

REAL-TIME PERFORMANCE MANAGEMENT FOR THE ENTERPRISE

**RtPM**



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# Presenter's Name

Dave Bowles

(403) 874-9702



# Finding More Time To Leverage Your PI System

Efficient Administration Of  
Large PI Systems

# Size And Complexity Of The System

Early in 2004, one of North America's largest oil and gas companies, with very widely dispersed operations, decided to offer PI Historian services to each of its business units through a small, centralized corporate team.

- Three smaller PI systems were merged into one.
- The number of tags used has almost doubled in a year to 115,000. The system is licensed for 250,000.
- All sites are connected via a wide area network, including some very slow satellite connections.
- Each of the many business units has a great deal of discretion in SCADA technology and how it is supported (staff/contractors/EPCM's).





# Diversity Of The System

The system consists of more than three dozen interfaces to a broad spectrum of SCADA, DCS and PLC systems including:

- PlantScape/Experion
- Cygnet
- FactoryLink
- Moore APACS
- Fisher Provox
- ABB SCADA Vision
- Modbus
- RSLinx
- WonderWare
- Delta-V



# Use Of The PI Data

Operations, engineering and accounting users have significant interest in the data from all the new business units/wells and are poised to make good use of it as soon as it becomes available in PI.

- Making good use of key performance indicators.
- Well production optimization has been aided significantly with the use of production variance reports.
- A number of sites have replicated some of their key SCADA displays on the web using PI data. This gives corporate users a valuable view of operations without security issues.



# PI System Growth And Change

Continued adoption of PI use by additional business units and a very aggressive well drilling program are creating significant workload and administrative demands for this heavily used and constantly growing PI system. Keeping it all running reliably and adding new interfaces/tags could easily consume most of our time and prevent us from helping users to get the most value out of the data.



# Administration Strategies

- **Semi-Automate Tag Maintenance.**
- Automate notification of problems with interfaces.
- Build a consistent process for DataLink report scheduling, distribution and archiving.
- Build a consistent process for transferring PI data to other business systems (such as Production Volume Reporting and maintenance systems).
- Streamline the process of reviewing log files.





# Semi-Automation of Tag Maintenance (Goals)

- Reduce tag building/maintenance effort for both PI administrators and field/plant personnel.
- Automatically keep PI tagset accurately configured and in synch with the SCADA/DCS systems.
- Make it easy for users to see what tags exist on the SCADA/DCS systems and streamline the process of building them in PI.
- Ensure that useful data is being gather for use by a variety of disciplines.



# Semi-Automation of Tag Maintenance (Technology)

- Oracle Database – Data Storage
- Visual Studio .Net – Programming Environment
- PI-SDK – Interactions with PI
- OPC/SQL/ASCII Files – Interactions with SCADA/DCS systems

# Semi-Automation of Tag Maintenance (SCADA/DCS Data)

- Individual executable programs acquire raw tag information from the various SCADA/DCS systems and load it into the Oracle database.
- Rules built into each of these programs that use tag naming conventions to automatically flag records for tags that should be added to PI.
- Different naming conventions and design approaches were used on many of the SCADA/DCS systems thus the need for a unique executable for each system. The rules used to identify “default” PI tags are also different from system to system.



# Semi-Automation of Tag Maintenance (PI Data)

- Executable program that acquires the current PI tagset and loads it into the Oracle database.
- This is needed in order to take advantage of the power of SQL for all of the data processing that will be done.





# Semi-Automation of Tag Maintenance (Scheduling)

A master application runs each of the executables that obtain the SCADA/DCS data.

- Executables are run one at a time to keep processor and database demands under control.
- Once all of the SCADA/DCS data is in the database, the current PI tagset is loaded into Oracle as well.



# Semi-Automation of Tag Maintenance (Data Processing)

Daily processing of the Oracle data produces Excel, SMT formatted files that will accomplish the following:

- Turn scanning off on all tags that no longer exist on the SCADA/DCS systems.
- Build all of the “default” PI tags.
- Modify all existing PI tags that have had attributes changed on the SCADA/DCS systems and produce a matching log file that shows the changes that will be made.

