

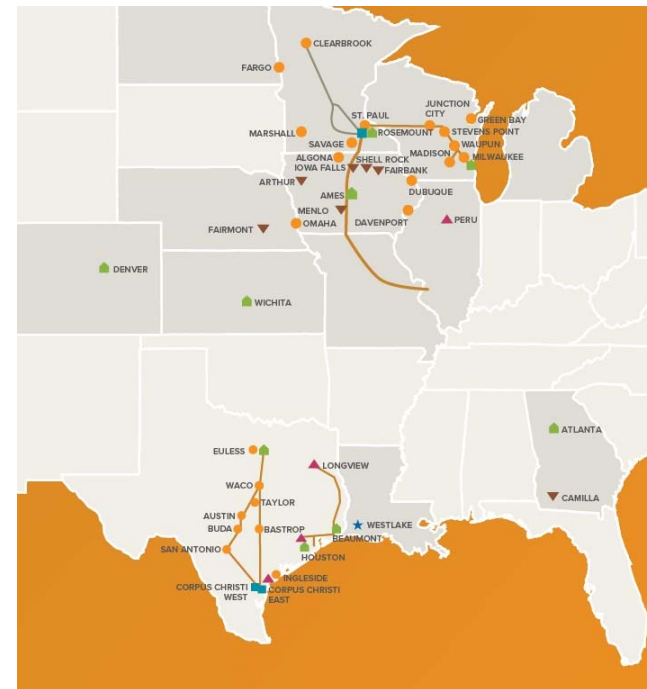
Doctor PI: The Democratization of the PI System

