VERIFIDE

Acquire. Analyze. Adapt. Advance.

Production Automation System Software

Introduction

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Problem

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High Level Problem

Device complexity is Increasing

Test and data volumes are Growing

Product cycles are Shrinking

Test system costs are Escalating

Maintenance costs are Climbing

Test organizations are being Squeezed

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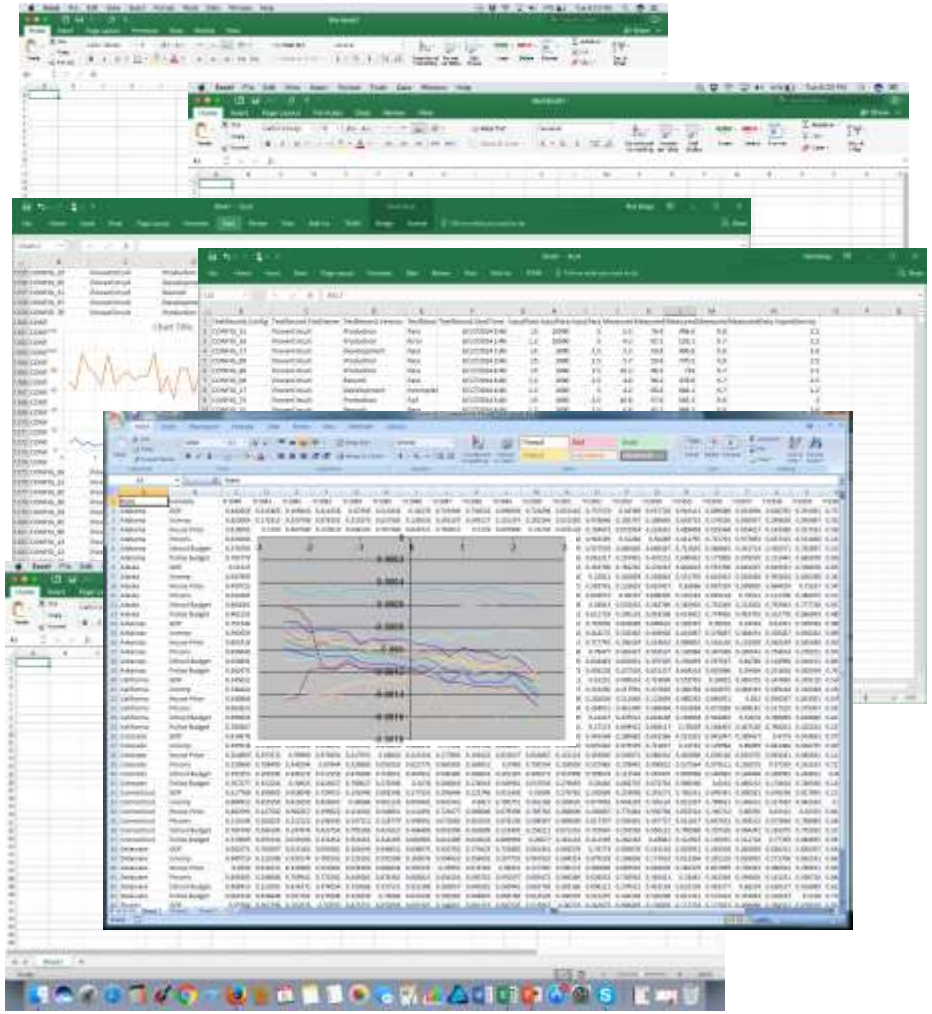
Current Challenges



Lack of data management and analysis tools makes troubleshooting, verification, quality control, audit and sell-off processes very manual and tedious.

How are you doing it today?

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Current Challenges

Managing multiple test instruments and systems is messy. Upgrading, interchanging or sharing equipment requires significant rework of test code.

How are your tests affected by equipment/driver changes?

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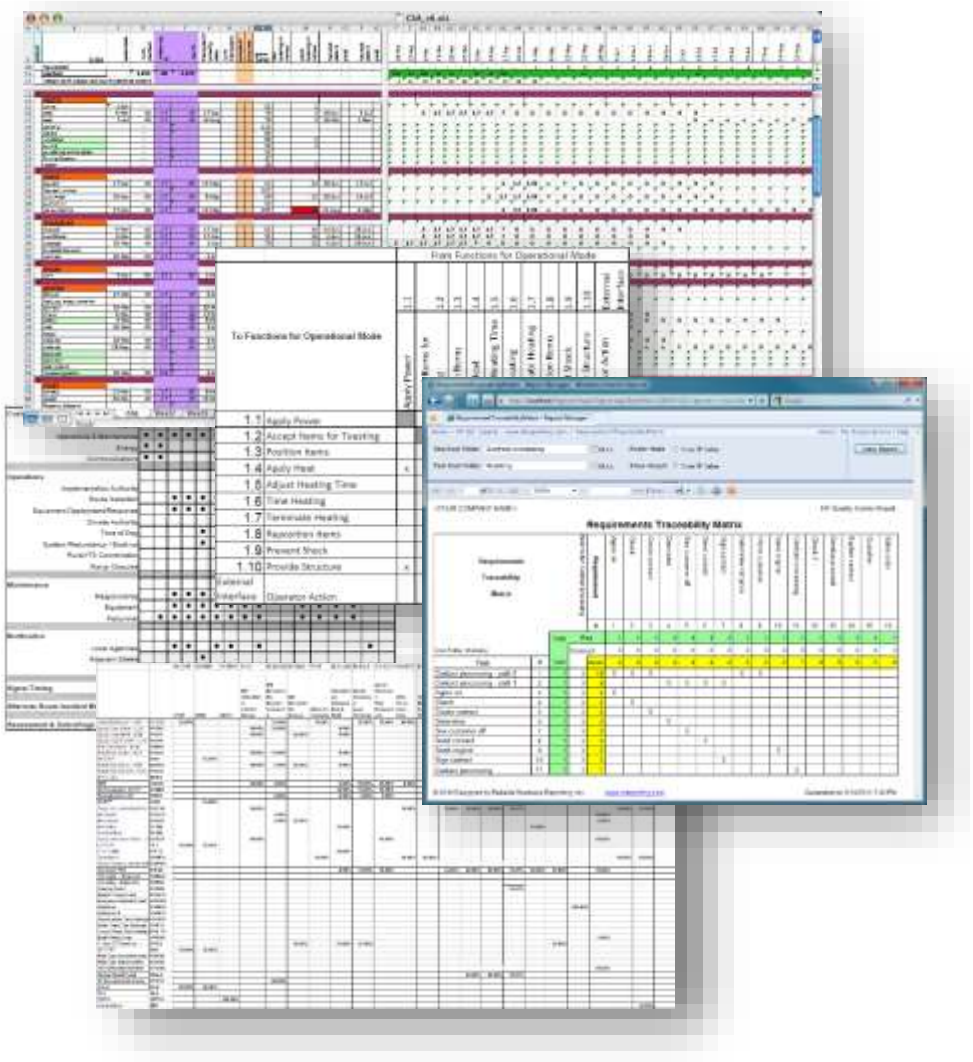
Current Challenges



Test requirements, limits and specifications are complex. Creating and updating sequences and limits from requirements is cumbersome and time consuming.

How are your test requirements converted to test sequences?

Solution/Concepts

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Solution

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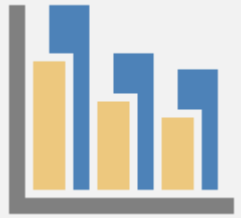
BAE SYSTEMS
INSPIRED WORK

1

- Test Data Analysis



2

- Test Automation

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Solution

1 Test Automation

- ✓ **Services Framework** – Modular and scalable services framework for hosting instrument drivers, tests, or other code
- ✓ **Monitoring and safety** –Framework and tools for logging and data monitoring, with automatic event and alarm handling
- ✓ **Development** – Rich API, supports LabVIEW™, .NET, Python and more
- ✓ **Reqs and Specs** – Efficient, table based test sequences, limits, and parameters - supports Excel™

2 Test Data Analysis

- ✓ **Data Storage** – Dynamic database technology that eliminates need for data management code.
- ✓ **Data Analysis** – Rich and interactive tools to visualize, analyze, and sell-off test data.
- ✓ **Metrics and Yield** – Tools to view metrics, data distributions, and perform post-test limit check and yield analysis.
- ✓ **Reports** – Report generation with no coding

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Compatibility

DEVELOPMENT ENVIRONMENTS

TEST EXECUTIVES

What platforms are you using today?

Develop in your environment of choice, use Verifide API for data storage, logging, or other services.

Use existing front end applications to execute tests in production or end-of-line scenarios.