These files are emailed to the system administrator for review prior to being exported to PI.



# Semi-Automation of Tag Maintenance (Web Interface)

A web interface to the Oracle database allows users to:

- See the complete SCADA/DCS tagset.
- Search tagnames and descriptors with wildcards.
- Request new tag creation in PI. SMT formatted Excel files are sent to the PI administrators after users select the tags they are interested in and submit the request.



# PI Tag Maintenance

Site:

Site #1

Tag Filter:

Description Filter:

Show tags already in PI: ☒

Display Tags

Request Tag Creation

RecordCount: 7389

BUILD IN PI	BUILT IN PI	Tag	Description	Instrument Tag
<input type="checkbox"/>	N	PKA_P0682063MFT201	06-01-044-03W5 Meter 201 Differential Pressure	P0682063MFT201.value
<input type="checkbox"/>	N	PKA_P0682063MPT201	06-01-044-03W5 Meter 201 Static Pressure	P0682063MPT201.value
<input type="checkbox"/>	N	PKA_P0682063MTT201	06-01-044-03W5 Meter 201 Temperature	P0682063MTT201.value
<input type="checkbox"/>	N	PKA_P0682063PLCDAY	06-01-044-03W5 RTU DAY	P0682063PLCDAY.value
<input type="checkbox"/>	N	PKA_P0682063PLCHR	06-01-044-03W5 RTU HR	P0682063PLCHR.value
<input type="checkbox"/>	N	PKA_P0682063PLCMIN	06-01-044-03W5 RTU MIN	P0682063PLCMIN.value
<input type="checkbox"/>	N	PKA_P0682063PLCMON	06-01-044-03W5 RTU Month	P0682063PLCMON.value
<input type="checkbox"/>	N	PKA_P0682063PLCSEC	06-01-044-03W5 RTU Second	P0682063PLCSEC.value
<input type="checkbox"/>	N	PKA_P0682063PLCYR	06-01-044-03W5 RTU Yr 1998-99 2000-96	P0682063PLCYR.value
<input type="checkbox"/>	N	PKA_P0620008HIY020C	11-27-044-27 Flow Nom. Alarm Deadband	P0620008HIY020C.value
<input type="checkbox"/>	N	PKA_P0620008HIY020D	11-27-044-27 Max Line Press	P0620008HIY020D.value
<input type="checkbox"/>	N	PKA_P0620008HIY020E	11-27-044-27 Max Line Press Deadband	P0620008HIY020E.value
<input type="checkbox"/>	N	PKA_P0620008HIY020F	11-27-044-27 Min Back Press	P0620008HIY020F.value
<input type="checkbox"/>	N	PKA_P0620008HIY020G	11-27-044-27 Min Back Press Deadband	P0620008HIY020G.value
<input type="checkbox"/>	N	PKA_P0620008HIY020H	11-27-044-27 Methanol Flow Proving - Min Diff P	P0620008HIY020H.value
<input type="checkbox"/>	N	PKA_P0620008HIY020R	11-27-044-27 Casing Pressure Override High SP	P0620008HIY020R.value
<input type="checkbox"/>	N	PKA_P0620008HIY020S	11-27-044-27 Casing Pressure Override Low SP	P0620008HIY020S.value
<input type="checkbox"/>	N	PKA_P0620008KI020	11-27-044-27 Time Left To Next Event	P0620008KI020.value
<input type="checkbox"/>	N	PKA_P0620008KI020A	11-27-044-27 Post Plung Arriv Flow Time	P0620008KI020A.value
<input type="checkbox"/>	N	PKA_P0620008KI020B	11-27-044-27 Cycle Time Off SP In Use	P0620008KI020B.value
<input type="checkbox"/>	N	PKA_P0620008KI020D	11-27-044-27 Plunger Arrival Time (Secs)	P0620008KI020D.value
<input type="checkbox"/>	N	PKA_P0620008KIY020A	11-27-044-27 Cycle Time On SP	P0620008KIY020A.value
<input type="checkbox"/>	N	PKA_P0620008KIY020B	11-27-044-27 Cycle Time Off SP	P0620008KIY020B.value





# Administration Strategies

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# Automate notification of problems with interfaces (Context)

With about 3 dozen geographically distributed interfaces, it would take a lot of time to manually check them all regularly to see if they are working properly. The following metrics are monitored automatically on a regular basis to determine the health of the interfaces:

- Ping tags.
- I/O Rate tags.
- % tags in each interface that have changed in the last 2 hours.
- Age of the most recent tag value in each interface.