Matthew Wallace
Kevin Brashears

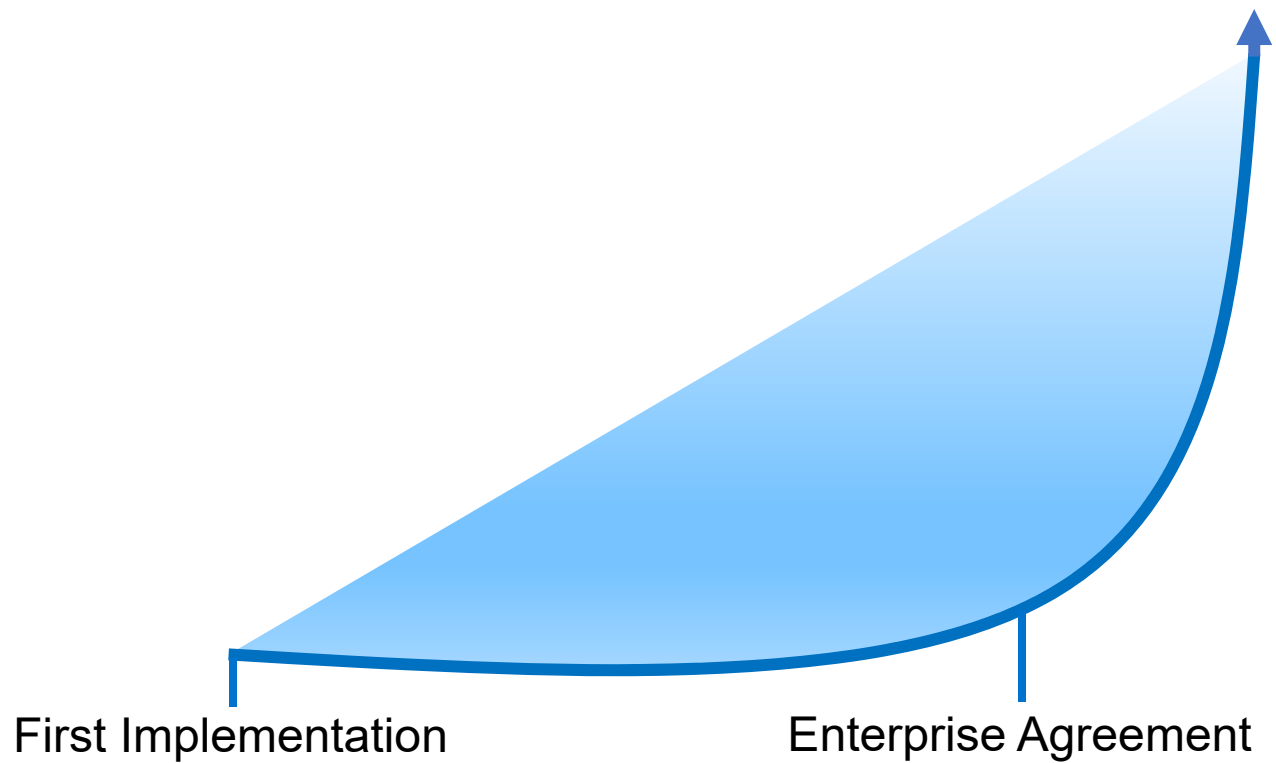


Flint Hills Resources, LLC

- Refining, chemicals and biofuels
- Wichita, Kansas
- ~4,000 employees



PI System Utilization



Philosophy

- Vision for AF
- PI Points as a commodity
- Enable subject matter experts to develop freely

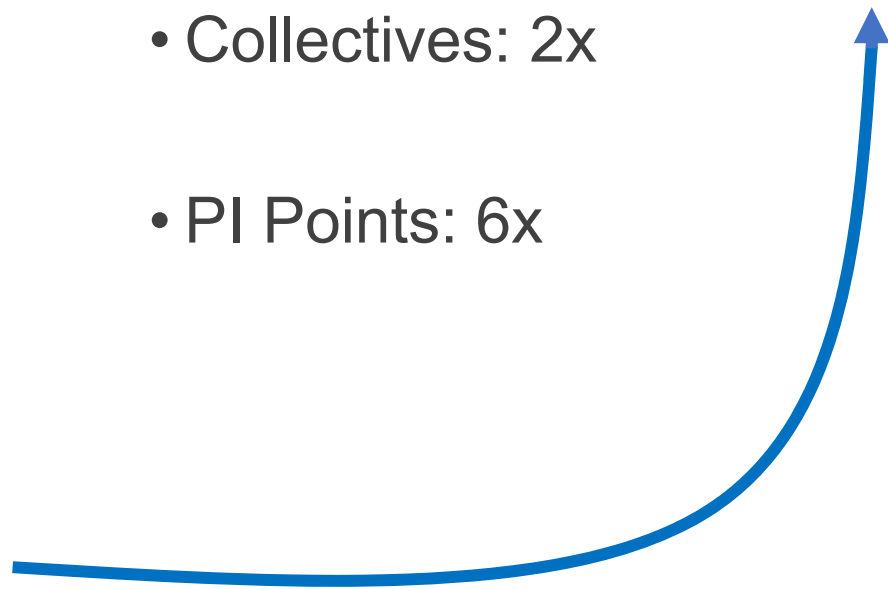
By the Numbers

PI Asset Framework

- Servers: 4x
- Databases: 3x
- Elements: 7x
- Analyses: 8x

PI Data Archive

- Collectives: 2x
- PI Points: 6x



What did that growth lead to?



What did we do?

- Upgraded PI AF - allowed retrieval of analysis runtime info
- AFSDK / .NET Framework
- Periodic extracts throughout the day

Doctor PI

- Power BI report showing an enterprise view of our PI System
- Not just for IT/OT
 - PI Admins
 - Leaders
 - Users

DEMO

DOCTOR PI

Server

AF Server	#
AF_Server_1	52897
AF_Server_2	43015
Total	172651

Database

AF Database	#
Database_1	92868
Database_2	28758
Database_3	18825
Database_4	13809
Database_5	4260
Total	172651

Time Rule By Frequency (min)

Time Rule	Frequency	#
Periodic	0.00	68556
Periodic	60.00	36264
Natural	0.00	24893
Periodic	5.00	15901
Periodic	15.00	7268
Periodic	30.00	6771

