

# B4P

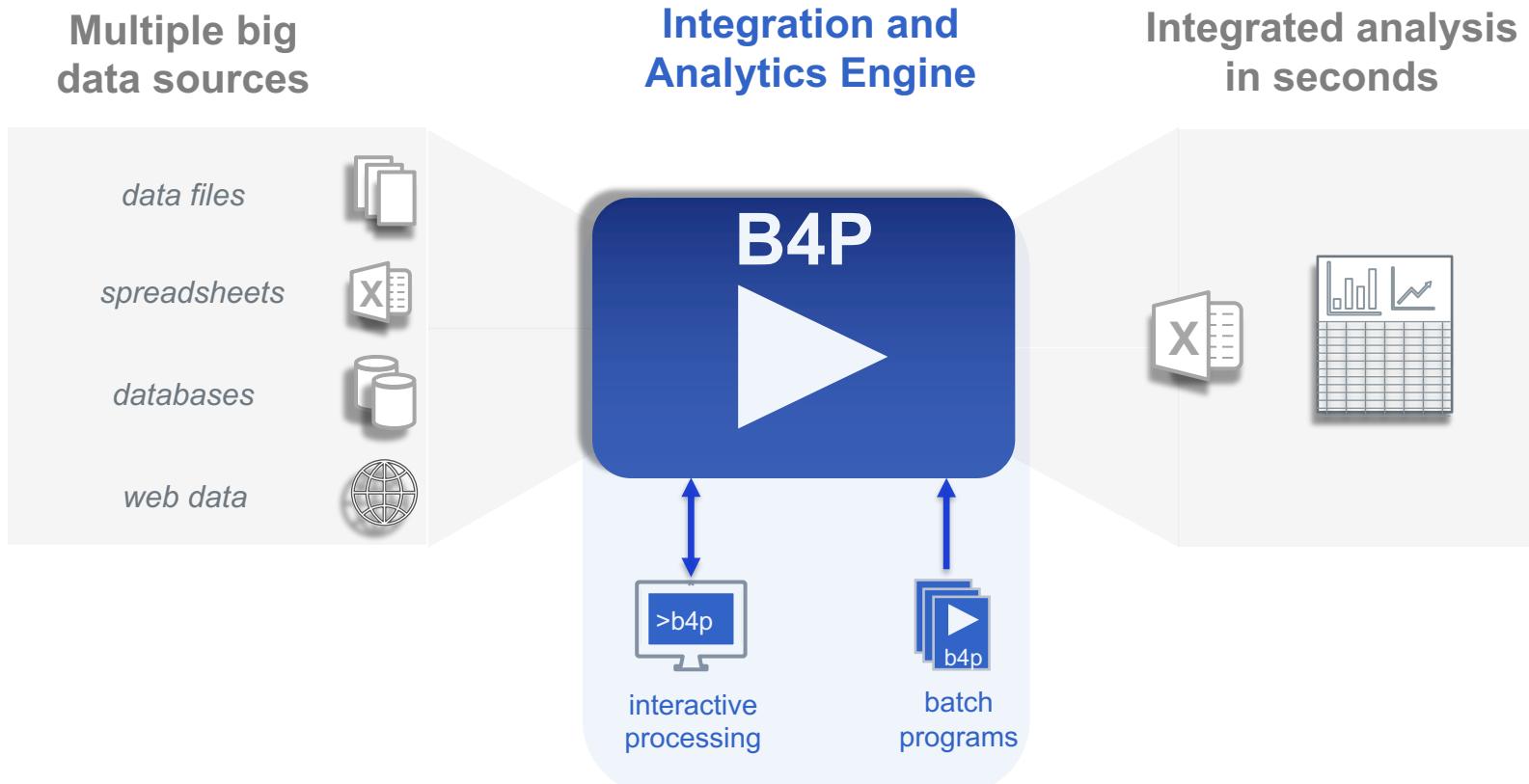
## Beyond Former Performance.

*A powerful programming language and analytics engine  
enabling rapid transformation of big data into powerful insights*

*Transforming Big Data into Powerful Insights*



## B4P Data Integration and Analytics Engine



### Data Sources and Formats

<b>data files</b>	Excel, CSV, XML, JSON, HTML, Zip, Text (and others)
<b>databases</b>	Database exports (Salesforce, Oracle, SAP, FileMaker, et al)
<b>web data</b>	Internet sources of structured data (websites, web services)
<b>other data</b>	Statistical (R, SAS, SPSS, Stata), PDF (via Tabula)

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# B4P Data Integration and Analytics Engine

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# Business Analytics: Problem Statement

## Spreadsheets are Essential to Business but are a Source of Error, Risk, and Loss

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### Spreadsheets are Essential to Business

- Excel is over 30 years old and is the most common tool used in business and finance. According to Microsoft, there are over 750 million Excel users worldwide [6].

### Most Spreadsheets Contain Errors

- Studies show that 88% of corporate spreadsheets contain at least one - but most commonly multiple - material errors [2, 7, 8, 9].

### Spreadsheet Errors are Costly

- \$2.6 Billion: Fidelity Magellan Fund (minus sign error)
- \$1.1 Billion: Fannie May (“honest mistake”)
- \$ 6.2 Billion: JPMorgan Chase: (copy-paste errors)

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[1] [https://en.wikipedia.org/wiki/Microsoft\\_Excel](https://en.wikipedia.org/wiki/Microsoft_Excel)

[2] European Spreadsheet Risks Interest Group: <http://www.eusprig.org>

[3] <https://www.cio.com/article/2438188/eight-of-the-worst-spreadsheet-blunders.html>

[4] <https://www.businessinsider.com/excel-partly-to-blame-for-trading-loss-2013-2>

[5] <https://blog.trginternational.com/7-worst-financial-fiascos-caused-by-excel-errors>

[6] <https://www.businessinsider.com/satya-nadella-excel-is-microsofts-best-consumer-product-2016-6>

[7] <https://www.forbes.com/sites/bernardmarr/2016/06/16/spreadsheet-reporting-5-reasons-why-it-is-bad-for-business>

[8] <https://www.forbes.com/sites/metabrown/2017/10/30/why-spreadsheets-are-eating-your-business-from-the-inside-out/>

[9] <https://www.marketwatch.com/story/88-of-spreadsheets-have-errors-2013-04-17>

[10] <https://www.forbes.com/sites/salesforce/2014/09/13/sorry-spreadsheet-errors>

[11] <https://www.nytimes.com/2003/10/30/business/fannie-mae-corrects-mistakes-in-results.html>

# Business Analytics: Problem Statement

## Spreadsheets are Essential to Business but are a Source of Error, Risk, and Loss

JPMORGAN CHASE & CO.

