Best Practices for Implementing Asset Framework

Presented by **Richard M Smith Jr**
Stephen Kwan, Product Manager

INTERNATIONAL PAPER

Keep in Mind

Who will consume the data?

There is no “right way” to building AF

Start small and build up

Solve a specific problem

Get Started, with a Plan and a Purpose

Look for one or two business cases to define:

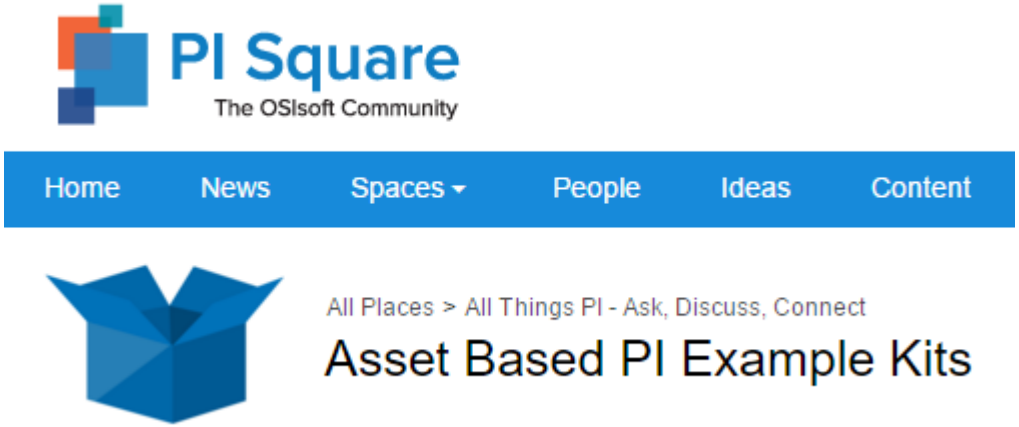
- Critical assets
- Data sources of
  - Time series
  - Meta data
  - Structure
- Someone has to maintenance
- Change management

Best Practice

- Only model what you have understood
- Only invest in resources if you have the use case

Don’t try to boil the ocean or find theory of everything

Need Examples to get Started?



- Customer examples - http://www.osisoft.com/templates/presentation-list.aspx?id=1818

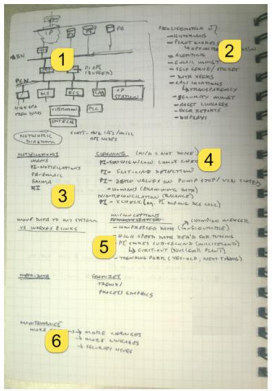
International Paper

Building the Case for AF (UC 2015)

- IT Service Providers Want to Simplify a Complicated Environment

Red-Eye Flight from OSISoft 2014 UC...

1. Typical Network
2. Proliferation
3. Notifications
4. Data Cleaning
5. Misconceptions
6. More…More… More



- Management Wants Significant Return-on-Investment (ROI)

How to Satisfy Many Customers?

- **IT Service Providers**
  - Simplify/Standardize Archaic Solutions
  - Leverage Software We Already Owned
- **Management and Operations**
  - Rapidly Solve High Value Problems
  - Solve Difficult Problems
    - Reduce Time Transforming Data into Information
    - Improve Data Visualization => Events and Batches
    - Alert When Operation Deviating from “Normal”
  - Replicate Solutions Across Enterprise
- **Me**
  - Leverage AF and Event Frames… and PI Coresight
  - Avoid Mill-Wide and Focus on Single Operating Lines/Units

My Selection Criteria for Picking Projects

- High Return and Unit Level Scope
  - Mill-Wide/Enterprise Projects Create Lots of “Help”
- Look for High Replication Potential
  - 10 Times… 50 Times… 1000 Times
- Leverage AF Features
  - We Are Not Just Replacing Performance Equations
- Find Hard to Analyze Scenarios
  - 3+ Hours -> 5 Minutes
- Know How to Collect/Transform/Visualize/Alert Operators

AF Projects (2015-Present)