Analyses Type

Analysis Type	#
PerformanceEquation	116416
Rollup	35949
EventFrame	20259
AnalysisSQC	30

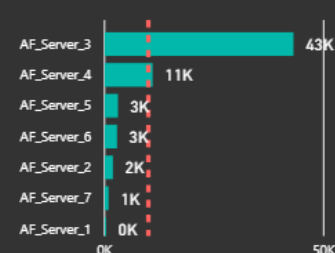
Rollup Types

Type	#
Sum	34378
Average	541
Maximum	534

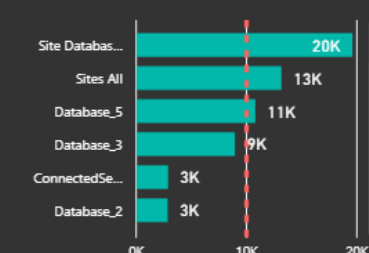
3/23/2020 7:24:58 PM

Earliest Timestamp

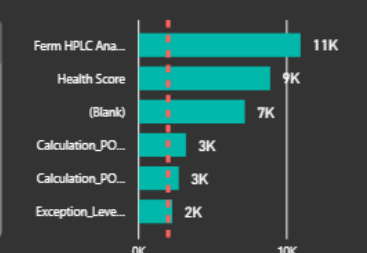
Eval Time Server (min)



Eval Time Database (min)



Eval Time Template (min)



Eval Time Analysis (min)



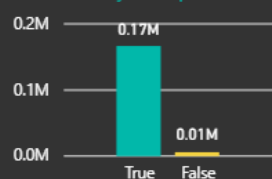
Analysis Template

Template Name	#
Maintenance Recommendation	4512
Priority	4511
Program	4508
Availability	4010
Availability - Daily	3928
Issue Notification	3770
ICBM Abnormal and Health Analysis	2899
ICBM CPM Performance Rating	2899
ICBM Description_AC	2899
Hourly Metrics	2857
Battery Change Flag	2690

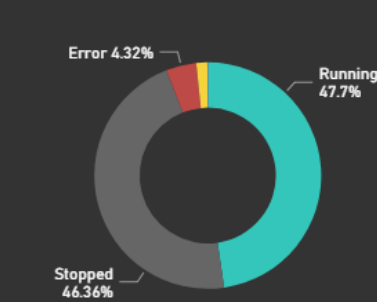
Time Rule



Defined By Template



Status



Checked Out by Server

AF Server	Machine
AF_Server_1	1
Enterprise QA	1

Checked Out by Database

AF Database	Machine
Database_1	1
Database_4	1

Checked Out Analyses

Machine	User	Checkout Time
machine-1		4/12/2019 8:41:01 PM
machine-2		3/18/2020 3:23:27 PM

Analysis Inputs

Attribute Type	#
PI Point	384256
Table Lookup	159313
Formula	18419
String Builder	17400
Analysis	10796
Seq Signal	2674
PI Point Array	830
Total	593688

Analysis Attribute Inputs

Attribute Type	Variable Name	Attribute Path
PI Point	Zone1	Pine Bend Root\Hydrogen\Hydrogen Plants\33-1\Methanator Reactor\Bottom Bed TI
PI Point	Zone1	Pine Bend Root\Hydrogen\Hydrogen Plants\33-1\Methanator Reactor\Inlet Temperature
PI Point	Zone1	Pine Bend Root\Hydrogen\Hydrogen Plants\33-1\Methanator Reactor\Max Exotherm

Analysis Detail

afdatasenname	name	template	status	frequency	totalelapsed	averageelapsed
Database_5			Running	0	9,443.96	0.04
Database_5			Running	0	8,825.34	0.04
Database_5			Running	0	5,490.39	0.03

By Historian

Historian	#
hist1	310492
hist2	283312
hist3	167801
hist4	134770
hist5	128345
hist6	67226
hist7	65481
Total	1183650

Created By User

creator	#
account	251545
account1	169199
account2	142480
account3	118994
account4	74754
account7	31438
user0	30800
Total	1183650