**\$6.4 Billion loss:** “The London Whale,” the name given to a **JP Morgan** trading operation in London by its counterparties because of the outsized bets it was making. In the wake of a discovery of the large losses racked up by “the Whale,” JP Morgan launched an internal investigation into how it happened. One of the key points that came out of the internal investigation was the role of desktop spreadsheets in creating the mess. “The Model Review Group noted that the ***Value at Risk computation was being done on spreadsheets using a manual process and it was therefore ‘error prone’*** [1,2,3,4]



**\$2.6 Billion loss:** An accountant at the **Fidelity Investments' Magellan mutual fund omitted a minus (-) sign in a spreadsheet** and turned a US\$ 1.3bn net capital loss into a US\$1.3bn gain. This \$2.6 bn error required the company to withdraw its promised year-end distribution of \$4.32 per share. [1, 3]



Fannie Mae®

**\$ 1 Billion loss:** A **spreadsheet error at Fannie Mae** regarding cost the company in excess of \$1 billion, causing the share price to fall from \$73.10 to \$2.25 after the error was announced publicly. [5]

[1] <https://www.cio.com/article/2438188/eight-of-the-worst-spreadsheet-blunders.html>  
[2] <https://www.businessinsider.com/excel-partly-to-blame-for-trading-loss-2013-2>  
[3] <https://blog.trginternational.com/7-worst-financial-fiascos-caused-by-excel-errors>

[4] <https://www.forbes.com/sites/salesforce/2014/09/13/sorry-spreadsheet-errors>  
[5] <https://www.nytimes.com/2003/10/30/business/fannie-mae-corrects-mistakes-in-results.html>

# Business Analytics: Problem Statement

## Current Spreadsheet Analytics Tools are Unsafe, Complex, and Expensive

### **Unsafe**

Excel Macros

(Visual Basic)

- Only acceptable for simple, small, low-risk tasks
- Formulas are ‘hidden’ and opaque and not auditable.
- Macros are cumbersome and cryptic
- Performance extremely poor if working with large, real-world data sets.

**Manual, opaque, un-auditable, poorly performing “code” with high risk for error**

### **Complex**

Programming

(Python, R, SAS etc.)

- Requires programming expertise and complex development environment
- Runs fast, but requires many years of programming experience to program, debug and optimize.
- Others may have difficulties to understand what is written.
- Large, complex code with many functional details coded by hand.

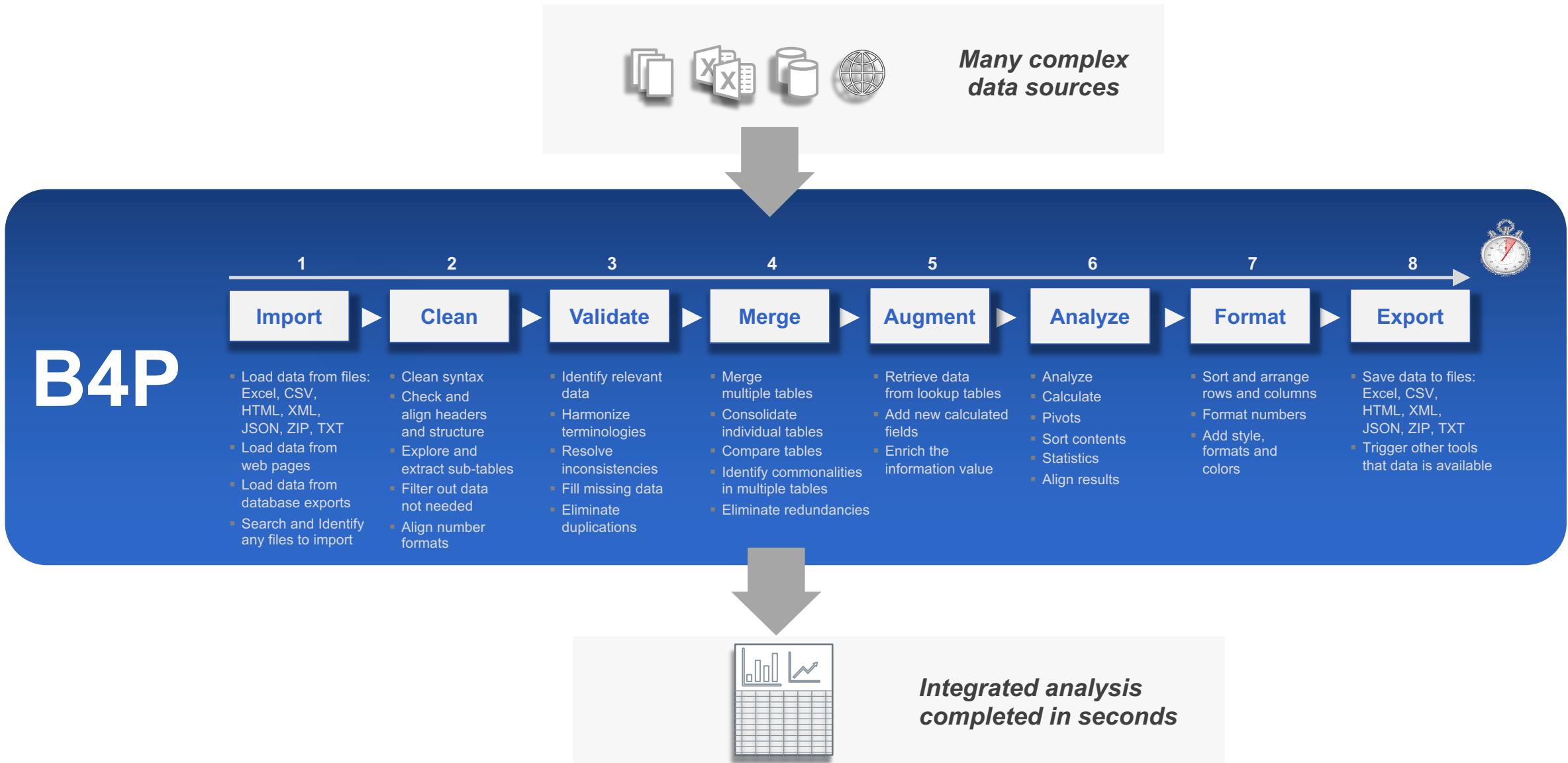
**Code difficult to create, comprehend, share, manage, maintain, or adapt**

### **Expensive** Consultants

- Consultants are happy to solve your problems for cash. Solutions can be decent, but ...
- ... if you need further enhancements, they will ask for more cash.
- You end up depending on them, and you need to repeatedly convince your boss that the updates are worth the money.

**Solution is expensive with vendor lock-in and no long-term sustainability**

## B4P Data Integration and Analytics Engine



# B4P Components

## B4P is a Language and Analytics Engine

### B4P Language

The B4P Language is a Low-Code, Domain-specific Language designed specifically for tabular data, and has over 800 functions built in.

```
table load excel file
table load
table rename column headers
table process selected rows
table merge
table sort rows
table rearrange columns
table save excel file
```

#### Principle of Low-Code Approach

- **Simple syntax:** Easy to read, learn, understand and run
- **Extensive library:** Over 800 powerful functions built-in, with easy extensibility for new functions.
- **Compact methods** for powerful processing steps eliminates need for complex code, loops, or other administrative overhead.

