FAB
MIXED-SIGNAL FOUNDRY EXPERTS

Plasma Trace System

- Kyle Romero
  - 10/6/2011

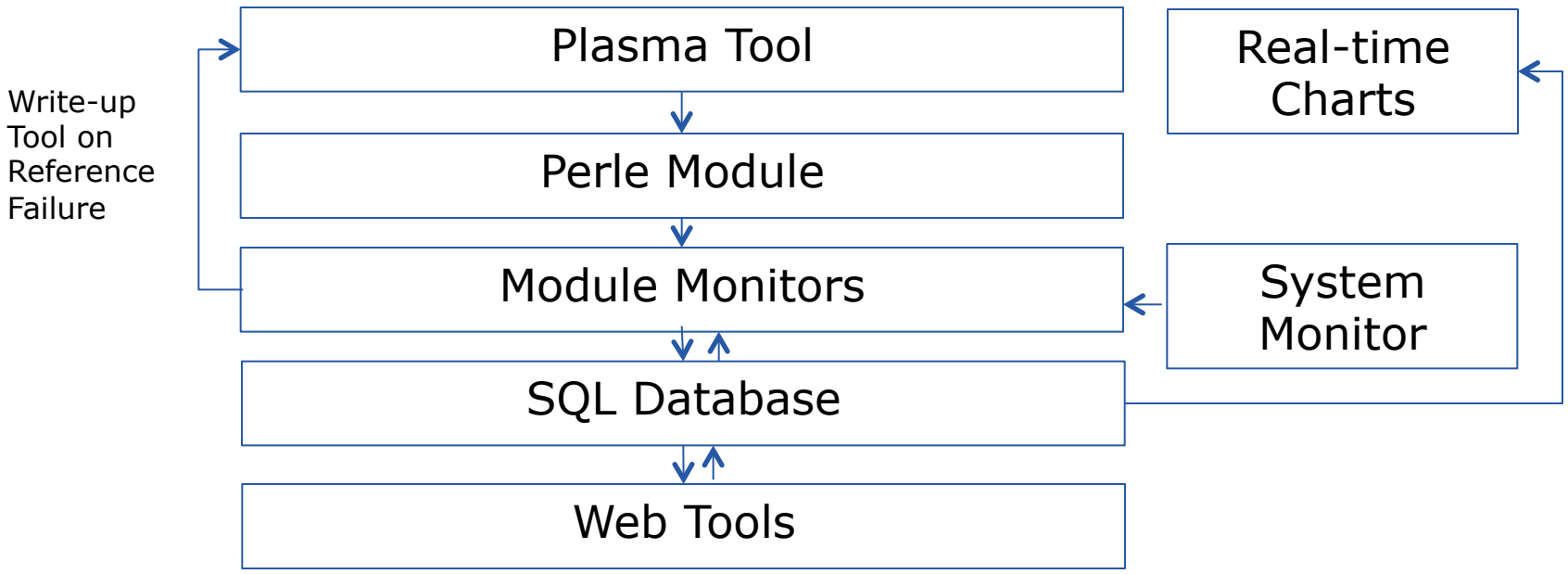
Project Description

- Provide accurate and easily accessible Endpoint voltage measurements for tools used by the plasma group
- Allow the system to automatically compare current voltage measurements to preset references
  - In the event that the current voltage levels deviate too greatly, stop tool to prevent damage to wafers
- Replace current system
- Make the system modular and easy to maintain

Trace System

- Overview
  - Used to monitor endpoint voltage levels
  - Components
    - Web application (.NET) charting tool
    - Perle IOLAN modules
    - SQL database
    - Custom Monitor software
      - 1 monitor per module
      - Process monitor (monitors the monitors)
    - Other Web Tools

System Flow


Write-up Tool on Reference Failure
Plasma Tool
Perle Module
Module Monitors
SQL Database
Web Tools
Real-time Charts
System Monitor

Step 1: Perle Module

- Machine begins processing wafers
- Gas ON signal goes high
- Perle module outputs sensor inputs, 4 Analog and 2 Digital, to a UDP socket pointed at the IP where I have my software running

Step 2: Monitor

- Monitor program is started for each Perle module. Each program tracks the UDP broadcast from its specified Perle module
- When the Gas ON line goes high on the Perle module signal, a wafer start event is triggered
- The current event information is retrieved from the manufacturing system.
- Voltage information is parsed out of the UDP broadcast and written out to a SQL Table

Step 3: Reference Compare

- When The Gas On signal goes low after previously being high, the wafer end event is triggered
- The monitor checks for the existence of a reference trace for the current PL/OPN/Recipe combo. If it exists, it retrieves it.
- The complete trace is put into an array object. So is the reference.
- Loops are performed that pick out the max value of the current trace and the reference. The two data arrays are normalized against their max value
- The lengths of the arrays are checked against each other. If the current trace is too long or short based on the threshold number of points value compared to the reference, it fails for endpoint reasons.

