



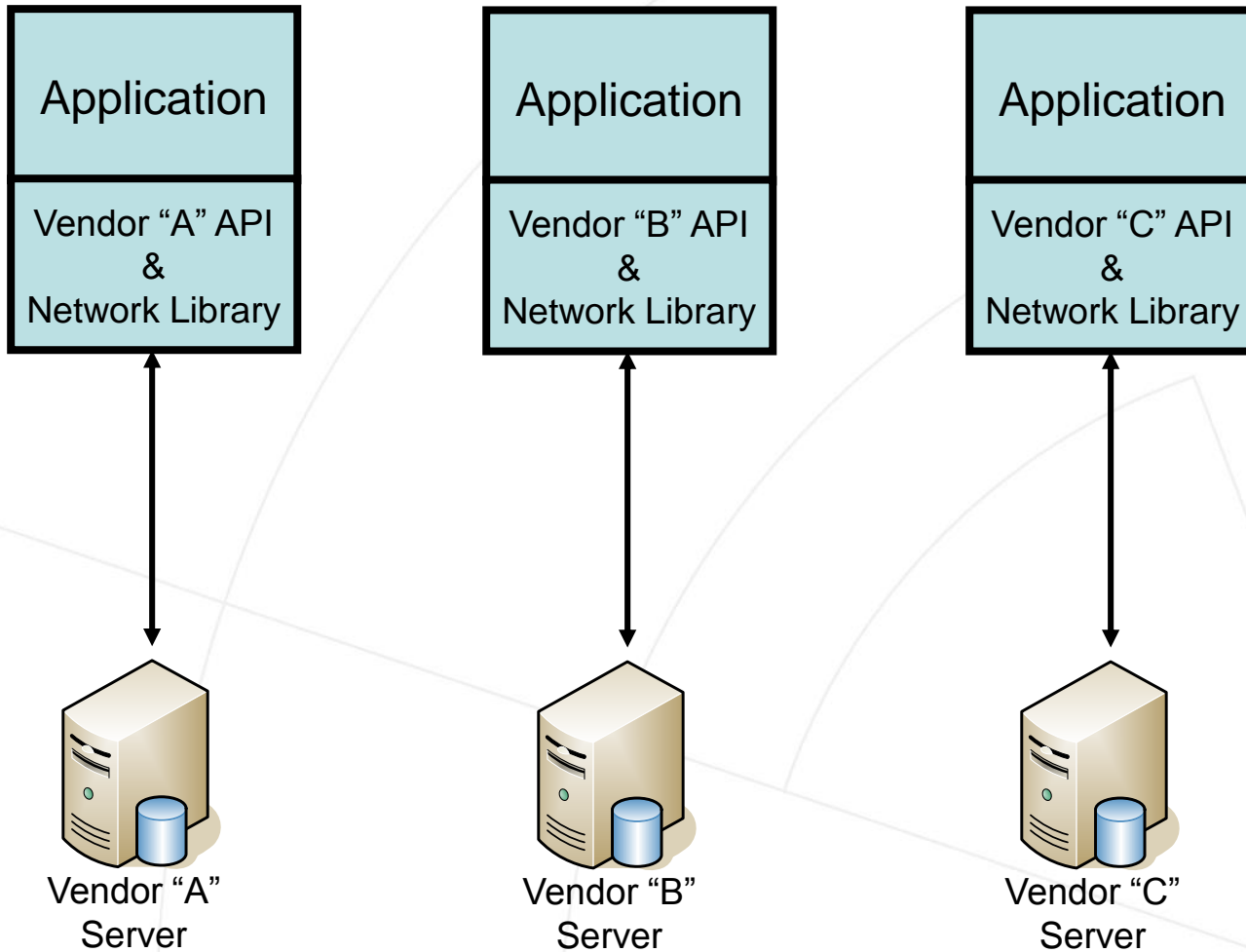
Putting OPC to Work: OSISOFT's OPC Architecture

Ray Verhoeff
VP Research

Agenda

- The Interfacing Problem
- What is OPC?
- OSIsoft's OPC architecture
- Current products
- What will OPC do next?
- How will OSIsoft respond?