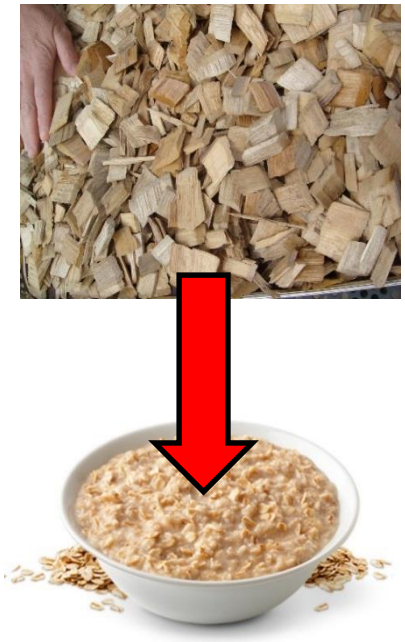
- **Batch Digester Performance (2015)**
- Paper Machine Winder Performance (2015)
- Paper Machine Sheet Break Analysis (2016)
- Track/Alarm on Heat Exchanger Fouling (2016)

- Pick a Project…
  - **We Are Going to Make Mistakes…**
  - **Admit it… Get Over it… and Get Started!!!**

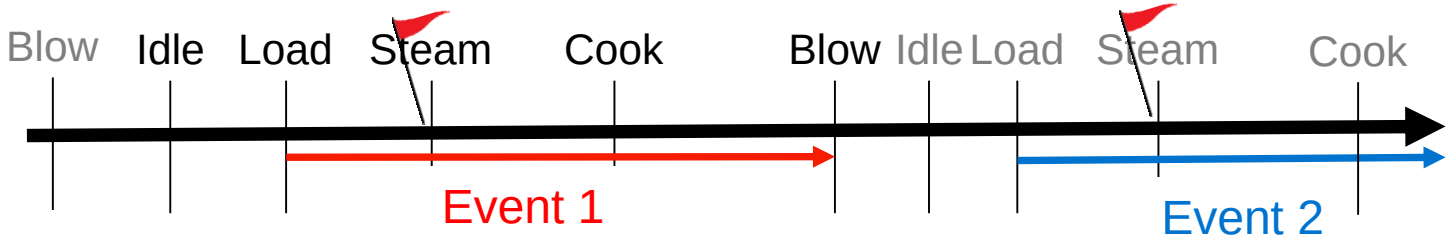
Batch Digester Project Requirements (2015)

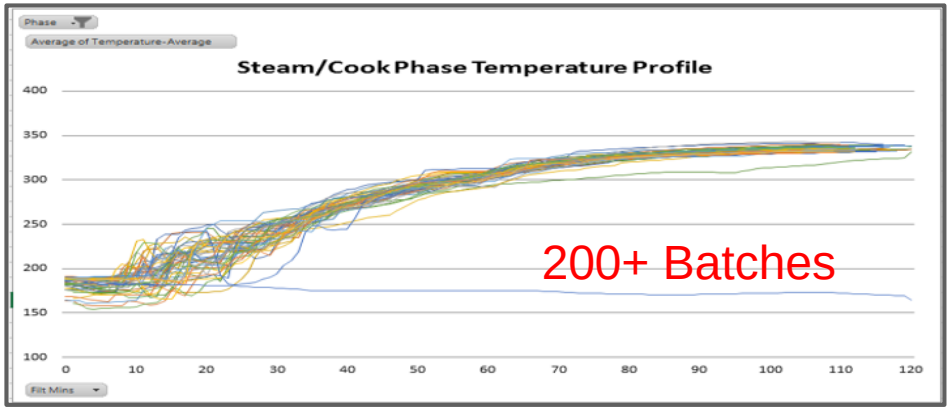
- **Problem: Low Performance and Dropping**
  - Digesters Convert Wood Chips to Pulp

- Mill Needed to Improve Data Analysis
  - Chips, Chemicals by Digester
  - Create Temperature Profile Curves
  - Meta Data (Dig #, Line #, Crew, etc.)
- Mill Wanted to Improve Data Visualization



What is a Digester Batch?





