

Technology Update

Mike Phillips, Technical Director

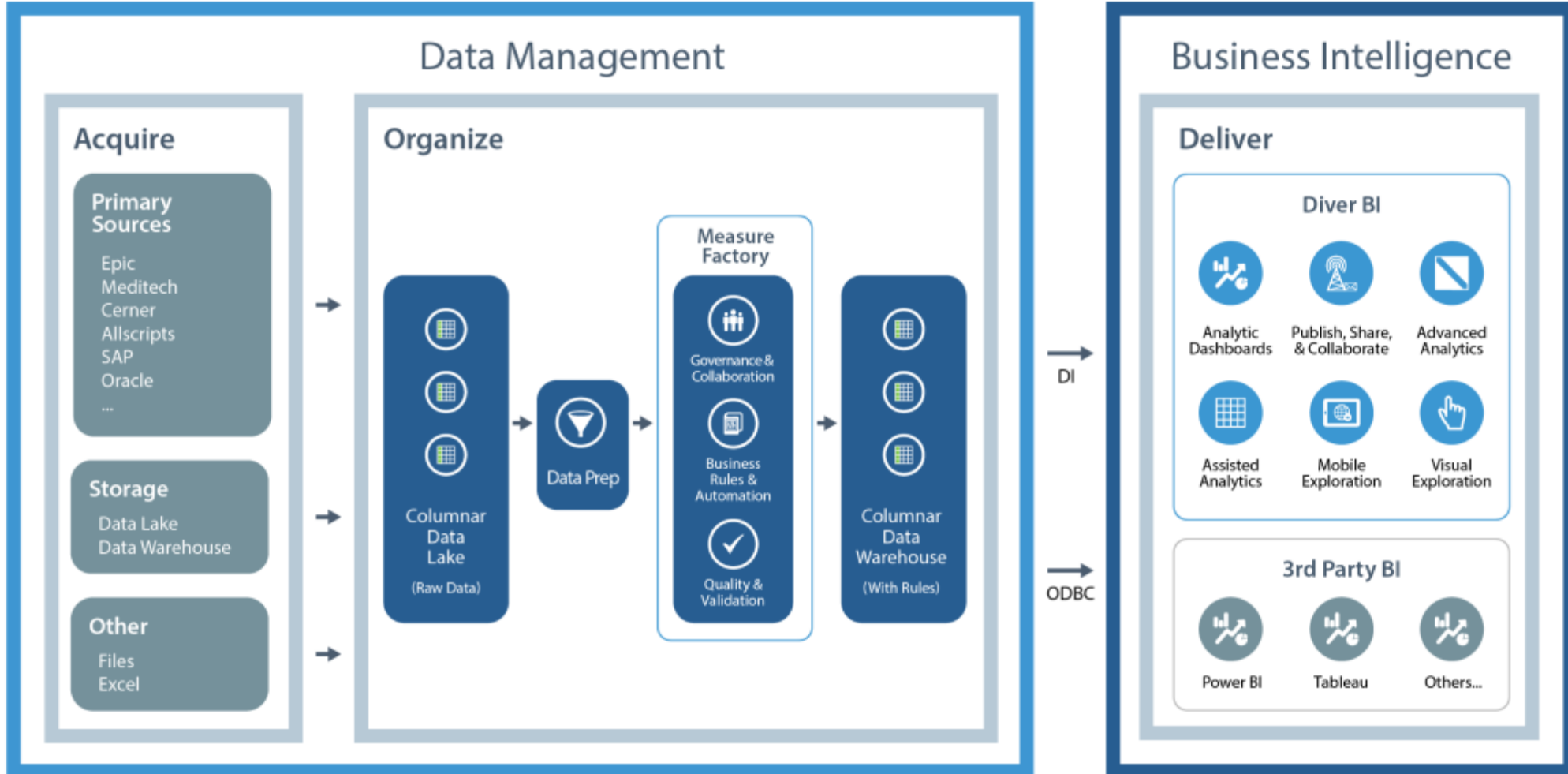
Jamie Clark, Technical Director