The Interfacing Problem



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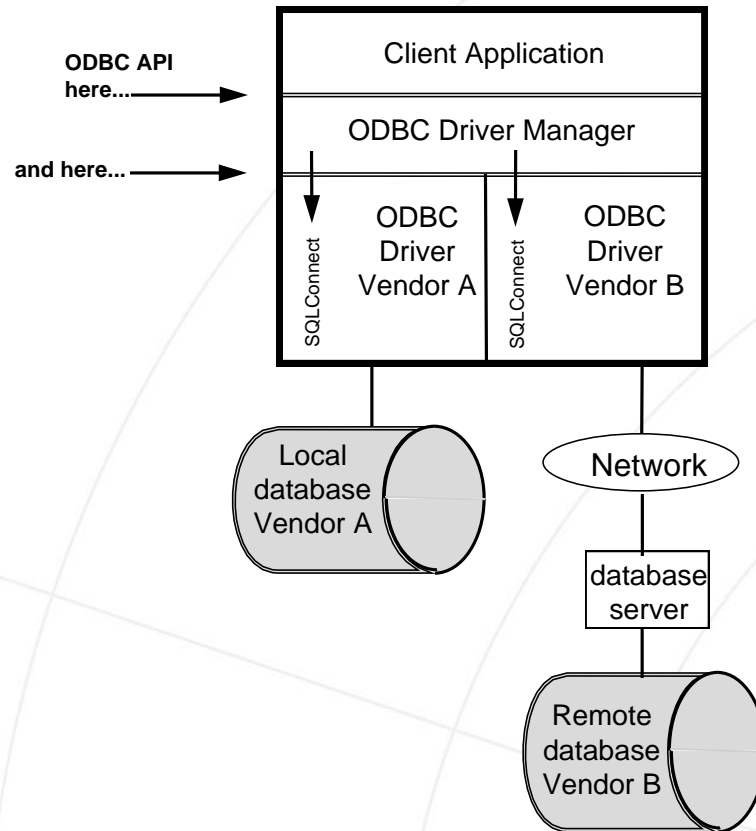
Windows DLLs

- Simple: code library with named subroutines
- Vendors shipped their Windows libraries as DLLs
 - version independence
 - Allowed update of application without relinking

Windows DLLs

- DLL subroutine names and semantics remained proprietary
- No one suggested developing an industry-standard set of subroutines for accessing industrial data

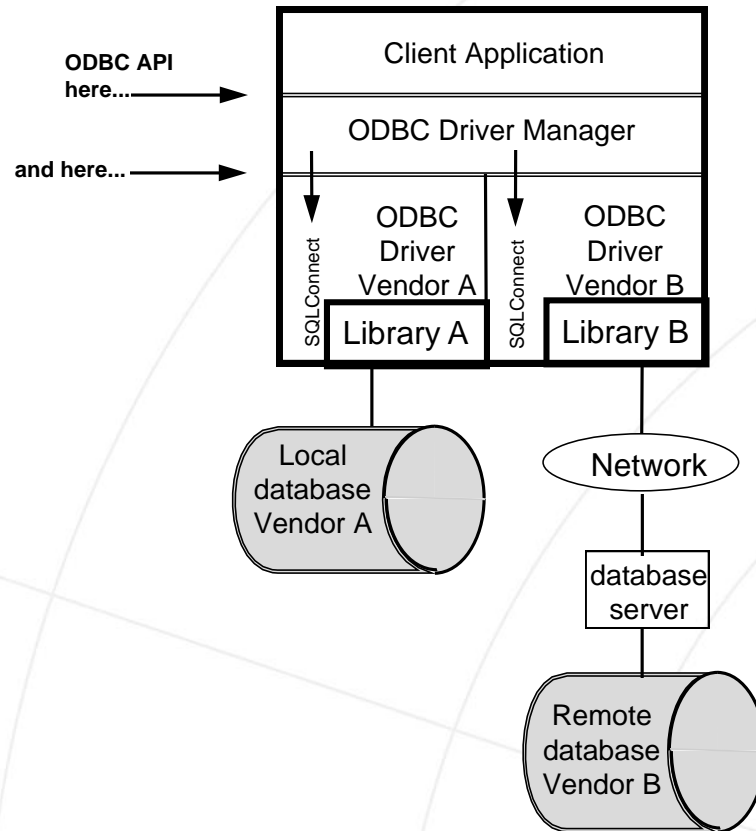
Open Database Connectivity (ODBC)



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Open Database Connectivity (ODBC)



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Open Database Connectivity (ODBC)

“ODBC == Ray Verhoeff”

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ODBC Successes

- Abstracted access to relational databases
- Allowed database vendors to leverage their existing programming & network APIs
- Enable client application vendors to broaden the databases they support

ODBC Failures

- Subtle differences in SQL implementations
- “Spaghetti” connections
 - All clients connect directly to all servers
- Vendor’s API libraries still need to be deployed on all workstations
 - Difficult upgrades
 - Troubleshooting often means visiting the workstation

History of COM

- OLE first released by Microsoft in 1991
- Organized routines into groups called Interfaces and gave them unique identifiers
 - If a object “exposed” an interface, it was required to support all routines in it
- Facilities for browsing available Interfaces
- Intuitive support for COM in Visual Basic

History of OPC

- Industry realized it could continue to create proprietary interfaces OR work together
- OPC Foundation created in 1996
- First standard, OPC DA, released in August 1996

