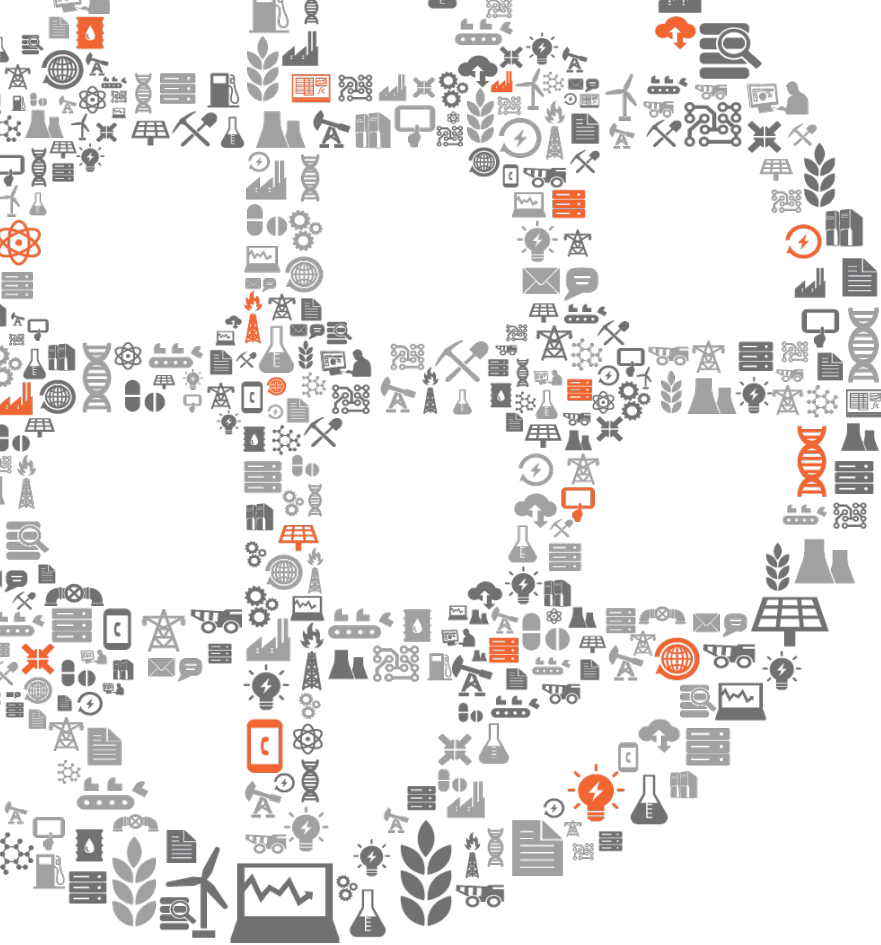


# How to build a PI System in 3.14 minutes.

Presented by **Rhys Kirk, Shell PI Center of Excellence (Wipro)**  
**John De Koning, Shell PI Center of Excellence Lead**



# Satellite PI Systems and PI Collectives

# Complexity of big numbers

- Current PI System deployment of around 125 PI systems
- Per PI System 4 – 12 servers are involved
- Additional deployment of >250 PI systems is expected

# Case for change

- New PI System deployments will be combined with additional tools for optimization
- Current deployment effort for combined system is ~ 7 days
- Deployment of >250 PI Systems → 1750 days of effort

# Satellite PI Systems and PI Collectives

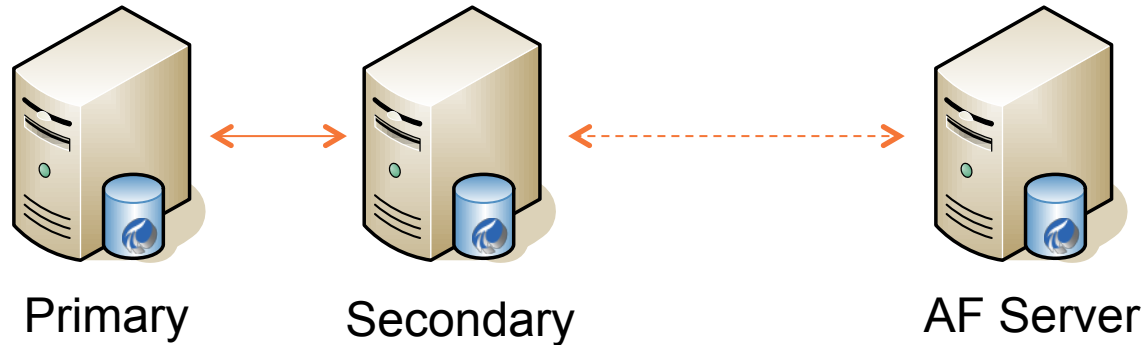
- “Natural satellite, an object naturally occurring in orbit.” – Wikipedia
- “Satellite campus, which is physically detached from the main campus” - Wikipedia
- A satellite PI System is a detached collection of OSIsoft products that perform a specific function and “orbit” a PI Collective sending data to it.