James Kirtley, Principal Software Engineer

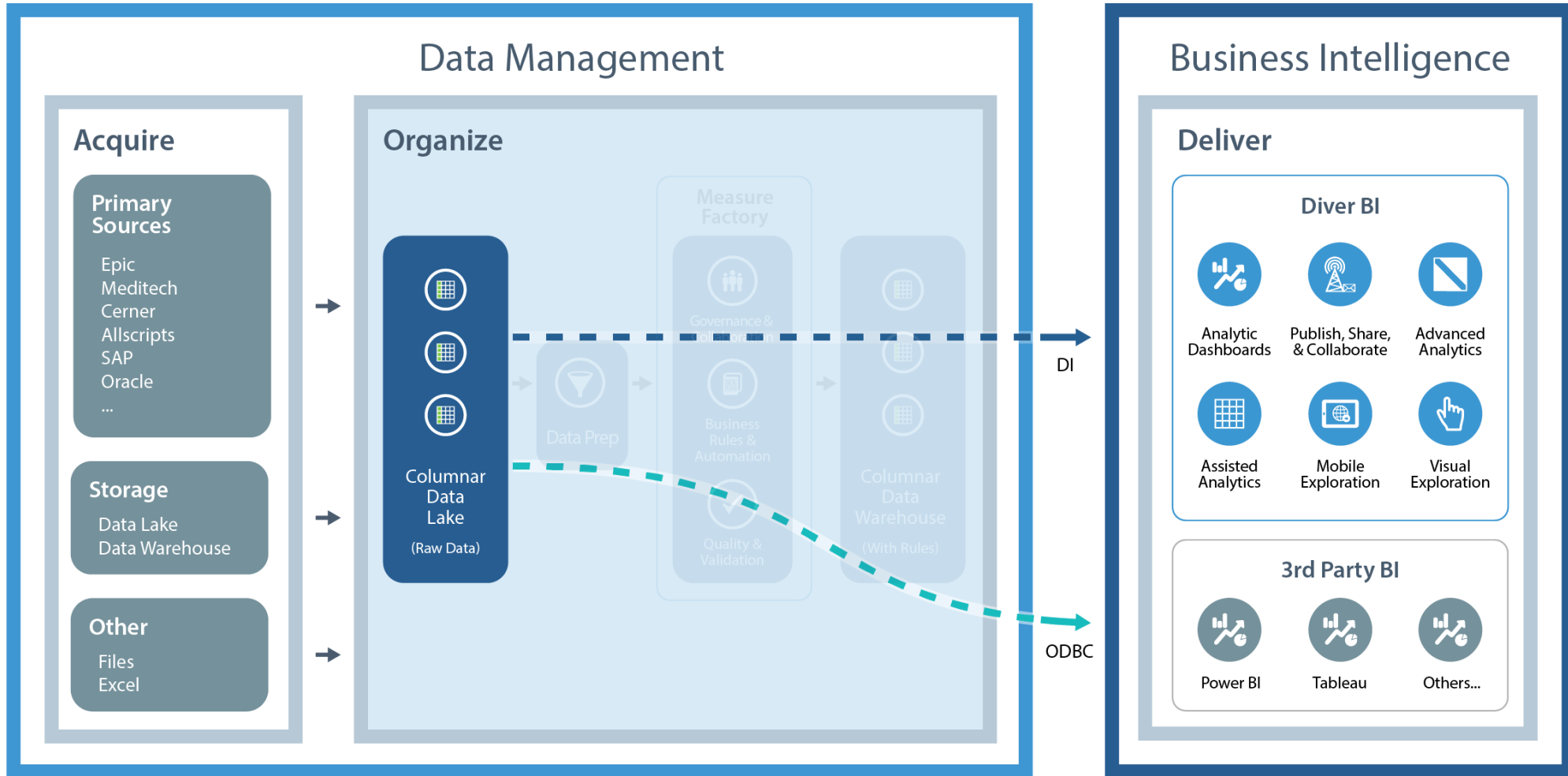
Dimensional Insight User Group

2019

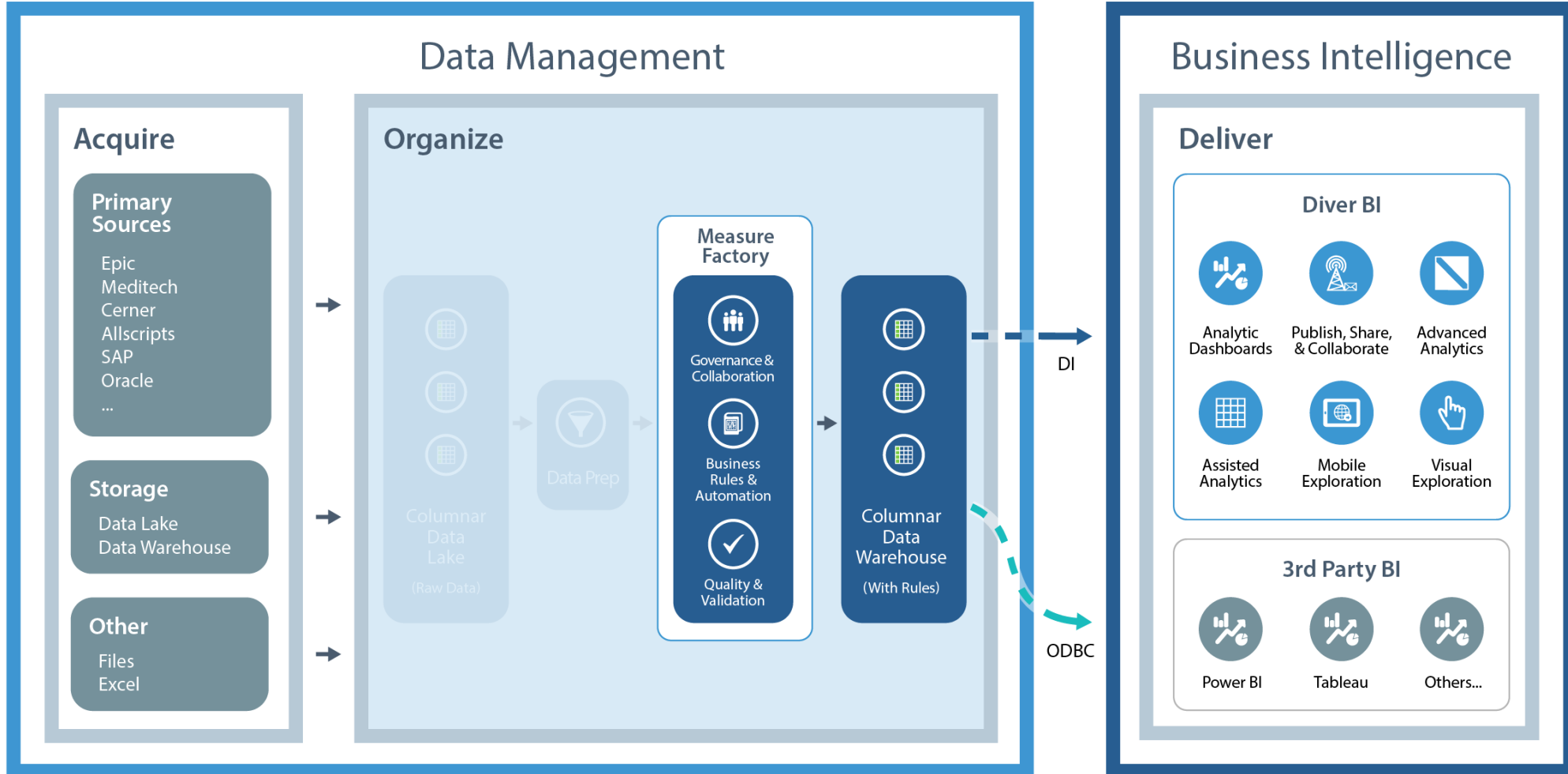