# Automate notification of problems with interfaces (Ping tags)

Since PI-Ping basic is limited to 32 tags we have chosen to monitor those where there has historically been a problem with network reliability.

Email is sent to work, home and cell phone text message accounts whenever a ping tag goes into I/O Timeout or above a threshold level for a configured period of time.



# Automate notification of problems with interfaces (I/O Rate tags)

I/O Rate tags are a great indication of many problems but not all of them.

Email is sent to work, home and cell phone text message accounts whenever an I/O Rate tag goes below a threshold level for a configured period of time.





# Automate notification of problems with interfaces (% Changed by interface)

An application has been built that runs twice a day and checks the range of data for every numeric tag that is currently configured to scan. The percentage of tags that have a range greater than zero is calculated for each interface and reported in a table format.



# Automate notification of problems with interfaces (% Changed by interface)

Below is a sample of the report that is generated. The interface names have been changed to keep the company anonymous. This report is sorted by the “% Changed” column and abnormally low values stand out once you are used to seeing this report on a regular basis.

Starting point processing: 5/29/2005 6:19:22 AM

Ending point processing: 5/29/2005 6:54:54 AM

## Interface Details

=====

8 ID=6 Interface #1  
6 ID=1 Interface #2  
1 ID=1 Interface #3  
0 ID=1 interface #4

# Tags % Changed (2 hrs)

=====

6151 2  
3159 12  
2857 39  
120 95



# Automate notification of problems with interfaces (Age of most recent tag value by interface)

An application has been built that runs twice a day and checks the age of every tag value that is currently configured to scan. The age of the most recently received tag value is reported in a table format.



# Automate notification of problems with interfaces (Age of most recent tag value by interface)

Below is a sample of the report that is generated. The interface names have been changed to keep the company anonymous. This report is sorted by the “Age” column and abnormally old values stand out once you are used to seeing this report on a regular basis.

Starting point processing: 5/29/2005 6:00:06 AM

Ending point processing: 5/29/2005 6:19:21 AM

Total point Count = 113660

PointSource	Interface	Age (min.)	Points Scan	Points Total
=====	=====	=====	=====	=====
Z ID=1	Interface #1	66	1116	1170
K ID=3	Interface #2	55	491	491
_ ID=2	Interface #3	9	40	40
I ID=0	Interface #4	2	142	142
~ ID=1	Interface \$5	0	3	3



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# DataLink Report Scheduling and Distribution (Context)

