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MONTEREY CALIFORNIA

MVDC Roadmap: From Proprietary to Standard PI

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International Paper

INTERNATIONAL PAPER

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International Paper

- Employees: 42,000 US + 18,000 non-US
- 26 Pulp and Paper Mills Worldwide
- 138 Converting and Packaging Plants
- 2006 Sales: $22 Billion (#82 on Fortune 500)
- Products
  - Containerboard
  - Uncoated Freesheet
  - Coated Papers

MVDC State of Union (2000)

- Corporate PI Purchase (12/1998)
  - 19 Facility Roll-Out December 1998 - May 1999
- 70+ Paper Machines at 23 US Paper Mills
- Two Paper Machine Gauge Suppliers
- Existing Manufacturing Applications
  - Reel/Roll Quality, ThumbPrint, Variability Analysis

Key Challenges

- Technology Change
  - Resolution: 60-120 Data Boxes -> 600-900 Data Boxes
  - Communication Link: Serial -> OPC
    - OLE for Process Control
  - Scans: 1 minute -> 15 seconds
- Recent Mergers and Acquisitions
- New Paper Machine Gauge Suppliers

Vision: 2000 Process Control Conf.

- Replace Serial Links with OPC Links
  - Add Virtual Sensors via PI-PEs
- Replace MVDC Gauge Historian with PI
  - Handle New Gauge Resolution
  - Handle New Gauge Scanning Frequency
- Migrate Existing Capability Off VMS

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MVDC Data Consumers

- ThumbPrint (Client)
- Roll Quality for Product Tracking (Distributed)
  - As-Cut, Zone, Reel
- Paper Variability Analysis (Web, Centralized)
- Reel Profile (Web, Centralized)
- DCView (VMS Troubleshooting Tool)

Thumbprint HR V06.05.03 (1.4.2_04) Support: (800)526-1017 or (901)419-5656

Reel Profiles | Scans | Preferences

Select a Mill: IN-Inverurie, Scotland
Number of Sensors to Show: 3
Compare Each Scan With: Scan Average

Select By Machine/Time
MachineNumber: 3
Start Date/Time: cur 70701 10:38:58

Select By Reel
Reel Number:

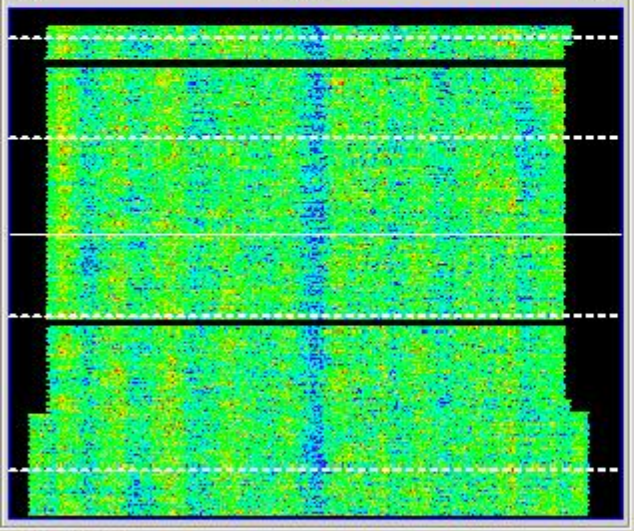
Later Scans
Show Scans
Earlier Scans

RL.BSWT (7)

Scans (2 Hours)

Max	85.62	%Above 2 Std	1.39
Avg	80.4	%Above 1 Std	14.5
Min	72.37	%Below 1 Std	13.5
Std	1.42	%Below 2 Std	3.39