Diver Platform Architecture



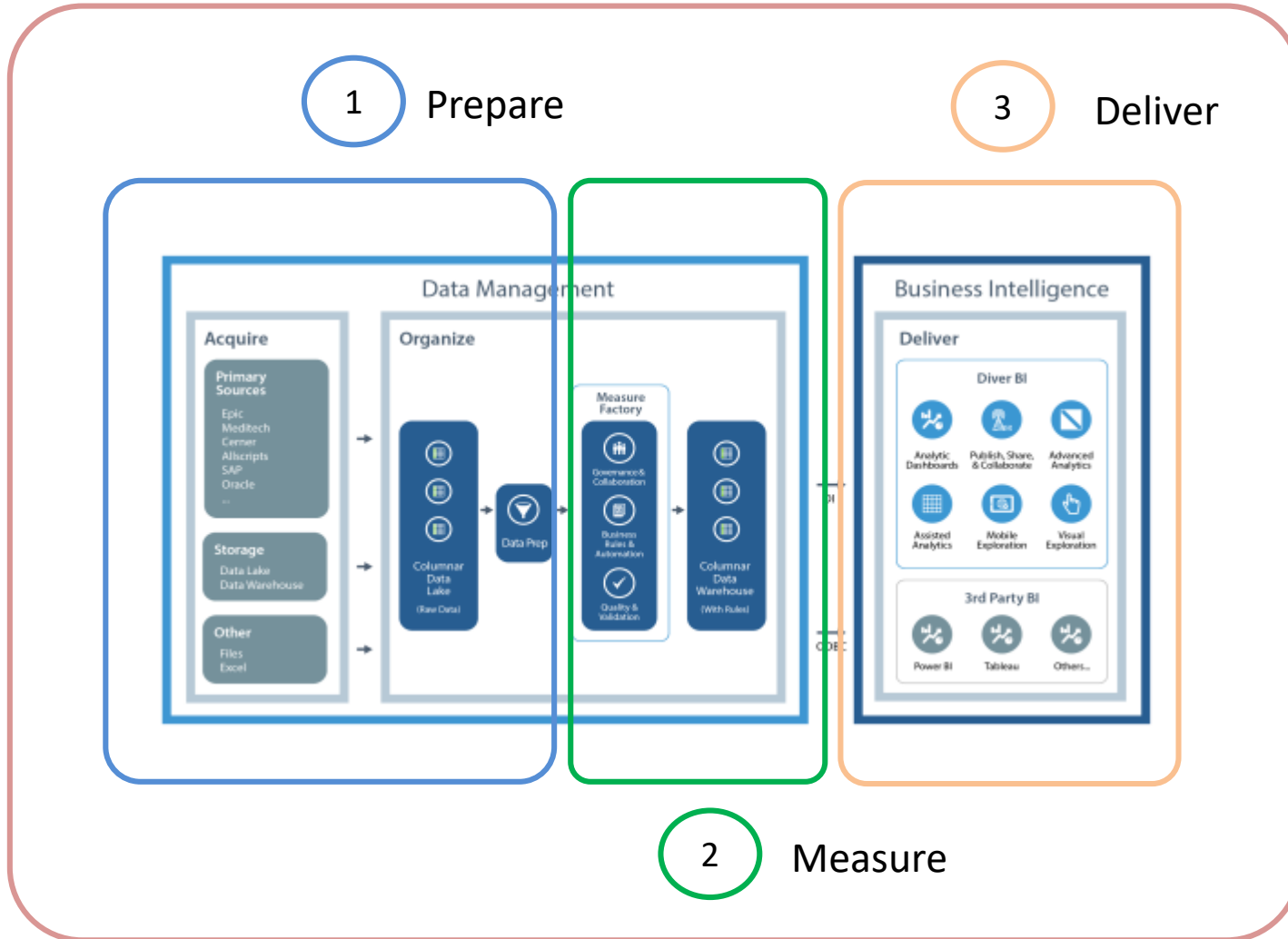
Diver Platform Architecture



Diver Platform Architecture