### B4P Analytics Engine

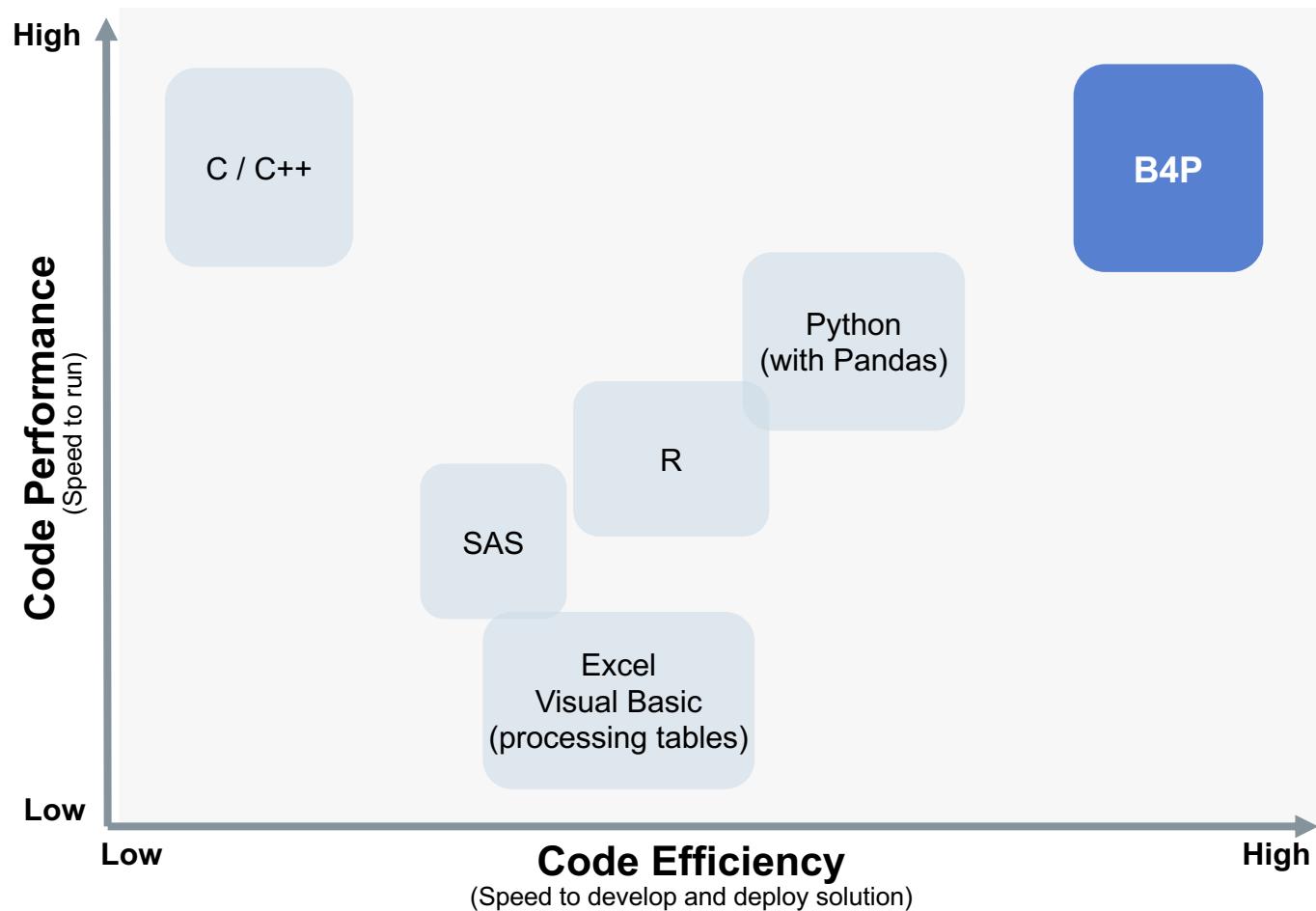
The B4P Engine has extreme performance processing Big Data – tens of millions of rows of data in seconds - on commodity personal computers.



- **Fast:** Compiled and runs 'on the metal' to the peak performance of the very latest 8-core and 12-core processors from Intel and Apple (M1).
- **Lightweight** (< 3 MB installation footprint).
- **Secure.** No connection to any 'cloud service'. Runs 100% on standalone personal computer fully isolated within the corporate network.
- **Reliability.** Single integrated analytics engine has no dependencies, including network access to any other resources.
- **Many data formats supported**  
(Excel, HTML, XML, JSON, text files, etc., full UNICODE)

# B4P Language

## Provides Highest Efficiency and Performance



*The B4P Language is a Low-Code, Domain-specific Language for tabular data, and has over 800 functions built in.*

### High Performance and Scalability

- Processes extremely large data (tens of millions of rows) in seconds

### High Efficiency and Simplicity

- Single statements replace need for 10-50 lines of code in other languages.

### Low Code

- Delivers solution with minimal coding**
- Maximum functionality with fewest lines of code

### Optimized for Simplicity of Coding

- Function library and semantics allow for flexible and powerful operations without loops and variables
- Example: **table process ( ... )**

### Programs are Portable across all Platforms

- B4P programs are fully portable, sharable, and executable across all operating systems (Windows, Linux, MacOS) and all computer architecture (Intel x32, x64; ARM M1), assuring maximum re-use across the enterprise.

# B4P

## Language Features

### Simplicity

#### Easy to read und understand

- Close to natural language.
- Clear syntax easy to read.
- Compact and powerful semantics.

#### Big Tables are the DNA

- Language semantics are built on processing tables easily.
- No external libraries needed.

#### Low Code - Very Compact

- Achieve the most with few lines of code in step-by-step approach.
- No hassle with declaring variables, memory management, etc.

#### High Power Density

- High coding density translates into maximum machine performance.

### Performance

#### Rich Function Library

- More than 800 functions available and growing.
- Many functions process very large tables, sets, matrices and other structures.
- Broad spectrum of other general purpose and file system functions.
- Advanced flow control functions going far beyond *for*, *while* and *if*.

#### Code in Function Parameters

- B4P supports code passed as parameters to functions which are then executed when needed.
- Makes operations possible without using variables and loops.

#### Colorful & Formatted Output

- B4P supports a rich library to create Excel and HTML files with rich formatting, auto filters, etc.

### Flexibility

#### Freedom of Naming

- Full naming flexibility (all characters, incl. space) for variables, tables and headers.
- Create variable names from other data, e.g. table header names.
- Multiple word function names

#### Flexible Variable Structure

- Create and work with simple variables, parameter sets, structures and arrays.
- Supports complex variable tree structures in a simple way.

#### Libraries

- Import libraries or create your own libraries to optimize your programming efficiency.

### Portability

#### Cross Platform Portability

- B4P programs run under Windows, LINUX and MacOS (incl. M1) without adaptations.
- No need to change path names to run on other OS environments.