Modified By User

changer	#
user7	176495
account	132617
user94	118566
S-1-5-21-193423778-355344483-1597073328-437241	117287
user83	88579
Total	1183650

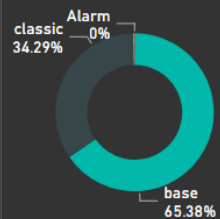
Point Sources By Historian

Historian	Point Source	#
hist2	AF	162858
hist3	ptsource1	114424
hist1	ptsrc2	95624
hist1	AF	54404
hist1	ptsrc3	45512
hist4	ptsrc5	41901
hist2	ptsrc8	30969
Total		1183650

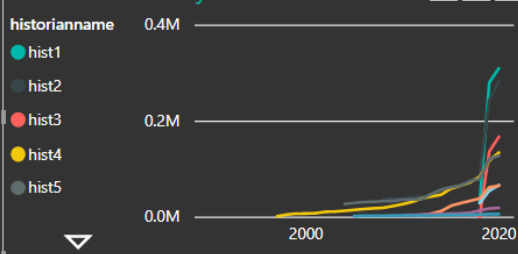
Point Security By Historian

Historian	ptsecurity	#
hist1	piadmin: A(r,w) piadmins: A(r,w) PIVision: A(r) PIIntegrator: A(r) PIAssetFramework: A(r,w) AspenOnline: A(r,w) PIReadOnly: A(r) PISuperUsers: A(r,w) Automic: A(r,w) Contractors: A(r,w) Boom:	198585

Point Class



PI Point Growth by Historian



PI Point Growth by Historian

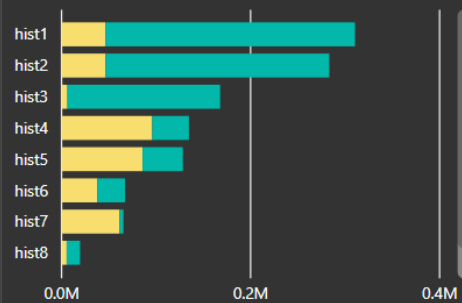
Year	hist1	hist2	hist3	hist4	hist5	hist6	hist7	hist8
2020	310492	283312	167801	134770	128345	67226	65481	1962
2019	280803	243956	136867	118133	120997	55175	62596	1835
2018	29433	88975	116	83761	79885	29594	38934	1393
2017	69933	72990	75454	34347	934			
2016	66643	65761	65849	29139	804			
2015	62854	59565	62512	23672	713			
2014	58954	40027	37066	12060	696			
Total	310492	283312	167801	134770	128345	67226	65481	1962

Data Security By Historian

Historian	datasecurity	#
hist5	BLIS: A(r,w) _BLIS: A(r,w) PIWorld: A(r)	3
hist5	CAPSAL: A(r,w) _CAPSAL: A(r,w) PIWorld: A(r)	15
hist5	CRP_Admin: A(r,w) CRP_DU: A(r) PIWorld: A(r)	2
hist5	DataEntry: A(r,w) _DataEntry: A(r,w) Intelatrac: A(r,w)	1

Compression By Historian

compressing False True



PT Created Value By Historian

Historian	#
hist1	25995
hist3	14597
hist6	14217
hist4	11048
hist2	8900
Total	85013

Point Class By Historian

Historian	PT Class	#
hist1	base	270118
hist2	base	197605
hist3	base	158366
hist4	classic	102501
Total		1183650

PT Created Value

Historian	Point Source	PI Point Name	Creation Date
hist5	L	40CAUR	6/7/2005 8:19:17 PM
hist2	C	52G1T10NR	7/22/2008 7:16:52 PM
hist2	C	52G1T18NR	7/22/2008 7:33:26 PM
hist2	C	52G1T28NR	7/22/2008 7:33:29 PM
hist2	N	G1TNK10NR	7/22/2008 7:33:33 PM
hist2	C	52G1T25NR	7/22/2008 7:34:11 PM
hist2	N	G1TNK18NR	7/22/2008 7:34:29 PM
hist2	N	G1TNK28NR	7/22/2008 7:34:33 PM
hist2	C	52G1T12NR	7/22/2008 7:34:49 PM

