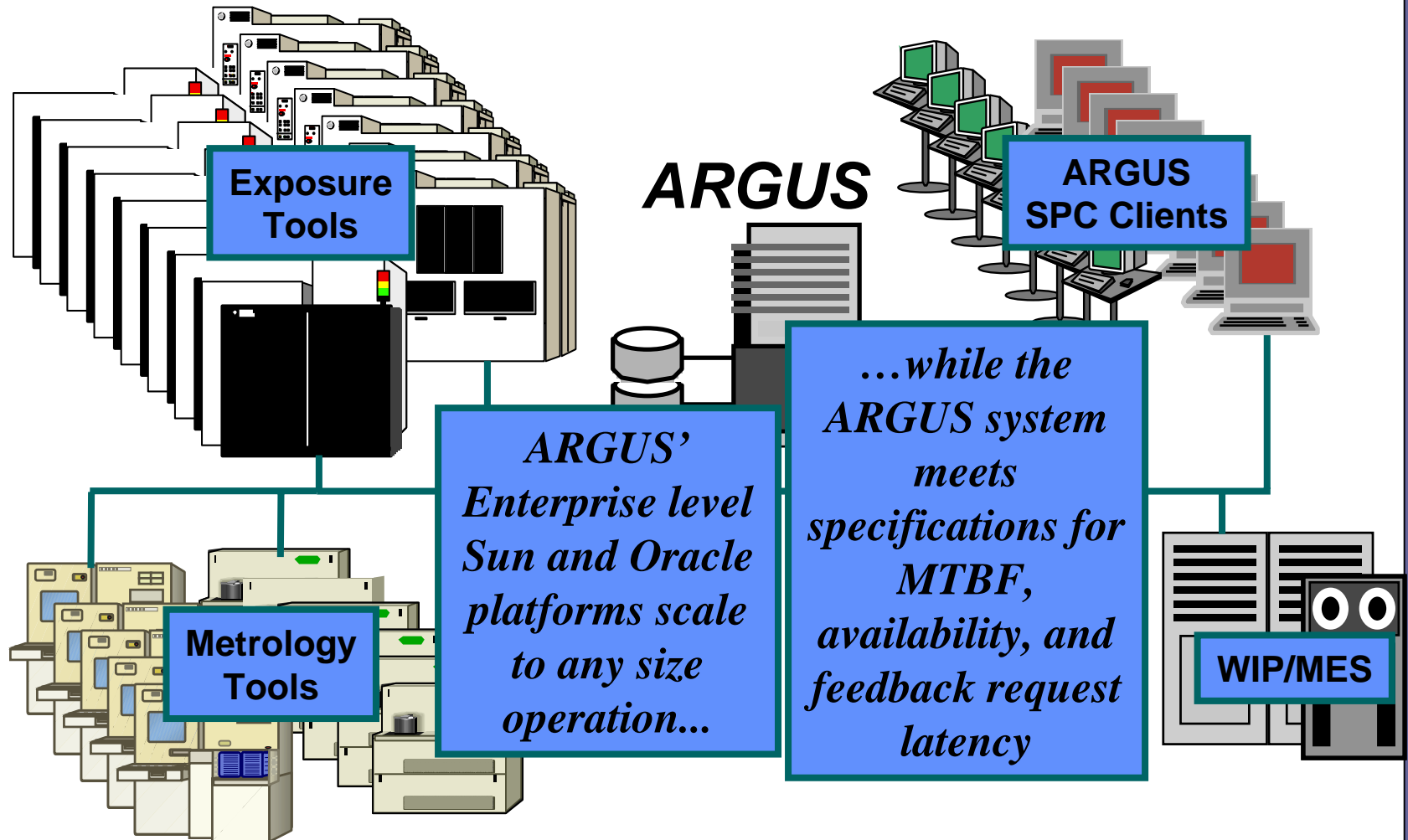


**New**   
**Vision**   
**Systems**

# ARGUS System Network Overview



# ARGUS User Interface Overview

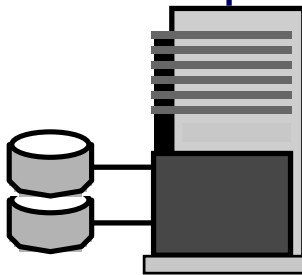
Feedback Optimizer  
(98, NT, 2000)



MONO-LITH for Windows  
(98, NT, 2000)

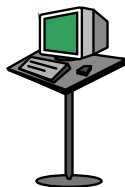


*On-Line or Stand-Alone*



*ARGUS Central  
Node (ACN)*

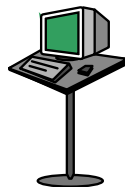
*On-Line*



SPC Client  
(98, NT, 2000)



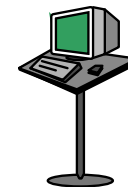
SPC Client  
(Solaris)



Registry Editor  
(98,NT,2000)



Registry Editor  
(Solaris)

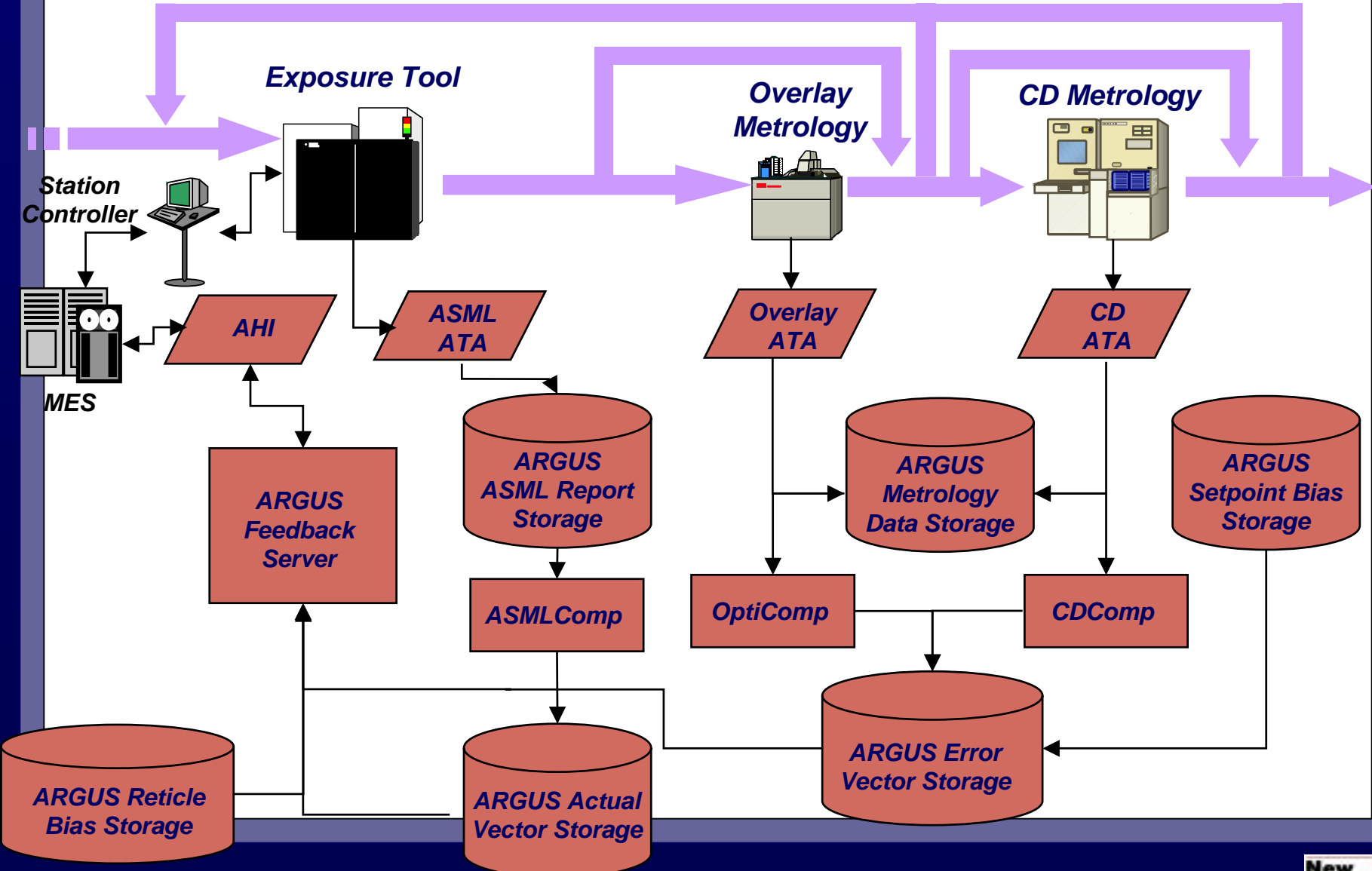


Feedback Analyzer  
(98,NT,2000)