Back — Wet End — Front



Selected Scan

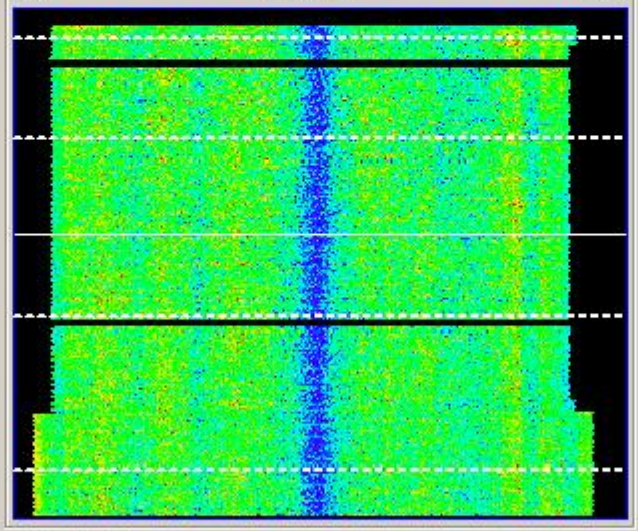
Max	83.0	Time	7/1 11:45:45
Avg	80.36	Reel	UNVERIFIED
Min	77.7	Foot	16894
Std	1.15		0.0

RL.MST (10)

Scans (2 Hours)

Max	6.77	%Above 2 Std	1.79
Avg	5.0	%Above 1 Std	14.77
Min	2.76	%Below 1 Std	14.75
Std	0.39	%Below 2 Std	3.36

Back — Wet End — Front



Selected Scan

Max	6.0	Time	7/1 11:45:45
Avg	4.93	Reel	UNVERIFIED
Min	3.63	Foot	16894
Std	0.34		0.0

RL.BSWT (7)

Scans (2 Hours)

Max	85.62	%Above 2 Std	1.39
Avg	80.4	%Above 1 Std	14.5
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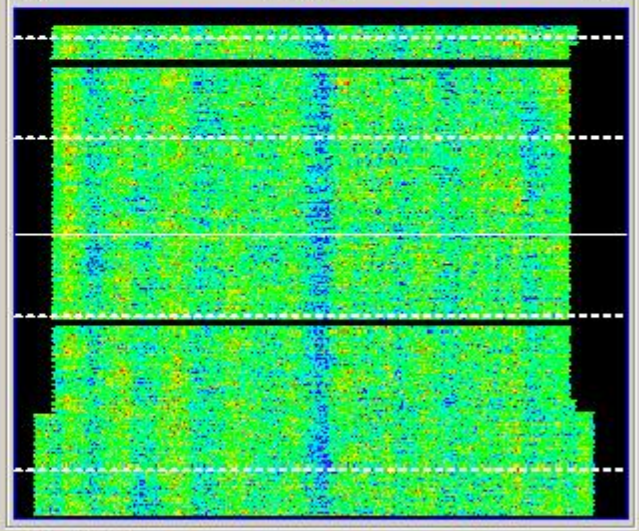
Back — Wet End — Front