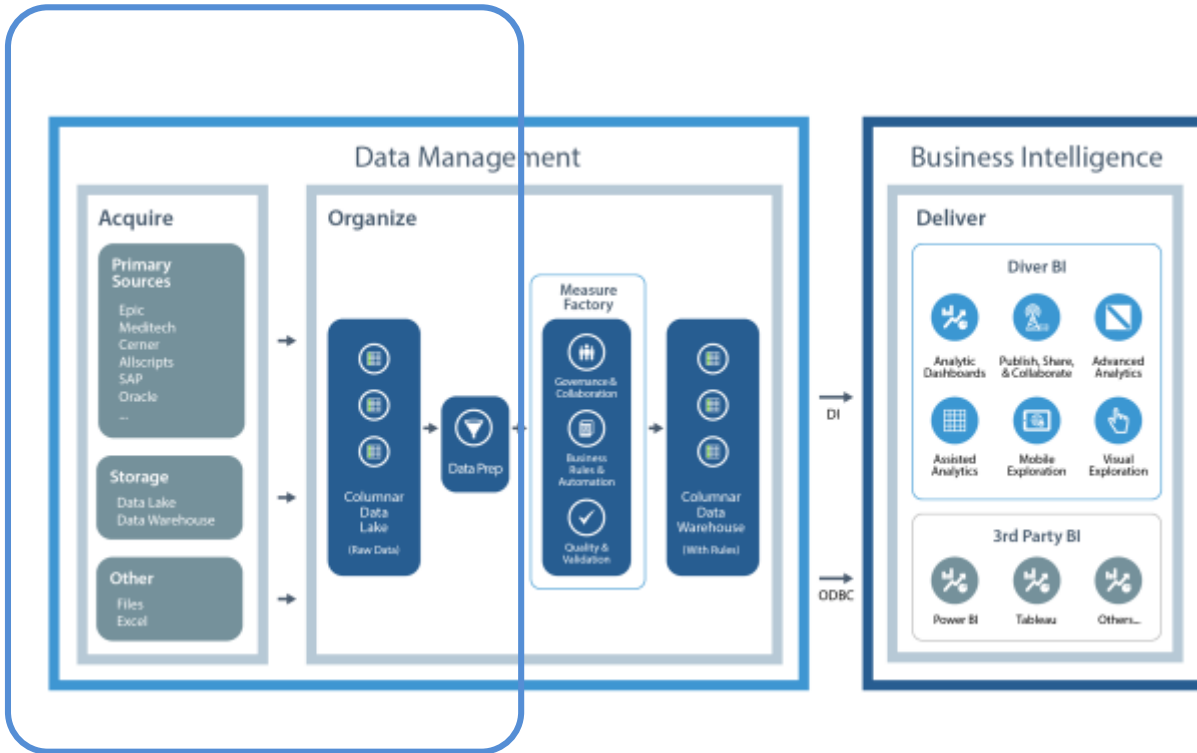


Platform Map



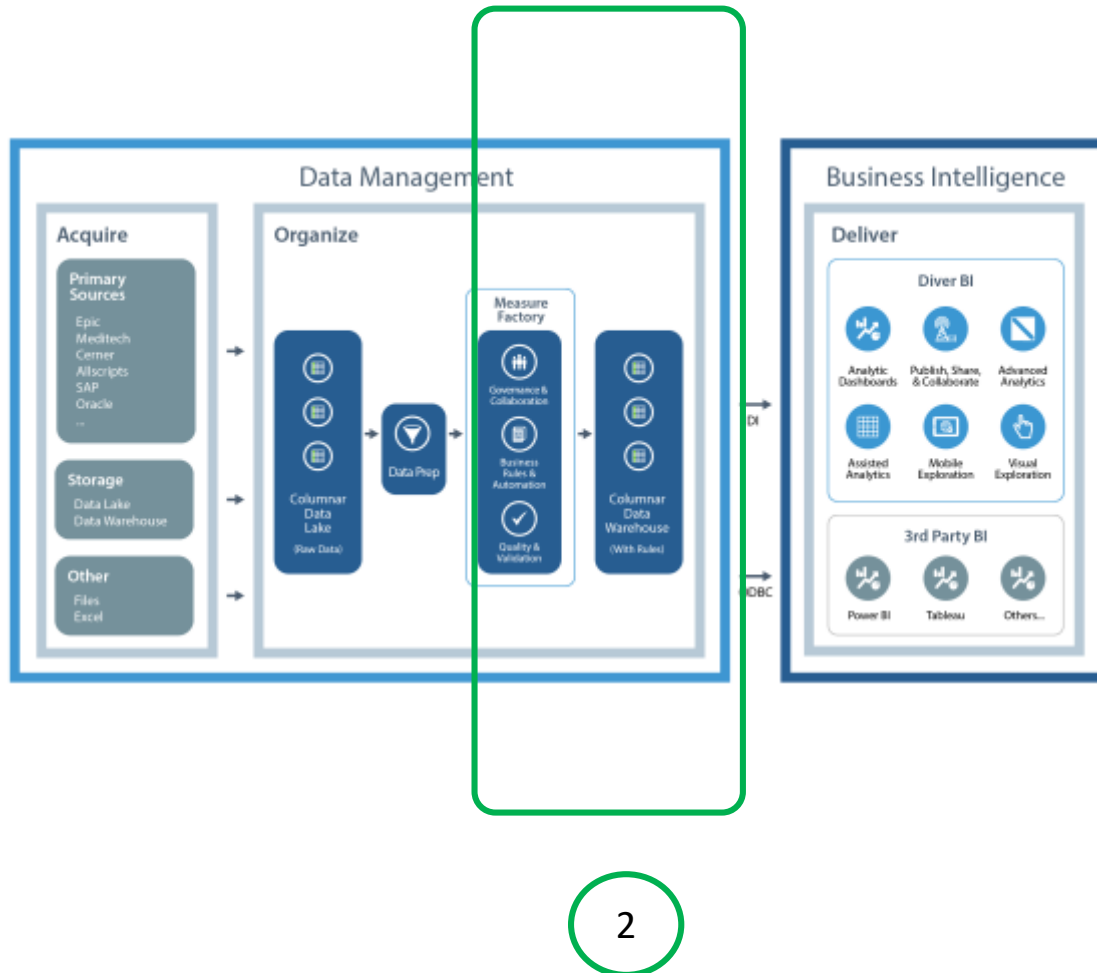
Part 1: Prepare

1