Detail

historianname	name
hist1	%@Functional Location%.27
hist1	%@Functional Location%.40
hist1	%@Functional Location%.Ab
hist1	%@Functional Location%.All
hist1	%@Functional Location%.All
hist1	%@Functional Location%.Co
hist1	%@Functional Location%.Co
hist1	%@Functional Location%.Da
hist1	%@Functional Location%.Da

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Earliest Timestamp

Shutdown



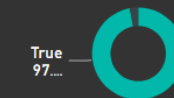
Scan



Archiving



Step



By Historian

Historian	#
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Total	1183650

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account1	169199
account2	142480
account3	118994
account4	74754
account7	31438
user0	30800
Total	1183650

Modified By User

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user7	176495
piadmin	132617
user94	118566
S-1-5-21-193423778-355344483-1597073328-437241	117287
user83	88579
Total	1183650

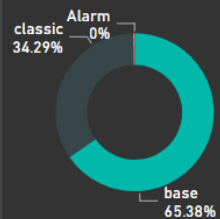
Point Sources By Historian

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hist2	ptsrc8	30969
Total		1183650

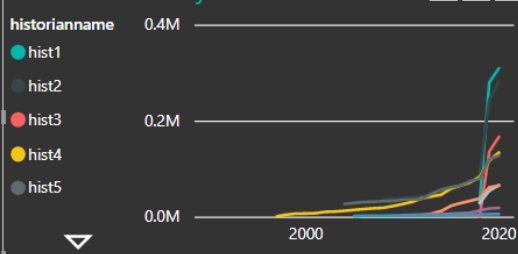
Point Security By Historian

Historian	ptsecurity	#
hist1	piadmin: A(r,w) piadmins: A(r,w) PIVision: A(r) PIIntegrator: A(r) PIAssetFramework: A(r,w) AspenOnline: A(r,w) PIReadOnly: A(r) PISuperUsers: A(r,w) Automic: A(r,w) Contractors: A(r,w) Boom:	198585

Point Class



PI Point Growth by Historian



PI Point Growth by Historian

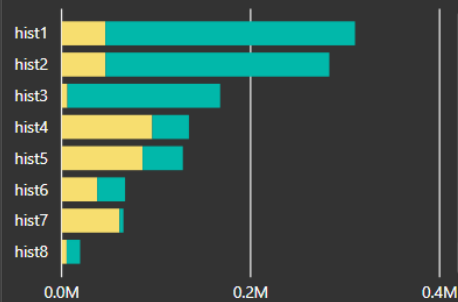
Year	hist1	hist2	hist3	hist4	hist5	hist6	hist7	hist8
2020	310492	283312	167801	134770	128345	67226	65481	1962
2019	280803	243956	136867	118133	120997	55175	62596	1835
2018	29433	88975	116	83761	79885	29594	38934	1393
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2015	62854	59565	62512	23672	713			
2014	58954	40927	37066	12060	696			
Total	310492	283312	167801	134770	128345	67226	65481	1962

Data Security By Historian

Historian	datasecurity	#
hist5	BLIS: A(r,w) _BLIS: A(r,w) PIWorld: A(r)	3
hist5	CAPSAL: A(r,w) _CAPSAL: A(r,w) PIWorld: A(r)	15
hist5	CRP_Admin: A(r,w) CRP_DU: A(r) PIWorld: A(r)	2
hist5	DataEntry: A(r,w) _DataEntry: A(r,w) Intelatrac: A(r,w)	1

Compression By Historian

compressing ● False ● True



PT Created Value By Historian

Historian	#
hist1	25995
hist3	14597
hist6	14217
hist4	11048
hist2	8900
Total	85013

Point Class By Historian

Historian	PT Class	#
hist1	base	270118
hist2	base	197605
hist3	base	158366
hist4	classic	102501
Total		1183650