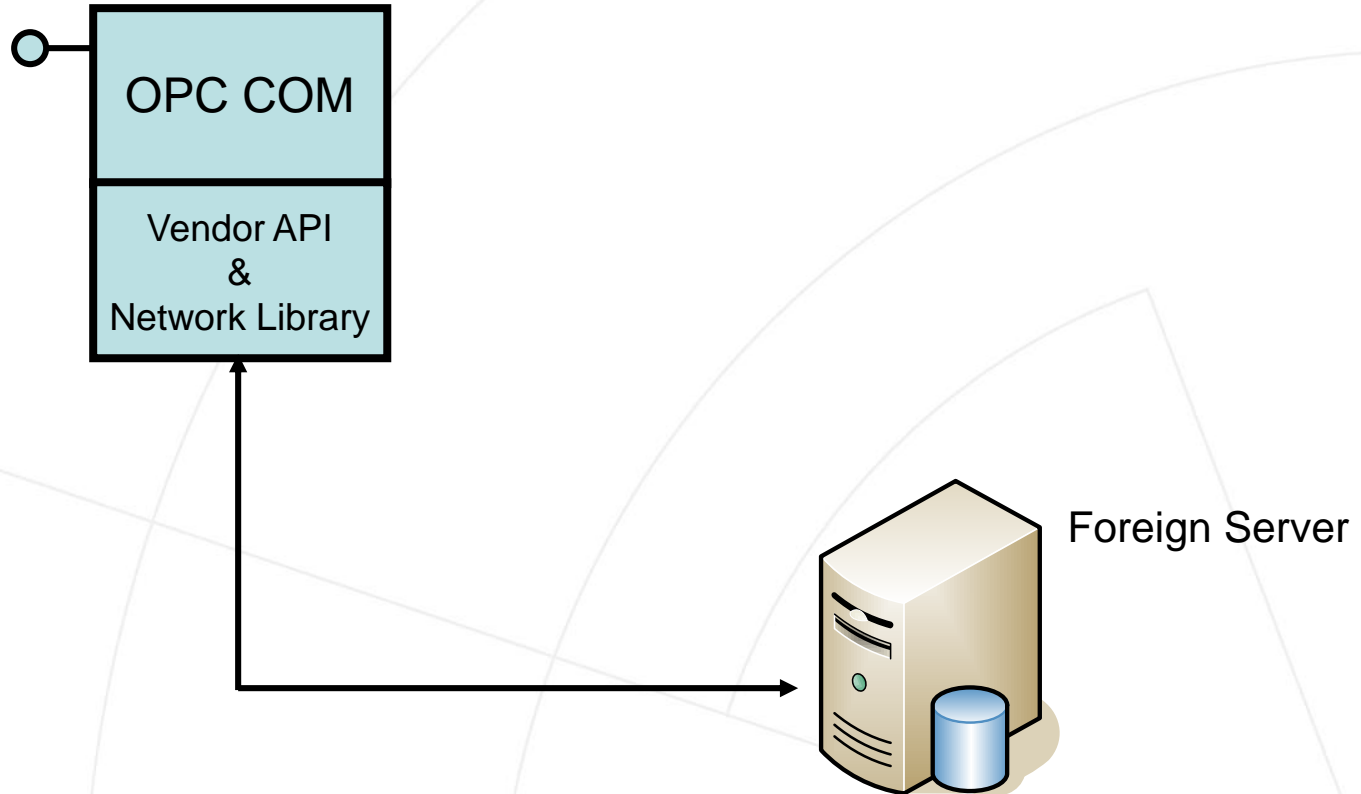
OPC Interfaces

- DA
 - Data Access
- HDA
 - Historical Data Access
- A&E
 - Alarms and Events
- Command Execution
- Batch