# Satellite PI Systems and PI Collectives

- Global PI Collectives collect data from multiple Satellite PI Systems.
- The default is that all Satellite PI Systems send their data to a single global PI Collective, unless there are specific issues such as data export compliance.
- Where required there will be additional PI Collectives for collecting data but the same principle applies.

# PI Collective

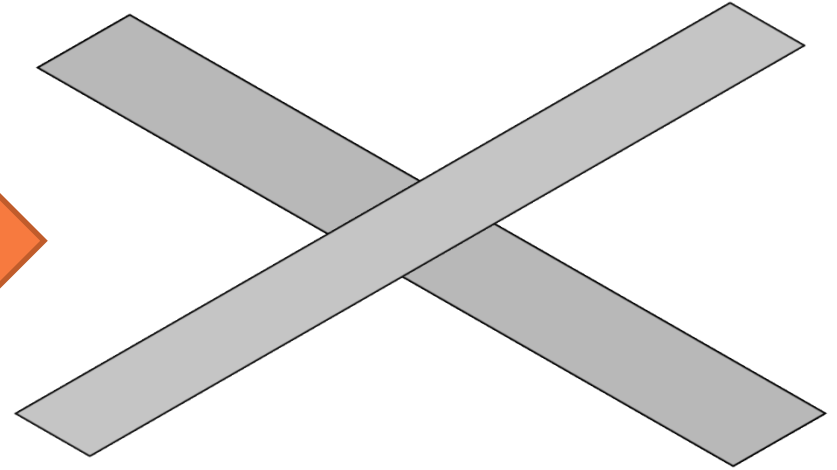
- 2 members of the PI Collective
- High availability
- 1 place to see all satellite PI System data