#### File and Data Formats

- Supports CSV, HTML, Excel (with formats), JSON, etc. transparently.

#### UNICODE

- B4P is fully UNICODE compatible, and accepts all UTF character formats on top of legacy formats.

#### Standard I/O

- GUI intentionally not supported to preserve cross-platform portability.
- Same console I/O feature set across platforms, incl. text colors.
- Embed B4P in batch programs

**The B4P Language allows one to solve complex problems with minimal, simple, clear code**  
**Focus on the what, not the how.**

# B4P Examples

# B4P Example #1

## Merging Two Soccer Clubs

**Football Club Membership**

First Name	Family Name	City	Level
Abel	Amberstone	Amsterdam	Beginner
Beata	Berghill	Barcelona	Experienced
Corinne	Carlson	Copenhagen	Beginner
Dietmar	Davis	Dublin	Beginner
Ellen	Evans	Essen	Beginner
Fred	Fisher	Frankfurt	Experienced
Gregory	Green	Gaza City	Experienced
Henry	Hansson	Hamburg	Experienced
Ida	Ingelberg	Ingolstadt	Beginner
John	Janssen	Johannesburg	Beginner
Karl	Karlsson	Kansas City	Experienced

**Soccer Club Membership**

Level	Town	Last Name	First Name
Questionable	Kyoto	Karlsson	Karl
Novice	London	Lee	Linda
Experienced	Morristown	Miller	Mike
Experienced	New York	Nguyen	Nathali
Experienced	Oslo	Oliveiro	Oscar
Novice	Phoenix	Paulsson	Petra
Novice	Quebec City	Quarles	Quincy
Experienced	Riga	Richardson	Richard
Experienced	San Diego	Stewart	Sandra
Experienced	Tahoma	Turner	Tim
Questionable	Ulm	Ufford	Uwe
Novice	Venice	Viking	Victor

**Merged Club Membership**

Level	First Name	Last Name	Town
Beginner	Abel	Amberstone	Amsterdam
Beginner	Corinne	Carlson	Copenhagen
Beginner	Dietmar	Davis	Dublin
Beginner	Ellen	Evans	Essen
Beginner	Ida	Ingelberg	Ingolstadt
Beginner	John	Janssen	Johannesburg
Beginner	Linda	Lee	London
Beginner	Petra	Paulsson	Phoenix
Beginner	Quincy	Quarles	Quebec City
Beginner	Victor	Viking	Venice
Experienced	Beata	Berghill	Barcelona
Experienced	Fred	Fisher	Frankfurt
Experienced	Gregory	Green	Gaza City
Experienced	Henry	Hansson	Hamburg
Experienced	Mike	Miller	Morristown
Experienced	Nathali	Nguyen	New York
Experienced	Oscar	Oliveiro	Oslo
Experienced	Richard	Richardson	Riga
Experienced	Sandra	Stewart	San Diego
Experienced	Tim	Turner	Tahoma
Questionable	Uwe	Ufford	Ulm
Questionable or Experienced	Karl	Karlsson	Kyoto or Kansas City



**Task:** Create a new merged club based on two existing sports clubs

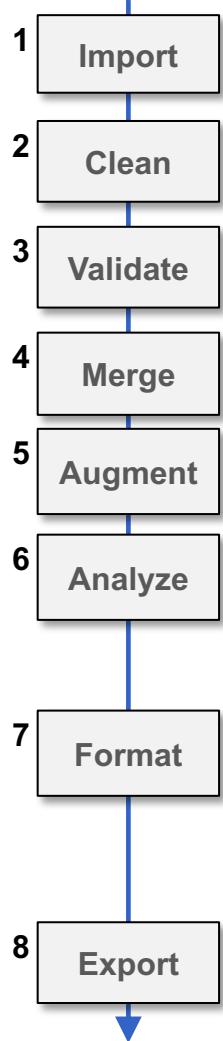
- The tables of the two clubs are arranged differently and use different naming schemes
- Some people are members in both clubs and need to be resolved properly.
- Highlight possible inconsistencies (red text color)

# B4P Example #1

## Merging Two Soccer Clubs

### Solution: 8 Statements

(Optional formatting: 5 statements)



```
table load excel file      ( football club, Football Membership List.xlsx );
table load                  ( soccer club, Soccer Membership List.csv );

table rename column headers. ( football club, { Family Name, City }, { Last Name, Town } );

table process selected rows. ( soccer club, [Level]==Novice, [Level]=Beginner );

table merge                 ( football club, soccer club,
                               {Last Name,First Name},{Level,Town},append," or " );

table sort rows             ( soccer club, { Level, Last Name, First Name });
table rearrange columns     ( soccer club, { Level, First Name, Last Name, Town } );

table style table            ( soccer club, sheet, freeze rows, 1, autofilter, 0 );
table style auto width       ( soccer club );
table style rows              ( soccer club, 0, sheet, boldface, true, fill color, gray 15 );

table process selected rows  ( soccer club, ([Level] = '*Questionable*'),
                               ( soccer club, Level, row(), single, text color, red ) );

table save excel file        ( soccer club, Soccer Club, New Soccer Club Membership.xlsx );
```

**Plain English multi-word names**

- Functions, variables, tables, etc.