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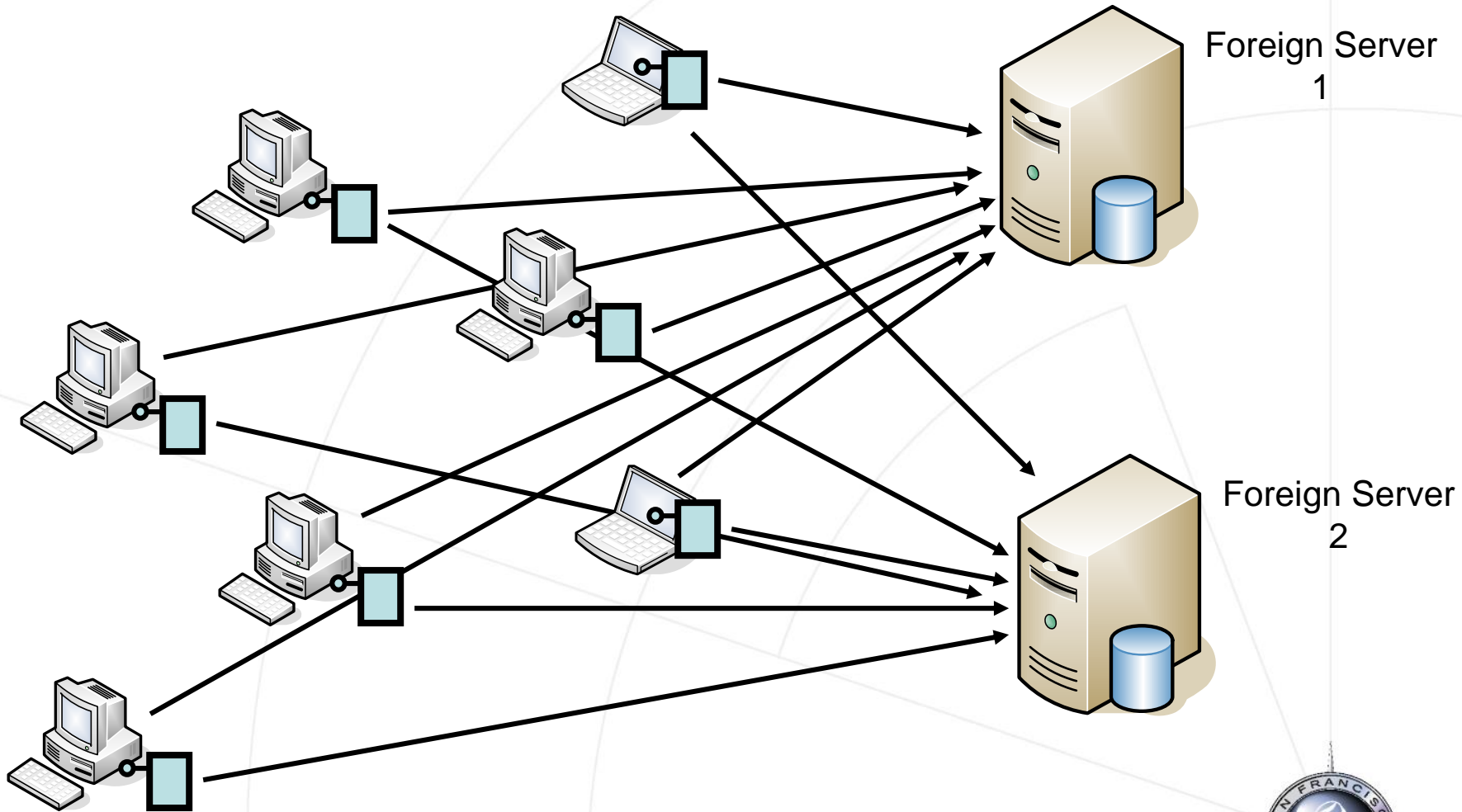
OPC Interface Model



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OPC Deployment



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OPC Access in OSIsoft Clients

- This is not our architecture
