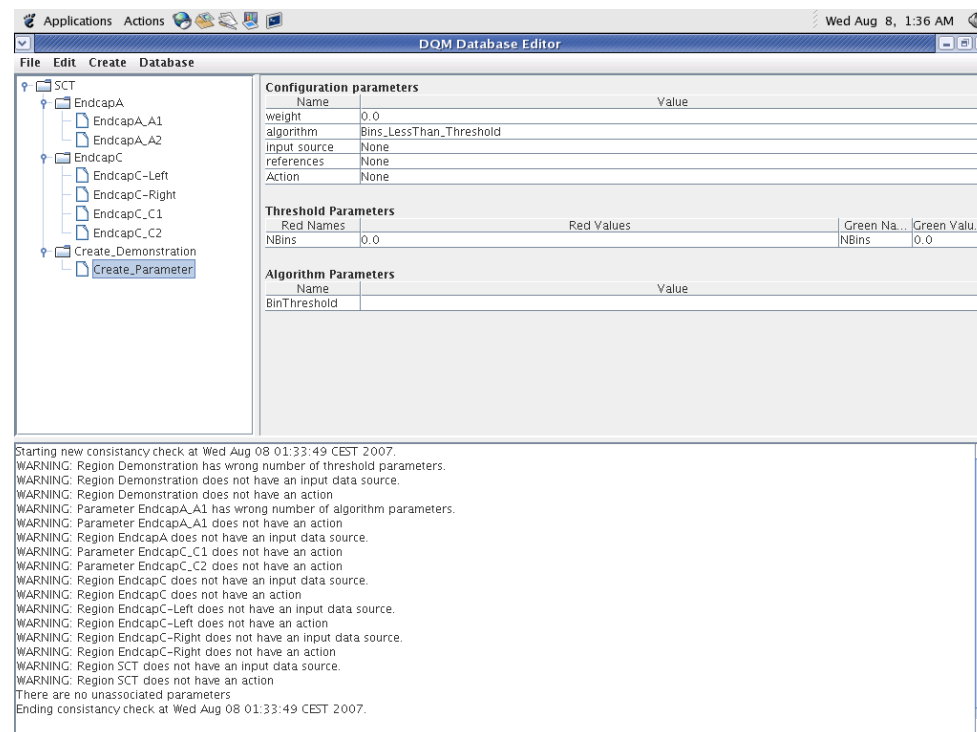
- Make a new Region.

The screenshot shows the DQM Database Editor GUI. On the left is a tree view with a root node 'SCT' and sub-nodes: 'EndcapA', 'EndcapC', and their respective left and right sub-nodes. The main area is divided into sections for 'Configuration parameters', 'Threshold Parameters', and 'Algorithm Parameters', each with a table of Name and Value. A 'Build Parameter' dialog box is open in the foreground, prompting for 'Weight', 'Action', 'Reference\_ID', 'Name', and 'InputDataSource'. The bottom of the window shows a console with warning messages about missing actions and input data sources for various parameters.

# DQM Database Editor GUI: Create



- New region Create\_Demonstration and new parameter Create\_Parameter are now displayed.

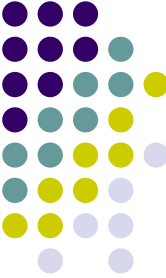


# DQM Database Editor GUI: Create



- Create Multiple Parameters:
  - Allows for the creation of multiple parameters with same features except for slightly different names and input data sources.
    - First Algorithm must be chosen from list.
    - Beginning and ending strings for data sources and names must be specified.
    - Total number of parameters and beginning index must be specified.
    - Then, names and data sources are created in the form “beginng\_String” + Index + “ending\_String”
    - Optionally, thresholds can be specified before creation.

# DQM Database Editor GUI: Create



The screenshot shows the 'DQM Database Editor' application window. A 'Create Parameters' dialog box is open, allowing the user to define new parameters. The dialog is titled 'Make Multiple' and contains several sections:

- Number of Desired Parameters:** A text input field with the value '7'.
- Beginning Index:** A text input field with the value '2000'.
- Name: Beginning String:** A text input field with the value 'The\_Year\_Is\_'.
- Name: Ending String:** An empty text input field.
- Input Source: Beginning String:** A text input field with the value 'IDS\_'.
- Input Source: Ending String:** An empty text input field.
- Weight:** A text input field with the value '0.0'.
- Action:** A dropdown menu currently set to 'None'.
- Reference\_ID:** A text input field with the value 'None'.