# Satellite PI System



Treasure Map

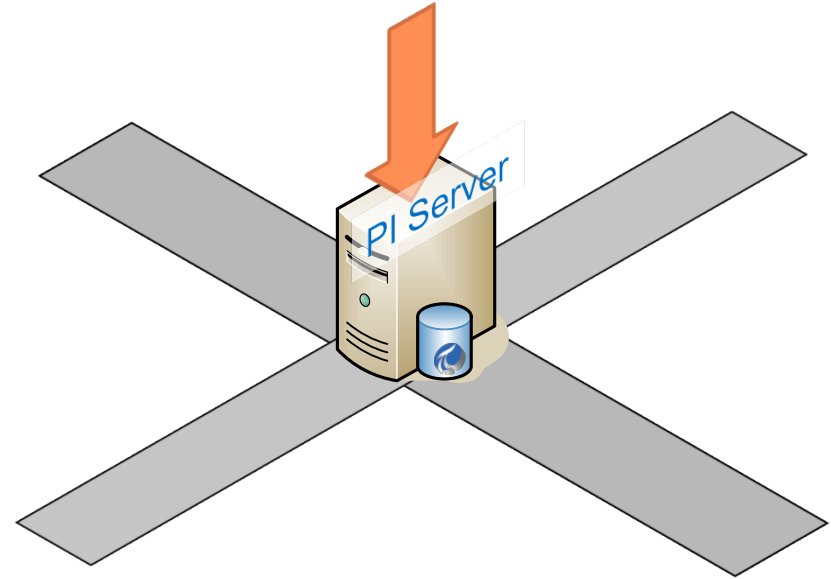


X marks the spot



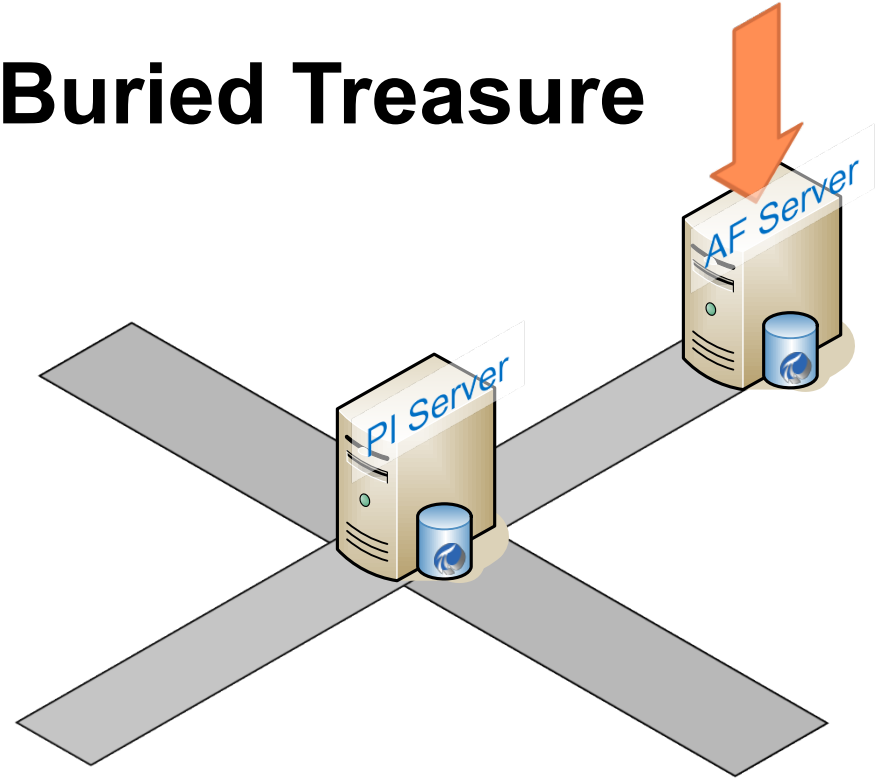
# Satellite PI System – Buried Treasure

- At the centre of any good X on a treasure map is the buried treasure.
- At the centre of our X is the PI Server treasure chest.



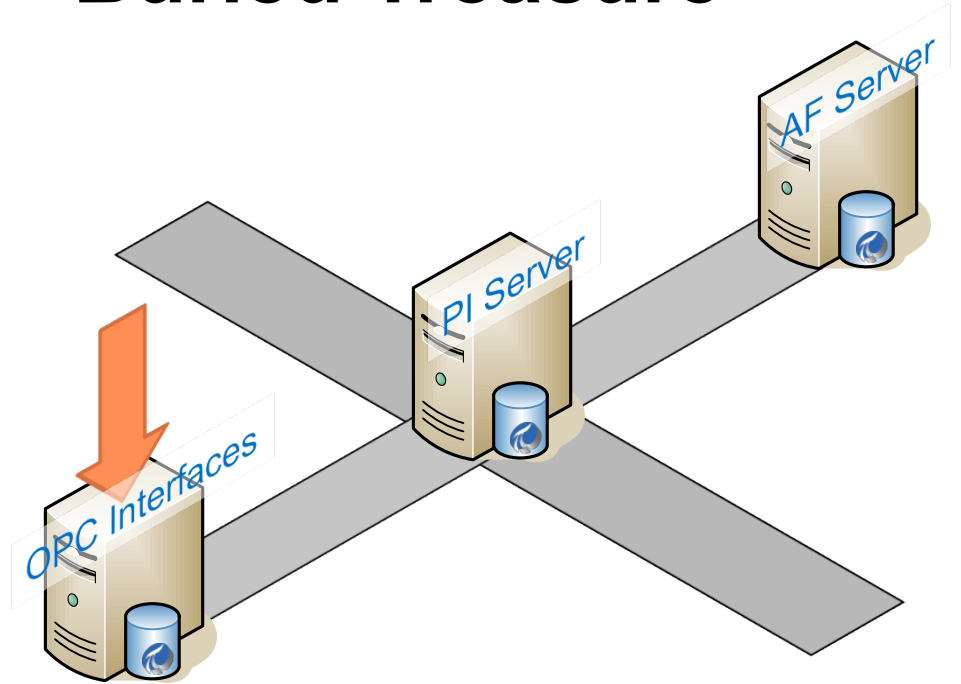
# Satellite PI System – Buried Treasure

- You can't take a PI Server anywhere these days without his buddy the PI AF Server.
- Turns out his buddy has some skills that we will need later on...