Selected Scan

Max	83.0	Time	7/1 11:45:45
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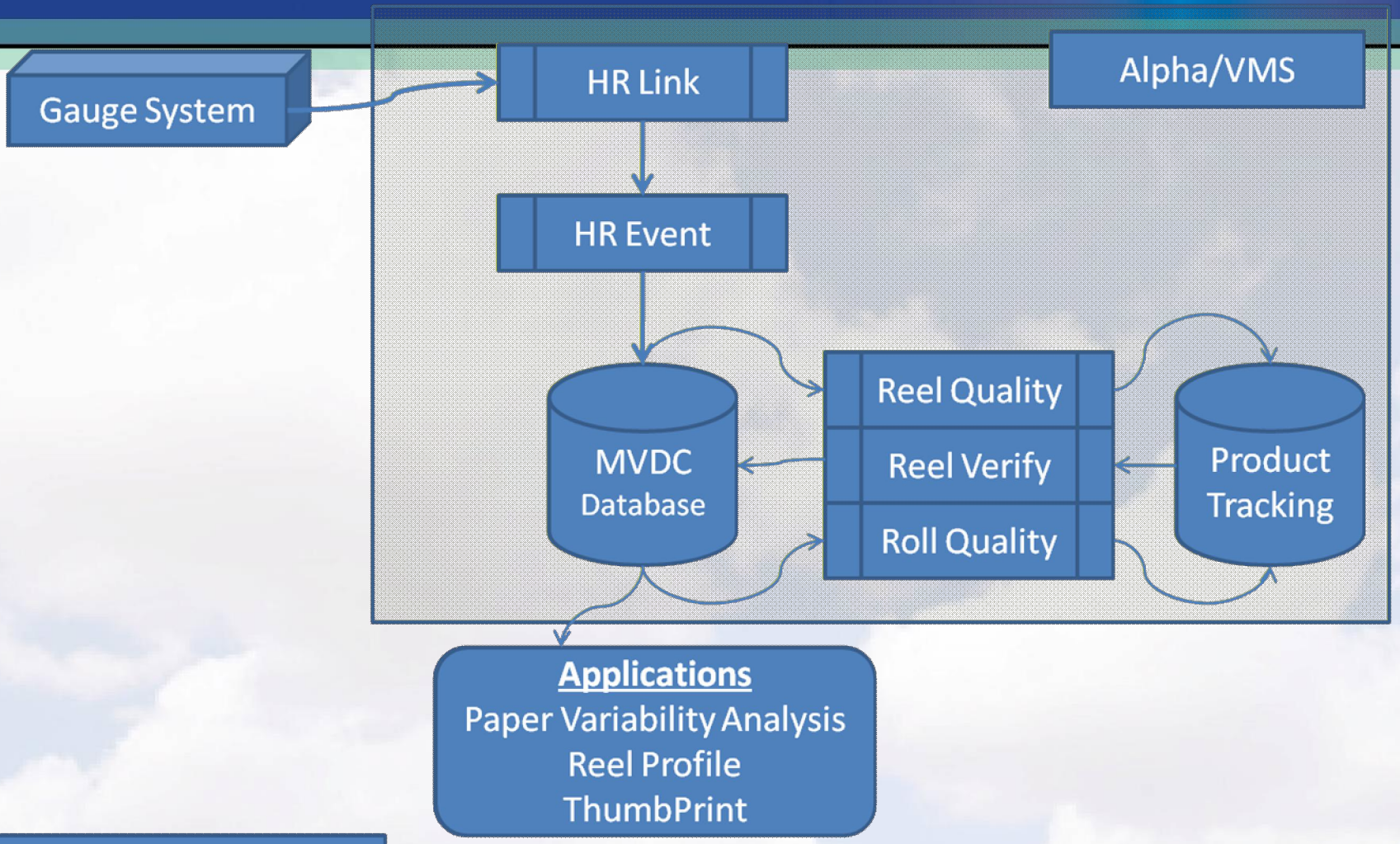
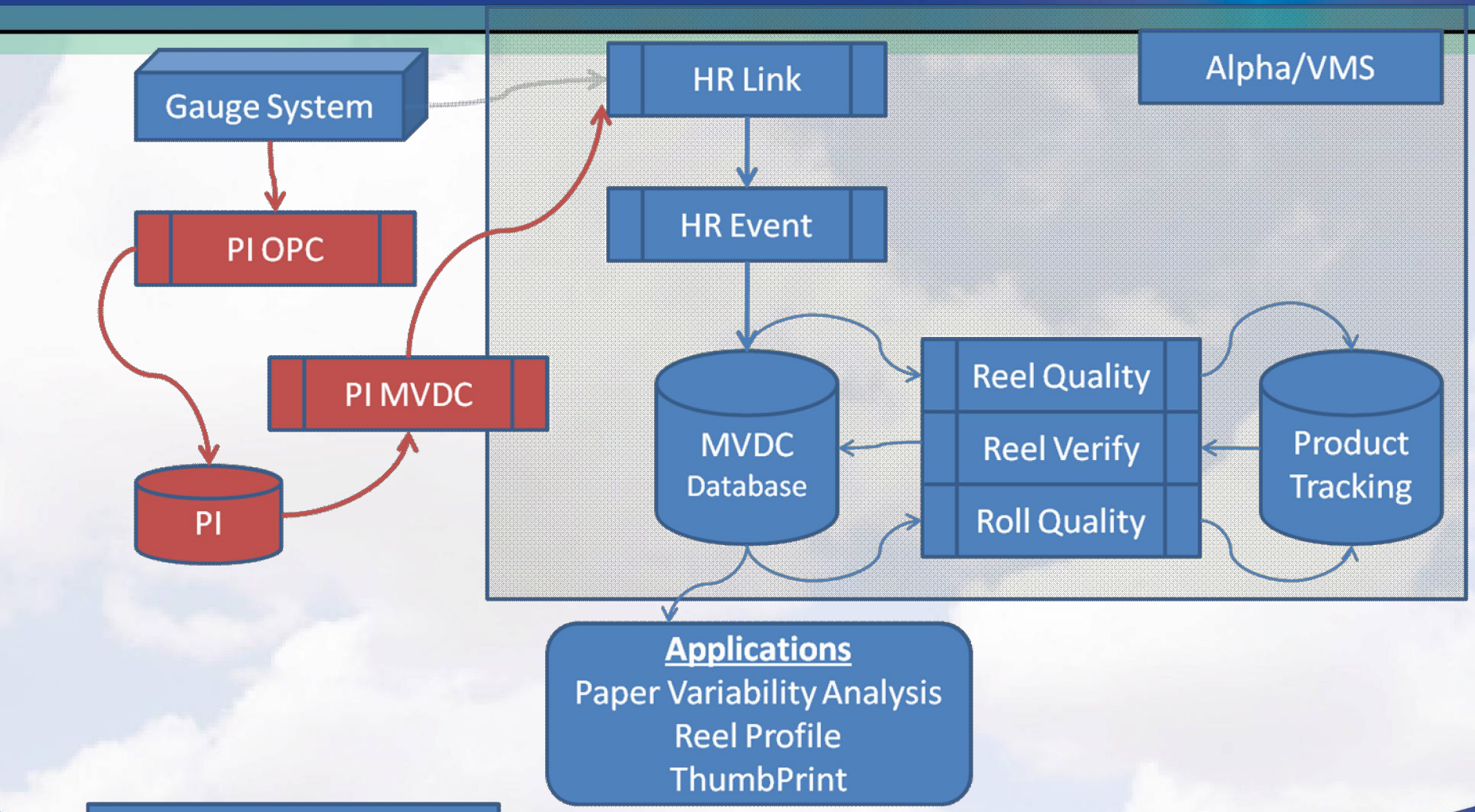
Std	1.15		0.0