There are also two tables within the dialog:

- Threshold Parameters:**

Red Names	Red Values	Green Names	Green Values
NBins	100	NBins	200
- Algorithm Parameters:**

Name	Value
NSigma	300

The background shows a tree view of the database structure with folders like 'SCT', 'EndcapA', 'EndcapC', and 'Create\_Dem'. A status bar at the bottom left shows several warning messages: 'WARNING: Parameter', 'WARNING: Region End', and 'WARNING: Region SCT'. The system tray at the top right shows the date 'Wed Aug 8, 1:49 AM'.

# DQM Database Editor GUI: Create



Applications Actions Wed Aug 8, 1:49 AM

**DQM Database Editor**

File Edit Create Database

- [-] SCT
  - [-] EndcapA
    - [-] EndcapA\_A1
    - [-] EndcapA\_A2
  - [-] EndcapC
    - [-] EndcapC-Left
    - [-] EndcapC-Right
    - [-] EndcapC\_C1
    - [-] EndcapC\_C2
  - [-] Create\_Demonstration
    - [-] Create\_Parameter
    - [-] The\_Year\_Is\_2000
    - [-] The\_Year\_Is\_2001
    - [-] The\_Year\_Is\_2002
    - [-] The\_Year\_Is\_2003
    - [-] The\_Year\_Is\_2004
    - [-] The\_Year\_Is\_2005
    - [-] The\_Year\_Is\_2006

**Configuration parameters**

Name	Value
weight	0.0
algorithm	Chi2Test_Chi2_per_NDF
input_source	None
references	None
Action	None

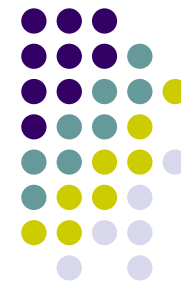
**Threshold Parameters**

Red Names	Red Values	Green Na...	Green Valu...
Chi2/ndf	0.0	Chi2/ndf	0.0

**Algorithm Parameters**

Name	Value
------	-------

Starting new consistency check at Wed Aug 08 01:45:56 CEST 2007.  
 WARNING: Parameter EndcapA\_A1 has wrong number of algorithm parameters.  
 WARNING: Parameter EndcapA\_A1 does not have an action  
 WARNING: Region EndcapA does not have an input data source.  
 WARNING: Parameter EndcapC\_C1 does not have an action  
 WARNING: Parameter EndcapC\_C2 does not have an action  
 WARNING: Region EndcapC does not have an input data source.  
 WARNING: Region EndcapC does not have an action  
 WARNING: Region EndcapC-Left does not have an input data source.  
 WARNING: Region EndcapC-Left does not have an action  
 WARNING: Region EndcapC-Right does not have an input data source.  
 WARNING: Region EndcapC-Right does not have an action  
 WARNING: Region SCT does not have an input data source.  
 WARNING: Region SCT does not have an action  
 There are no unassociated parameters  
 Ending consistency check at Wed Aug 08 01:45:56 CEST 2007.



# DQMF Review

- DQMF runs **algorithms** on online data to ensure the quality of the detectors and the run.
- Algorithms produce results in the form: green = OK, Yellow = warning, Red = danger.
- **DQ Regions** and **Parameters** are a way of organizing the algorithms, their data sources, and their settings.
  - Regions contain Parameters.

# DQM Database Editor GUI: Review



- The editor allows for viewing, editing, and creating DQ regions and parameters.
  - Displays configuration parameters (such as input data source), thresholds (when red, yellow, or green), and algorithm parameters (other necessary values).
- All quantities and settings can be changed.
- New regions and parameters can be created.
- Multiple parameters of similar form can be created at the same time.

# DQM Database Editor GUI: Critique



- Successes
  - My editor fulfills all of the necessary requirements for a database editor.
  - It catches all exceptions and is user friendly.
- Missing attributes
  - Moving parameters and regions around within the database hierarchy is tedious.
    - Were there more time, I would have liked to implement such a method.