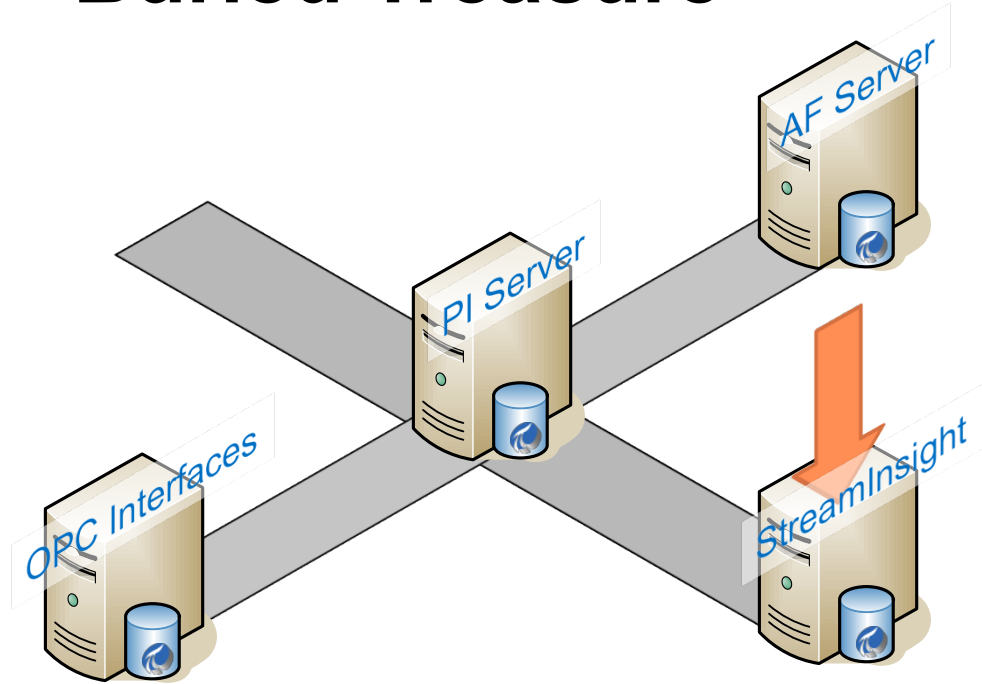
# Satellite PI System – Buried Treasure

- You won't have much fun with the PI Server without feeding it some data.
- We dug up the PI Interfaces for OPC DA to help us out.



# Satellite PI System – Buried Treasure

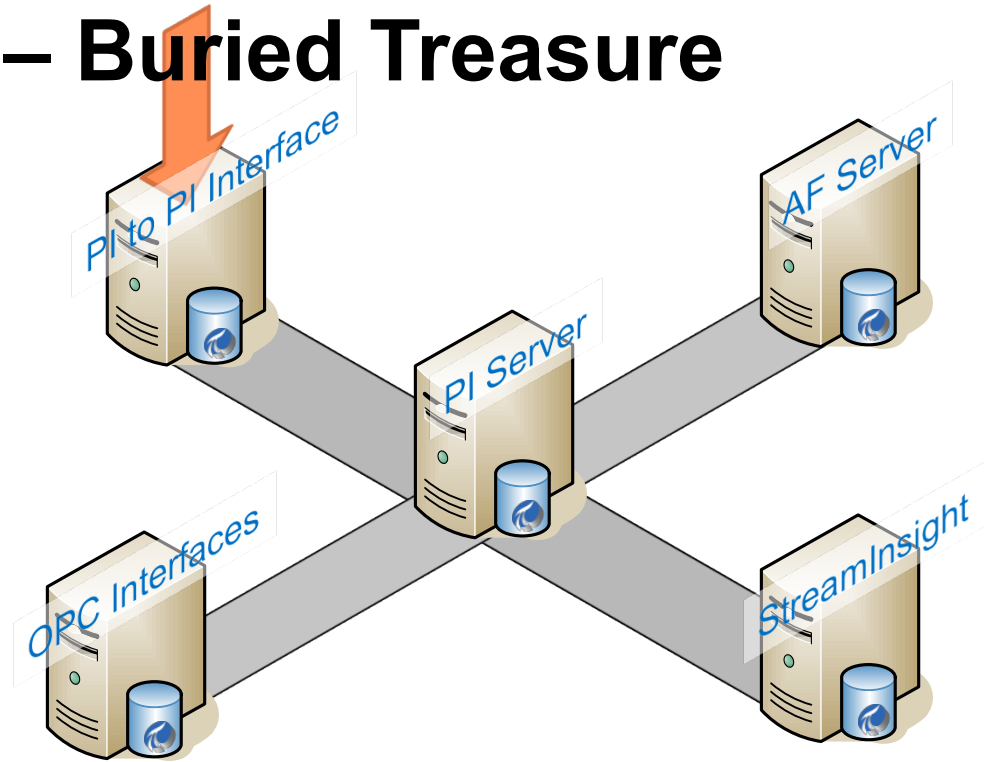
- We continued to dig... needing to perform some calculations on the data at source we decided to use Microsoft StreamInsight, and the PI for StreamInsight Adapters\*.