PT Created Value

Historian	Point Source	PI Point Name	Creation Date
hist5	L	40CAUR	6/7/2005 8:19:17 PM
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hist2	C	52G1T28NR	7/22/2008 7:33:29 PM
hist2	N	G1TNK10NR	7/22/2008 7:33:33 PM
hist2	C	52G1T25NR	7/22/2008 7:34:11 PM
hist2	N	G1TNK18NR	7/22/2008 7:34:29 PM
hist2	N	G1TNK28NR	7/22/2008 7:34:33 PM
hist2	C	52G1T12NR	7/22/2008 7:34:49 PM

Detail

historianname	name
hist1	%@Functional Location%.27
hist1	%@Functional Location%.40
hist1	%@Functional Location%.Ab
hist1	%@Functional Location%.All
hist1	%@Functional Location%.All
hist1	%@Functional Location%.Co
hist1	%@Functional Location%.Co
hist1	%@Functional Location%.Da
hist1	%@Functional Location%.Da

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Earliest Timestamp

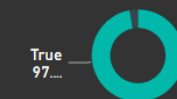
Shutdown



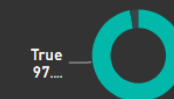
Scan



Archiving



Step



Elements by Server

AF Server	#
AF_Server_1	34652
AF_Server_2	28549
AF_Server_3	23166
Total	179513

Elements by Database

AF Database	#
Database_1	40316
Database_2	37871
Database_3	20739
Total	179513

Attributes by Database

AF Database Name	#
db2	614256
db3	318674
db1	157308
db4	121382
db6	93175
db13	34800
db8	34292
PI_MDB_AF_Sync_DB	33885
db23	25767
Configuration	24040
Total	1555455

Attribute Types

Data Reference	#
PI Point	745211
Table Lookup	84325
String Builder	79507
Analysis	22768
Formula	9008
Total	942341

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Earliest Timestamp

Elements By Template

Template Name	#
Template1	22439
Template2	18528
OPC	18006
UA.FolderType.79CA79D9	
OPC	5656
UA.FolderType.9F93805A	
OPC	3210
UA.FolderType.A328D877	
OPC	3210
UA.FolderType.C698A4AF	
Total	157062

Attribute Templates

Template	#
Tag Name	35487
Description	26608
Severity	22444
AcknowledgedBy	22443
AcknowledgedTime	22443
Weight	21890
RPI	21678
Stiction	21677
COV	21551
CF	18664
Total	1453323

Element Details

AF Database	Path
Sites All	\Misc\Texas Electric Cost
Sites All	\Sites\
Sites All	\Sites\East Plant Bleach Milk Run
Sites All	\Sites\Tanks
Sites All	\Sites\Tanks\Operations
Sites All	\Sites\Tanks\Operations\East
Sites All	\Sites\Tanks\Operations\East\E0310S103
Sites All	\Sites\Tanks\Operations\East\E105CT205
Sites All	\Sites\Tanks\Operations\East\E205CT211

Element Category

Category Name	#
OPC UA;	13189
General Equipment;	8141
Instrumentation Device;	4508
Wireless Device;	2409
category1	2323
OPC Connection;	2158
Pumps;	1534
Mass Balance;	1514
PFM;	1466
InhoZink	1379
Total	59386

Attribute Category

Name	#
CPM Data;	56076
Asset Data;	36752
Calculations;Program	25829
Health;	
Static Values;	23276
Process Data;	22664
Performance Counter;	22405
Property;	19067
Calculations;	13740
Asset Health;	13432
Total	545303

Elements Created By

Created By	#
user1	44147
user2	18990
user3	18881
user4	17582
user5	10665
user17	8597
user19	5426
user25	5405
user34	4692
user35	4425
Total	179145

PI Point References

PI Point Name	#
19FIS19E5	926
SINUSOID	546
30T89	256
20A1008A	223
10PC1005	102
00SFFGTEMP	91
E10AI9050C.PV	80
10TI0401	79
39AIHHGR.SG	76
TFMP	72
Total	697933