**Simple business logic**

- No or minimal loops or variables needed for coding

**Portability ensured**

- Statements are independent from platform and output format

**Powerful formatting functions**

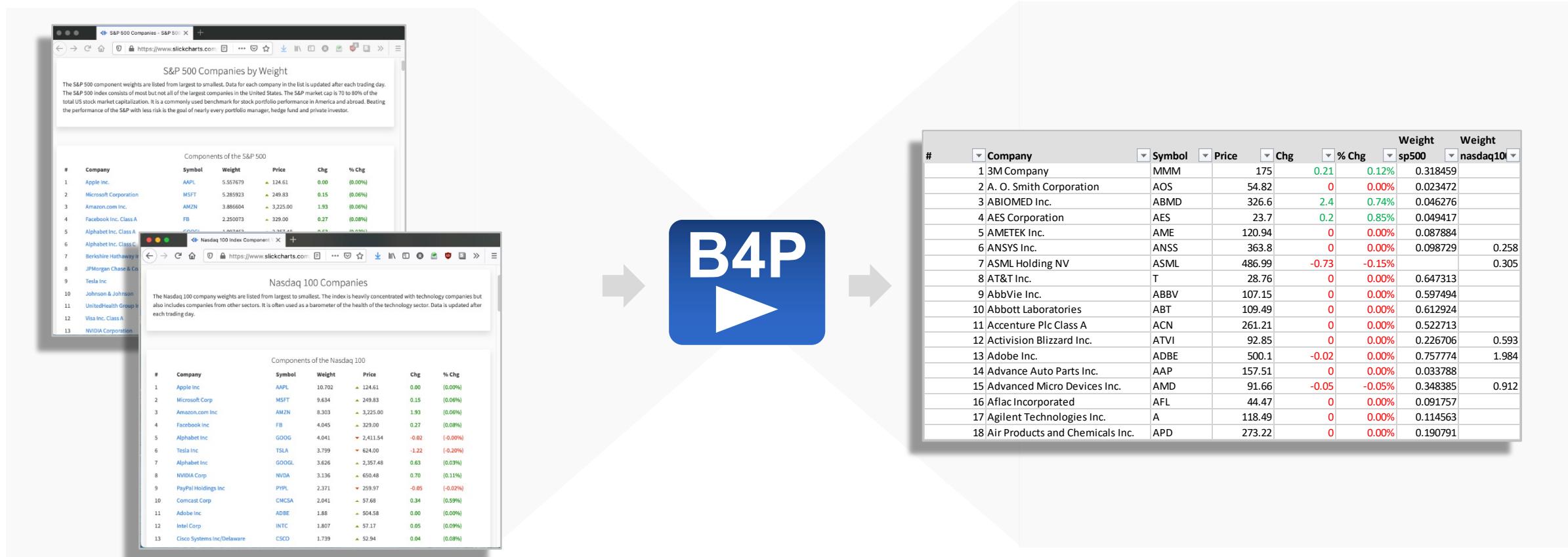
- Small number of statements suffice

**Full Excel support**

- Loading and saving
- Full data transparency

# B4P Example #2

## Combining Stock Data: S&P 500 and NASDAQ 100



**Task: Import real-time online S&P 500 and NASDAQ 100 stock information and merge them**

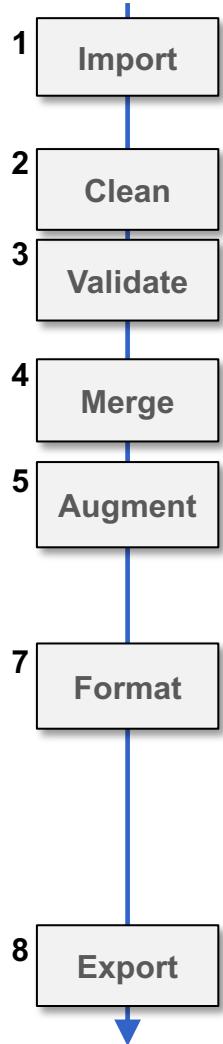
- Data source1: <https://www.slickcharts.com/nasdaq100>
- Data source2: <https://www.slickcharts.com/sp500>
- Some companies are listed in only one of them, others are listed in both.
- Combine the information, show weighting in the two listings and color code trends (positive/negative)

# B4P Example #2

## Combining Stock Data: S&P 500 and NASDAQ 100

### Solution: 12 Statements

(Optional formatting: 6 Statements)



```
for all parameters ( {nasdaq100, sp500} , listing[] )
{
    file download overwrite ( "https://www.slickcharts.com/" + listing[], listing[] + .html);
    table load
        ( listing[], listing[] + .html, HTML, "Components of the" );
    table clean
        ( listing[], trim spaces );
    table process
        ( listing[], [% Chg']=smart numeral( middle( [% Chg'], (',') ) ); [Price]=clean numeral([Price]) );
    table rename column headers ( listing[], "Weight", "Weight " + listing[] ); // Weights are specific to Nasdaq and S&P
}

table merge extend columns ( nasdaq100, sp500, Symbol );
table rename
    ( sp500, stocks );

table sort rows
    ( stocks, Company );
table process
    ( stocks, ['#'] = row() ); // Number the items

table rearrange columns
    ( stocks, { '#', Company, Symbol, Price, Chg, '% Chg' } ); // Weightings follow afterwards

table style auto width
table style theme
table process
    table style cells
table style columns
table style table
    ( stocks );
    ( stocks, Zebra Vertical Lines, pattern, 2, table, "gridlines, false" );
    ( stocks, // Negative numbers: red; positive numbers: navy blue
    ( stocks, { 'Chg', '% Chg' }, { 2: row() }, single, text color, select if ( [Chg]>0, navy, red ) ) );
    ( stocks, '% Chg', sheet, number format, "0.00%" ); // Value to show as percent.
    ( stocks, sheet, freeze rows, 1, autofilter, 0);

table save excel file
    ( stocks, "NASDAQ and SP500", Stocks.xlsx );
```

# B4P Example #3

## Analyzing all Presidents in Wikipedia

destroy the fragile unity holding the nation together, Washington remained unaligned with any political faction or party throughout his eight-year presidency.

**Contents [hide]**

- 1 Presidents
- 1.1 President-elect
- 2 Subsequent public office
- 3 See also
- 4 Notes
- 5 References
- 6 External links

**Presidents**

Presidency <sup>[a]</sup>	President	Party <sup>[b]</sup>	Election	Vice President
1 April 30, 1789 – March 4, 1797	George Washington	Unaffiliated	1788–89 1792	John Adams <sup>[c]</sup>
2 March 4, 1797 – March 4, 1801	John Adams	Federalist	1796	Thomas Jefferson <sup>[d]</sup>
	Aaron Burr		1800	



President	Presidency (1)	President	Party	Election	Vice President
1 April 30, 1789 – March 4, 1797	George Washington	Unaffiliated	1788–89, 1792	John Adams, Thomas Jefferson	
2 March 4, 1797 – March 4, 1801	John Adams	Federalist	1796	Thomas Jefferson	
3 March 4, 1801 – March 4, 1809	Thomas Jefferson	Democratic-Republican	1800, 1804	Aaron Burr, George Clinton	
4 March 4, 1809 – March 4, 1817	James Madison	Democratic-Republican	1808, 1812	, Vacant after Apr. 20, 1812, Elbridge Gerry, Vacant after Nov. 23, 1814	
5 March 4, 1817 – March 4, 1825	James Monroe	Democratic-Republican	1816, 1820	Daniel D. Tompkins, John C. Calhoun,	
6 March 4, 1825 – March 4, 1829	John Quincy Adams	Democratic-Republican	1824, 1828, 1832	, Vacant after Dec. 28, 1832, Martin Van Buren	
7 March 4, 1829 – March 4, 1837	Andrew Jackson	Democratic	1836	Richard Mentor Johnson	
8 March 4, 1837 – March 4, 1841	Martin Van Buren	Democratic	1840	John Tyler	
9 March 4, 1841 – April 4, 1841	William Henry Harrison	Whig	Vacant throughout presidency,		
10 April 4, 1841 – March 4, 1845	John Tyler	Whig	1844	George M. Dallas	
11 March 4, 1845 – March 4, 1849	James K. Polk	Democratic			