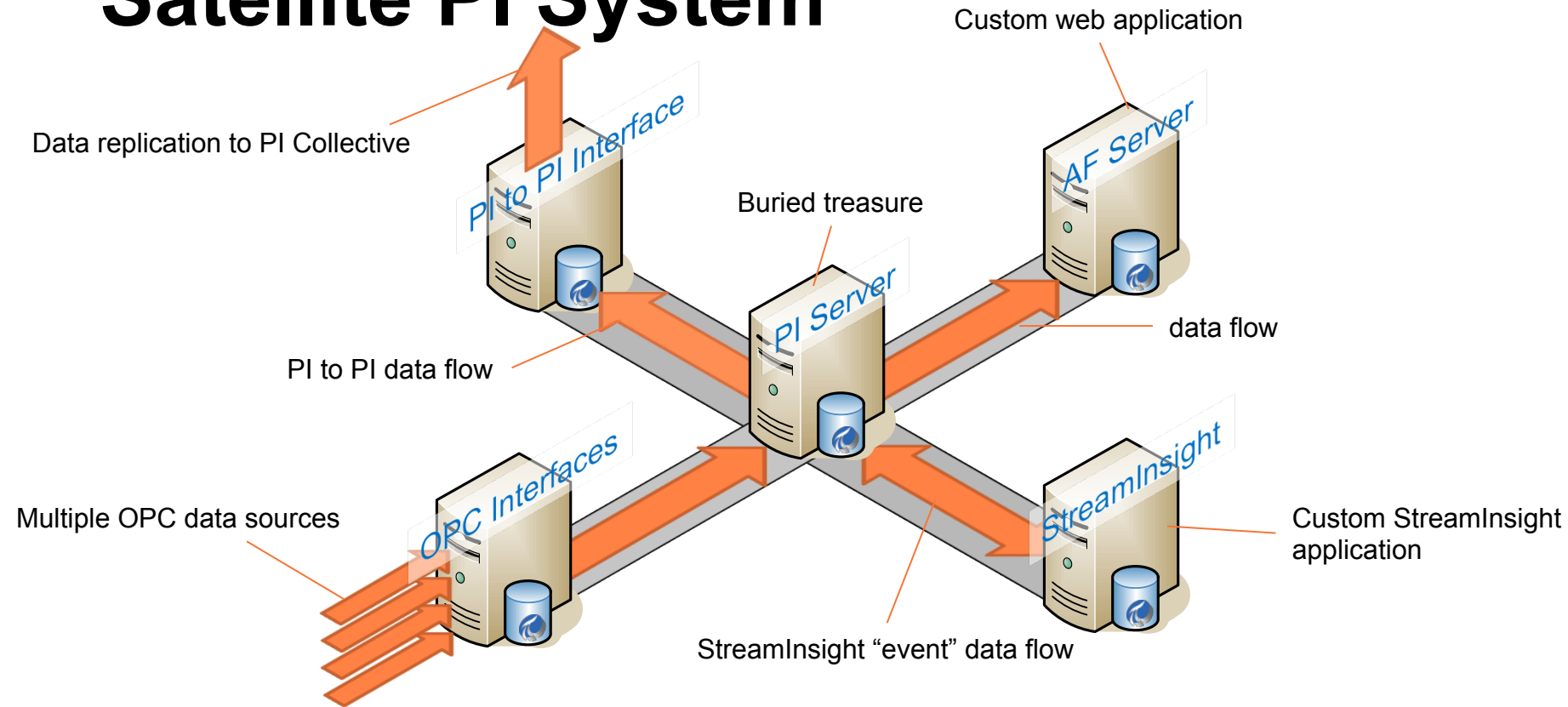
\*Redeveloping to use AF SDK + Reactive Extension strategy.

# Satellite PI System – Buried Treasure

- Finally, and fatigued from all the digging, we needed a method for replicating the data to the PI Collective.
- The PI to PI TCP/IP Interface was the perfect way to achieve this.