1 Test Automation

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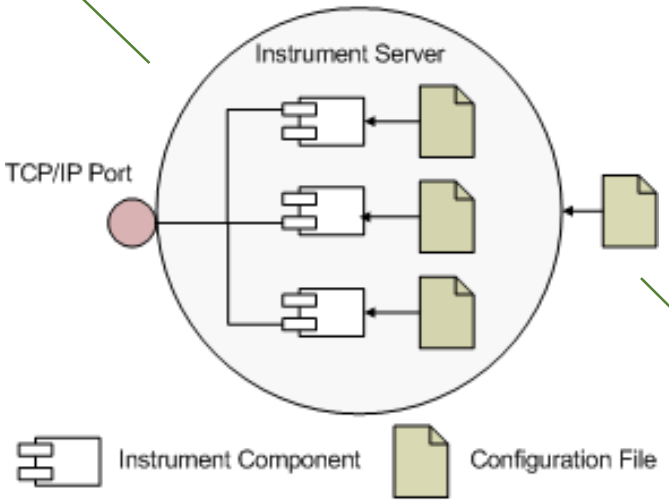
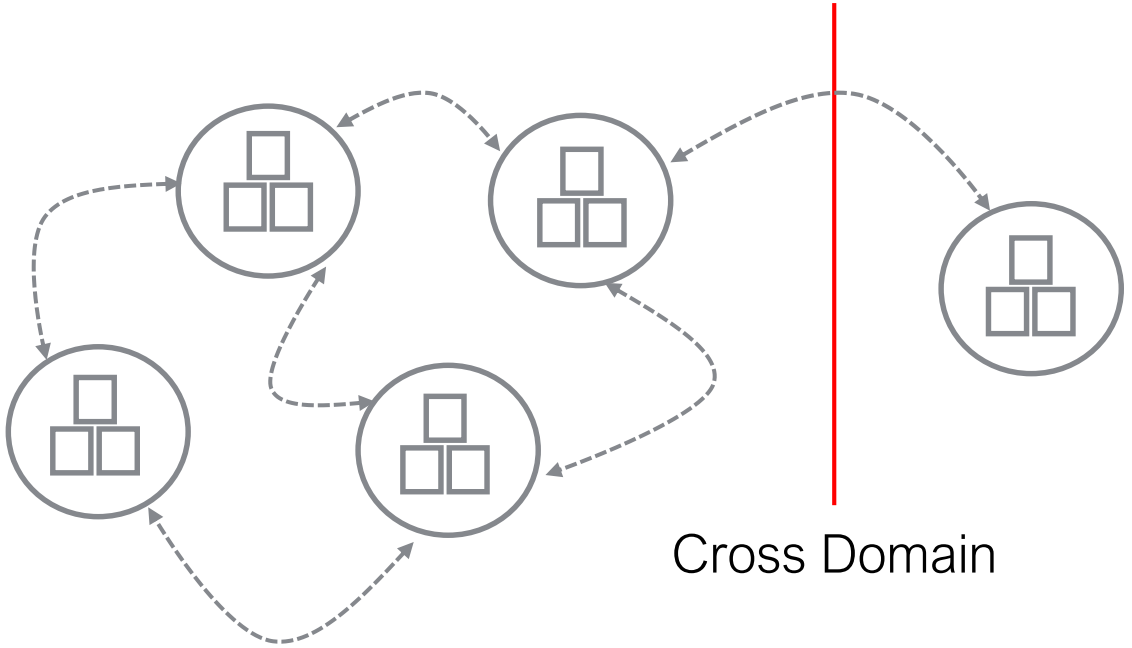
Modular Services Framework

Plug and play components to build system.
Components are instrument drivers, tests, common libraries, algorithms





Built-in asset management for sharing equipment across tests or systems (eg. Parallel testing)

You develop and control your components
(drivers,tests,services etc)

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Table-Driven Testing

Typical Processes

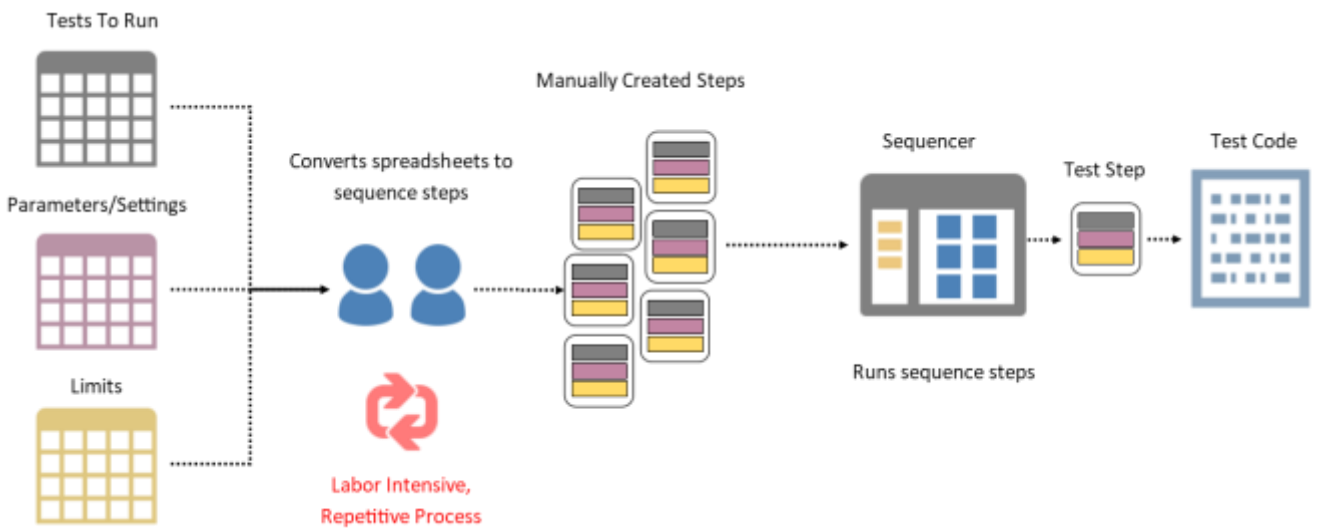
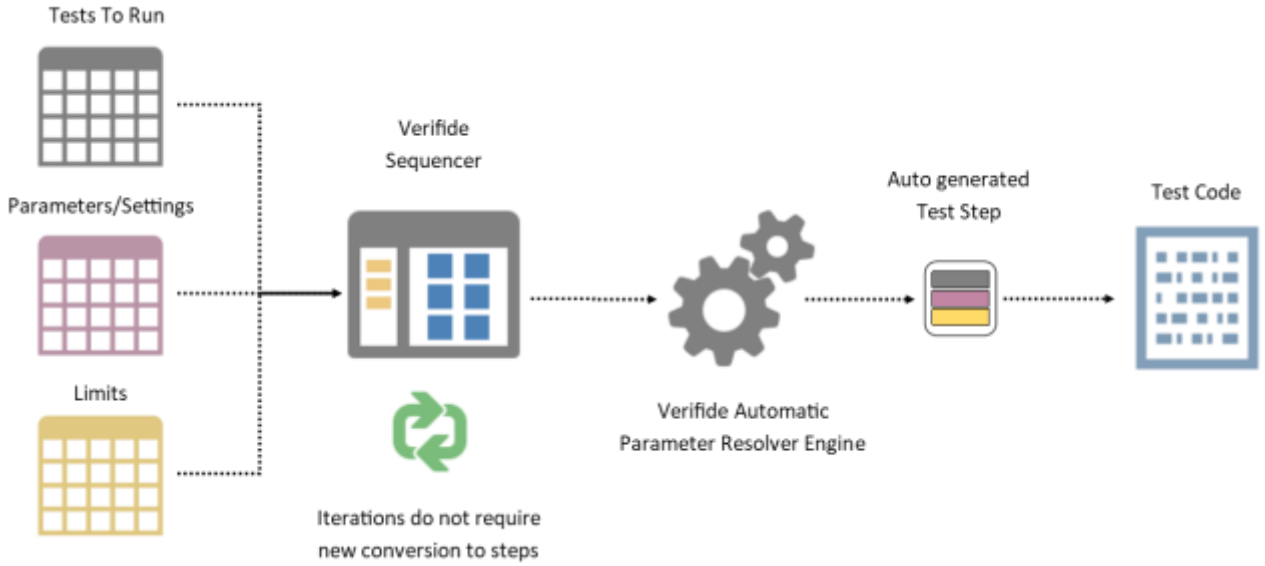