Did We Make Mistakes? Yes…

- **"Bad" Phase PI Tags (Inconsistent Equations)**
  - Fixed 3 Years of Data Archive History
- **Template Changes => "Bad" Event Frames**
  - Added "isFullBatch" Flag to Event Frame Template
- **Missed Meta-Data for Reporting and Replication**
  - Added to Template and Retrigger Events
- **Writing "Steam-Start-Time" to PI Took Iterations**
  - Change and Retrigger…Change and Retrigger… Change and Retrigger…
  - Event Backfill Was Hard in 2015, But is Easy Today
- **Mills Differ in Configuration and Units of Measure**
  - Continuing Opportunity for Improvement

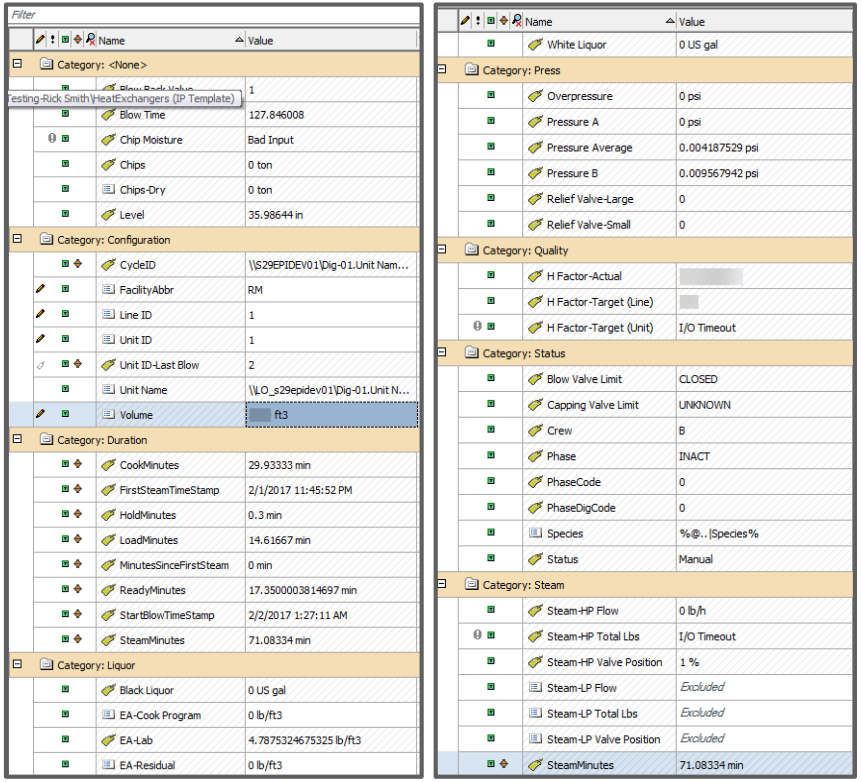
Development Methodology

1. **Create in Development Environment (Loveland, Ohio)**
   a. Read Data from Facility; Write Data to Development PI Server
   b. Built Elements and Analyses
   c. Configure 3 Digesters… Backfill 3 Days… Validate
   d. Build Test Reports… Review w/ Operations
2. **Configure 1st 3 Digesters at Facility**
   a. Transfer Templates and Reports to Facility
   b. Read Data from Facility; Write Data to Facility PI Server
   c. Backfill 7-10 Days and Validate; Review w/ Operations
   d. Backfill Same Digesters for 3 Years
3. **Configure Remaining Digesters at Facility**
   a. Repeat Step 2
4. **Go To Step 1 for Enhancements**

Build the AF Element

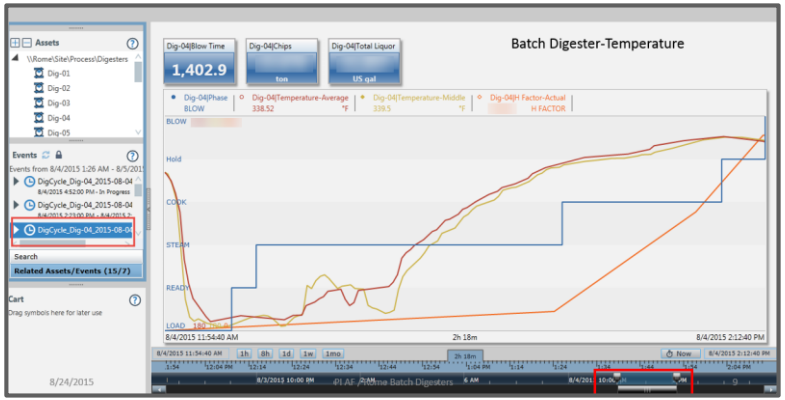
- 55 Element Attributes
- 51 Event Frame Attributes
- 2 Lines / 15 Digesters