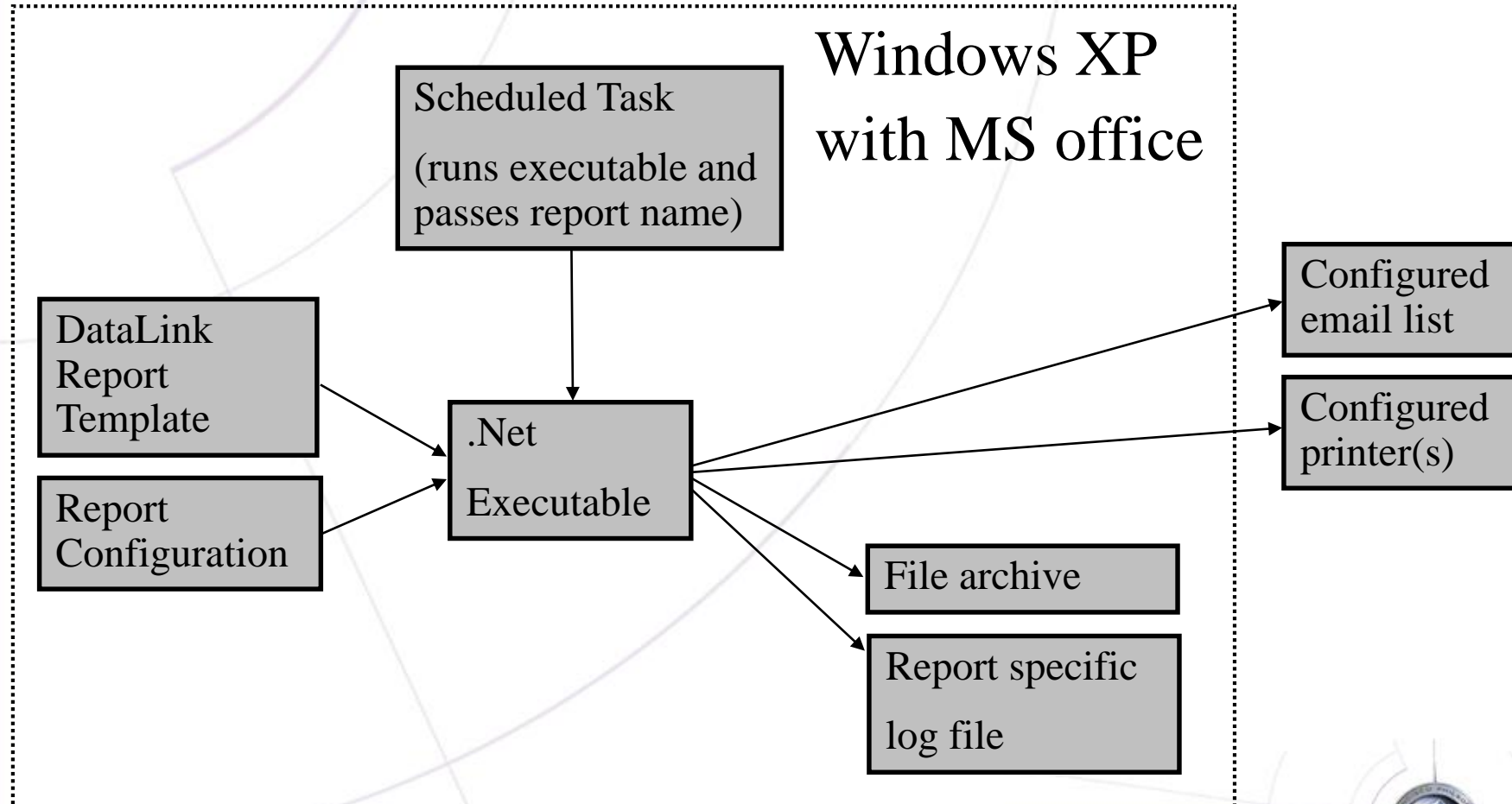
With widely distributed operations and users there were a number of legacy reports and databases that ran on stand-alone PC's in various control rooms. These were built using a variety of approaches by several different people who may or may not be in a position to continue supporting them.

- Users can now focus on building useful reports with PI data.
- With simple configuration, these reports are scheduled, archived and automatically distributed via email or printers.





# DataLink Report Scheduling and Distribution (Solution)



# Administration Strategies

- Semi-Automate Tag Maintenance.
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# Data Transfer To Other Business Systems (Context)