Table-Driven Process



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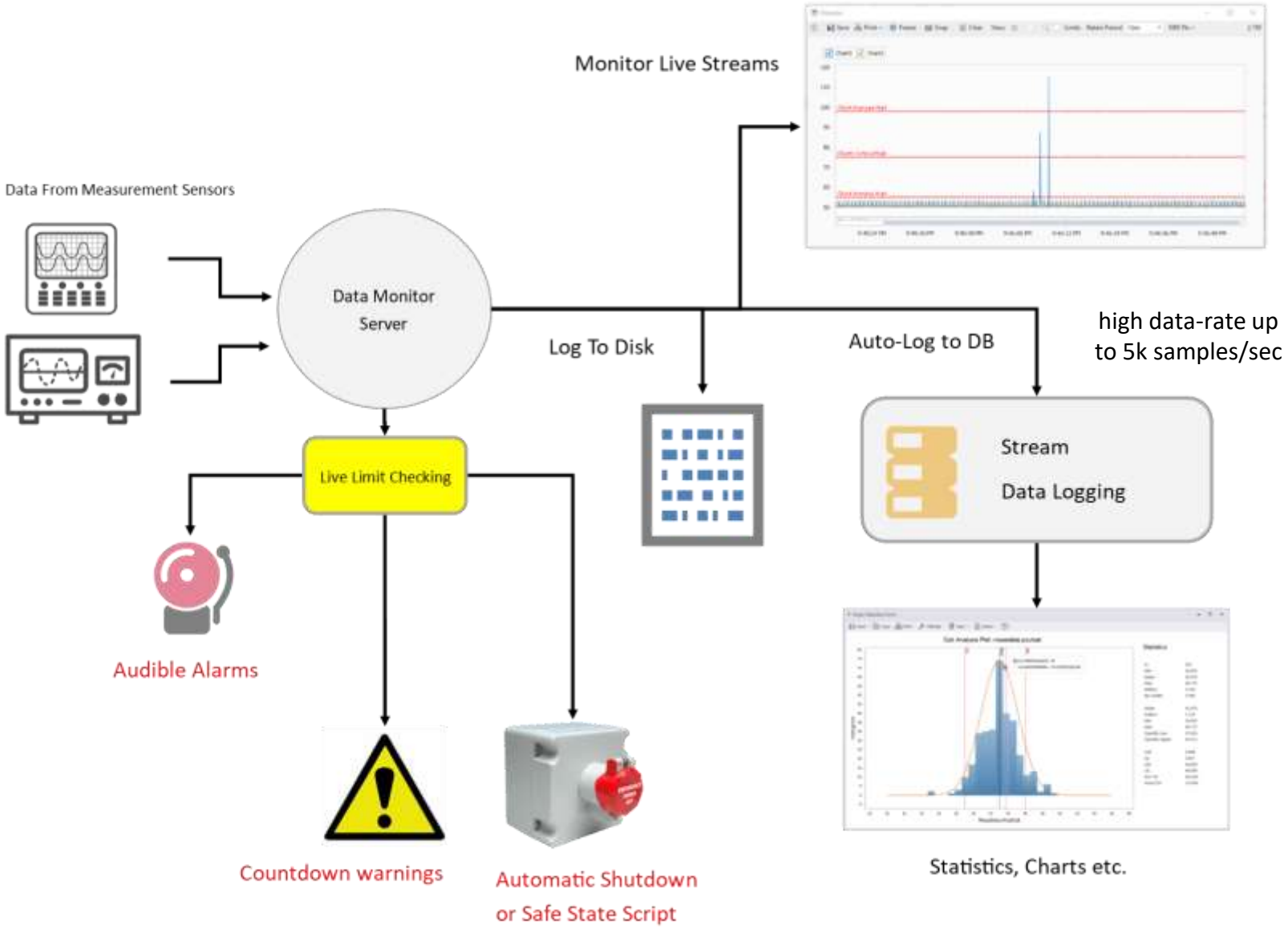
Data Monitoring & Strip Charts



2 Test Data Management & Analysis

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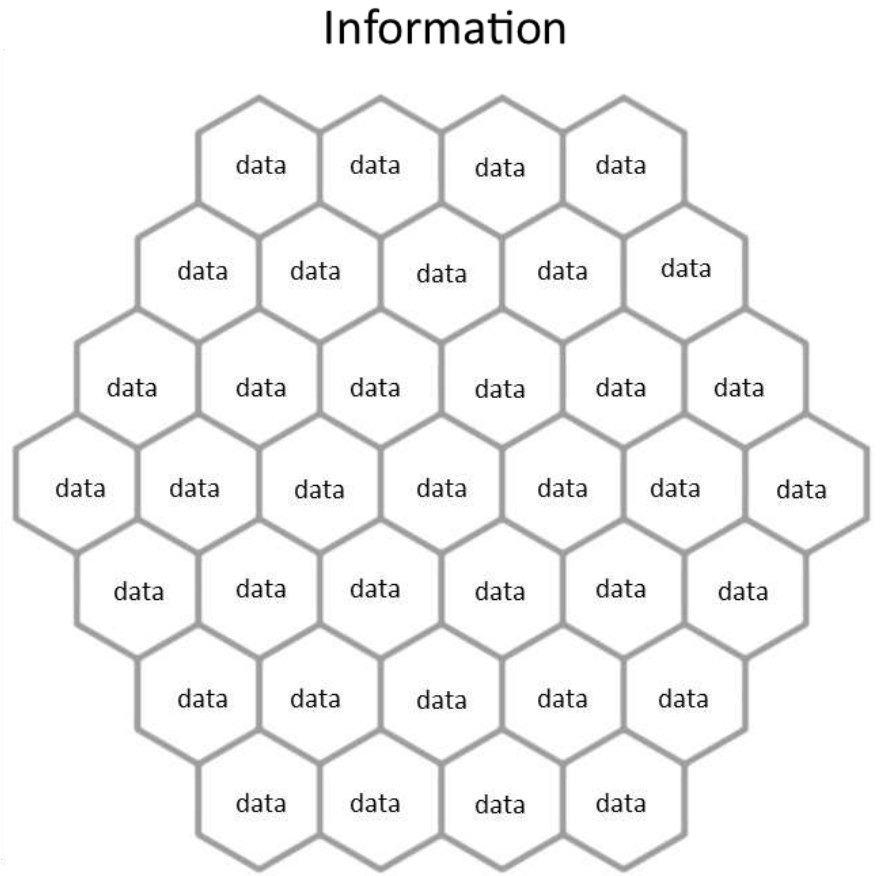
Data vs Information

- Data building block of **information**.
- Information is really what we are looking for – data is just the means to get there.
- Information is used to make **decisions.**
- Too little data gives you partial information.
- More data *contains* the information, but you have to stitch the right pieces of data together to get the right information out of it.
- D.R.I.P (Data Rich, Information Poor)



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Test-Data vs "Typical" IT data

(why typical data solutions don't work for test)

	DATA CREATED	DATA SCHEMA	DATA ACCESSED
Typical IT (Bank)	**Simple:** amount = $200 account = 15429	**Fixed:** Data structures don't change frequently	**Static:** Fixed reports, analysis
High-Tech Testing	**Complex:** Numerics, complex numbers, arrays, tables, images, binary blob	**Fluid:** Data structures changes very frequently (tests, products, systems)	**Dynamic:** Iterative analysis Slice data in many number of ways.

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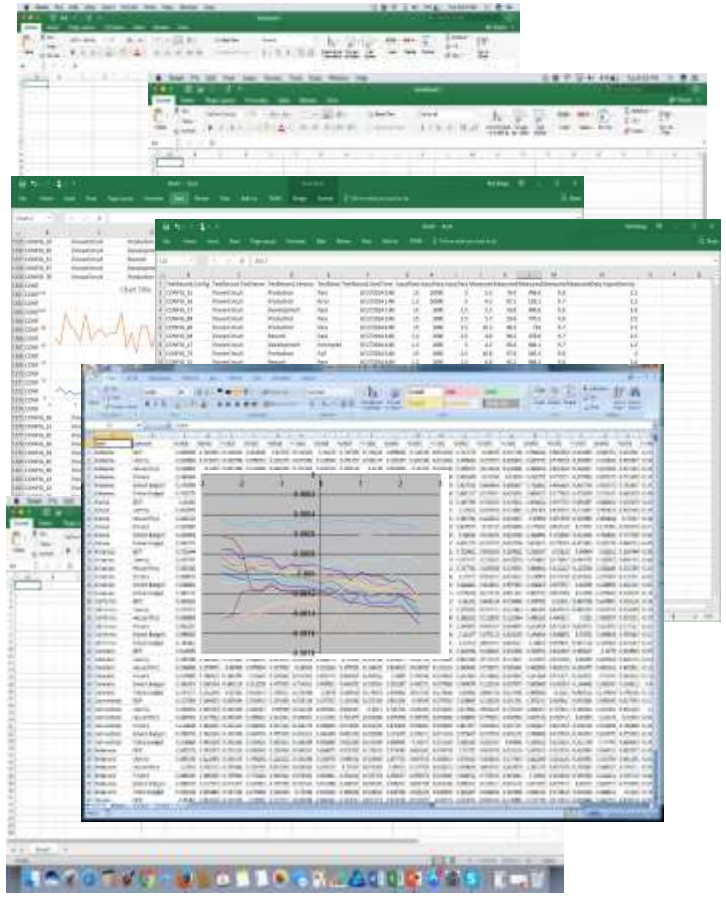
Why is test-data handling so difficult?



- Test data is *messy*;
- Storing and analyzing with relational database would be ideal….
- …but….databases are just not designed to store messy and “unstructured data”
- Databases incur high dev. and maintenance costs
- Test systems default to flat files for storage

Organizations are left with:

- Mountains of data files
- Messy and labor intensive solutions to get the information they need.

Why the problem now?

- Device complexity has increased
- Data volume has skyrocketed- harder to find the **information**.
- Delivery cycles are shrinking – need **information** FASTER!
- Labor cost is increasing – manual analyses is expensive.