Continued

- If no endpoint failure, a loop is performed through the arrays, comparing each corresponding point on the trace and the reference. They are on the same scale.
- If the current trace value falls outside of the safe zone identified by looking at the Reference Value +/- Threshold value, a failure counter is incremented.
- If the failure counter is greater than the number of failure points allowed, a failure is triggered do to threshold comparison
- The program sends out emails to notify in the event of failure
- The program checks to see if writeup is enabled for the machine, if so, tool writeup occurs

Step 4: Web tool

- Lots are identified based on the unique events that exist in the specified machine table
- If reference exists, it is plotted out first
- Wafers are plotted out next
- New reference can be set. Wafer that is chosen will be copied into reference table
- The web tool simply reports what current exists in the DB. All the heavy processing is handled real time by the monitor application.

Perle IOLAN DS1 A4D2

Used to monitor Endpoint voltage levels and transmit the results over the network at 1s intervals.

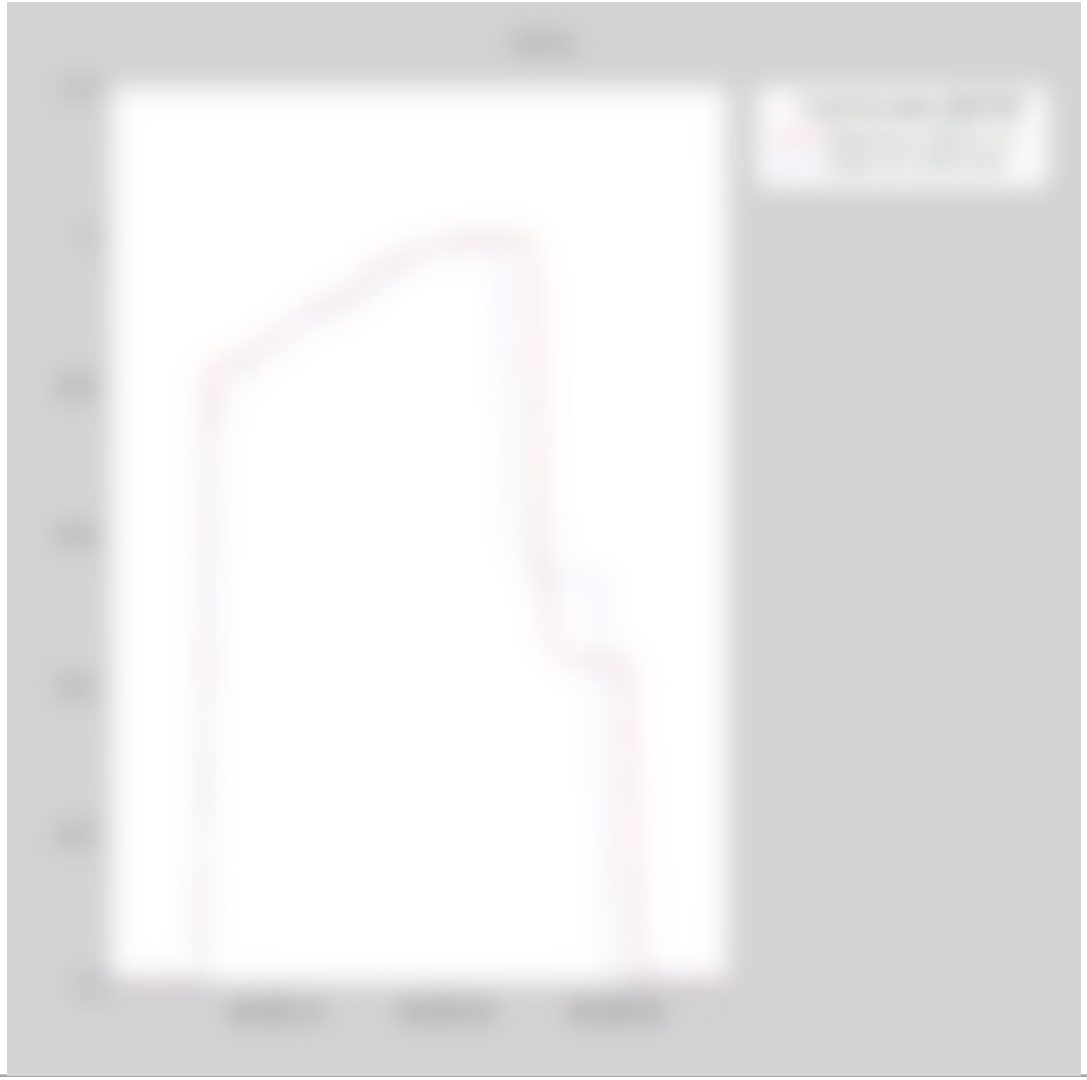
Tools

Several Web Tools have been created:

- Charting application
- Chart monitor
- System Commands

Charts

Wafer Comparison



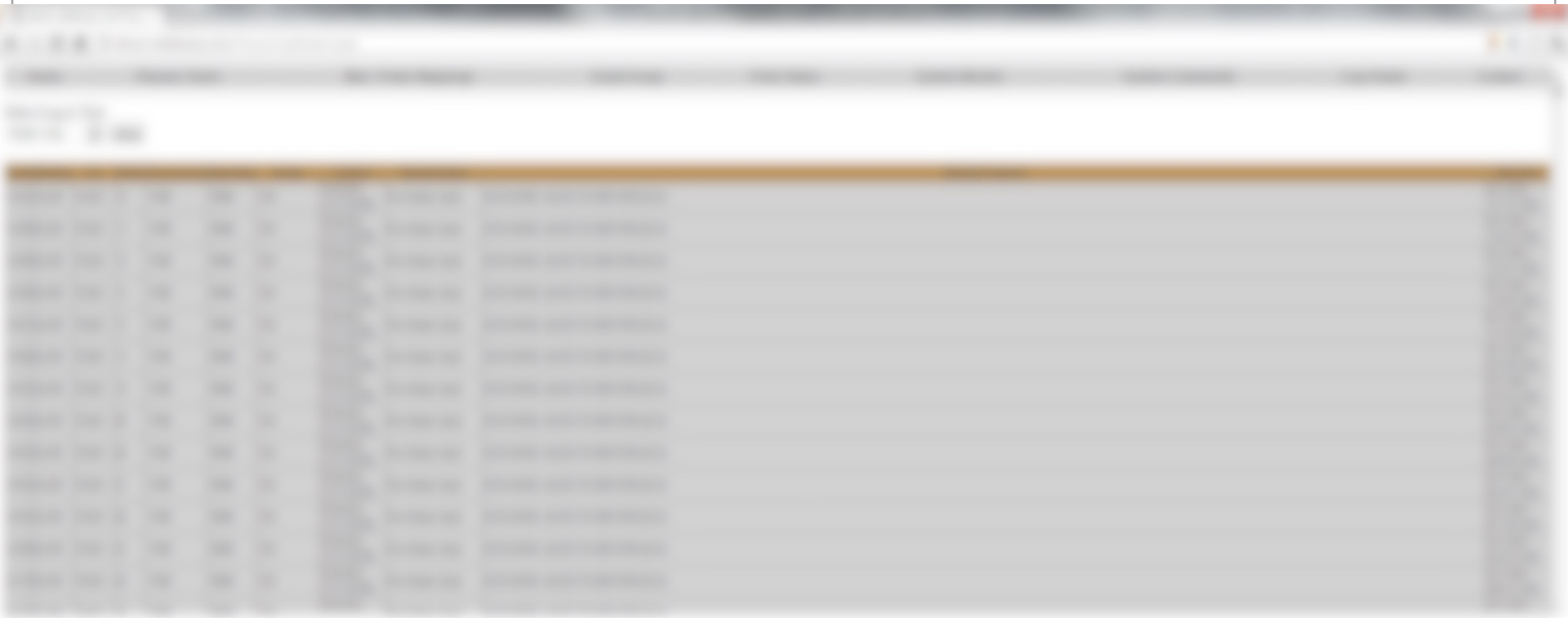
Real-Time Monitor

System Monitor

Operator Machine Monitor

System Commands

Log Viewer



FAQ and Contact Tool

Monitor System

Database

- MSSQL
- Two tables for each machine
  - Trace Data table: Contains the data passed in from the Perle modules (Chart data)
  - Reference Data: Contains the reference data.
- Perle Mapping Table: Contains information for each machine and how it relates to the Perle modules.
- System Commands: Holding area for commands from web tool.
- Runs on dedicated server

Project Summary

- Project Successfully completed
- Currently in use in Lubbock
- Stable use >6mo
- Development time: ~1yr
- Replaced existing system
- Developers: 1
- Added many new features over old system