- We want to help you avoid the workstation management problem

OSIsoft architecture

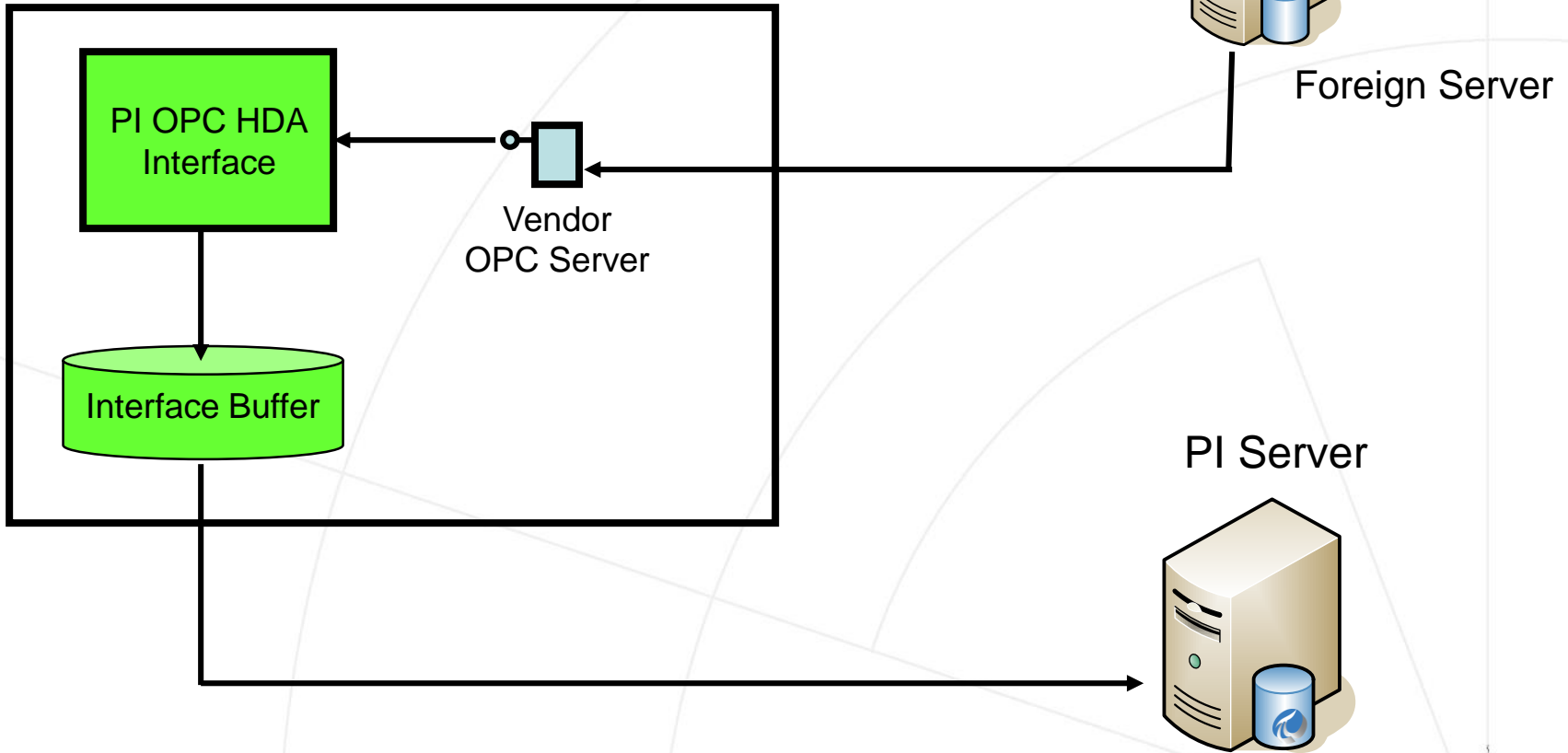
- Centralize!
- Install OPC Server and vendor libraries on PI Interface node or PI Server
- Keeps deployment, management and troubleshooting in one place