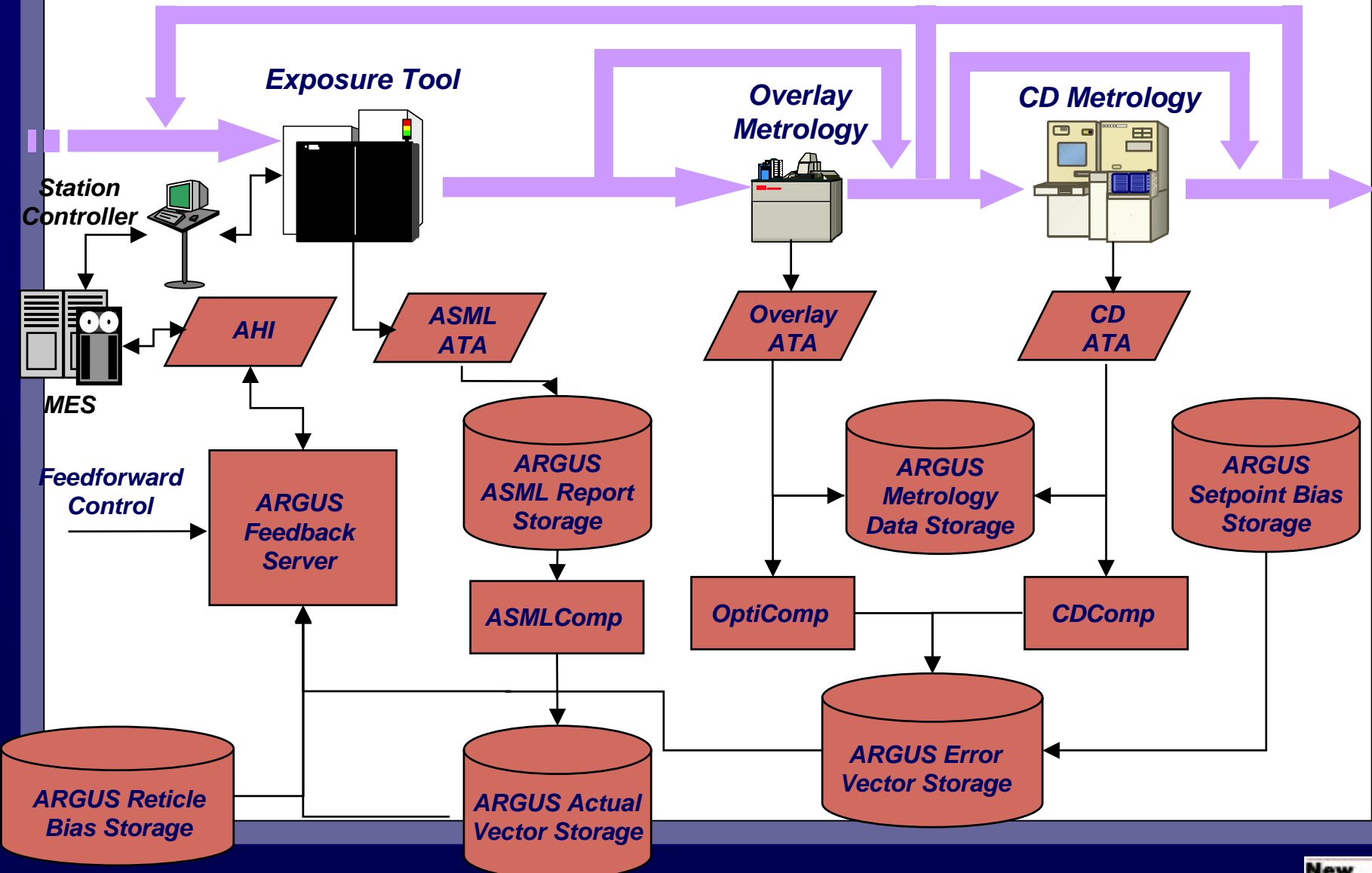


Feedback Analyzer  
(Solaris)