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Test-Data Related Challenges - Examples

- **Production stopped** due to an anomalous result – need to disposition before proceeding.
- **Find root cause faster** –correlate data across test system, serial numbers, production lots etc.
- **Detect problems earlier** – Need to see trends in measured values and to detect any degradation.
- **Become more efficient** - Identify the larger contributors that influence your process. 1 week efficiency = 2% of operating costs. (test time, system utilization, retests due to failures)
- **Avoid retests and failures in field** – Need to be able to iterate limit checking after testing, try different hypothetical limit sets and view yield.

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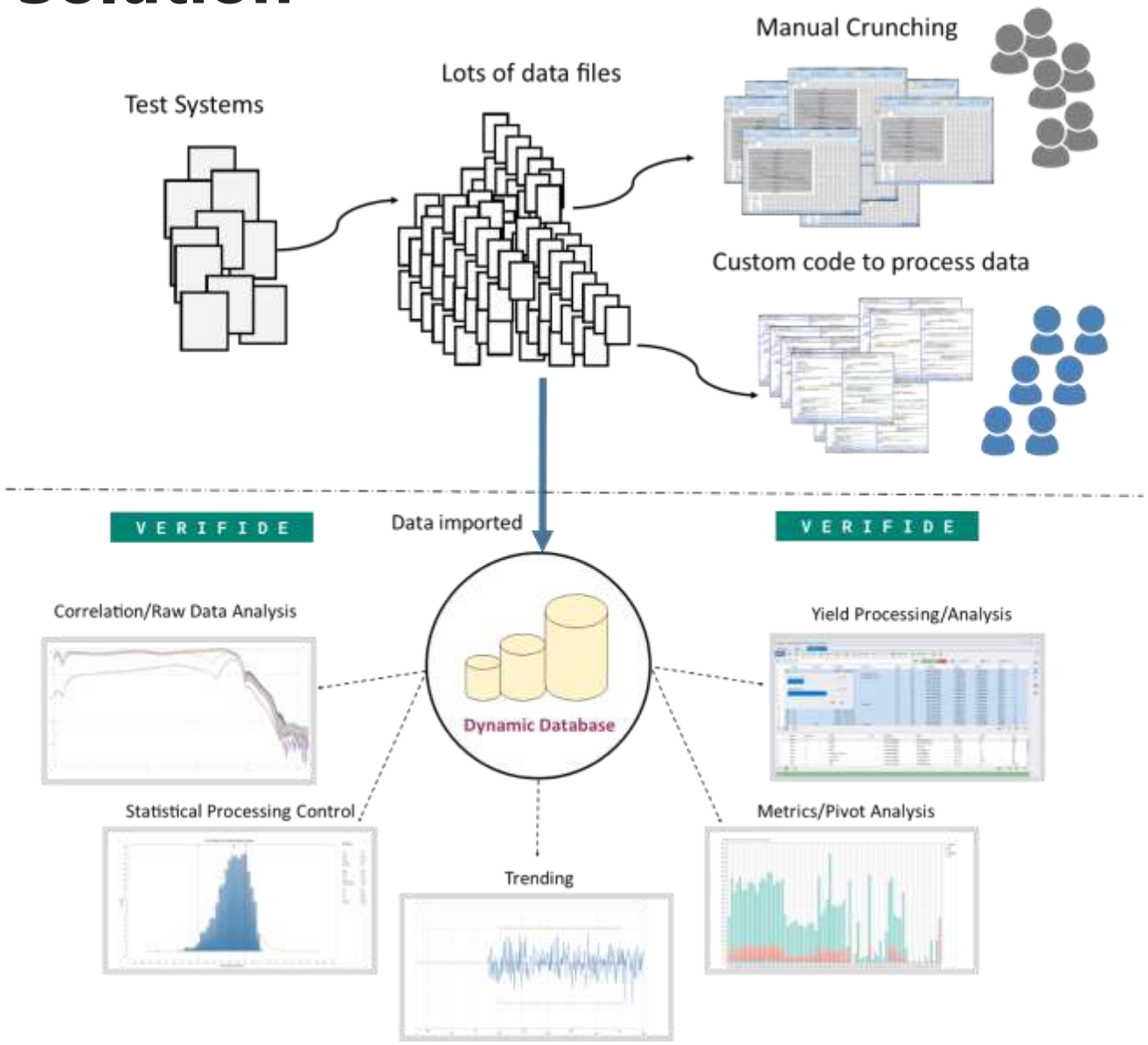
Solution

Existing systems

- Lot of excel scripts and data crunching
- Custom code to process data
- Repetitive and error prone
- Labor intensive

Verifide Solution

- Single platform to manage data across multiple systems/devices
- Common tools to perform analysis
- Visualization, Analytics, Statistics, Metrics out of the box.



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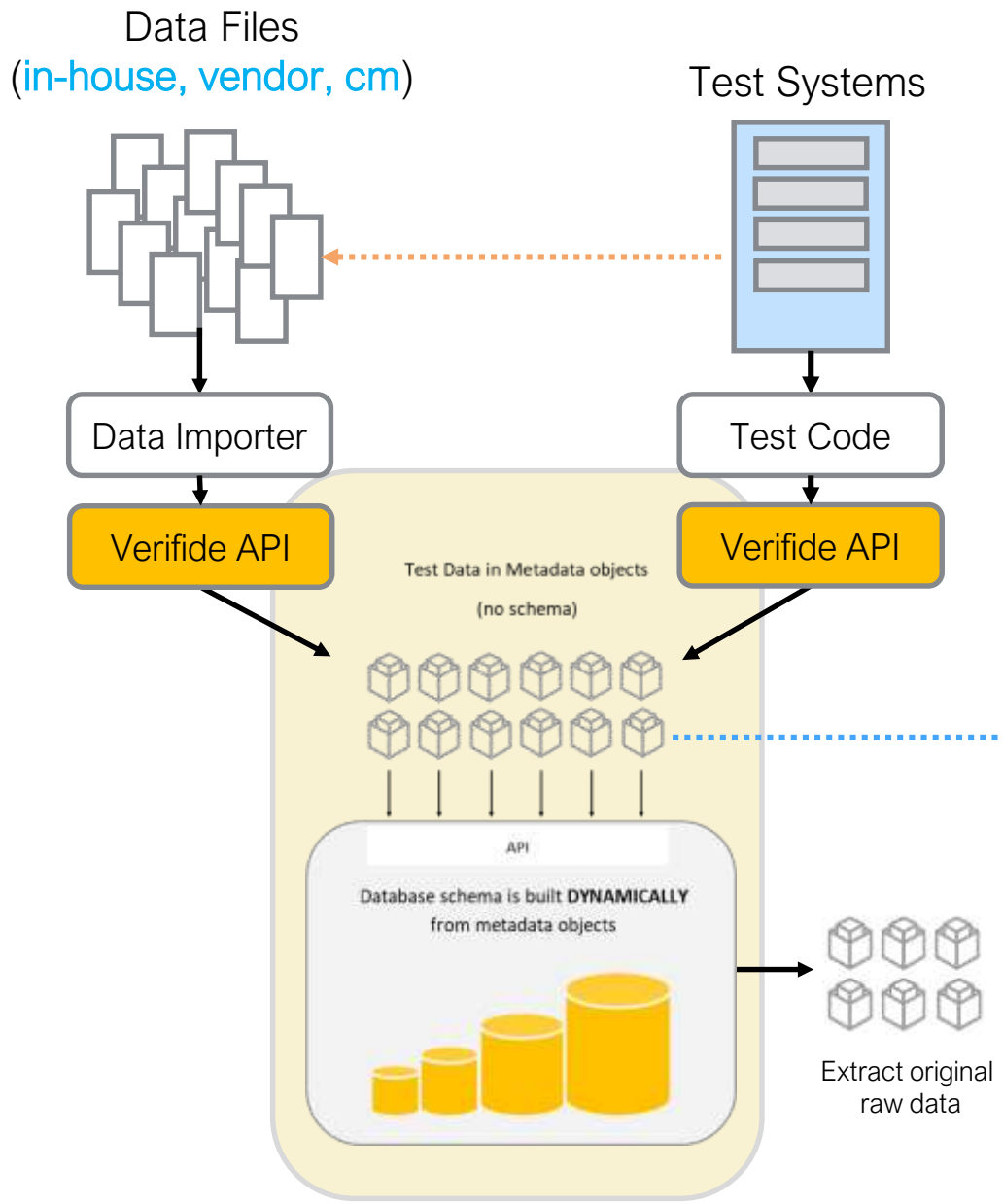
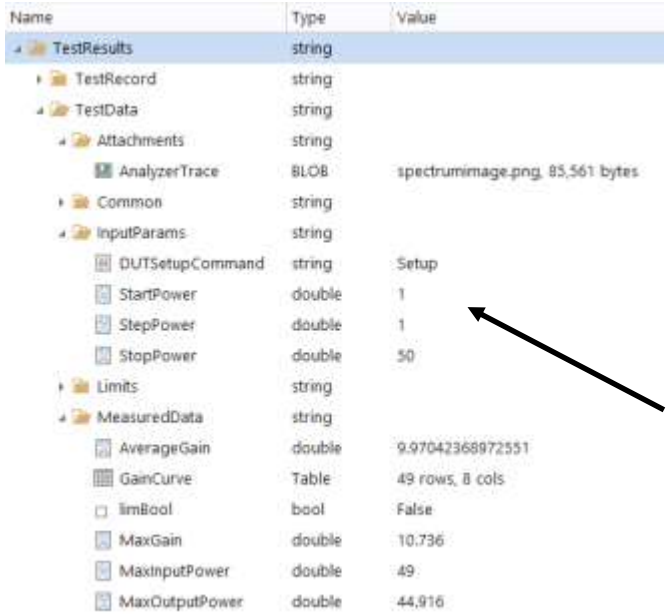
Breakthrough – Dynamic Database



- A layer on top of a commercial relational database
- Database builds and updates itself dynamically as data is stored into it.
- No database setup, design, or coding needed
- Multiple data structures can co-exist in same system.