**Task: Download the list of Presidents and generate an Excel table with one president per row.**

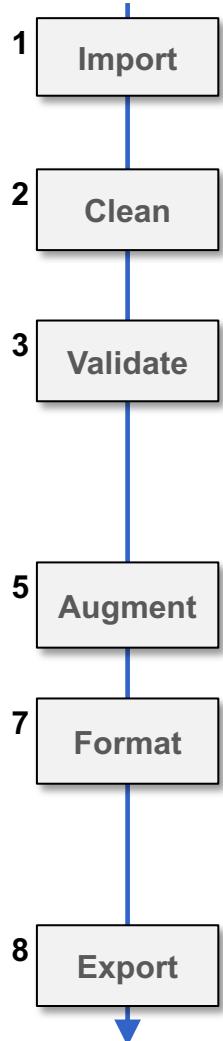
- Data source: [https://en.wikipedia.org/wiki/List\\_of\\_presidents\\_of\\_the\\_United\\_States](https://en.wikipedia.org/wiki/List_of_presidents_of_the_United_States)
- Some Presidents won multiple election terms
- Ignore the portraits
- Some vice presidents had deviating terms
- Remove redundant artefacts (cross-referencing symbols)
- Generate a nice table with **parties colored differently**

# B4P Example #3

## Analyzing all Presidents in Wikipedia

### Solution: 9 Statements

*(Optional formatting: 7 Statements)*



```
include ( Style Library );
file download overwrite      ( "https://en.wikipedia.org/wiki/List_of_presidents_of_the_United_States", presidents.html );
table load                  ( presidents, presidents.html, HTML, 'id="Presidents"' );

// Strip all footnote references and new lines in the fields, and the last table row with footnotes inside
table delete rows          ( presidents, table length( presidents ) -1 ); // -1 = Last Row (negative indexing)
table process all cells     ( presidents, [.] = replace all( literal([.]), { '[?]' , new line, '- ' }, { '' , '' , '-' } ) );

// Remove the blank column originally containing portraits and put president name into all rows
table delete columns        ( presidents, {Portrait, Party} );
table rename column headers ( presidents, {"Presidency (1)", "Party (1)"}, {Period, Party} );
table fill vertically       ( presidents, President );
table consolidate           ( presidents, President, { Election, Vice President }, append, ", " );

// Define party colors
table initialize            ( party colors, {{ Party Name, Colors },
    { Party Name, Colors }, { Democratic, azur }, { Republican, imperial red },
    { Federalist, coral }, { Whig, yellow }, { "Democratic-Republican", excel light green },
    { National Union, ocre }, { Unaffiliated, gray 15 } } );

// Add some colors and styles
table process               ( presidents, table style cells( presidents, Party, row(), single,
    fill color, [ party colors : Party Name, [Party], Colors ] ) );
table style columns          ( presidents, { "Presidency (1)", "President", "Vice President" }, sheet, column width, 30 );
table style columns          ( presidents, { Party, Election }, sheet, column width, 20, horizontal align, middle );
table style rows             ( presidents, 0, table, boldface, true );
table style table            ( presidents, sheet, wrap text, true, autofilter, 0, freeze rows, 1 );

table save excel file       ( presidents, All U.S. Presidents, presidents.xlsx );
```

# **B4P**

# **Real-World**

# **Use Cases**

# B4P Real-world Use Case #1

## Integrate corporate data from 20 branch offices worldwide

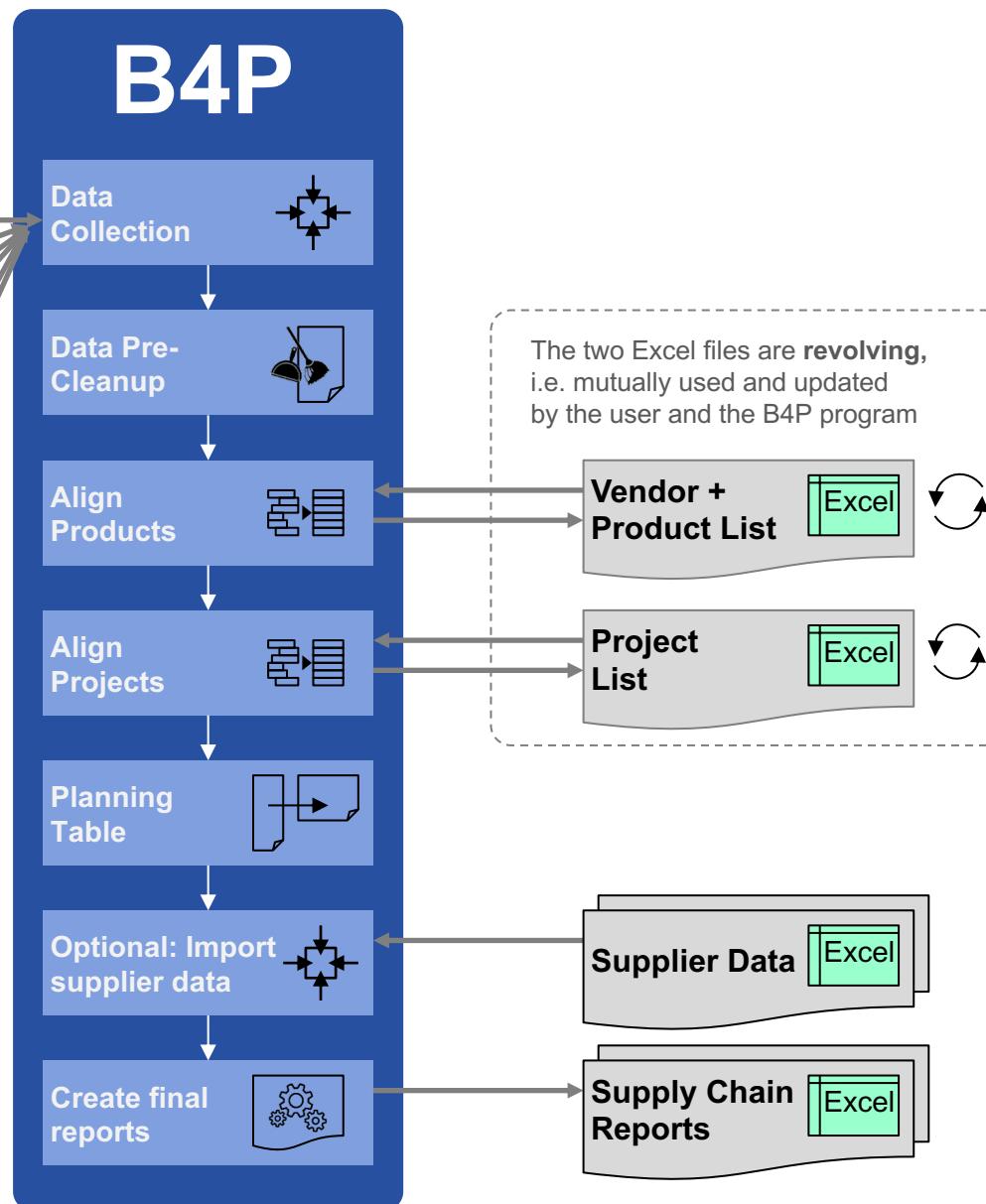
*Each region manages their own data in different database systems or manually with Excel*



⋮  
⋮



**More than 20 different files!**



### 1. Load Data from all Sources

- The data from different sites originate from 20 different database exports or manually prepared Excel files

### 2. Clean-Up and Harmonize

- Harmonize data formats to week numbers and years

### 3. Align Product Information

- The revolving table manages the products to include and allow for using harmonized product names.
- Orientation is by common product identification number.