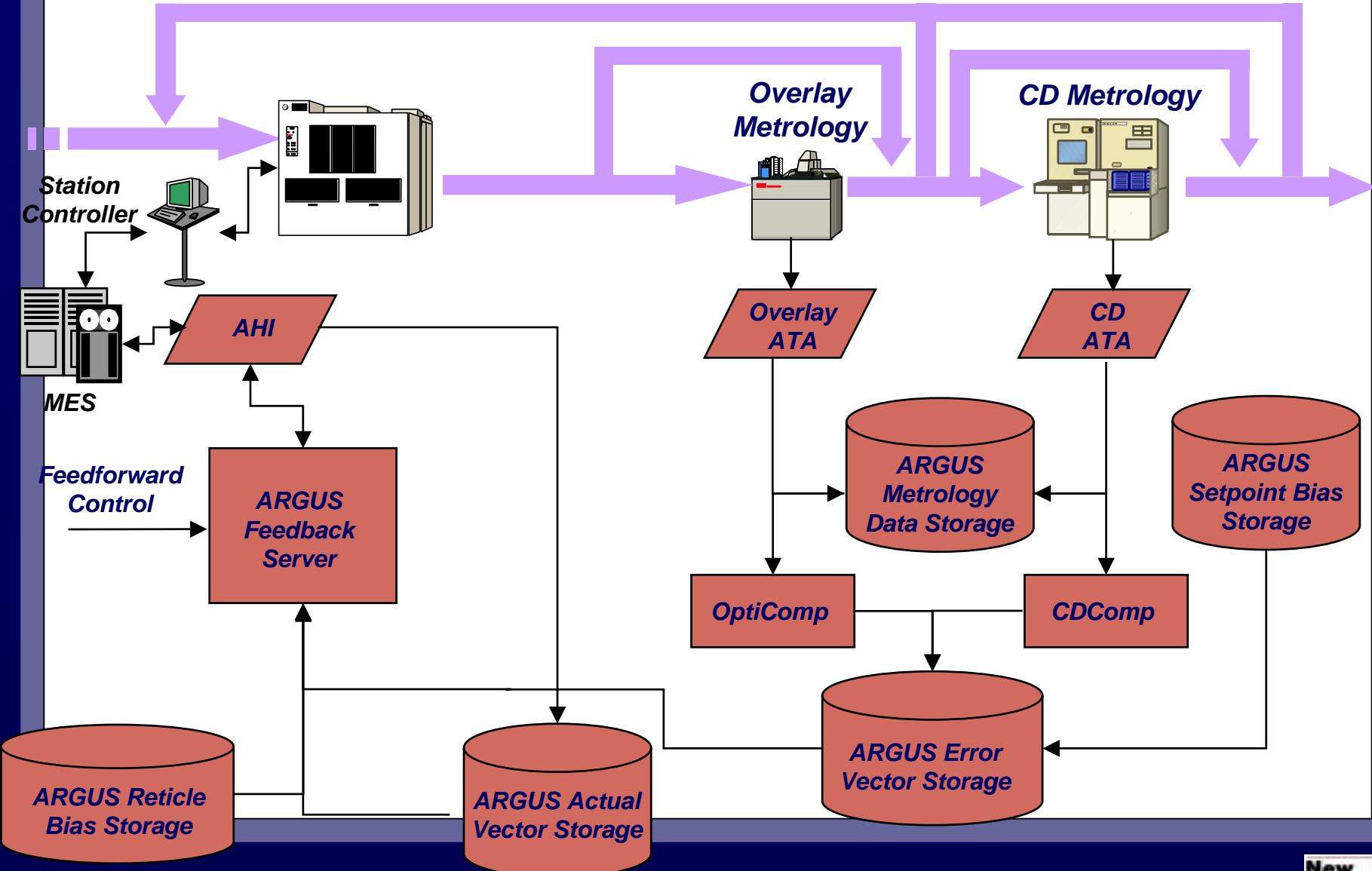
# ARGUS Lithography Run to Run Control



# ARGUS Lithography Run to Run Control

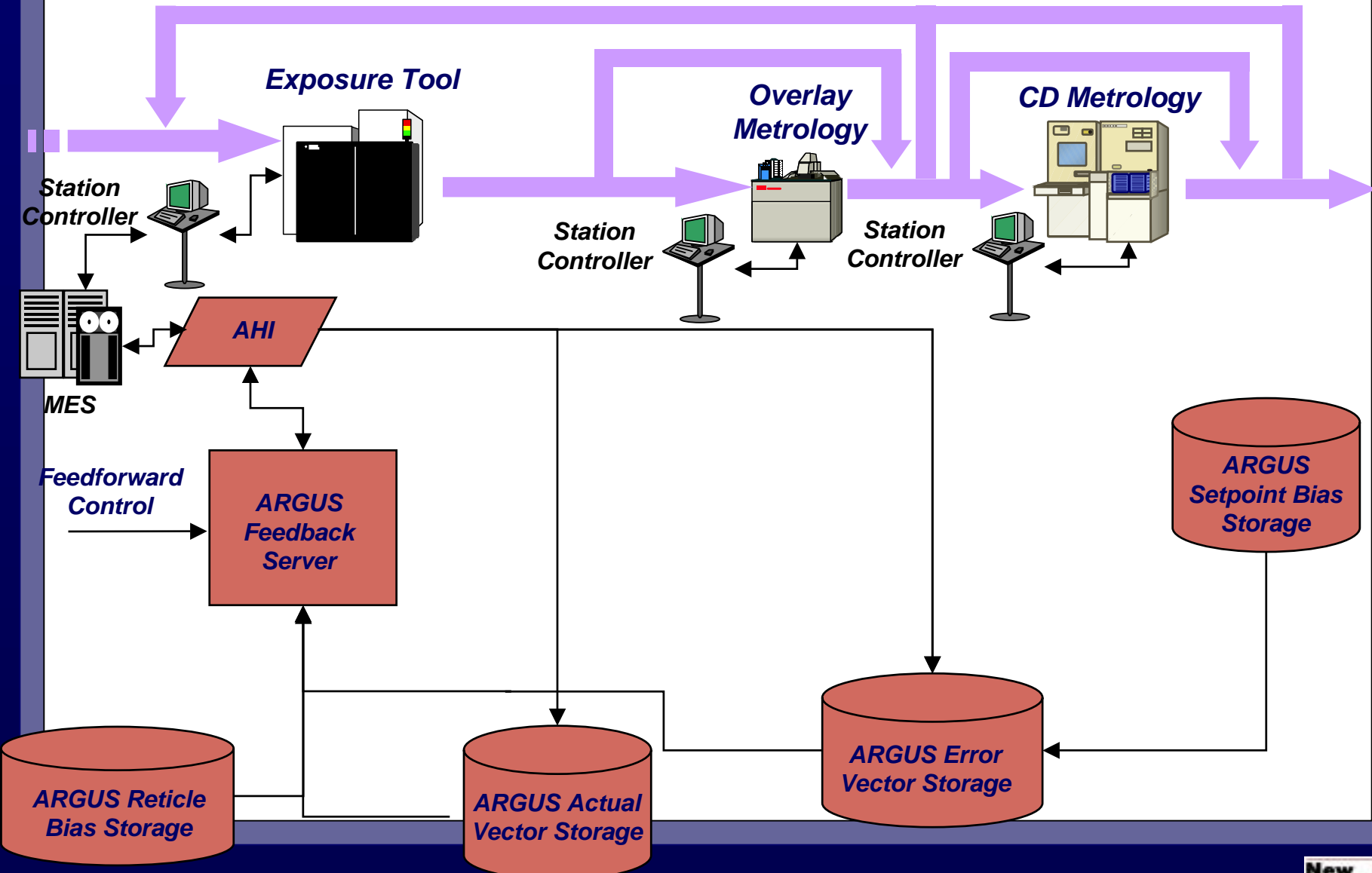


# ARGUS Alternate Integration Strategy #1

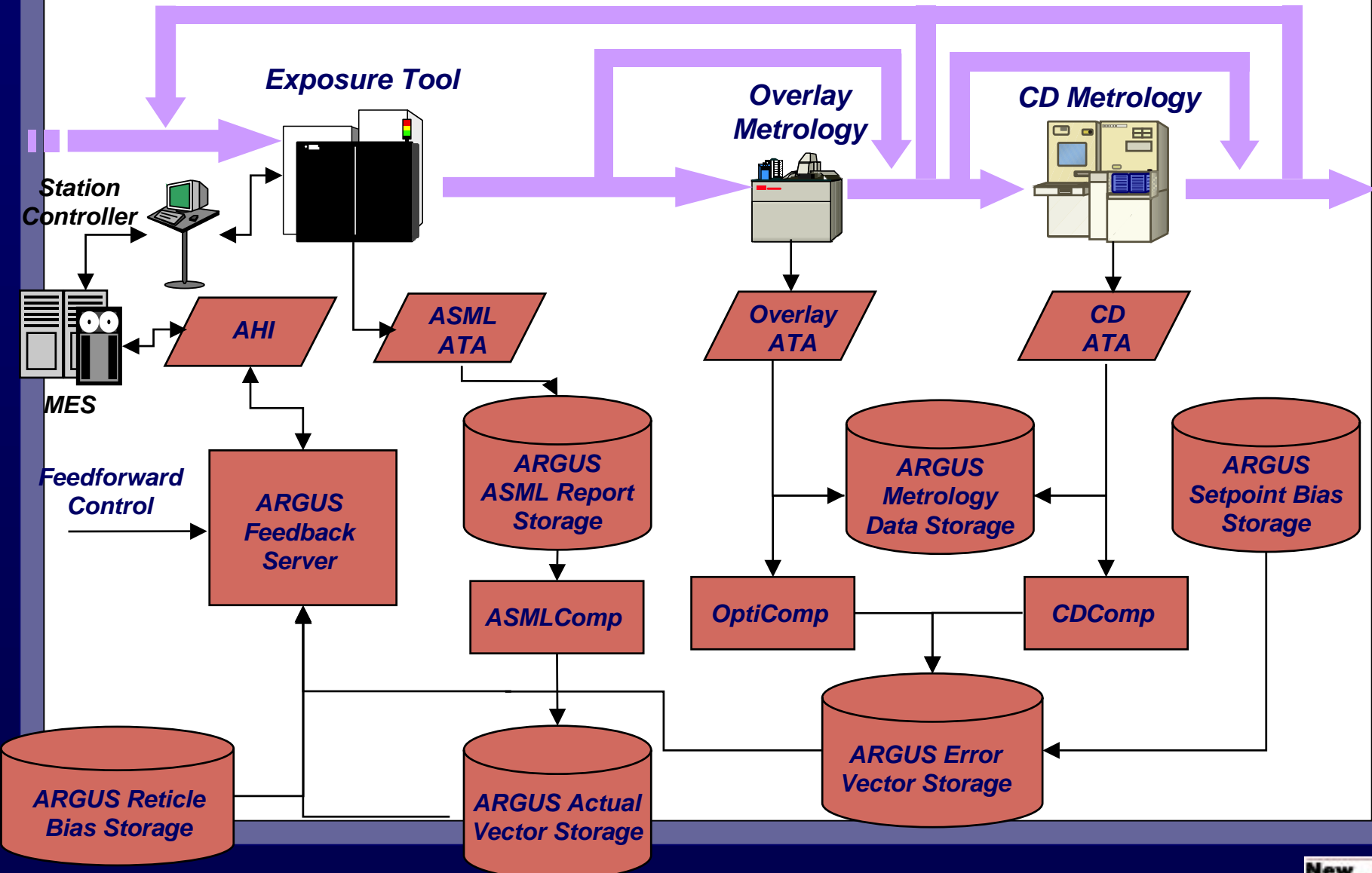




# ARGUS Alternate Integration Strategy #3



# ARGUS Lithography Run to Run Control



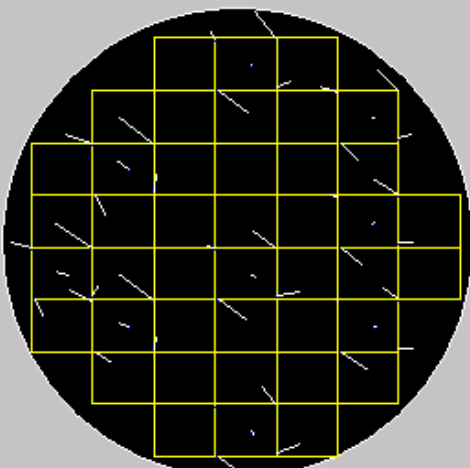
# Metrology Raw Data Storage

**NVS .REG File Viewer**  
 Session Data Scale View

Lot/File Data      Wafer Data

	File Name	File Note		Minimum X Error Microns	Maximum X Error Microns	Mean X Error Microns	Minimum Y Error Microns	Maximum Y Error Microns	
0	AV1150.reg F:\bld\optimiz	SYSTEM: ACV100960201K7726/2		-0.082	0.068	-0.003	-0.051	0.060	0
1	combined.reg F:\bld\optimiz	None	None	-0.095	0.062	-0.012	-0.060	0.092	0
2	combx.reg F:\bld\optimiz\	None	None	-0.066	0.061	0.002	-0.056	0.080	0
3	comby.reg F:\bld\optimiz\	None	None	-0.032	0.063	0.005	-0.037	0.079	0