Hierarchical data storage

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Solution – Micro and Macro Analysis

Micro Analysis

Day-to-day manufacturing operations

- View data for a single test
- View charts, tables
- Zoom into charts
- Compare test runs
- View Reports
- Troubleshooting

Macro Analysis

Quality assurance, process improvement, efficiency

- Trend data across time or other field
- Statistical analysis (Cpk, Tolerance)
- Metrics (volume, time, system utilization)
- Yield management

Features

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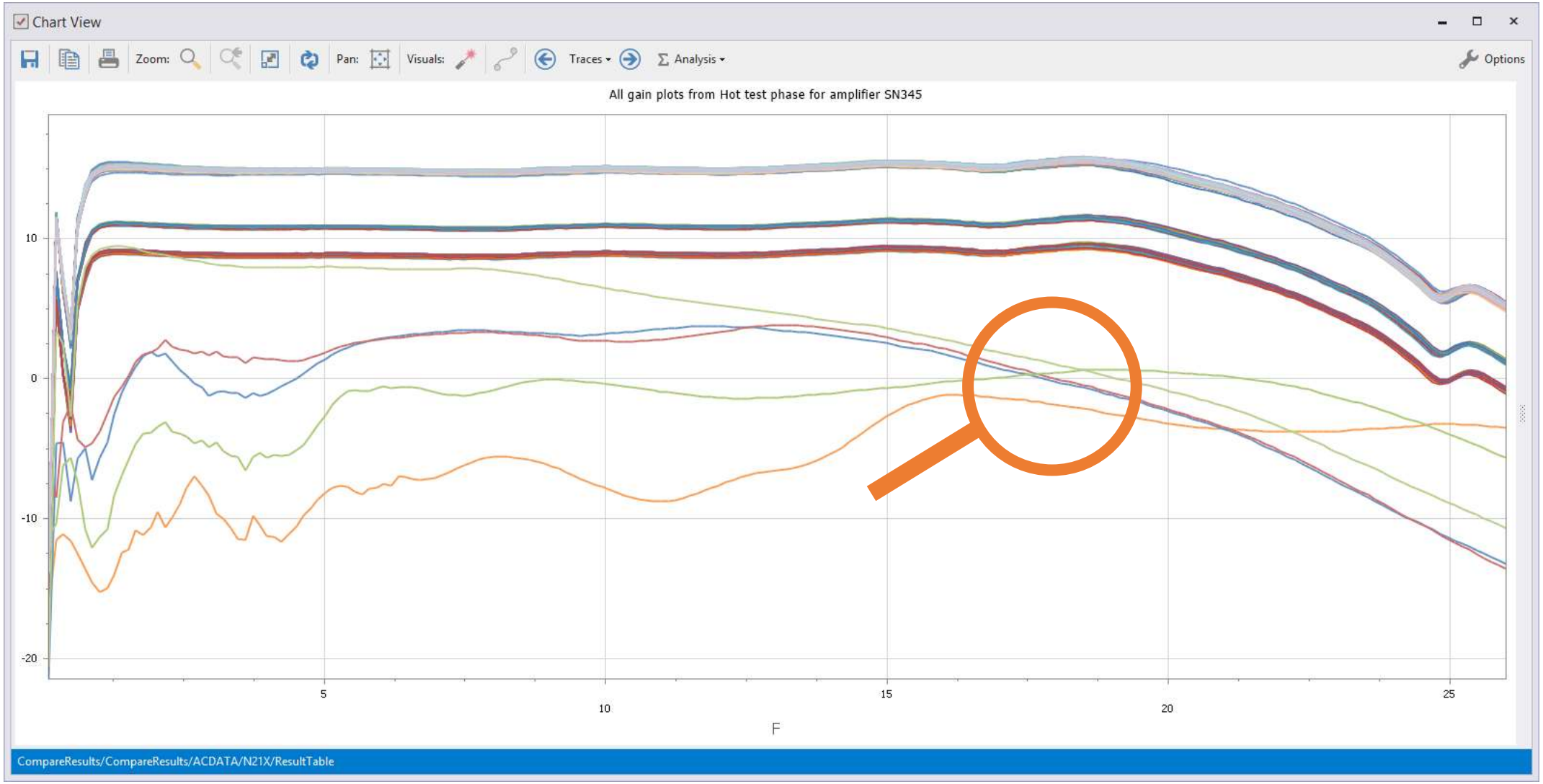
Plot Correlation (Out-of-family)



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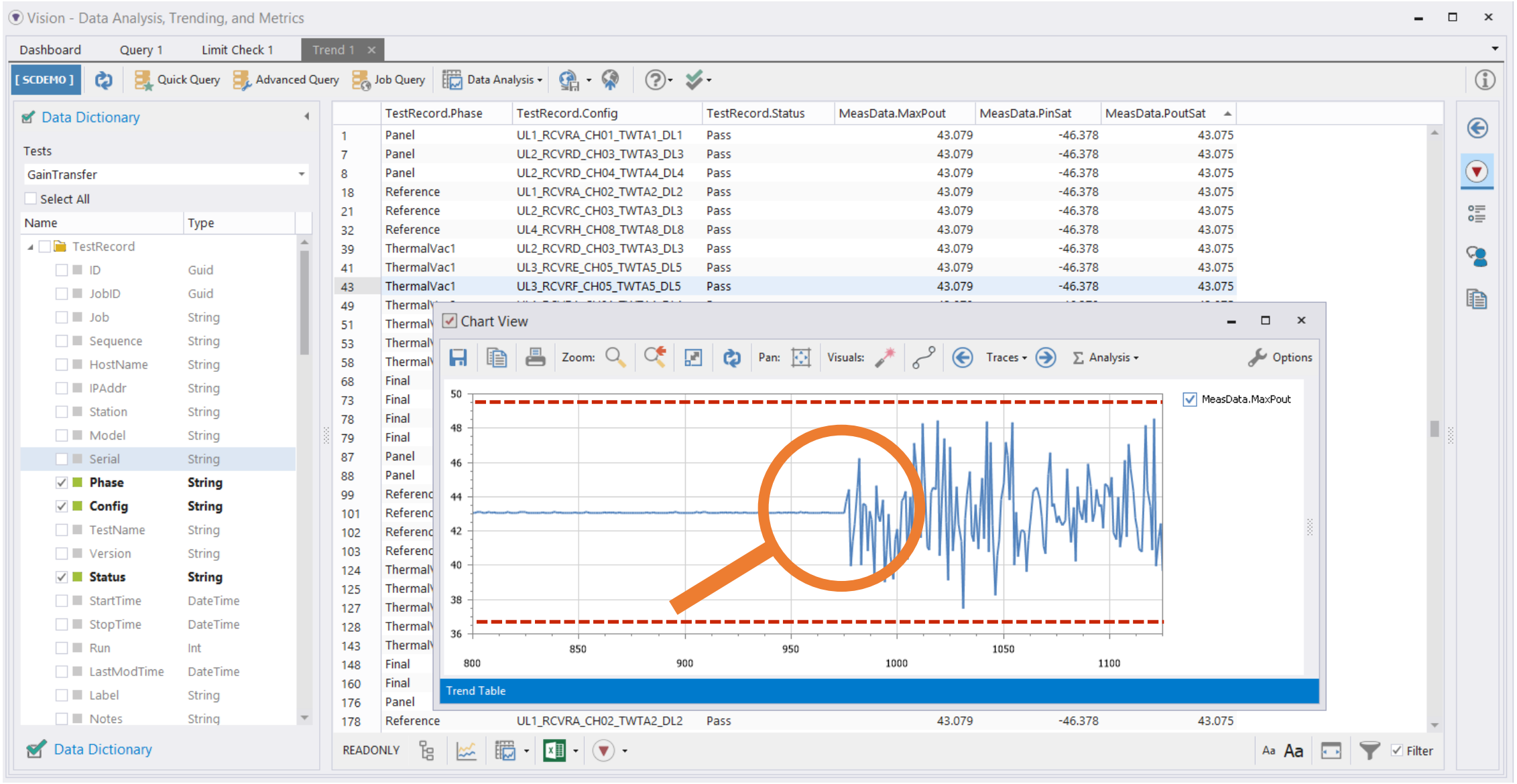
Trending – anomaly detection