- PI Coresight & PI ProcessBook Displays Leverage Assets



Validate Data and Calculation Assumptions

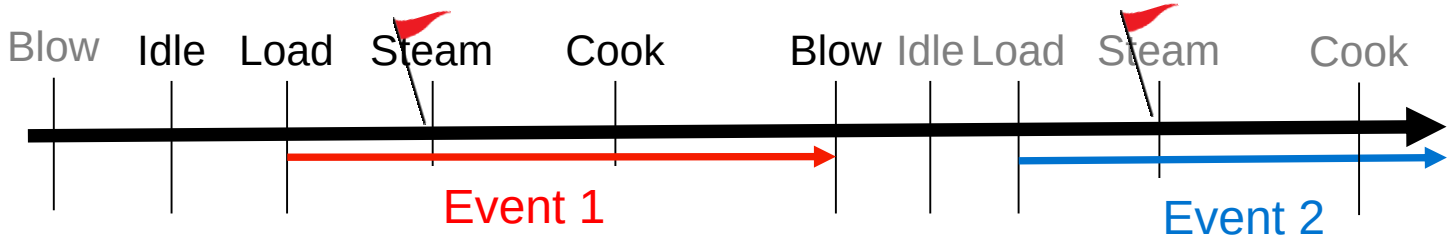
- Are Key Inputs Working?
- Is the Batch Phase Correct?
- Is the Process Data Correct?



- Corrections Were Required, But After Fixes We Could…
  - Build Batch/Phase Models and Event Frames

Build Analyses in AF

- **Batch Phases Generated by DCS**
- **DigCycle Analysis**
  - Event Frame to Summarize Batch Information
  - Incorporated **isFullBatch Flag** into Event Frame
- **DigCycleID Analysis**
  - Mill Wanted to Trend Minutes Each Phase PI Tags
- **DigFirstSteam Analysis**
  - Flag Timestamp Steam Begins (Temperature Profile)

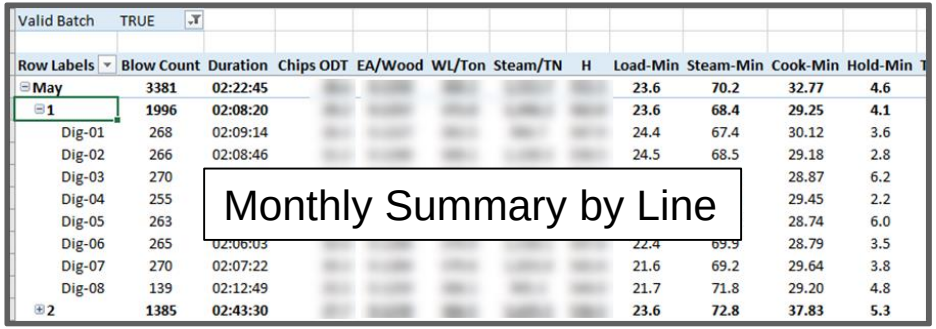


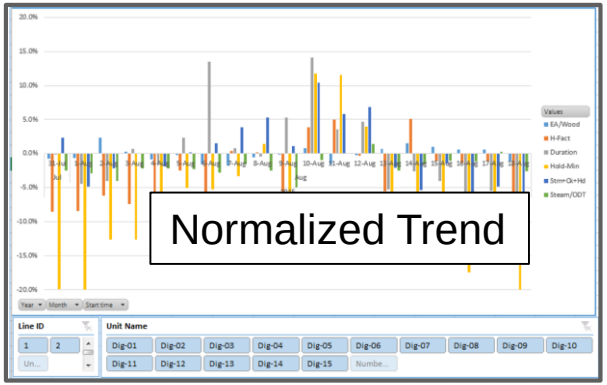
How to Visualize the Results?