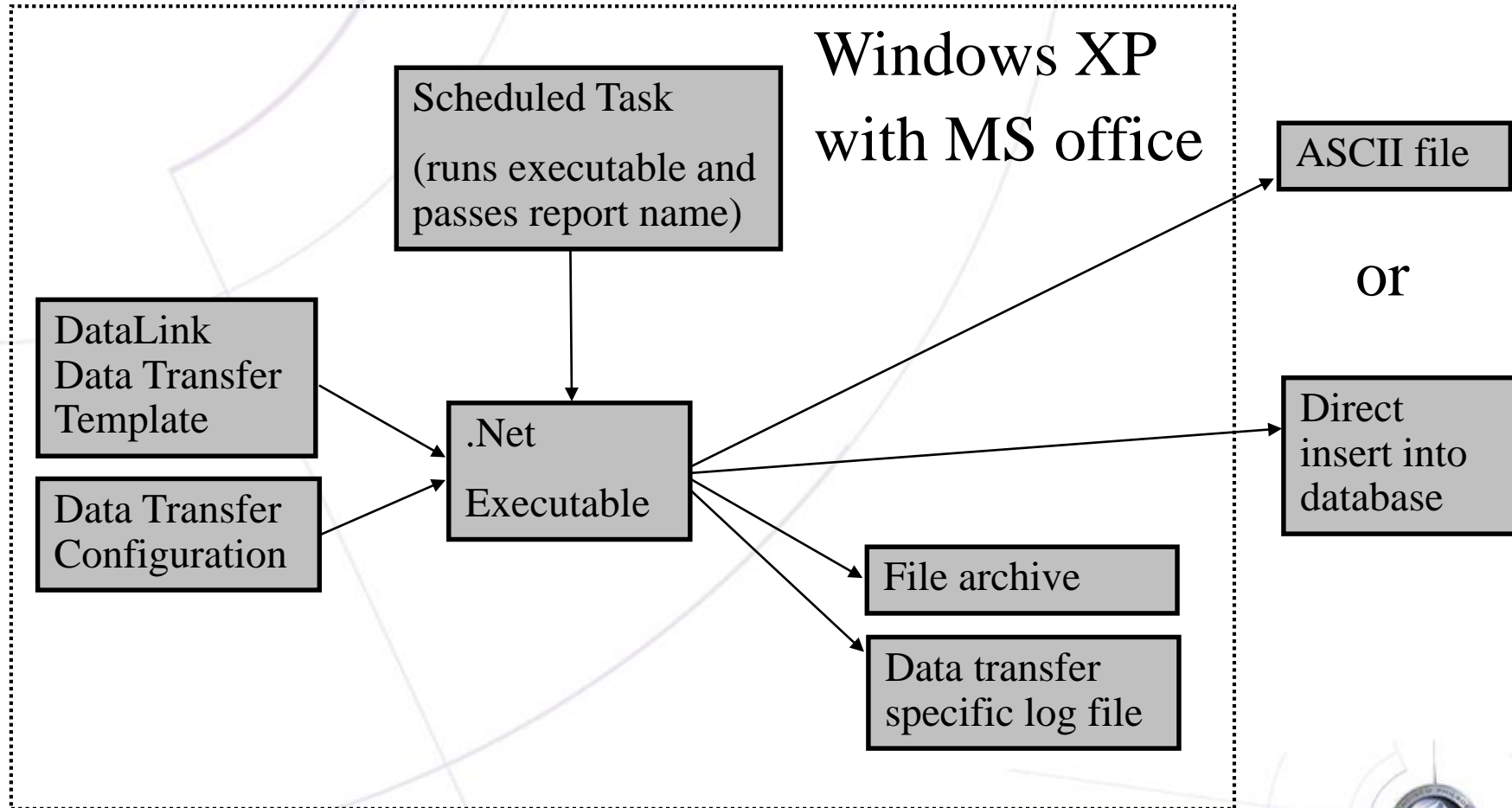
There are a wide range of uses for SCADA/DCS data in other business systems and a variety of different approaches were used to obtain this data.

- Production reporting/accounting systems make good use of accumulated daily production and production hours.
- Maintenance systems have a need for information about accumulated equipment runtime for use in scheduling preventative maintenance.
- Supporting inconsistent approaches of collecting this data is much less efficient than using a configurable and scalable process.

An approach was used that is very similar to that used for DataLink Report Scheduling and Distribution.



# Data Transfer To Other Business Systems (Solution)



# Administration Strategies

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# Streamlining Review of Log Files (Context)

With more than 3 dozen widely distributed interfaces, some of which are connected via slow satellite links, reviewing log files from all the PI interface nodes can be overly time consuming.

Troubleshooting is often made easier when interface log file information is combined with PI server log file information.

Routine log file messages are often overwhelming in number and make troubleshooting difficult.