# Satellite PI System





# Satellite PI System Complications

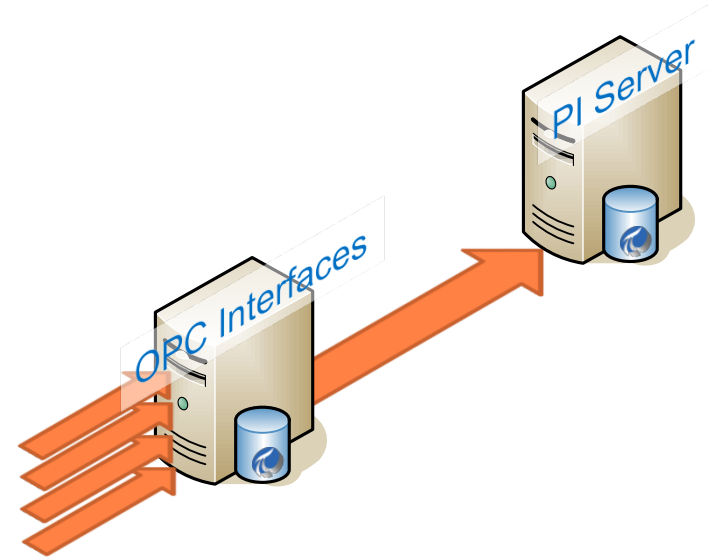
# Satellite PI System – complications

- Each satellite PI System will use a combination of different OPC data sources.
- Data rates will be either 250ms for approx. 1,000 tags, or 1000ms for approx. 700 tags.
- Need to be able to monitor all Satellite PI Systems.
- How to make sure all PI Systems are created the same when installing 300 times; eliminating the human factor.
- Time required to install each PI System.



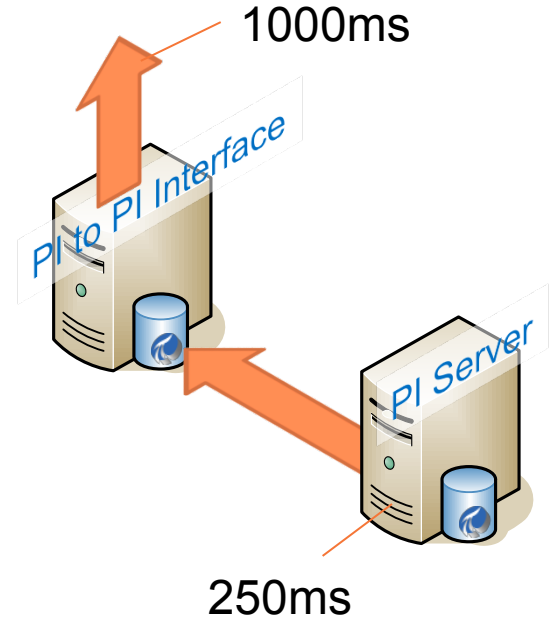
# Satellite PI System – OPC

- Pre-create all PI Interfaces for OPC DA instances.
- Disable each interface instance.
- Only switch on (enable) each interface instance that is required for a PI System deployment.



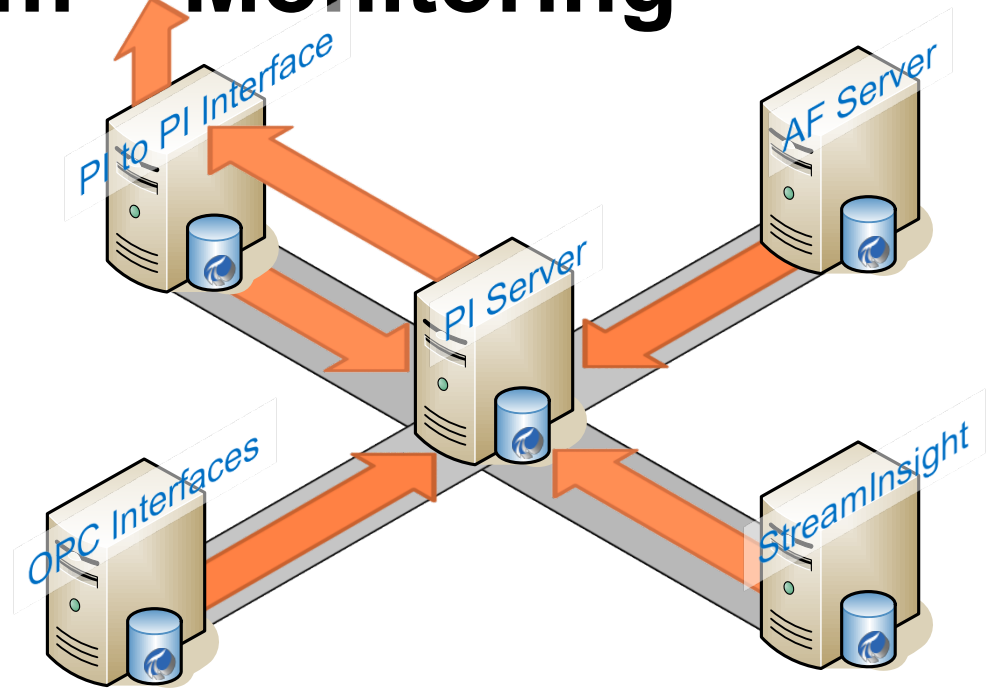
# Satellite PI System – Data rates

- Only ever replicate minimum 1000ms data events to the PI Collective.
- Controlled from the receiving PI Collective (Exception Minimum).
- 250ms data rate required by Satellite PI System users; PI Collective users only require 1000ms data rate.