Vector Scale: 100 nm

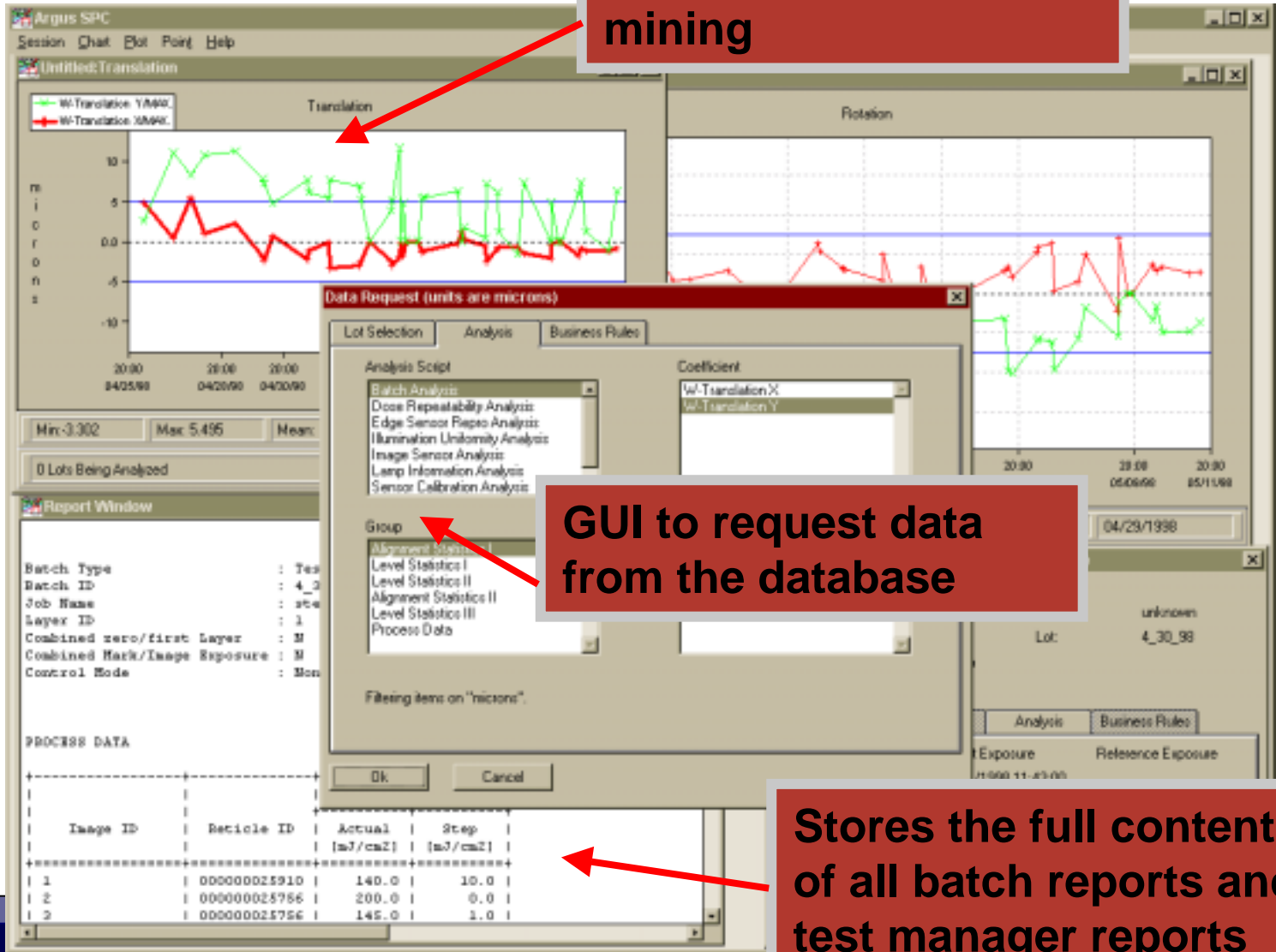


Raw Data

	X Location Microns	Y Location Microns	X Error Microns	Y Error Microns	Grid Row Index	Grid Col Index	
0	4187	56973	0.005	-0.005	0	4	0
1	11726	65667	-0.049	0.060	0	4	1
2	11987	50274	0.034	0.011	0	4	2
3	-6469	49004	0.068	-0.051	0	4	3
4	-7513	65298	-0.014	0.021	0	4	4
5	43188	40313	-0.010	-0.004	1	6	0
6	50727	49008	-0.046	0.048	1	6	1
7	50988	33614	0.031	0.011	1	6	2
8	32532	32344	0.040	-0.041	1	6	3
9	31487	48638	-0.038	0.012	1	6	4
10	-34813	23653	-0.029	0.022	2	2	0
11	-27274	32348	-0.078	0.060	2	2	1
12	-27014	16954	0.003	0.039	2	2	2
13	-45470	15684	0.023	-0.046	2	2	3

# ARGUS ASML Stepper Master

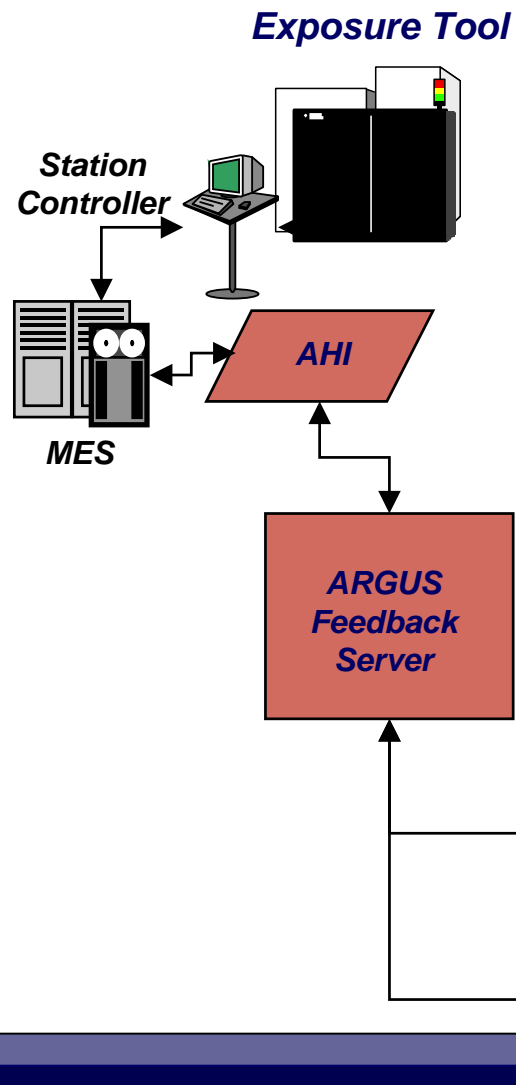
Point/click raw data mining



GUI to request data from the database

Stores the full contents of all batch reports and test manager reports

# ARGUS Feedback Server Features



- User defined multi-tier strategies
  - Weighted moving average (WMA)
  - Correlation key selection
    - Technology
    - Layer
    - Device
    - Reticle
    - Route
    - Operation (OPER)
  - Data expiration time limits
  - Advisory warning rules
    - Drift
    - Shift
    - Out of bounds

# ARGUS Flexible Event Matching Specification

## Query #1

Lot 5  
 Tool 11%  
 Device T1136\_  
 Route 5\_

### Data Pool showing matching and non-matching entries

Lot 5 Tool 118 Device T1136A Route <del>60</del>	5 <b>1</b>	Lot 5 Tool 115 Device T1136B Route 50	5 <b>2</b>	Lot <del>3</del> Tool <del>98</del> Device T1136A Route <del>66</del>	<del>3</del> <b>3</b>	Lot <del>3</del> Tool <del>97</del> Device <del>P4545G</del> Route <del>67</del>	<del>3</del> <b>4</b>
Lot 5 Tool 117 Device T1136B Route 52	5 <b>5</b>	Lot <del>2</del> Tool <del>97</del> Device T1136A Route <del>67</del>	<del>2</del> <b>6</b>	Lot <del>2</del> Tool 115 Device T1136A Route <del>88</del>	<del>2</del> <b>7</b>	Lot <del>3</del> Tool 118 Device T1136A Route 50	<del>3</del> <b>8</b>