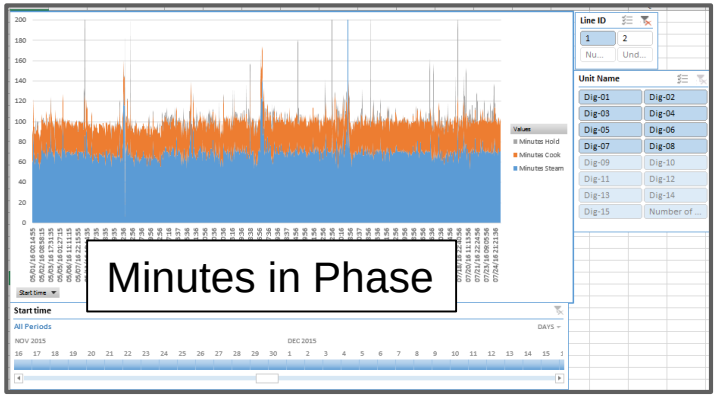
- **Potential Visualization Tools**
  - **User**: PI Datalink, PI ProcessBook, PI Coresight
  - **Developer**: PI OLEDB Provider, PI OLEDB Enterprise

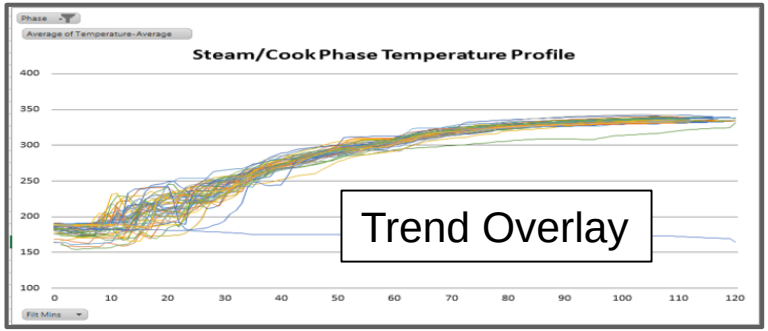
- **Mill Chose to Use an Excel Spreadsheet Solution**
  - **OLEDB** to Retrieve Events (w/ VBA)
    - Too Many Attributes for PI Datalink
  - Pivot Tables and Pivot Charts to Filter and Analyze Data

Data Visualization (Excel Pivot Charts)









Transform Data Into Events Into Dollars

- AF Transformed Raw PI Data Into Events
- Rick Extracted Events into Excel for Analysis
- Mill Used Overlapping Temperature Profiles for Visual Indicator
- Mill Analyzed the Batch Events Across Time and Digesters
  - **Weekly Analysis Dropped from 3+ Hours to 5 Minutes**
  - **Identified Process Issues in Minutes vs. Hours/Days**
- Identified Relationship Between Blowing Digester and Screens