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OSIsoft OPC Interface

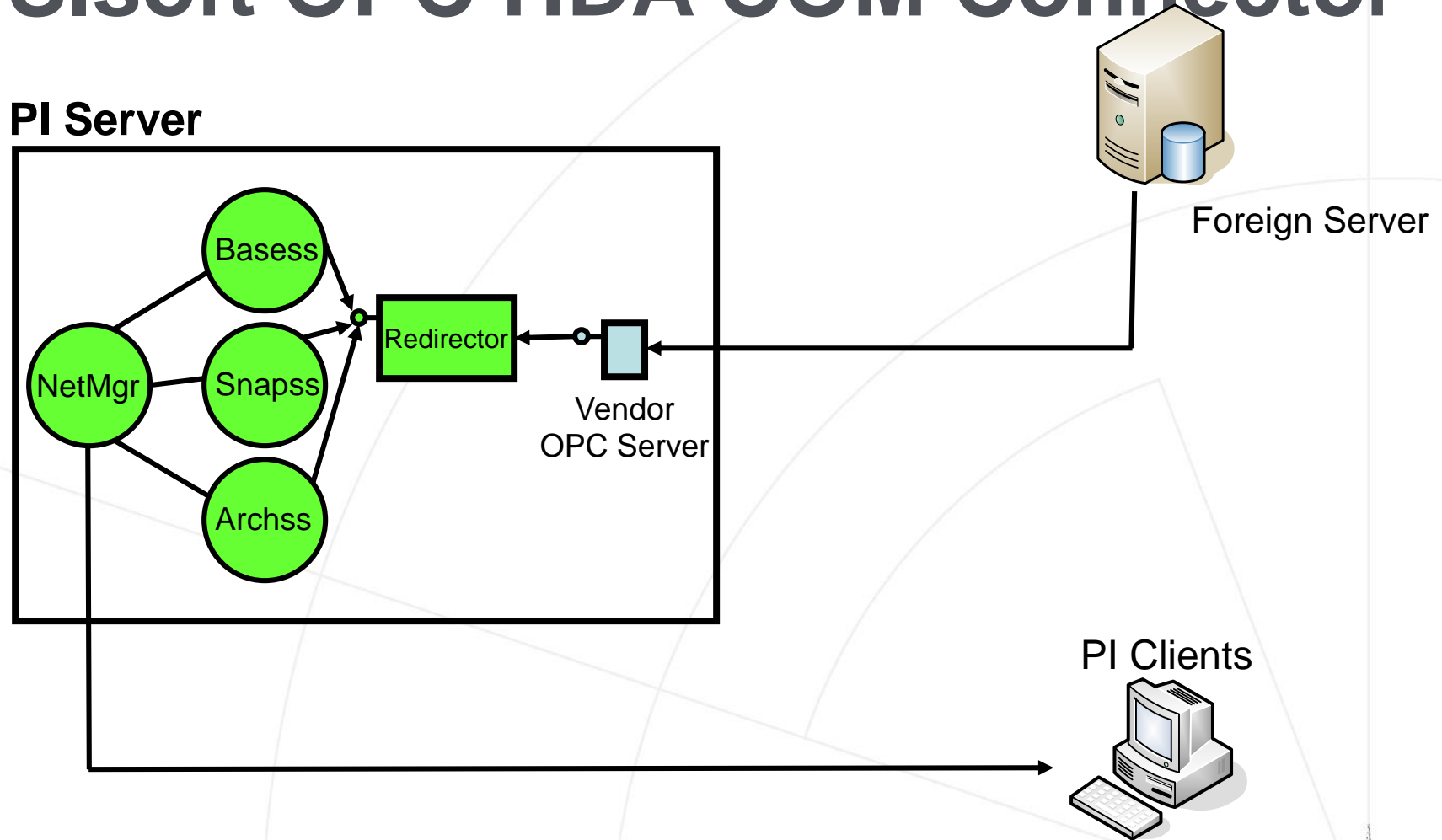
PI Interface Node



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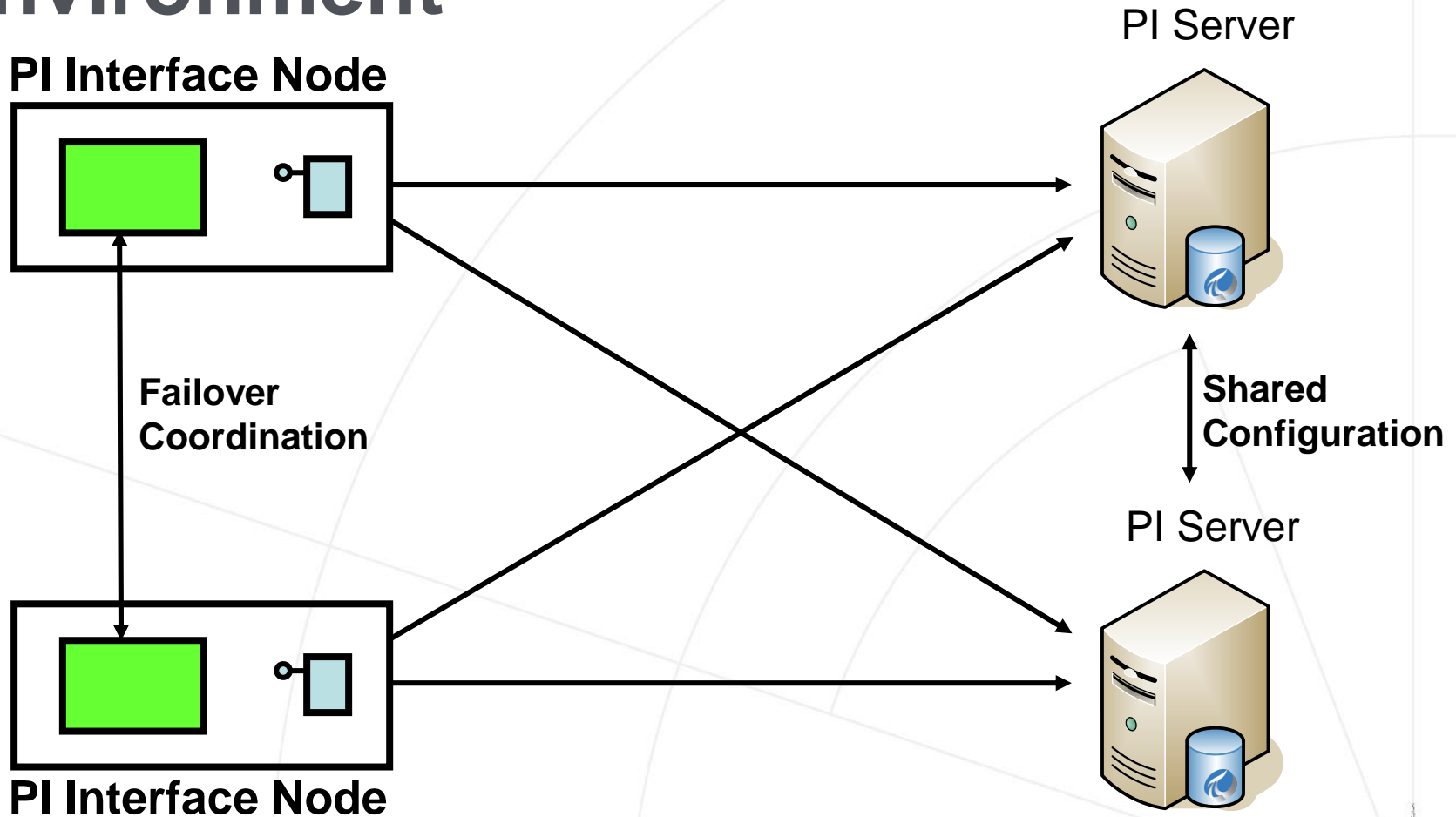
OSIsoft OPC HDA COM Connector