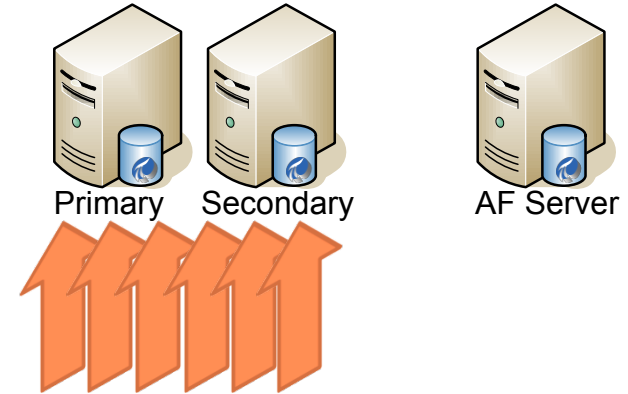
# Satellite PI System – Monitoring

- PI Performance Monitor interface used on each machine.
- Satellite PI Systems stores all performance data locally, and then the performance data is replicated to the PI Collective.
- A single view on the PI Collective enables each Satellite PI System to be monitored from one place. (Providing it maintains it's network connection.)



# Satellite PI System – Monitoring

- PI Notifications used to alert on specific components of a satellite PI System.
- PI ProcessBook used as primary monitoring tool based on template displays.
- PI CoreSight used as secondary monitoring tool for drill down investigation of Satellite PI System issues.
- Working with OSIsoft to bring these specific monitoring requirements to OSIsoft Managed PI.





# Automating builds

# Satellite PI System – Automating builds

- Most installs are repetitive on each of the different machines involved in the PI System. For example, PI Prerequisites Kit.
- Most installs would then be repeated across all deployments of the PI System.
- Main differences really came from changes to the environment where the PI System runs, e.g. the server names & IP addresses.

# Satellite PI System – Automating builds

- Original starting point (and fall back option) is to have manual installation “cookbooks” that detail each step of a PI System installation.
- Over 200 pages and counting just for PI components, with a few assumptions and references to other “cookbooks” of the overall build.
- Unavoidable that when the same cookbook is given to two different people that two identical base systems are not built given the complexity and extent of each PI System installation.

# Satellite PI System – Automating builds

- Current manual build time of between **5 and 8 days**, dependent on the experience of the PI System within the build team across the globe.
- Target is to complete the PI System installations in a matter of **minutes**. 3.14 minutes to be precise.
- How?