# Streamlining Review of Log Files (Solution)

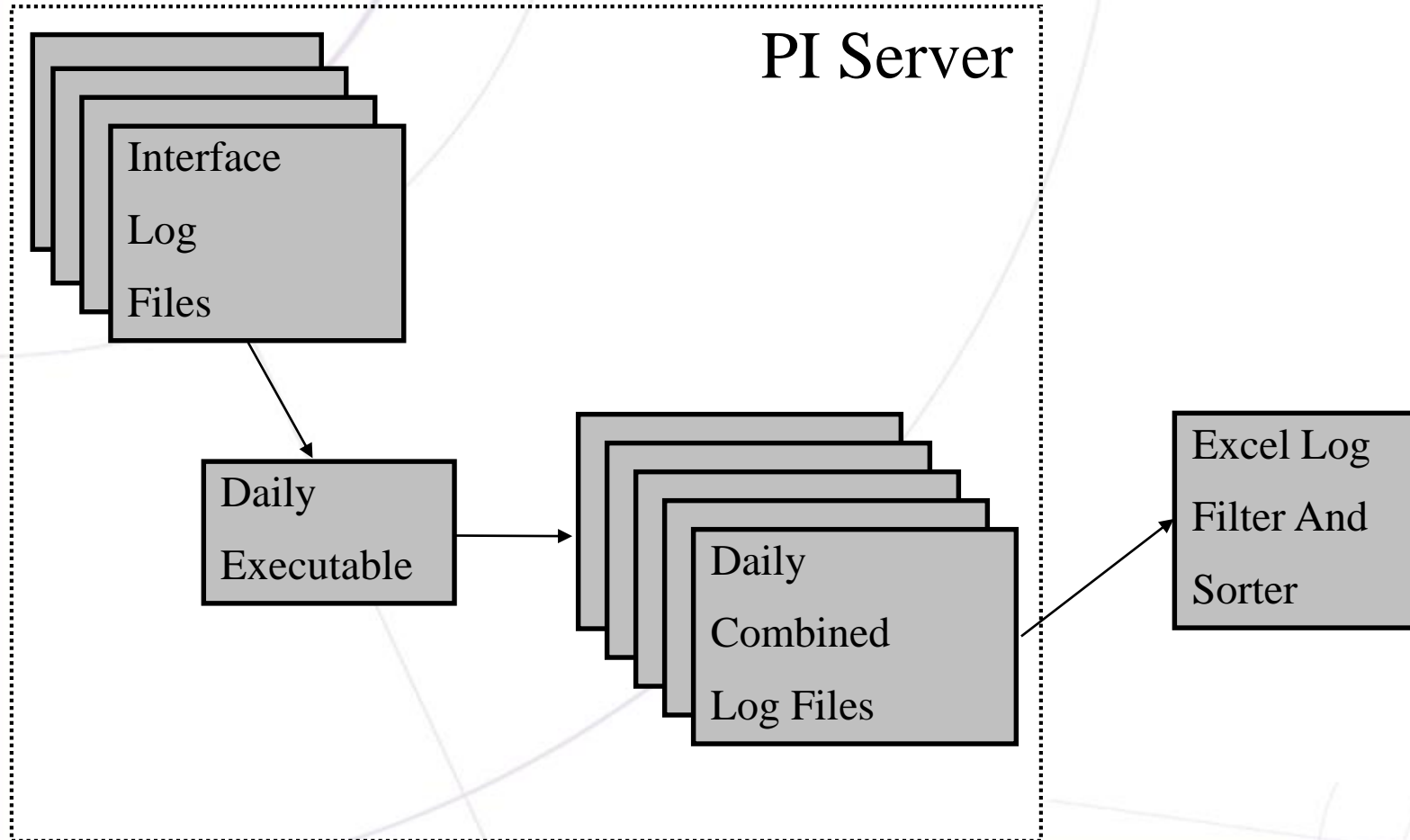
The daily executable acquires the last 24 hours of log data from the PI server and each interface and combines it into a single text file.