MVDC / Product Tracking (2000)



Original: Pre-2000

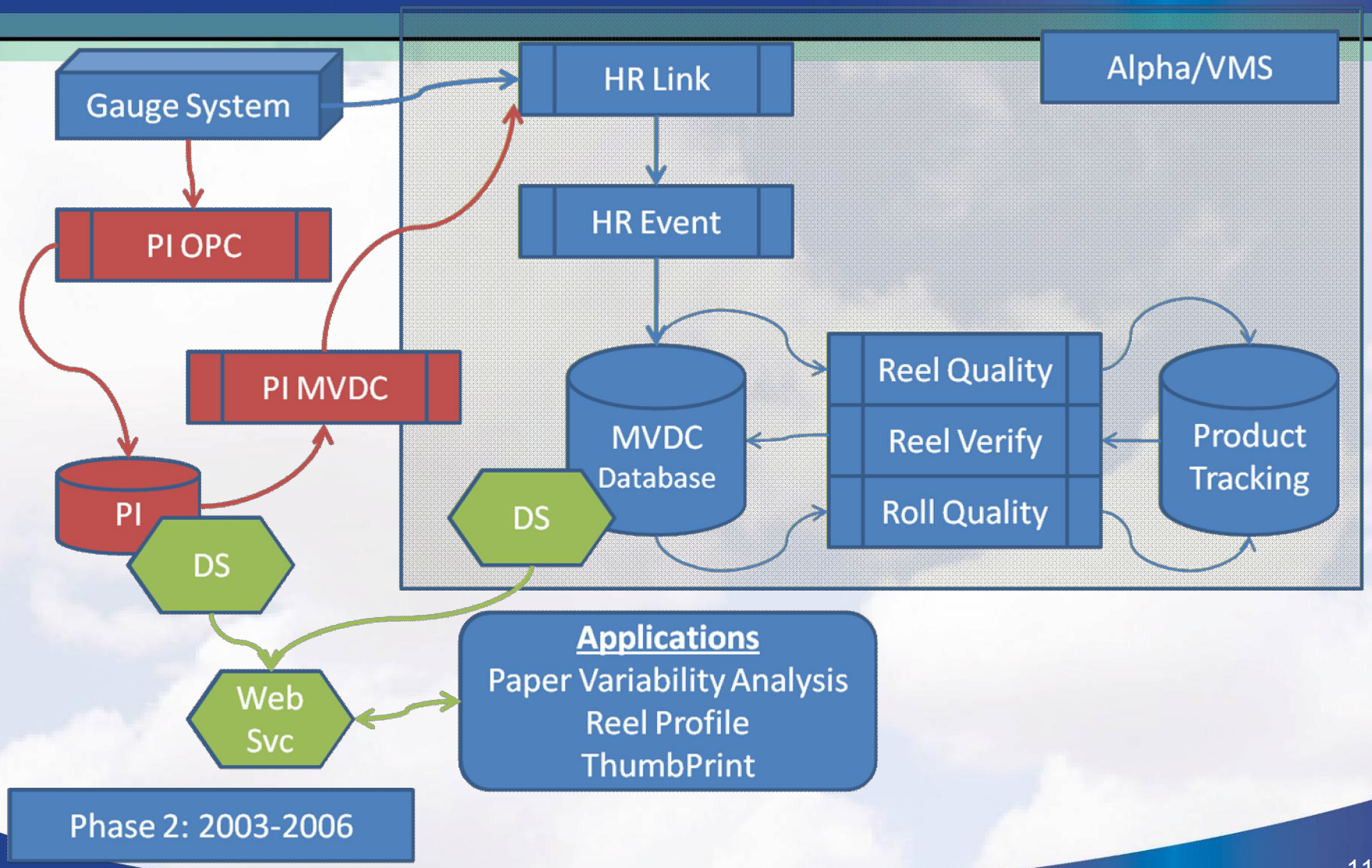
Replace Serial Links (2000-2002)



Changes During Phase 1

- Transition to PI OPC for Gauge Links
- Trigger Tags for Scan Synchronization
- Added Edge of Sheet Logic to PI
- Wrote PI-MVDCLink with PI-API
  - Caching Point IDs
  - Trigger Tags
- Virtual Sensors with PI-PE's
  - Conditioned Weight = f(Basis Weight, Moisture)

“Proof of Concept” (2003-2006)



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Changes During Phase 2

- Added MVDC Web Service
  - Hides Data Source from Applications
  - Manages Configuration Information
- Made PI-MVDCDS Look Like VMS MVDCDS
  - Added Reel Profile to the Data Server
  - “Compressed XML”
  - Multi-Threaded the API for Speed
- Changed MVDC Applications to Use Web Services
- Added MVDC Status Information