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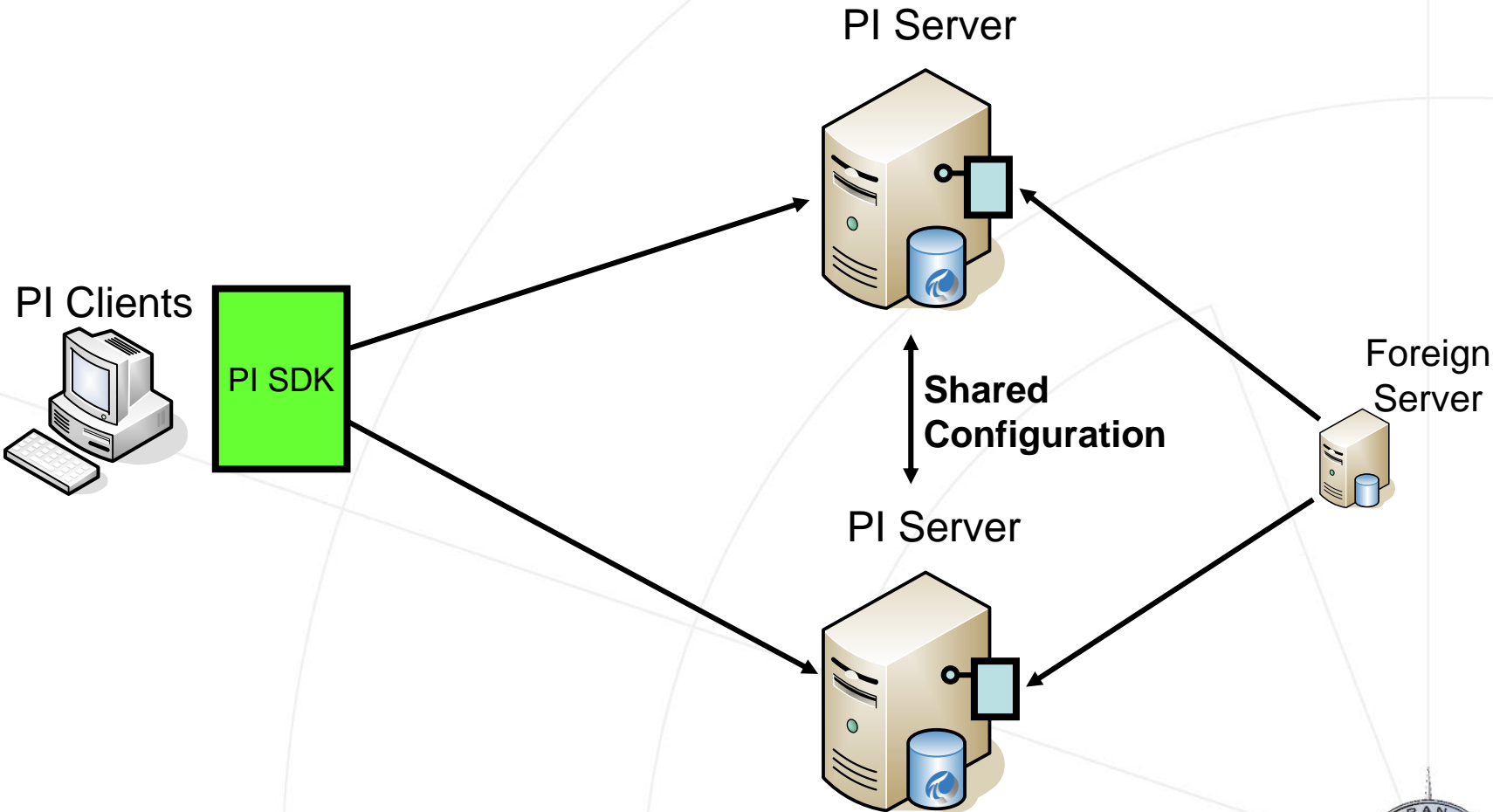
OPC Interface in the High-Availability Environment



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OPC COM Connector in the High-Availability Environment



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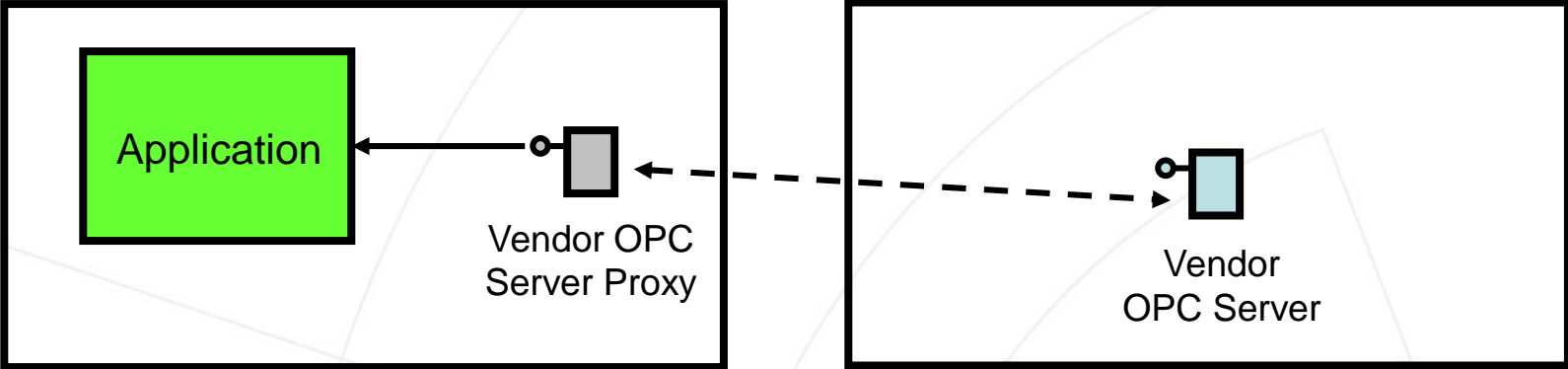
OPC Point Configuration Simplified