The Excel filter and sorter allows administrators to pick a daily combined log file and configure the records to be automatically filtered out of the daily combined log files. The remaining unfiltered records are sorted chronologically and displayed in a spreadsheet along with interface node information making it easy to:

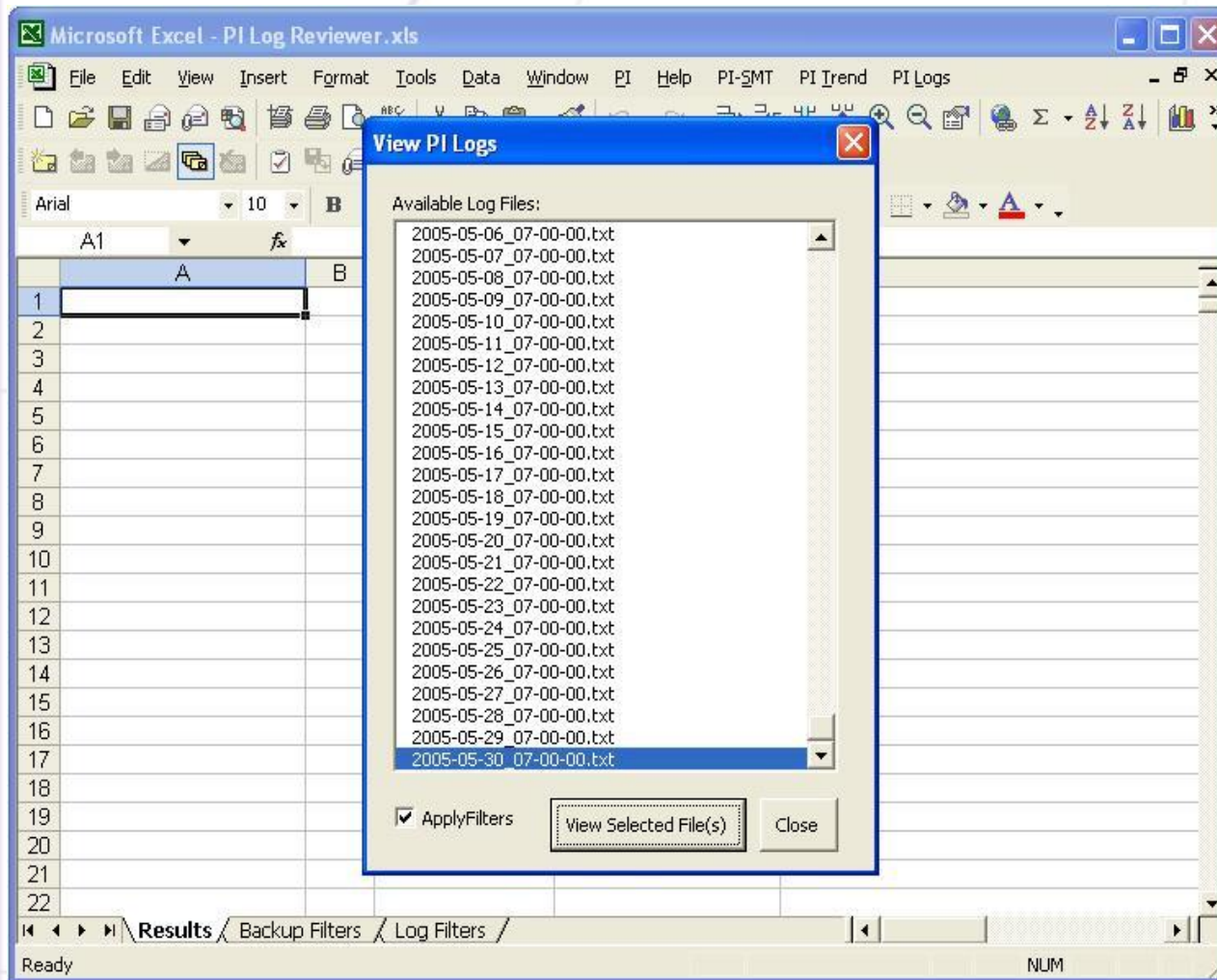
- See when machines have been rebooted.
- Review Scan Performance Summaries for all interfaces.
- Troubleshoot interface communication problems.



# Streamlining Review of Log Files (Solution)



# Streamlining Review of Log Files (Solution)





A1         Message Source

Results Backup Filters Log Filters



# Questions?