# Satellite PI System – Automating builds



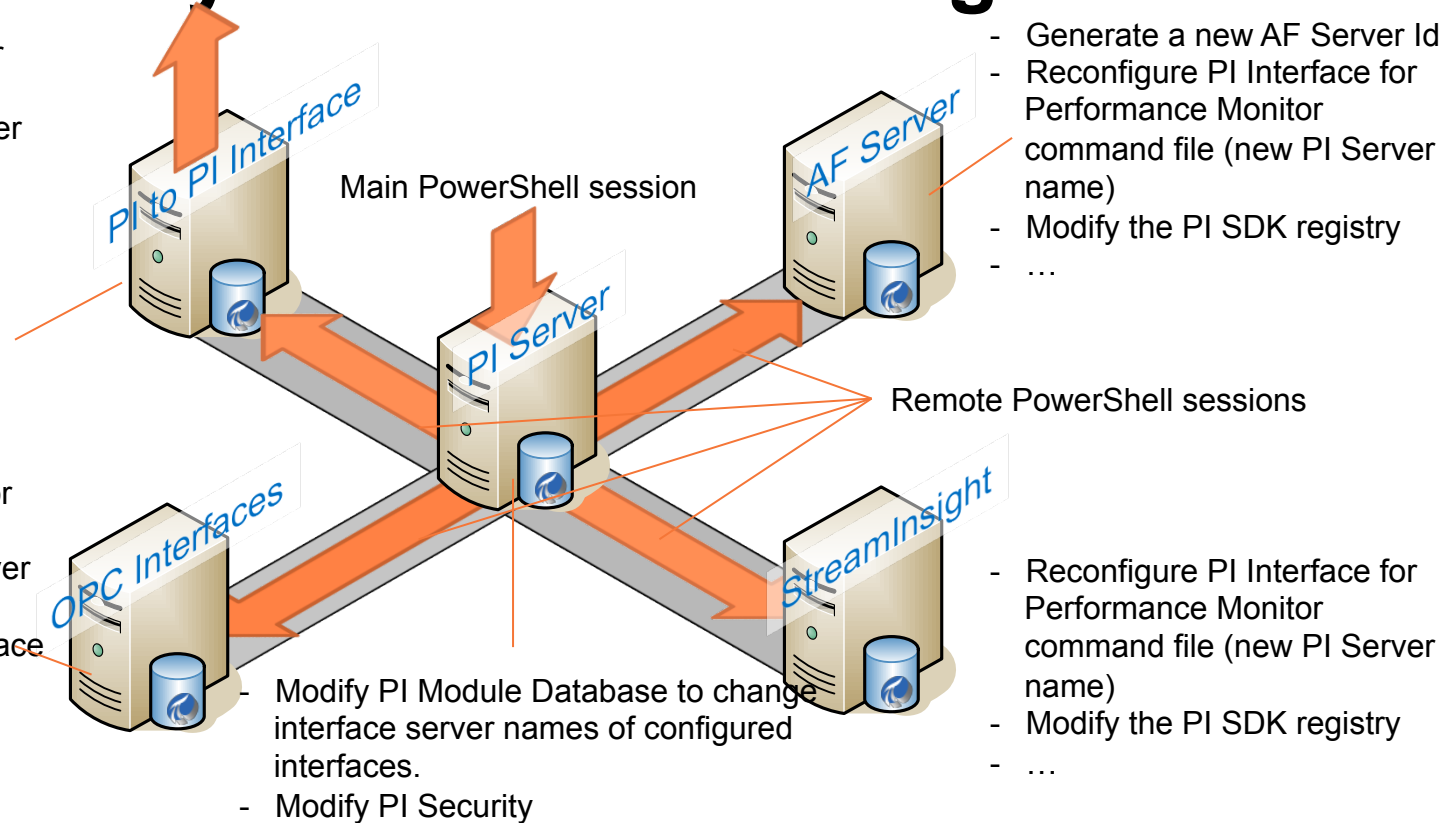
The how includes some parts that some PI System Administrators may find disturbing!

# Satellite PI System – Automating builds

- Use VMware imaging to create base set of images with the PI Components installed.
- Use PowerShell to create scripts to localise the base images when used in a deployment.
- Tinker with some parts of the PI System that are normally hidden from users.

# Satellite PI System – Automating builds

- Reconfigure PI Interface for Performance Monitor command file (new PI Server name)
- Reconfigure each PI to PI Interface command file; default PI Collective? (Includes reconfiguring PI Buffer Subsystem.)
- Modify the PI SDK registry
- ...
- Reconfigure PI Interface for Performance Monitor command file (new PI Server name)
- Reconfigure each PI Interface for OPC DA command file
- Modify the PI SDK registry
- ...



- Generate a new AF Server Id
- Reconfigure PI Interface for Performance Monitor command file (new PI Server name)
- Modify the PI SDK registry
- ...

- Reconfigure PI Interface for Performance Monitor command file (new PI Server name)
- Modify the PI SDK registry
- ...

# Satellite PI System – Automating builds

- Installations are now consistent.
- Installation time is dramatically reduced, leading to faster deployments of PI Systems.
- Support of deployed PI Systems should be relatively consistent for troubleshooting issues.
- Validation and periodic monitoring scripts can be built to ensure on-going alignment with the installation script; no unauthorised deviations.

# Satellite PI System – Automating builds

- PowerShell Tools for the PI System used to test the theory for the automated builds. Currently only a CTP on OSIssoft vCampus, waiting eagerly for its full release.
- Will be put to the test and refined as we approach mass deployments of PI Systems.
- On-going support, patching and management of VM Images is a separate activity from this presentation but an important one to consider for automating builds.



# What next?

# What next?

- Produce extensive validation scripts with deviations reports in PowerShell, and replicate to the receiving PI Collective via normal data replication (clue: BLOB).
- Develop PowerShell script standards to rapidly deploy private cloud based PI Systems for all of the Shell businesses.

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# THANK

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