### 4. Align Project Information

- Different project names and/or abbreviations are used by the sites. They will be aligned.

### 5. Project Name Alignment

- The sequential list of individual demands is transformed to a horizontal planning table with weekly schedule.
- Information consolidation and summing up

### 6. Import supplier planning data

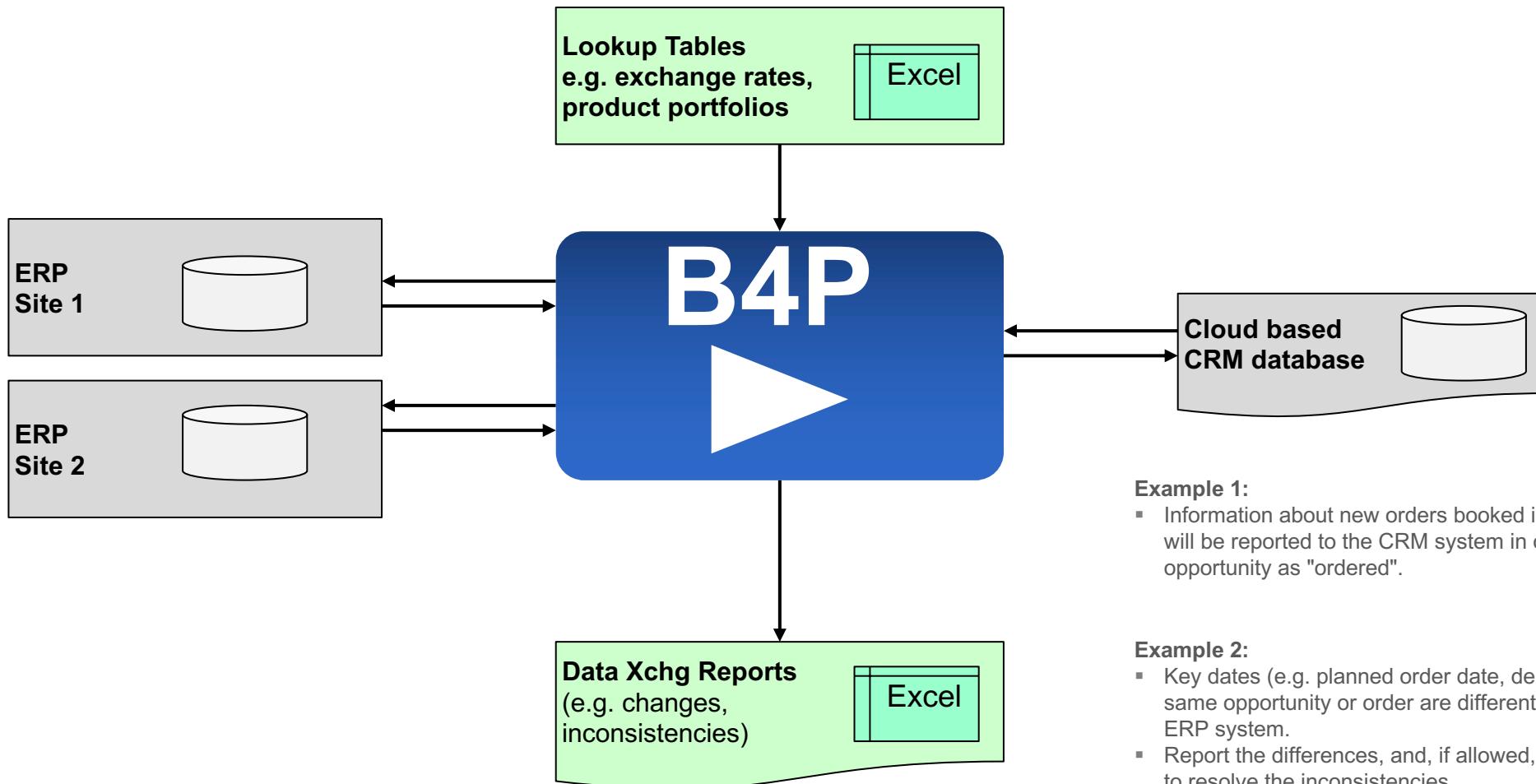
- If supply info is available, then match demand with their delivery plans

### 7. Reports

- Detailed internal reports for performance monitoring
- Condensed reports for suppliers

# B4P Real-world Use Case #2

## Information interchange between multiple different databases



### Example 1:

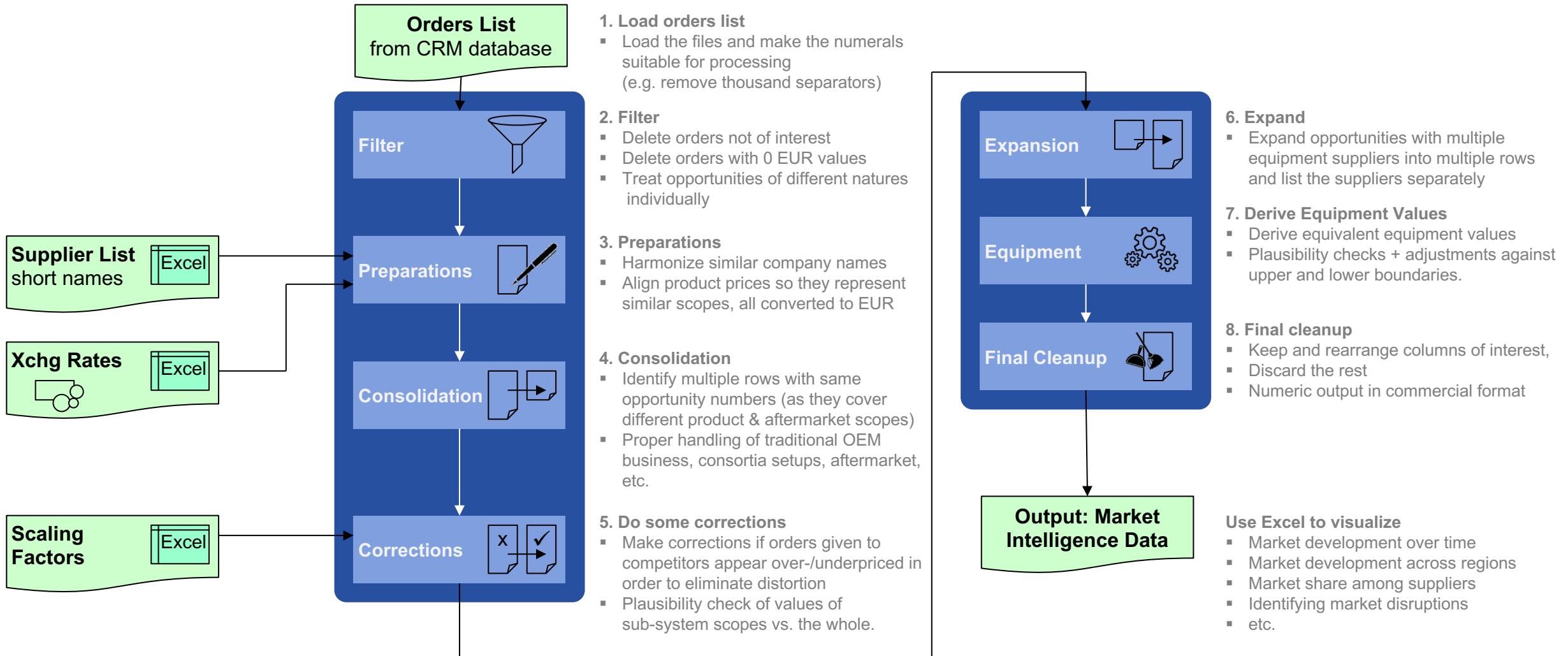
- Information about new orders booked into the ERP system will be reported to the CRM system in order to mark the opportunity as "ordered".