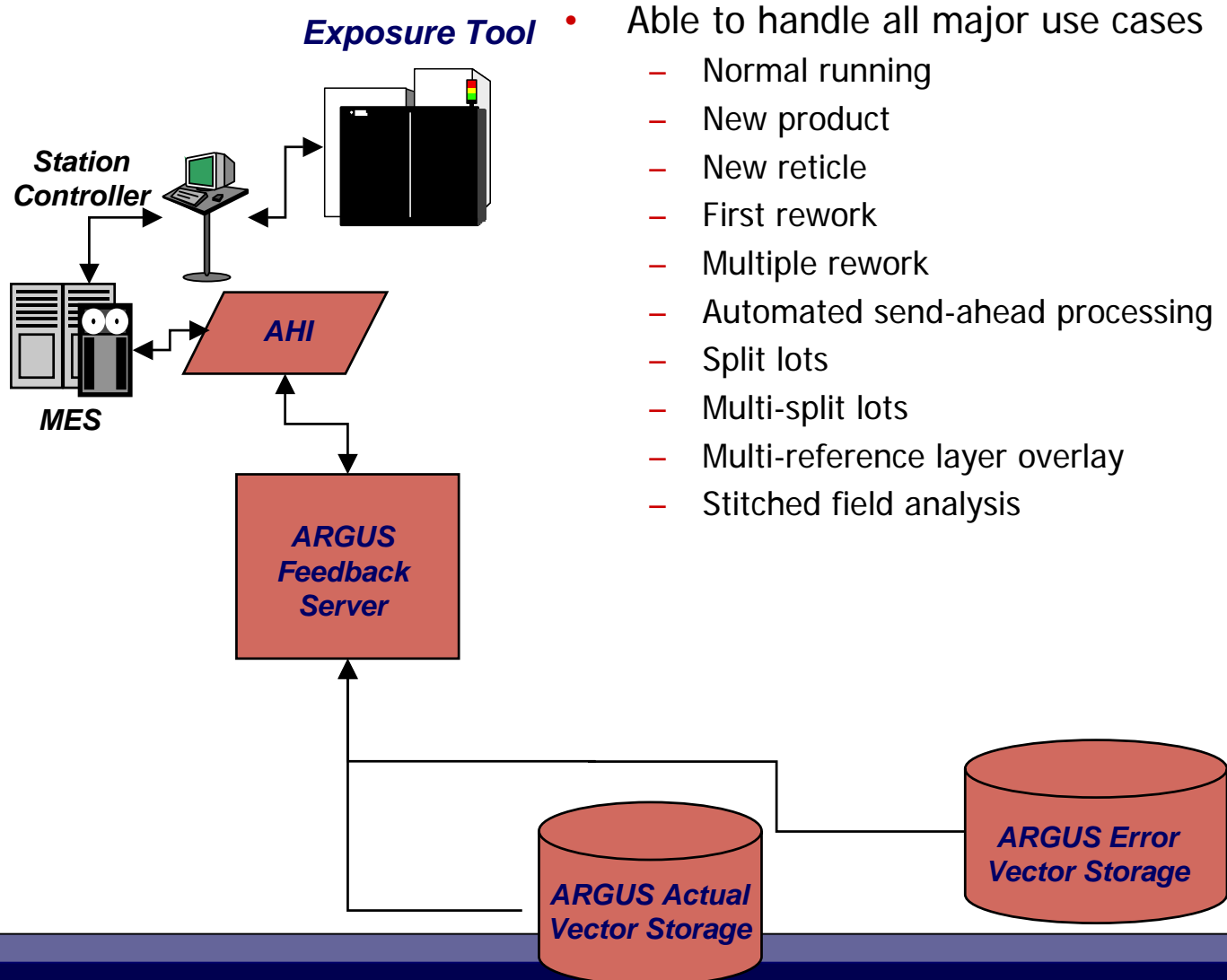
## Query #2

Lot 5  
 Tool 11%  
 Device T1136\_  
 Route %

### Data Pool showing matching and non-matching entries

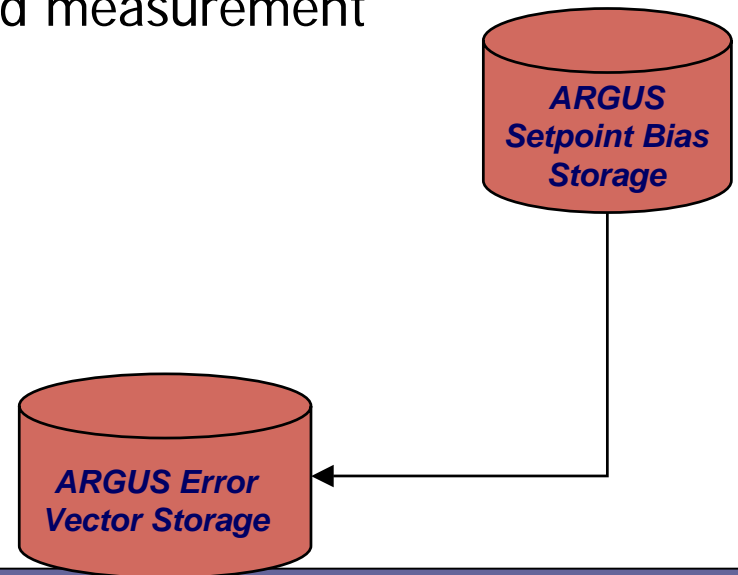
Lot 5 Tool 118 Device T1136A Route 60	5 <b>1</b>	Lot 5 Tool 115 Device T1136B Route 50	5 <b>2</b>	Lot <del>3</del> Tool <del>98</del> Device T1136A Route 66	<del>3</del> <b>3</b>	Lot <del>3</del> Tool <del>97</del> Device <del>P4545G</del> Route 67	<del>3</del> <b>4</b>
Lot 5 Tool 117 Device T1136B Route 52	5 <b>5</b>	Lot <del>2</del> Tool <del>97</del> Device T1136A Route 67	<del>2</del> <b>6</b>	Lot <del>2</del> Tool 115 Device T1136A Route 88	<del>2</del> <b>7</b>	Lot <del>3</del> Tool 118 Device T1136A Route 50	<del>3</del> <b>8</b>