- **Before: <75% of Target… After: >100% of Target**

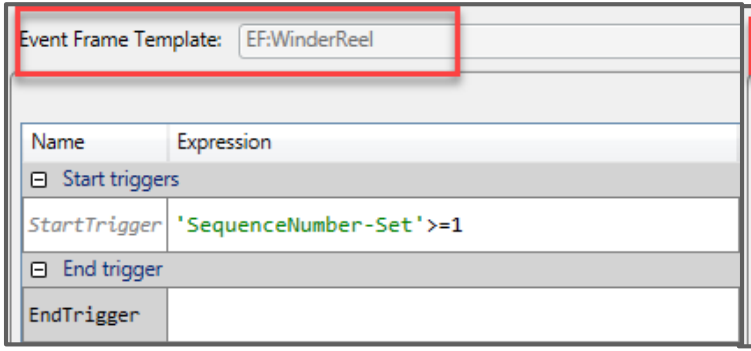
Return on Investment

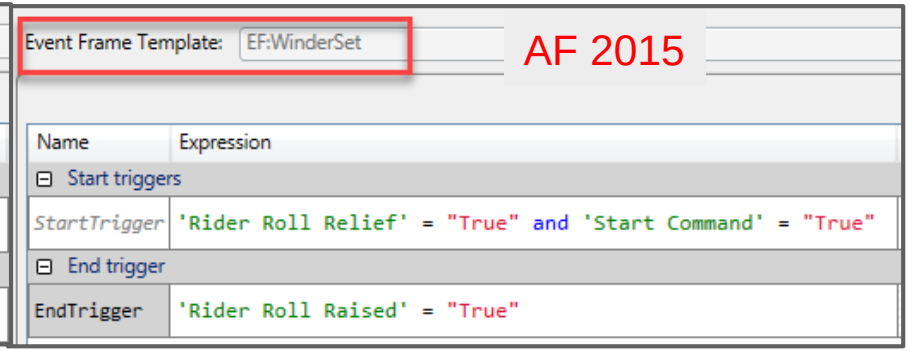
Project	Implementation (Calendar Days)	Cost Payback (Calendar Days)
Batch Digester (1st)	**20**	**<1**
PM Winder (1st)	5	<1
PM Sheet Break Data Collection (1st)	<1	n/a
Batch Digester (2+)	**5**	**<1**
PM Winder (2+)	1-2	<1
Heat Exchanger (1st Prototype)	5	?
Heat Exchanger (2+) (2017 Project)	0.2	varies

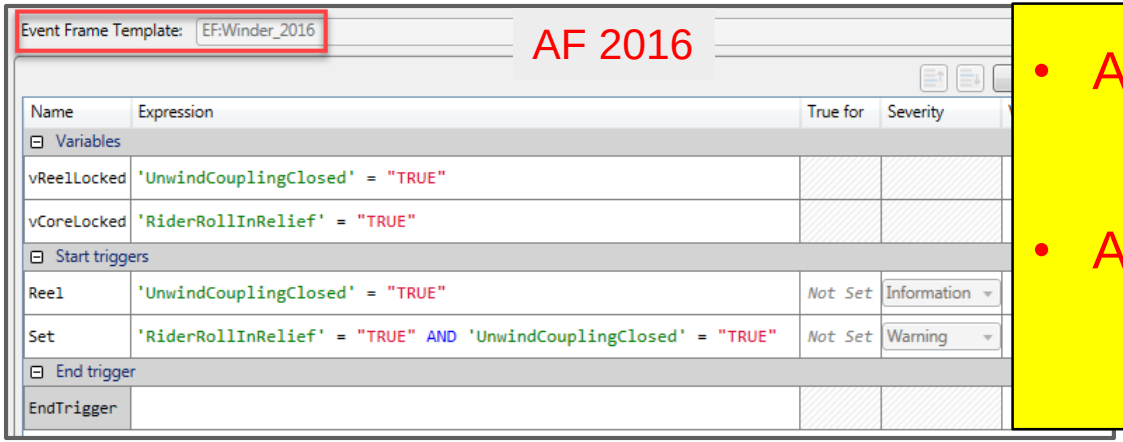
In Summary – Rick's 9 Tips

1. Focus on **High Value Projects**
2. Develop Requirements with **Customer**
3. Focus on **Needs** and Not Wants
4. **Keep Scope Small and Focused**
5. Accept "Good Enough" Visualization
6. Incorporate **Self Diagnosis** Into Analysis
7. **Consider Replication** Issues During Development
8. Stay "**In-the-Box**" As Long As Possible
9. **Watch for New AF Features**… Can Greatly Simplify Effort

Benefits of New AF Features (PM Winder Project)







- AF 2015
  - 2 Analysis Templates
  - 6 Analyses
- AF 2016 (Severity)
  - 1 Analysis Template
  - 1 Analysis

AF 2017 R2 and Beyond

AF 2017 R2 – Planning Stage

Enhanced Streaming Calculation	• Auto recalculation • Calculations on event frames
Manageability	• Support PI System Health
Performance and Scalability	• Event frame scale • Better diagnostics for analyses and notification rules • Search capabilities
Usability and Features	• Attribute display names • Hierarchical enumeration sets • Notifications push to phone

AF 2018 and Beyond – Research

Enhanced Streaming Calculation	• Integrate with 3rd party analytics – MATLAB, R, etc.
Manageability	• Enterprise deployment • Web based configuration
Performance and Scalability	• PI Analysis Service scaling • PI Notifications Service scaling
Usability and Features	• Incorporate Data Quality into the PI System • Flag stale data • Identity provider

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Contact Information

Rick Smith
Richard.SmithJr@ipaper.com
Process Information Consultant
International Paper

Stephen Kwan
skwan@OSISoft.com
Product Manager
OSISoft

Questions

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谢谢

Danke

Gracias

Merci

Thank You

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Спасибо

Obrigado

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