Attribute Details

AF Database	name	Attribute
db3	07AI0031	Analytics\
db3	07CTU.TDS	Analytics\
db3	07CTUTDS.1HRAVG	Analytics\
db3	07CTUTDS.1YRAVG	Analytics\
db3	07CTUTDS.I	Analytics\
db3	07CTUTDS.I2	Analytics\

Elements Modified By

Modified By	#
user45	48173
piadmin	22552
pidemo	22179
user56	19388
user85	17582
user95	8877
user931	8324
user75	4944
user521	4471
user9315	4443
Total	179175

Historian References

Historian Name	#
hist1	391229
hist2	89564
hist3	85761
hist4	67062
hist6	48810
hist8	12324
hist9	1861
hist11	912
hist15	399
hist23	11
Total	697933

Attribute Exceptions by Database

AF Server	Exception	#
server94	PI tag format '%@.JTag Name%' is not supported	3372
	[-12002] Code Not Found in PInt	1081
	PI tag format '%@.JTag Name%' is not supported	672
server94	[-12002] Code Not Found in PInt	354
Total		47278

By Historian

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piadmin	132617
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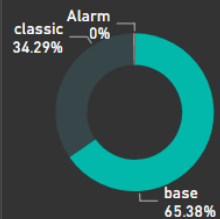
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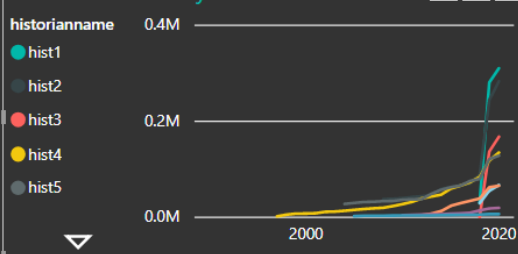
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Point Class



PI Point Growth by Historian



PI Point Growth by Historian

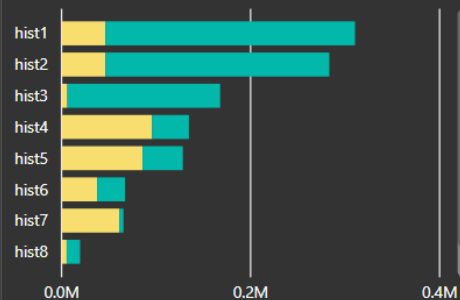
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2015	62854	59565	62512	23672	713			
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hist5	DataEntry: A(r,w) _DataEntry: A(r,w) Intelatrac: A(r,w)	1

Compression By Historian

compressing ● False ● True



PT Created Value By Historian

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hist2	C	52G1T18NR	7/22/2008 7:33:26 PM
hist2	C	52G1T28NR	7/22/2008 7:33:29 PM
hist2	N	G1TNK10NR	7/22/2008 7:33:33 PM
hist2	C	52G1T25NR	7/22/2008 7:34:11 PM
hist2	N	G1TNK18NR	7/22/2008 7:34:29 PM
hist2	N	G1TNK28NR	7/22/2008 7:34:33 PM
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Detail

historianname	name
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hist1	%@Functional Location%.Ab
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hist1	%@Functional Location%.Co
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3/24/2020 6:49:22 AM

Earliest Timestamp

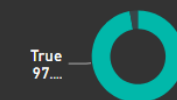
Shutdown



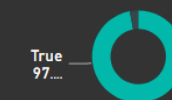
Scan



Archiving



Step



Our Growth



CHALLENGES

- Underutilized PI System
- Didn't know how the system was being used
- Free for all lead to underperforming analyses

SOLUTION

- Utilize the tools OSIsoft provides
- Make all the data visible
- Audit with limited restrictions

BENEFITS

- Enable subject matter experts
- Accelerated adoption
- Obtain greater value from the PI System faster



We all make choices when implementing a system, we chose to democratize the PI System



Questions?

Please wait for
the **microphone**

State your
name & company



Save the Date...



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AMSTERDAM

October 26-29, 2020



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