# ARGUS Feedback Server Features

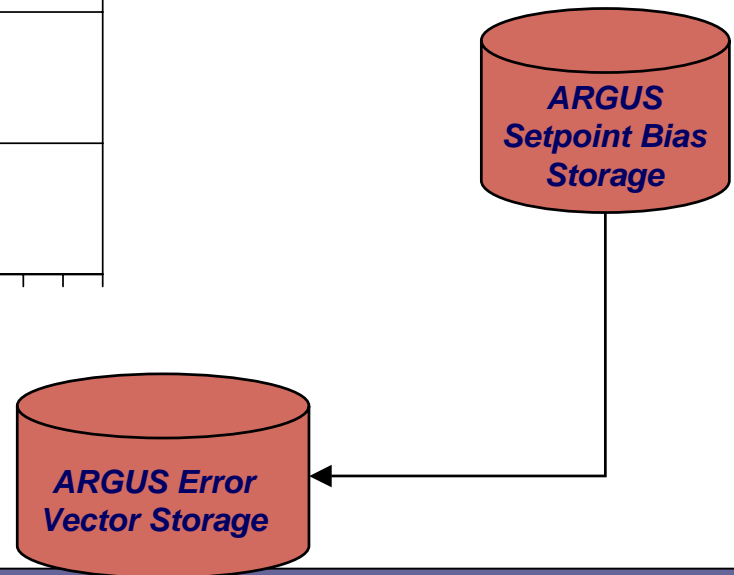
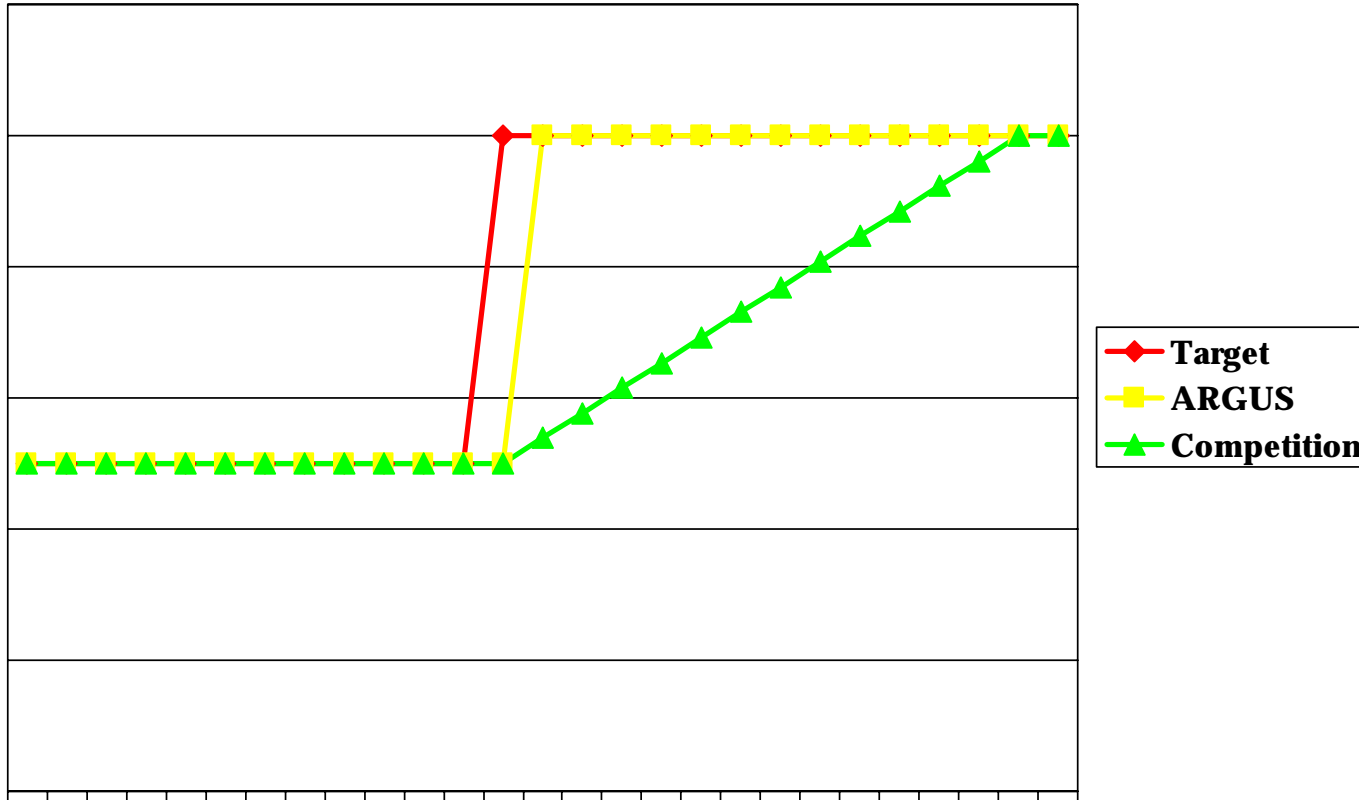


## ARGUS Set Point Bias Logic

- Solves a variety of real world issues
  - Target DI/CD to accommodate etch bias
  - Changing CD target to take advantage of improved CD variance.
  - Known CMP or deposition induced measurement errors.

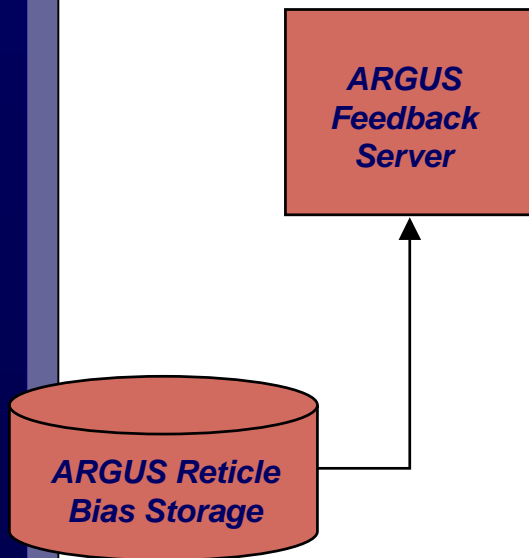


# ARGUS Set Point Bias Logic - Zero Delay to New Target



## ARGUS Reticle Bias Control

- What is the purpose of reticle bias control?
  - Necessary for effective overlay and CD control in high part count fabs (foundry and ASIC).
  - Provide dual loop control with mathematically separated dynamic control over:
    - High frequency / high sample rate tool and process variations
    - Low frequency / low sample rate reticle changes
- How can reticle biases be defined?
  - Vector definition methods
    - Input from external sources
    - Automated reticle learning
  - Correlation keys may be any combination of reticle ID, exposure tool ID, and device ID.

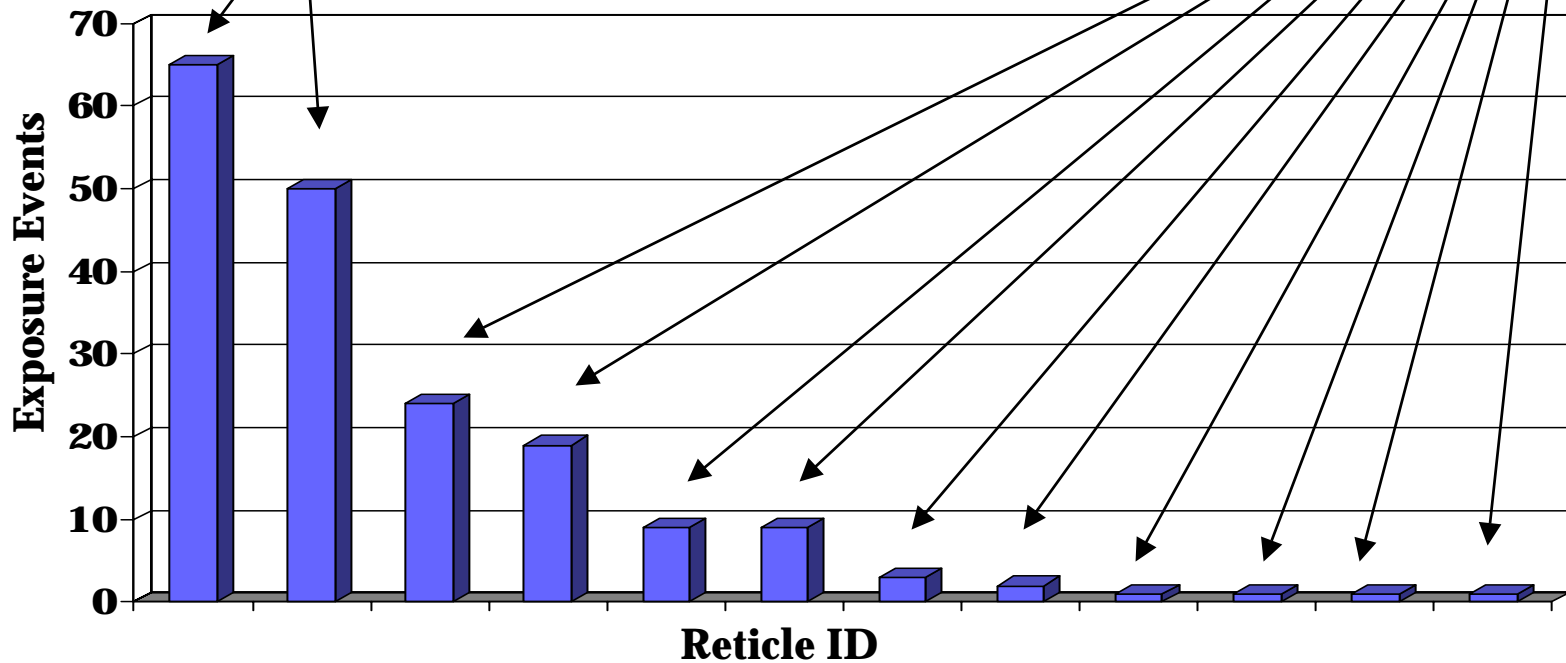


# Foundry is a "Mixed Stream" Operation

Typical Event Count Pareto  
One Scanner-Layer "Process Stream"  
(3 months)

*"Long Runners"*

*"Short Runners"*



# Process Stream Data Defined

1. **Long Runners**
  - Sufficient data to use Scanner-Layer-Reticle process stream strategy