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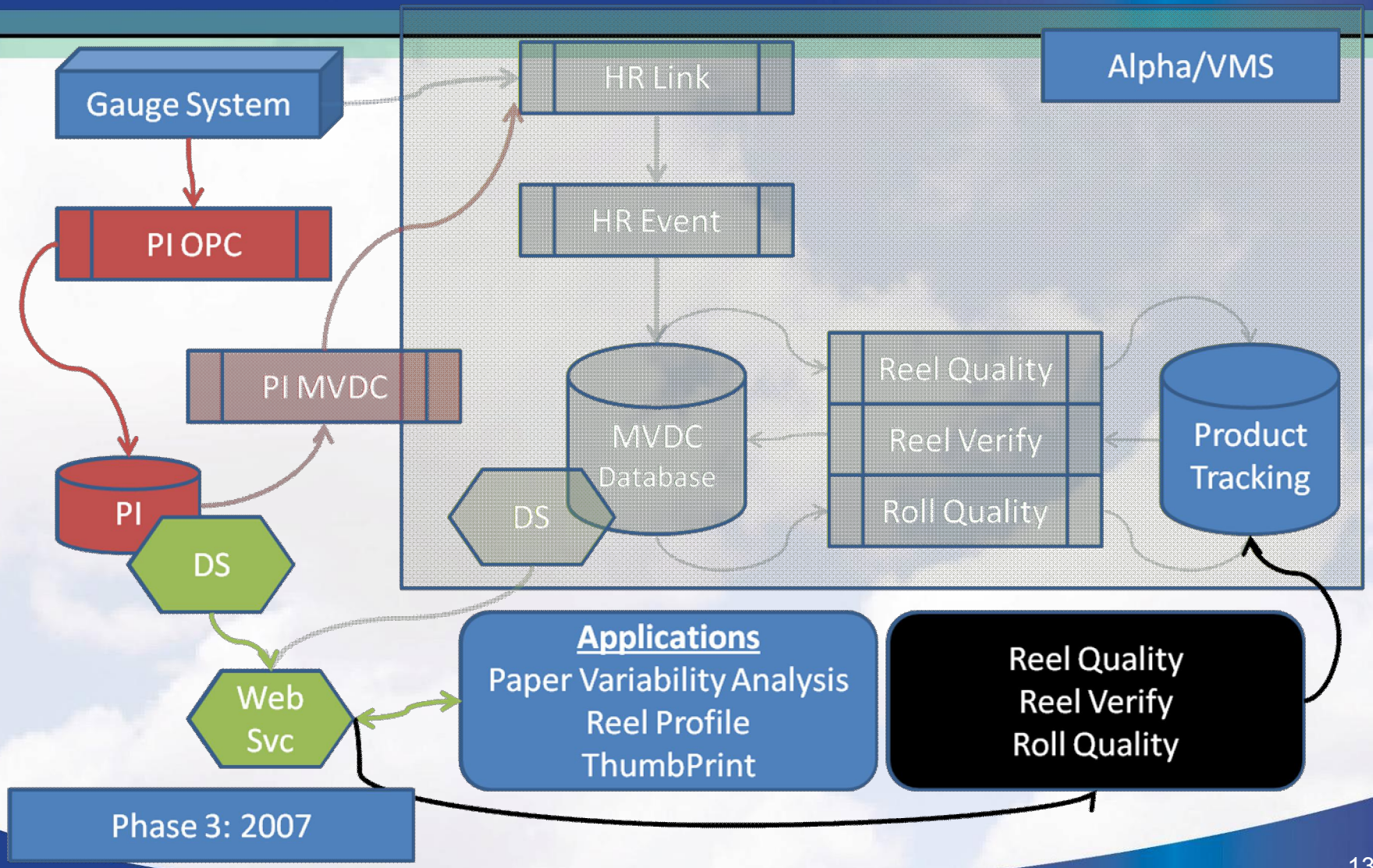
VMS Elimination (2007)



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Changes During Phase 3

- Expanded Web Service Methods
- Centralized Configuration
  - Distributed Web Services Cache Local Configuration
- Ported VMS Applications to Windows
  - Reel/Roll Quality, Reel Verify
  - Configurable Quality Calculations
  - Wrote Windows/VMS Shuttle Programs

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Resulting Benefits

- 59 Machines at 26 Paper Mills (17 US)
  - Same Data Available Anywhere
- Met Response Time Requirements
- Leveraged PI (Historian, Interfaces & PEs)
  - New Gauge Links in Hours
  - Nothing Proprietary to Store Scan Data
- Bare Bones VMS Requirements
  - Messages to Product Tracking

Future Plans

- Validate Data Quality OPC Add-In (2007)
- Troubleshooting Tools (2007)
  - MVDC Status
  - DCView
- Finish Roll-Out (2008)
- PI-High Availability Requires PI-SDK
  - Timing Study of PI-API vs. PI-SDK

Lessons to Take with You

- Do No Harm
- Develop a Roadmap
- Test Early to Help Guide Design
- N-Tier Development Techniques
  - Separate Applications from Data Sources
- Compressed XML for Speed

Tools Employed

- PI OPC
- PI Historian
- PI Performance Equations
- PI API
- EZ-JCom
- Apache Tomcat
- XML (Compressed)
- TCP/IP Socket I/O

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Thank You

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