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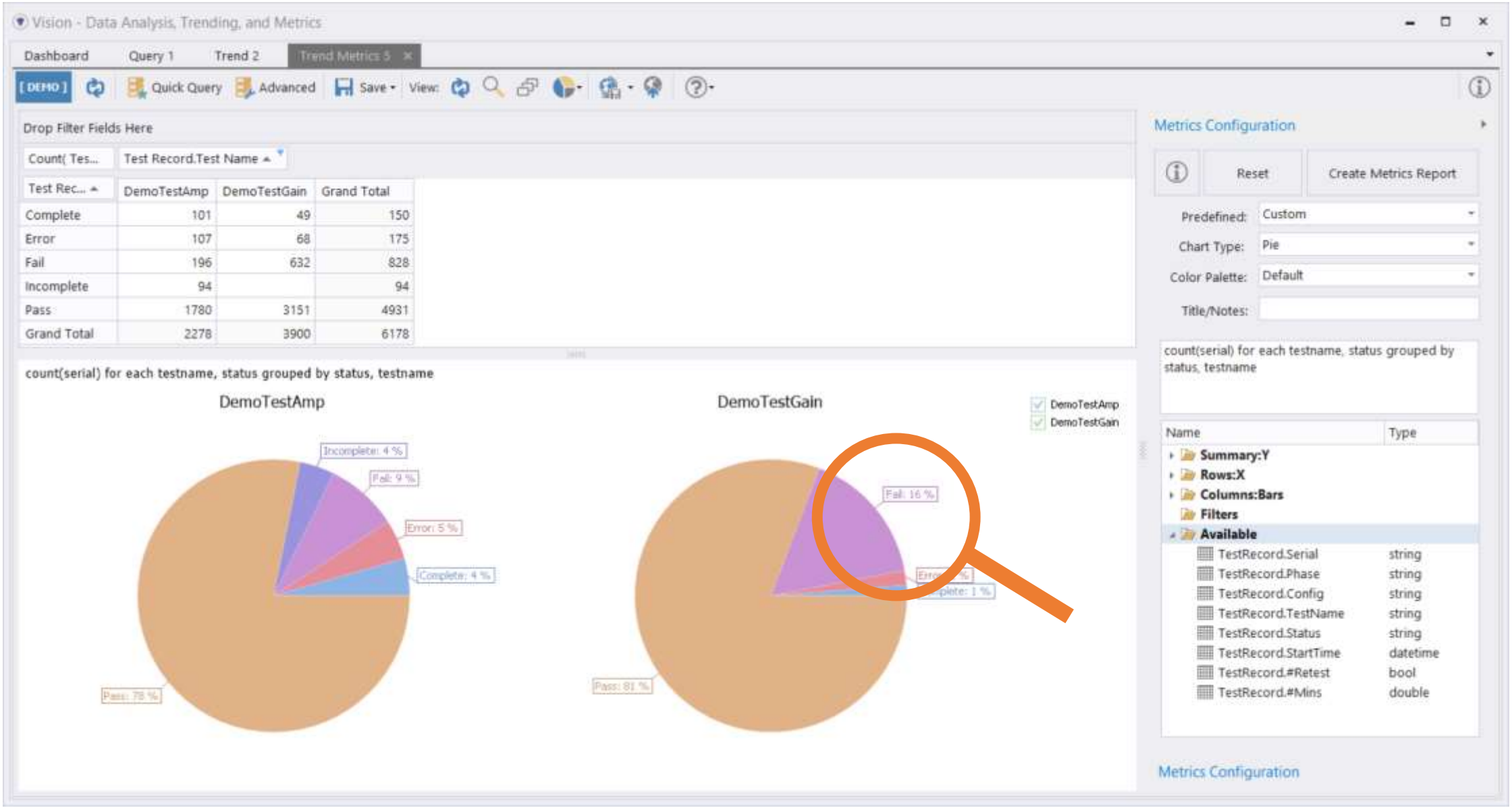
Metrics – Eg. Failure rates



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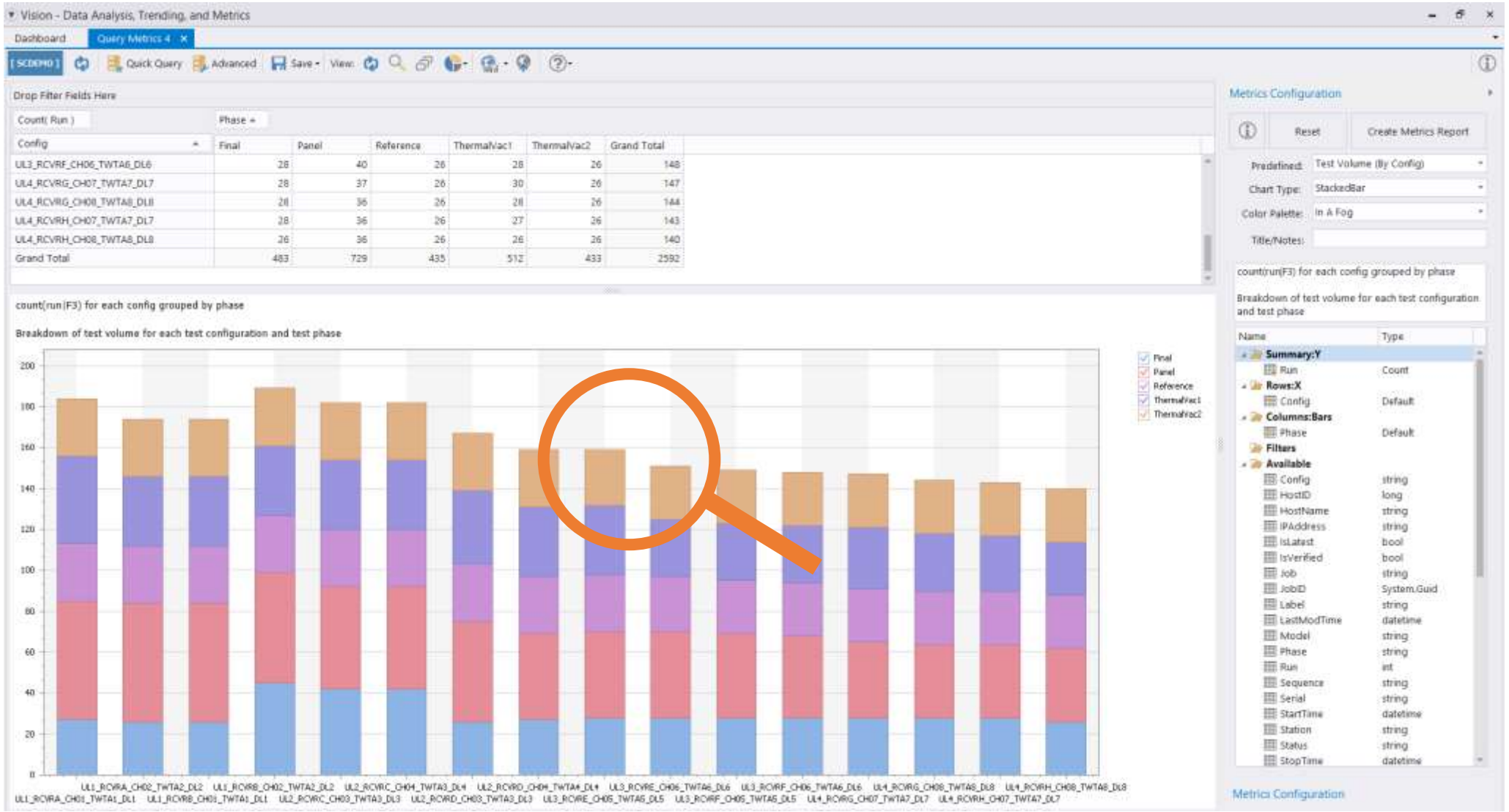
Data Pivots – Slice across multiple fields