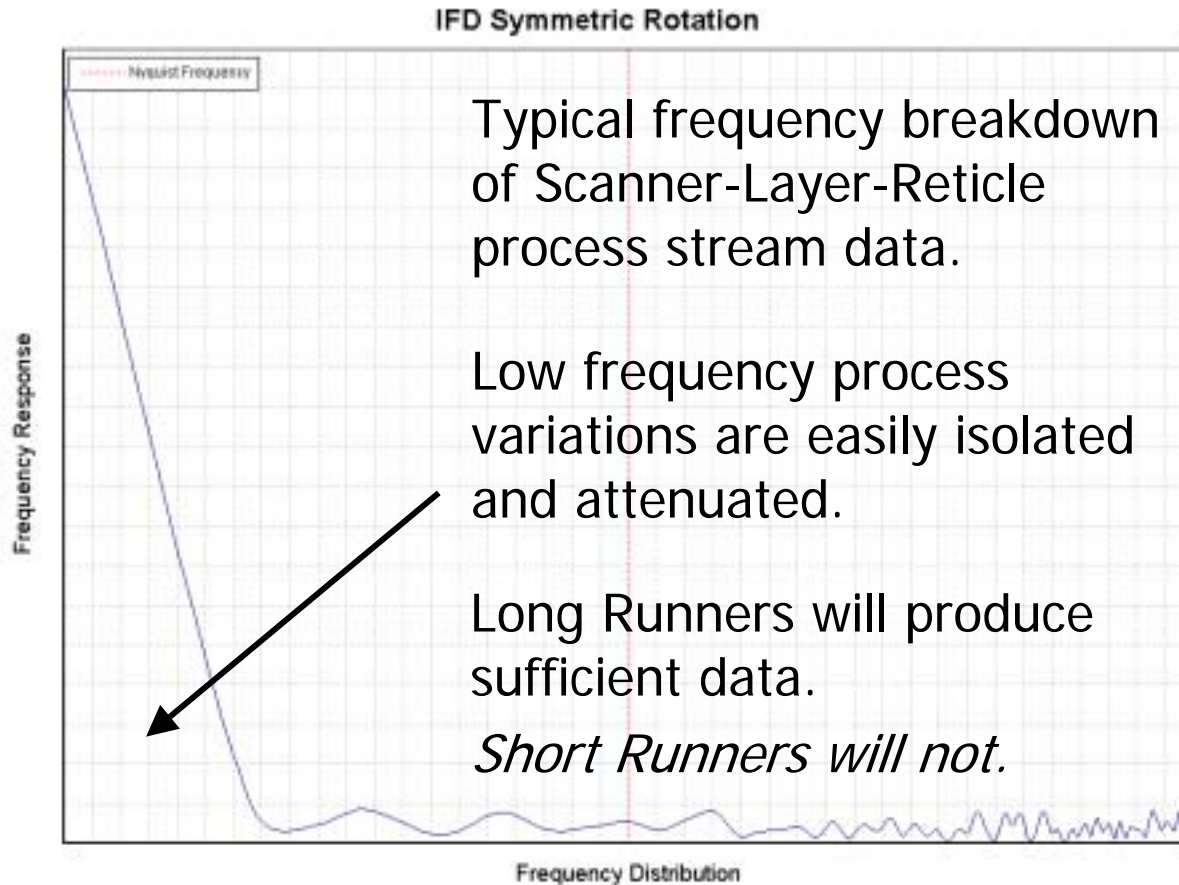
- Basic control methods address variations

2. **Short Runners**
  - Insufficient data to use Scanner-Layer-Reticle process stream strategy