# DQM Database Editor GUI: Programming



- All Programming done in Java.

```
root_node.add( node );
buildTree( node, root_regions[i] );
}
}
ToolTipManager.sharedInstance().registerComponent( this );
expandPath( new TreePath( root_node ) );
}

private dqm_config.dal.DQRegion[] getRootRegions( config.Configuration database )
{
    dqm_config.dal.DQRegion regions[] = dqm_config.dal.DQRegion_Helper.get( database, new config.C
    java.util.Vector<dqm_config.dal.DQRegion> root_regions = new java.util.Vector<dqm_config.dal.D
    for ( int n = 0; n < regions.length; n++ )
    {
        dqm_config.dal.DQRegion candidate = regions[n];
        boolean is_root = true;
        for ( int i = 0; i < regions.length; i++ )
        {
            dqm_config.dal.DQRegion sub_regions[] = regions[i].get_DQRegions( );
            for ( int j = 0; j < sub_regions.length; j++ )
            {
                if ( candidate.UID() == sub_regions[j].UID() )
                {
                    is_root = false;
                    break;
                }
            }
        }
        if ( is_root )
        {
            root_regions.add( candidate );
        }
    }
    return root_regions.toArray( new dqm_config.dal.DQRegion[0] );
}

private void buildTree( DefaultMutableTreeNode root_node, dqm_config.dal.DQRegion root_region )
{
    dqm_config.dal.DQRegion regions[] = root_region.get_DQRegions( );
    for ( int i = 0; i < regions.length; i++ )
    {
        RegionNode node = new RegionNode( regions[i] );
        root_node.add( node );
        buildTree( node, regions[i] );
    }

    dqm_config.dal.DQParameter parameters[] = root_region.get_DQParameters( );
    for ( int i = 0; i < parameters.length; i++ )
    {
        root_node.add( new ParameterNode( parameters[i] ) );
    }
}

private void setupTree()
{
    this.setShowsRootHandles(true);
    this.setEditable(true);
    this.setRootVisible(false);
    // this.setCellRenderer(new MyRenderer());
    this.addTreeSelectionListener( new javax.swing.event.TreeSelectionListener() {
        public void valueChanged(javax.swing.event.TreeSelectionEvent e) {
            selectionHasChanged( e );
        }
    });
}

public Object getValueAt( int row, int col ) { return rowData[row][col]; }

public boolean isCellEditable( int row, int col ) {
    boolean check = false;
    if( col == 0 ) {check = false; }
    if( col == 1 ) {check = true; }
    if( col == 2 ) {check = false; }
    if( col == 3 ) {check = true; }
    return check;
}

public void setValueAt( Object value, int row, int col ){
    rowData[row][col] = (String)value;
    TValue = Double.parseDouble((String)value);
    col = col;
    ROW = row;
    double[] tempRed = new double[redLength];
    for( int i = 0; i < redLength; i++ ) {
        tempRed[i] = Double.parseDouble(rowData[i][1]);
    }
    redData = tempRed;
}

package dqmf;
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
import javax.swing.event.*;
import javax.swing.tree.*;

import config.Configuration;
import dqm_config.dal.*;

public class MainFrame extends JFrame
{
    private JToolBar toolbar = new JToolBar();
    private JButton exitButton = new JButton( new ImageIcon(getClass().getResource("/img
    private JButton addButton = new JButton( "New Parameter" );
    private JButton removeButton = new JButton( "Remove" );
    private JButton saveButton = new JButton( "Save Values" );
    private JButton addRegionButton = new JButton( "New Region" );

    private InfoPanel info;
    private DataQualityTree tree;
    private PopupMenuExample example;

    MainFrame( final String partition_name )
    {
        setTitle( "DQM Database Editor" );
        JPanel contentPane = (JPanel) getContentPane();

        JSplitPane split = new JSplitPane( JSplitPane.HORIZONTAL_SPLIT );
        split.setDividerLocation( 250 );
        split.setDividerSize( 7 );
    }
}
```

# My Project: Lessons learned



- I gained insight into...
  - The methods for monitoring data from large detectors.
  - The ways in which massive quantities of information are organized in databases.
  - The methods for editing and reading information to and from the DAL (DQMF) database.
- Programming Knowledge:
  - I learned JAVA.
  - I learned how to creates GUI's.



# My Travels...

- Corsica (before CERN for 12 days)
- England (before CERN for 5 days)
- Chamonix (1<sup>st</sup> weekend)
- Interlaken (2<sup>nd</sup> weekend)
- Bern (3<sup>rd</sup> weekend)
- Romanch Switzerland (4<sup>th</sup> weekend)
- Paris (5<sup>th</sup> weekend)
- Hospital / Montreux (6<sup>th</sup> weekend)
- Sardegna (and briefly hospital ) (7<sup>th</sup> weekend)

# Thank You



- Thanks to Dr. Kolos, the NSF, Prof Jean Krisch, Prof Homer Neal, Dr. Steven Goldfarb, University of Michigan, and CERN.