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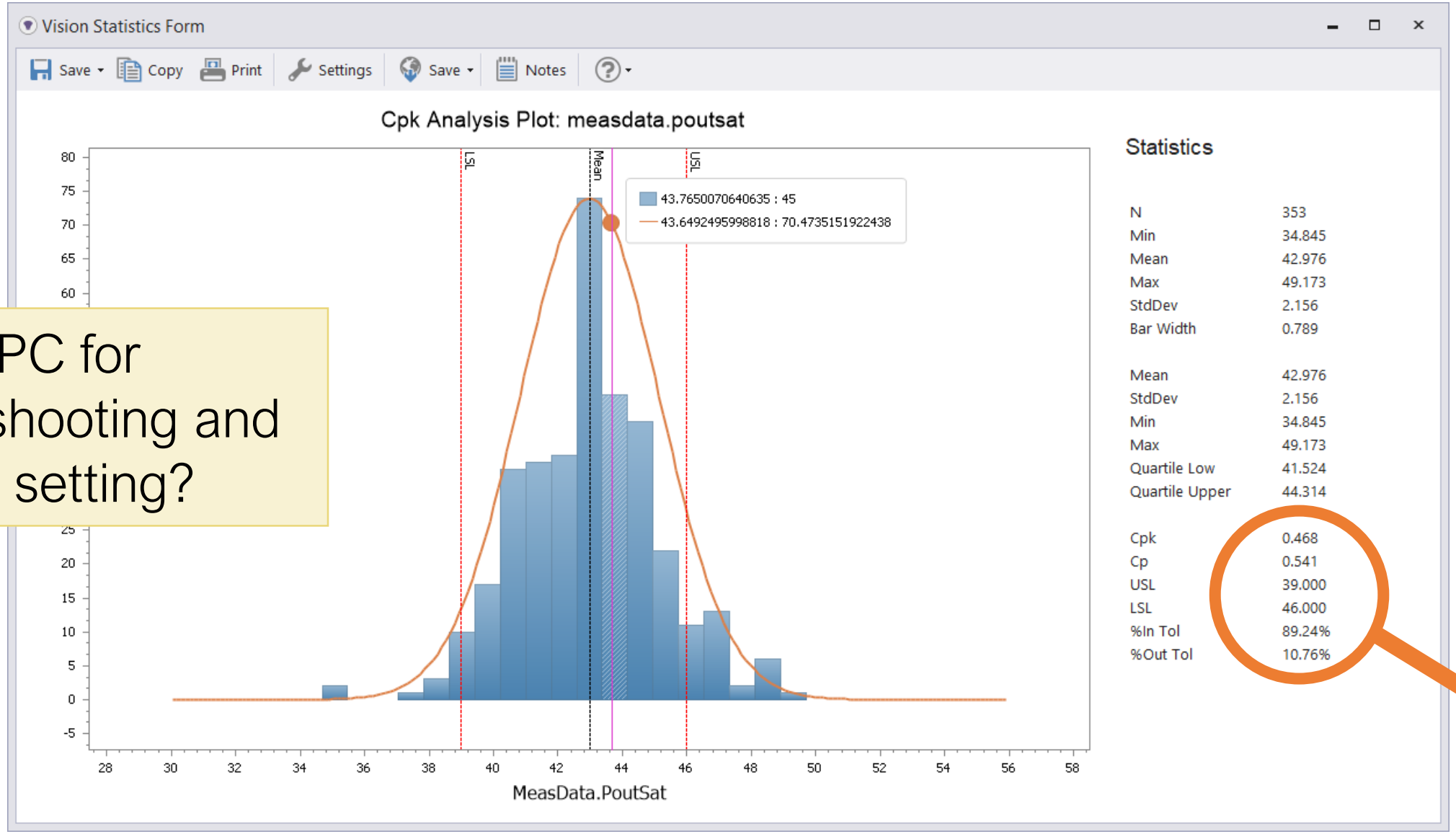
Statistical Analysis – Multiple Uses

SPC for troubleshooting and limit setting?



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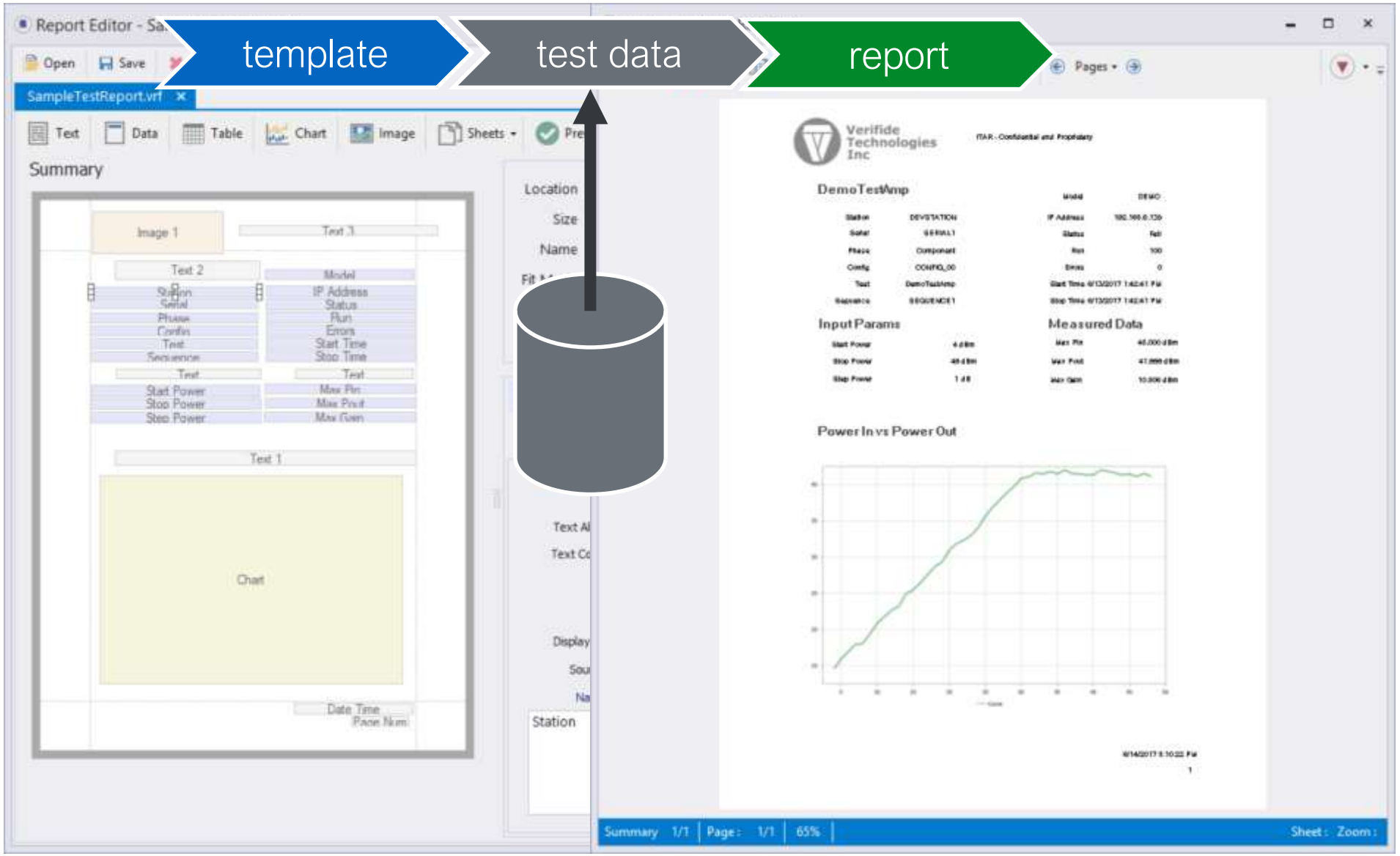
Dynamic Report Generation – no coding



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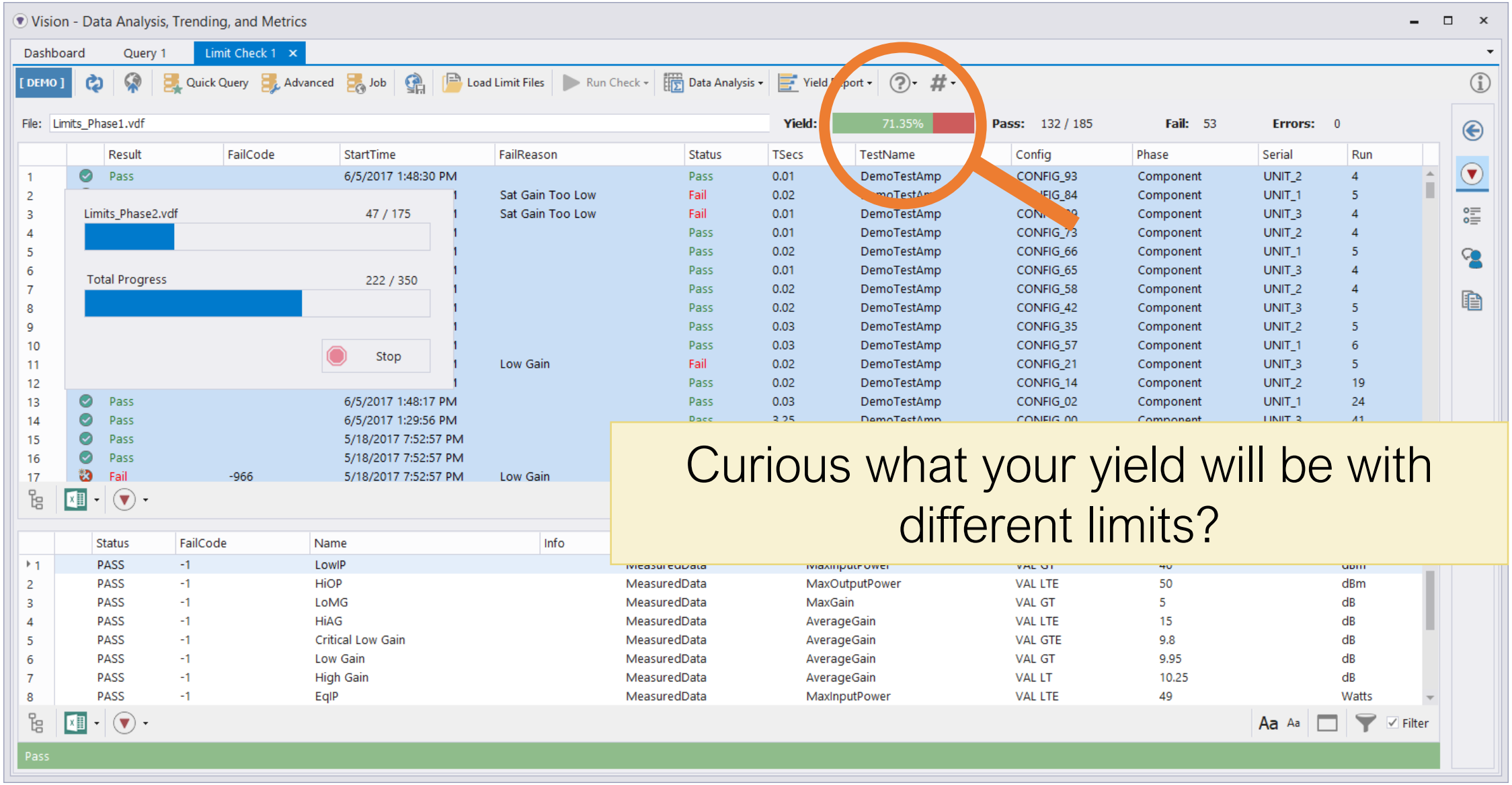
Post-Test Yielding/Limit Checking