### Example 2:

- Key dates (e.g. planned order date, delivery dates) for the same opportunity or order are different in the CRM and ERP system.
- Report the differences, and, if allowed, use automated rules to resolve the inconsistencies

# B4P Real-world Use Case #3

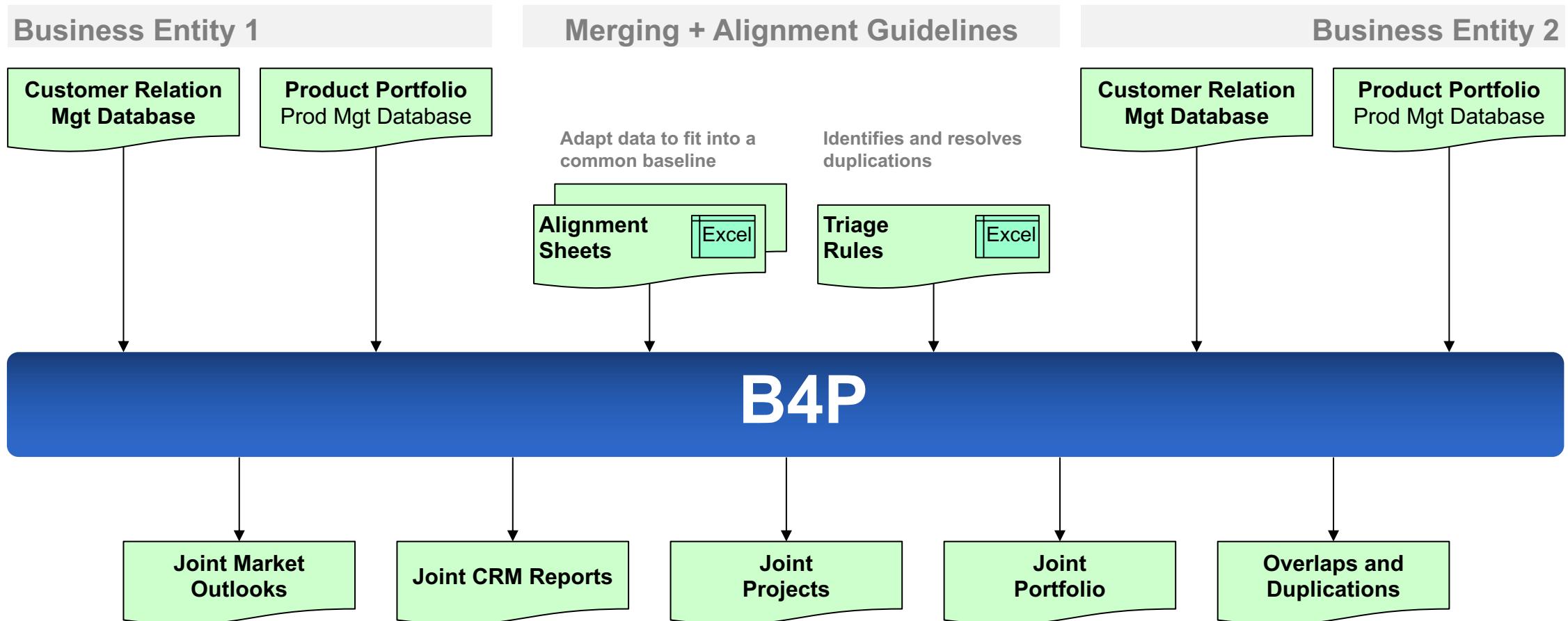
## Enriched Business Intelligence from many data sources



## B4P Real-world Use Case #4

### Merger and Acquisition

During the business integration, the two organization, even their individual sites will continue using their information repositories for a certain time until the business integration process has been finalized.



# B4P: Strategic and Operational Use Cases

## Strategic Use Cases

### Business and Market Analytics

- Processing big data collected from (empirical) market assessments to derive market trends, value-adding conclusions and outlooks.
- Powerful analysis of financial and market data for your investment decisions.

### Mergers and Acquisitions

- Providing joint information analysis from both parties which (still) maintain two different databases and ways of working, ready for presentation.
- Swift generation of new data structures and database based on multiple legacy databases helpful for the business integration process

### Big Data

- Extract the most essential information from raw big data collections

### Data Integrity Verification

- Analyze financial, logistics, operational and CRM data for integrity and validity. Generate lists of suspected shortcomings and correct them.

### Engineering and Technical Applications

- Analyze simulation results and identify information patterns of interest.
- Analyze commonalities of multiple bills of material.
- Automatic documentation compilation and staging of software projects (Example: Complete B4P online documentation created with B4P)

## Operational Use Cases

### Efficient Reporting

- Collect and condense large base data in order to extract essential information required for periodic reporting and presentation.
- Validation: Compare the data with rules, best practice patterns, etc.
- Identify all potential deviations and help to explain abnormalities effectively towards senior management.
- Complement or enrich the data with supporting information.
- Provide the data in a form so using Excel is the final step to do the creativity work, e.g. making convincing charts.

### Repeating Procedures

- Save significant working time by automating repeating work patterns where Excel is used to collect, compile and analyze data.
- Benefit: Saving time and making significantly less mistakes

### Gather and Track Key Performance Indicators (KPI)

- Gather data from different sources, validate and provide updated KPI's
- Highlight root causes of possible abnormalities (e.g. discontinuities)

### Leverage Information Awareness

- Create an information environment where you are alerted in an early phase in case of any abnormalities or changes of particular interest.

*Reliable data analytics generates accurate conclusions  
providing your business a critical competitive advantage*

# B4P

## Beyond Former Performance.

Information

[www.b4p.app](http://www.b4p.app)

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