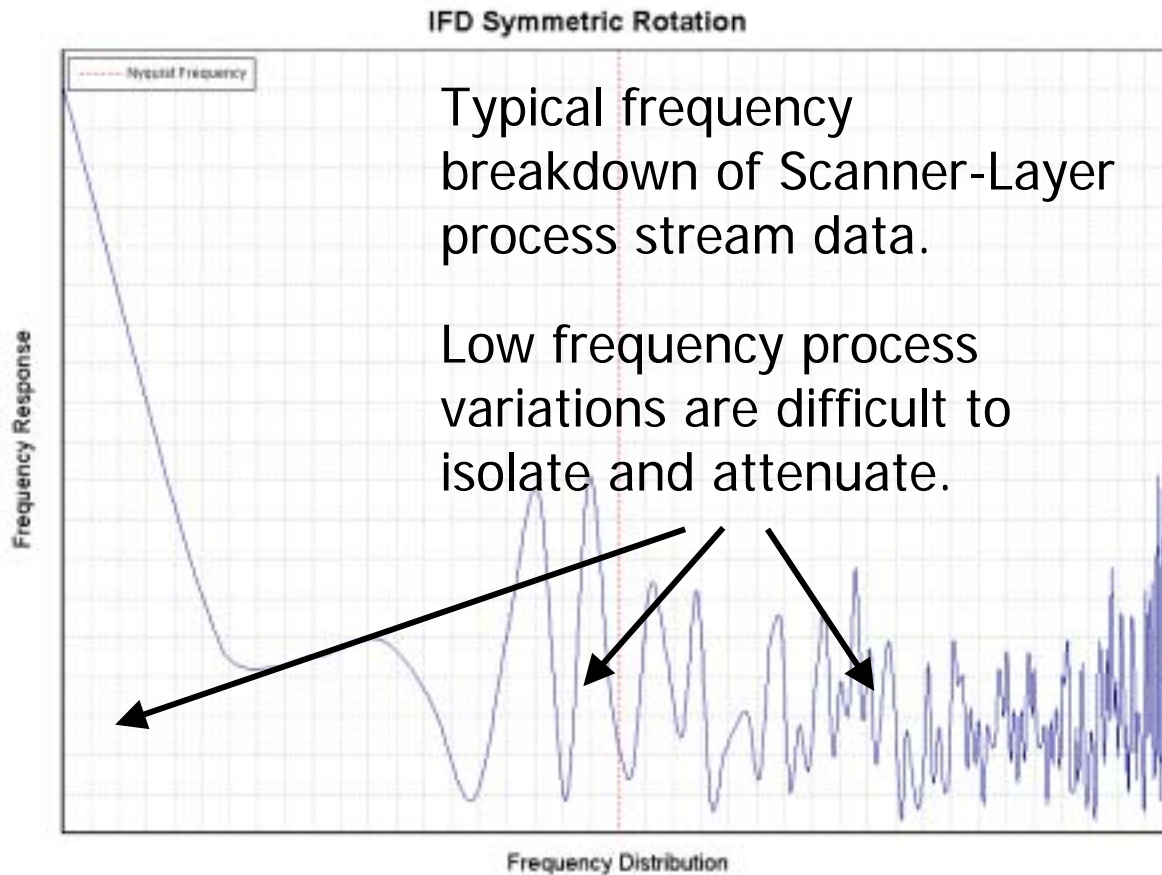
- Must use Scanner-Layer data

- Basic control methods fail

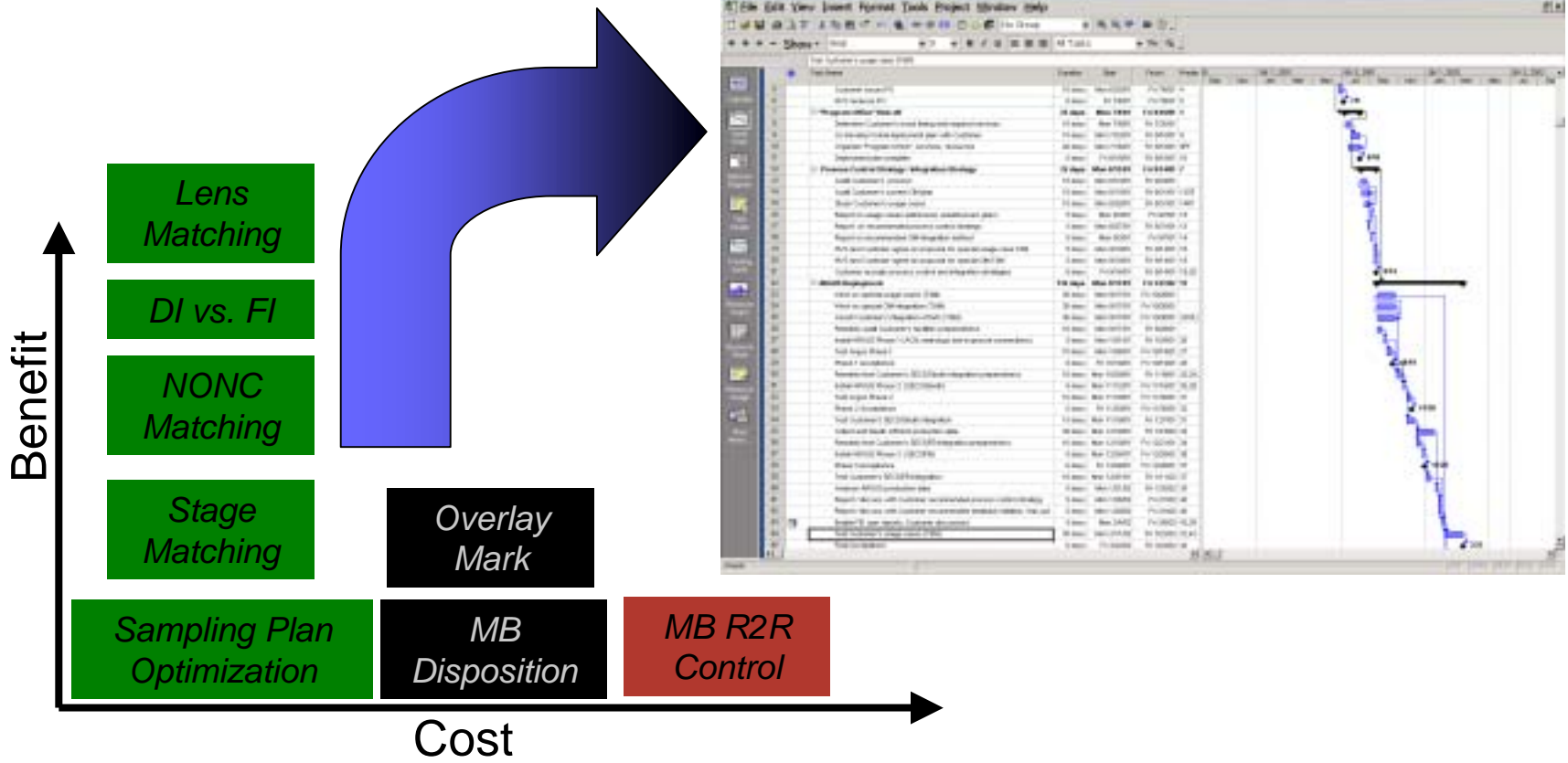
# Long Runners Yield Basic Frequencies



# Short Runners Yield Complex Frequencies



# NVS' Holistic Approach Drives the Most Effective and Predictable Deployments

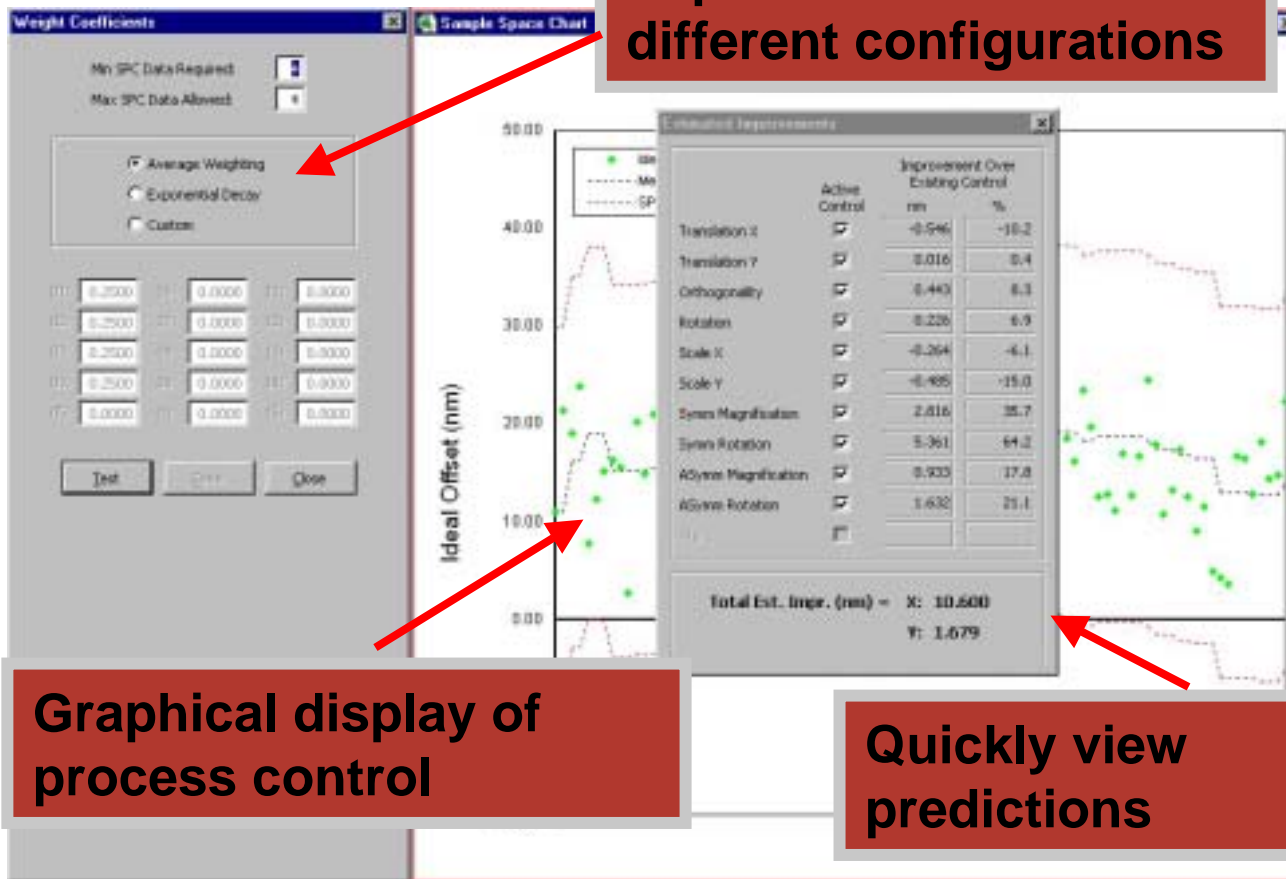


# Argus Performance VS. Feedback Optimizer Predictions

- Objective:
  - Review the performance of ARGUS relative to;
    - Previous method of process control
    - Feedback optimizer predicted performance
- Why use optimization tools?
  - Reduces cycles of learning
  - Evolutionary operation
  - Simplification of configuration setup
  - Test new functionalities
  - Determination of active control
- Data Analysis:
  - Exposure Tool: Single exposure tool
  - Process Level: Two – Backend process streams
  - Time Frame: 90 days of active ARGUS vs. the previous 60 days of manual control

# Argus Feedback Optimizer

Experiment with different configurations



Graphical display of process control

Quickly view predictions

## First Process Stream

Parameter	Actual Performance Without ARGUS*	Actual Performance With ARGUS*	Actual Improvement*	FBO Predicted Improvement*
Translation X	7.6	8	0	1
Translation Y	8	4	4	5
Grid Rotation	15	6	10	9
Grid Orthogonality				
Grid Scale X	12	12	-1	2
Grid Scale Y	13	11	2	2
IFD Symm Rotation	3	2	1	0
IFD Symm Magnification	7	3	4	4
IFD Asymm Rotation	2	1	0	0
IFD Asymm Magnification	2	2	0	0

	<b>FBO Predicted Improvement</b>	<b>Actual Improvement</b>
<b>X:</b>	<b>15.8</b>	<b>13.5</b>
<b>Y:</b>	<b>20.5</b>	<b>20.0</b>

\* All values normalized to nm

\*\* Model Based summation of the individual parameters

## Second Process Stream

Parameter	Actual Performance Without ARGUS*	Actual Performance With ARGUS*	Actual Improvement*	FBO Predicted Improvement*
Translation X	8.2	7.5	0.7	0.4
Translation Y	5.9	4.2	1.8	1.7
Grid Rotation	15.9	5.5	10.5	7.9
Grid Orthogonality				
Grid Scale X	10.8	12.4	-1.6	-1.5
Grid Scale Y	12.3	11.3	0.9	0.6
IFD Symm Rotation	3.1	2.4	0.8	0.8
IFD Symm Magnification	6.4	2.8	3.6	3.7
IFD Asymm Rotation	1.3	1.4	-0.1	0.2
IFD Asymm Magnification	1.8	2.4	-0.6	-0.1

	<b>FBO Predicted</b>	<b>Actual</b>
	<b>Improvement</b>	<b>Improvement</b>
<b>X:</b>	<b>11.4</b>	<b>13.3</b>
<b>Y:</b>	<b>14.8</b>	<b>16.8</b>

\* All values normalized to nm

\*\* Model Based summation of the individual parameters