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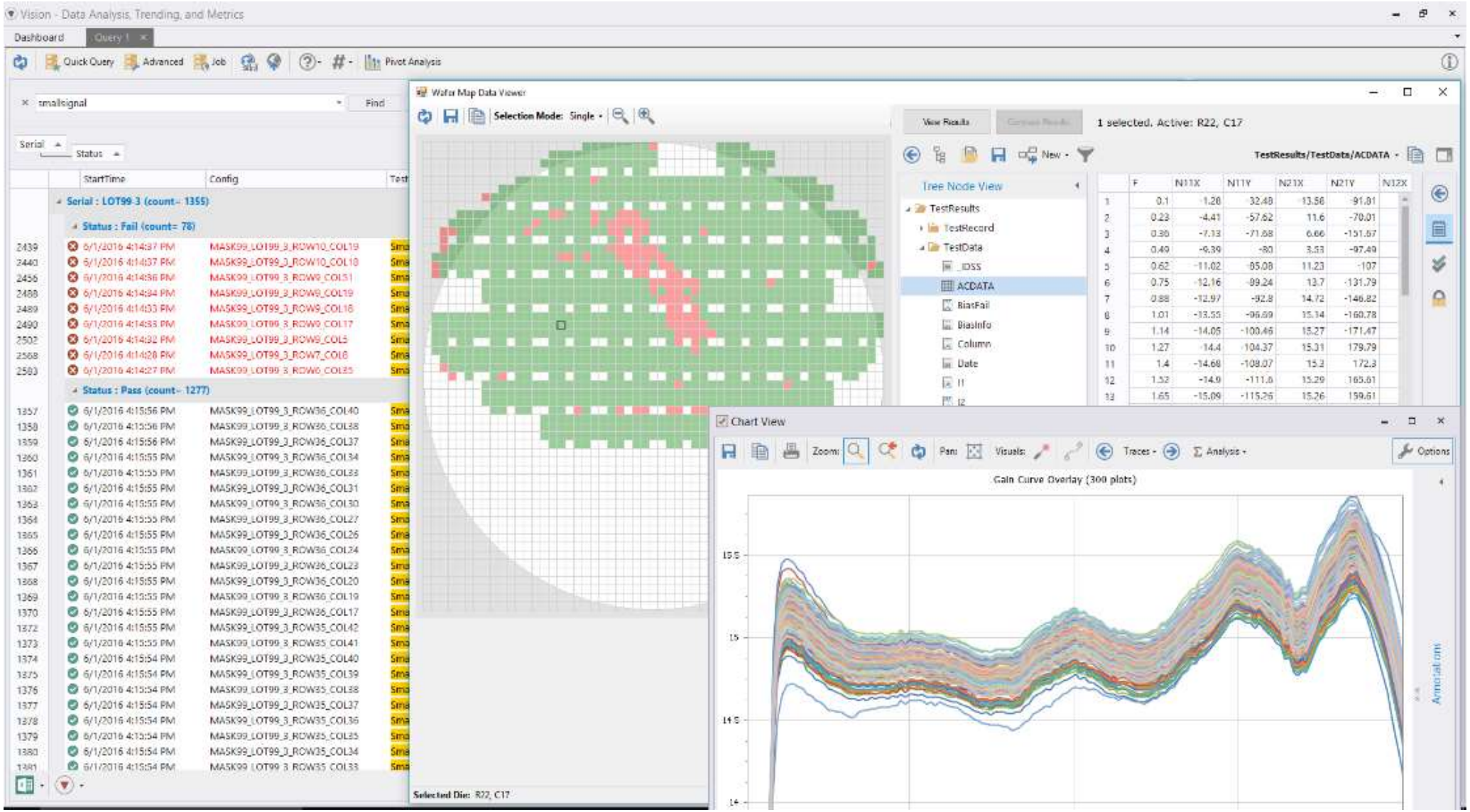
Extendable Architecture – Data Plugins

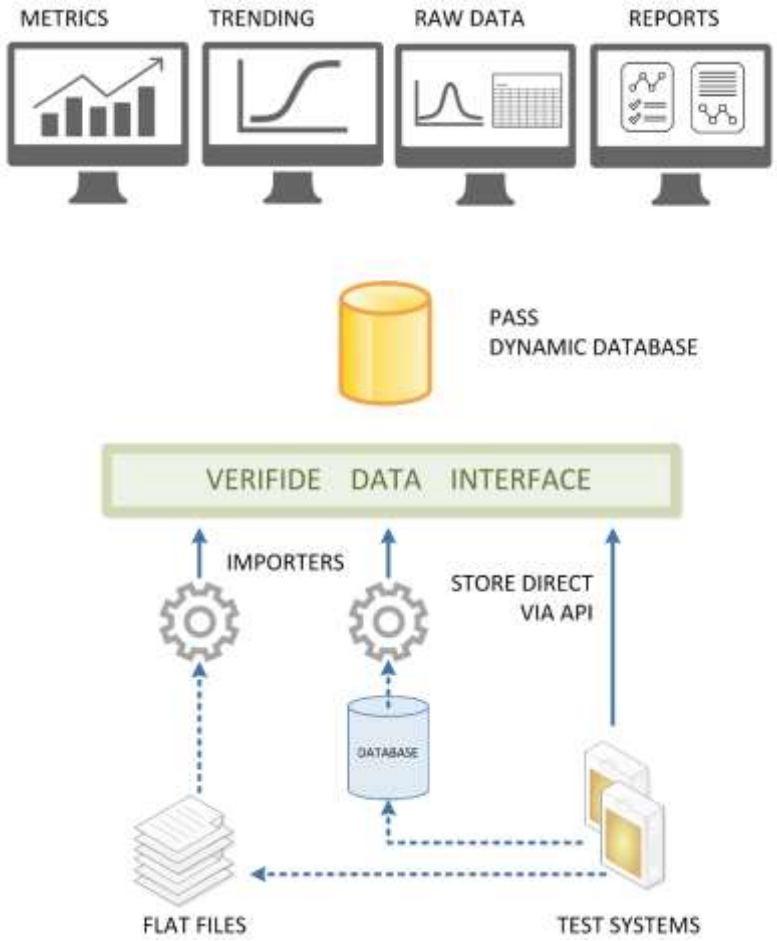


What about all that data I already have?

The software comes with a programmatic interface with sample code to be able to import data into our Dynamic Database.

Importing the data offline is the easiest way to get started because it requires NO changes to your test system code.

In the future, you can then gradually migrate existing test systems and code to store data directly into our database using our API without needing a separate import step.



Summary

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Benefit Summary – Data Analysis

- ✓ **Data Storage** – You can store data in a database without any DB setup, admin, or code. No need to iterate data infrastructure for different tests/systems.
- ✓ **Data Analysis** – You can stop using clunky Excel files and scripts for data analysis.
- ✓ **Metrics and Yield** – You don't have to do additional coding, importing and processing of data files to see trending, statistical processing reports, and to slice data with pivot tables.
- ✓ **Reports** – You don't have to write code to create reports over and over again for new requirements or new products

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Upcoming new features (Q2,Q3 2018)

- ✓ Additional Statistical Analyses: Gauge R&R, Gauge Linearity, Confidence interval, Prediction Interval
- ✓ More interactive charting features - manual annotations, selections/highlighting,
- ✓ **Enterprise automation** – daily/weekly reports to inbox, automate production reports
- ✓ **Triggers** (eg. Notify if Cpk < 0.7)
- ✓ Improved UI for stream/telemetry data.
- ✓ Data snapsnots (version a batch of data for analysis)

Solution Benefits - Automation

- ✓ **Services Framework** – Customers can re-use code and expensive engineering for equipment drivers and other components
- ✓ **Monitoring and safety** –Customers can add safety mechanisms to their test environments without needing to design, build, and mature critical code.
- ✓ **Development** – Customers can use the languages they are already using with our software. No new language to learn.
- ✓ **Reqs and Specs** – Customers can create and edit sequences and limits much faster for complex devices that have lots of tests to run.

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