- Auto-Point Sync
 - Builds correctly configured points in PI if the “foreign system” exposes its configuration
 - Available for OPC if “Browse” interface exposed
- APS Connector for the OPC Interface
- APS Connector for the OPC HDA COM Connector

OPC Security

- No formal security model
 - Implementations use Windows security or proprietary implementation
- DCOM

DCOM



DCOM

- Based on Windows RPC
- Did not perform particularly well
 - Replaced vendor networking with Microsoft's
- Difficult to configure

DCOM

- Deliberately disabled in Windows XP SP2, not removed
 - Microsoft KB 87560 article on how to restore it:
“How to Troubleshoot WMI-related issues in Windows XP SP2”
- Probably safe within a LAN
- Some sites use “Tunnels” for DCOM over TCP/IP
 - But “stateful” firewalls cannot track traffic

OSIsoft OPC Servers

- OSIsoft OPC DA Server
- OSIsoft OPC HDA Server

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What OPC is doing next

- OPC UA
 - Universal Architecture
- Embraces Microsoft .NET, Indigo
- Exploits Web Services
 - Non-Microsoft Server implementations possible
- Final spec due in August
- OPC Foundation hopes for commercial products in 2007

OPC UA Topics

- Address Space
- Relationships
- Service Sets
- Profiles
- Transport
- Security

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OPC UA Address Space

- “Set of objects and relationships exposed by an OPC UA Server”
- Nodes:
 - Have Attributes, which have values
 - Minimum:
 - Node name
 - Node type
 - Node id
- All objects are nodes, not all nodes are objects

OPC UA Relationships

- All Nodes exist at least in a hierarchy
- Nodes may have references to each other
 - Allows rendering of network relationships
- Server may show subsets called Views
 - Views are also hierarchies
 - Client can browse available Views
 - Default View is entire hierarchy

OPC UA Service Sets

- Available services are grouped:
 - Server
 - CreateSession, CloseSession, GetSecurityPolicies
 - Node
 - AddNode, AddReference, DeleteNode, DeleteReference
 - Attribute
 - Read, HistoryRead, Write, HistoryUpdate

OPC UA Profiles

- Client can obtain from Server exact features supported
- Profiles define:
 - Security model
 - Support for levels of DA, HDA, A&E
 - Transport

OPC UA Transport

- Actual transport not specified by OPC
- Transport Profiles:
 - SOAP or TCP/IP
- Payload Profiles:
 - XML or Binary

OPC UA Security

- Client and Server hold X.509 v3 Certificates
- How they are obtained is not defined by UA
- GetSecurityPolicies to exchange certificates
- RequestSecurityToken to create secure session

OPC UA Security

- Requirements
 - authentication
 - integrity
 - confidentiality
 - authorization
 - non-repudiation
 - availability

OPC UA Security Threat Types

- Message flooding
- Eavesdropping
- Message spoofing
- Message alteration
- Message replay
- Malformed messages
- Server profiling
- Session hijacking
- Rogue Client or Server
- Compromising user credentials

OSIsoft and OPC UA

- Use OPC Foundation “wrapper” to support COM-based OPC Interface against UA Clients in 2006
- Native OPC UA Interface committed
- OSIsoft OPC UA Server in 2007
 - Will expose Foundation data model

OSIsoft HA Platform Release

- OPC Interface failover
- N-way interface buffering
 - Supports Phase 1 PI Server Replication
- OPC HDA COM Connector configurations will replicate in Phase 1

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OSIsoft Futures

- Standards-based access techniques will become first-class connection methods
 - PI OPC UA Server
 - PI OLE DB

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OSIsoft Futures

- RtPM client connectivity will migrate to Platform Release 3 Data Access
 - “Foundation” Data Access
- RtBaseline Services will evolve to support data access by clients

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Summary

- OPC abstracts Servers allowing for common clients, still leveraging vendor networking
 - Vendor libraries need to be installed on clients
- OSIsoft has centralized OPC usage:
 - PI Interface node
 - PI Server
- Architecture scales on the OSIsoft High-Availability platform

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Summary

- OSIsoft active in OPC UA
- We will keep deployments centralized, but Highly-Available

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