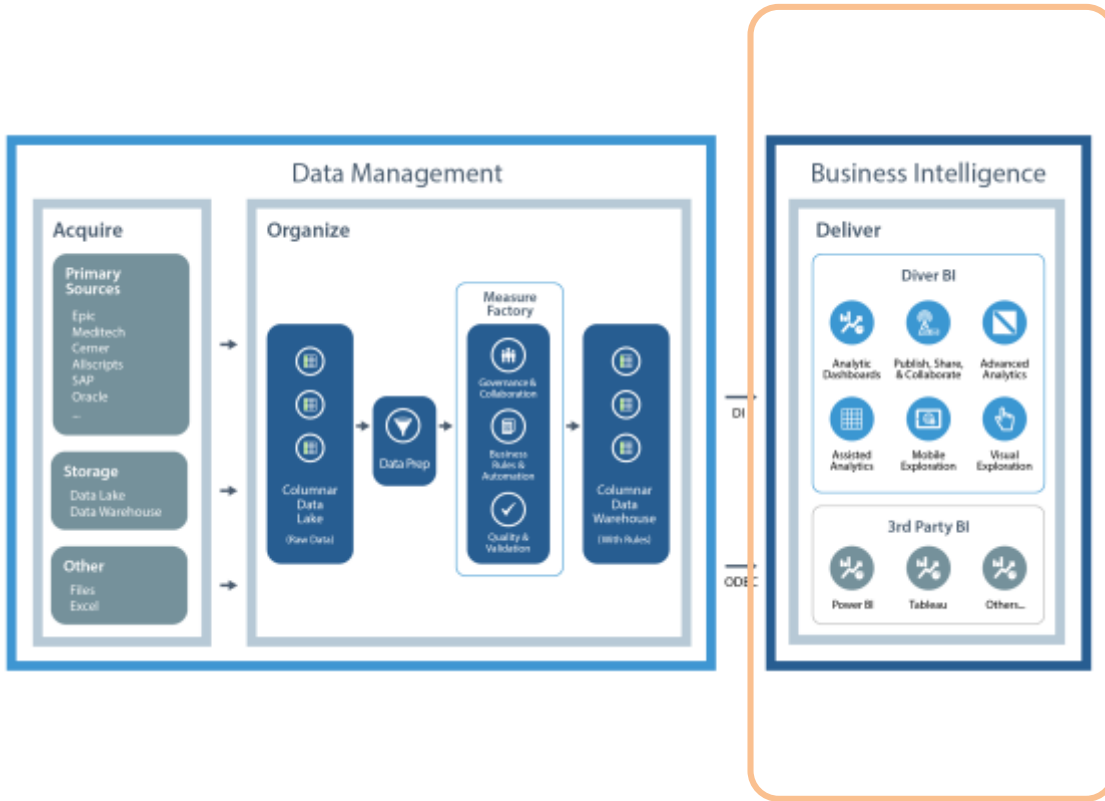
- Consistent approach to the data lake
- Built-in transformation pipeline
- Intuitive analysis tools for validation

Part 2: Measure



- Measure-centric approach
- Designed for subject matter expert
- Integrated presentation & development

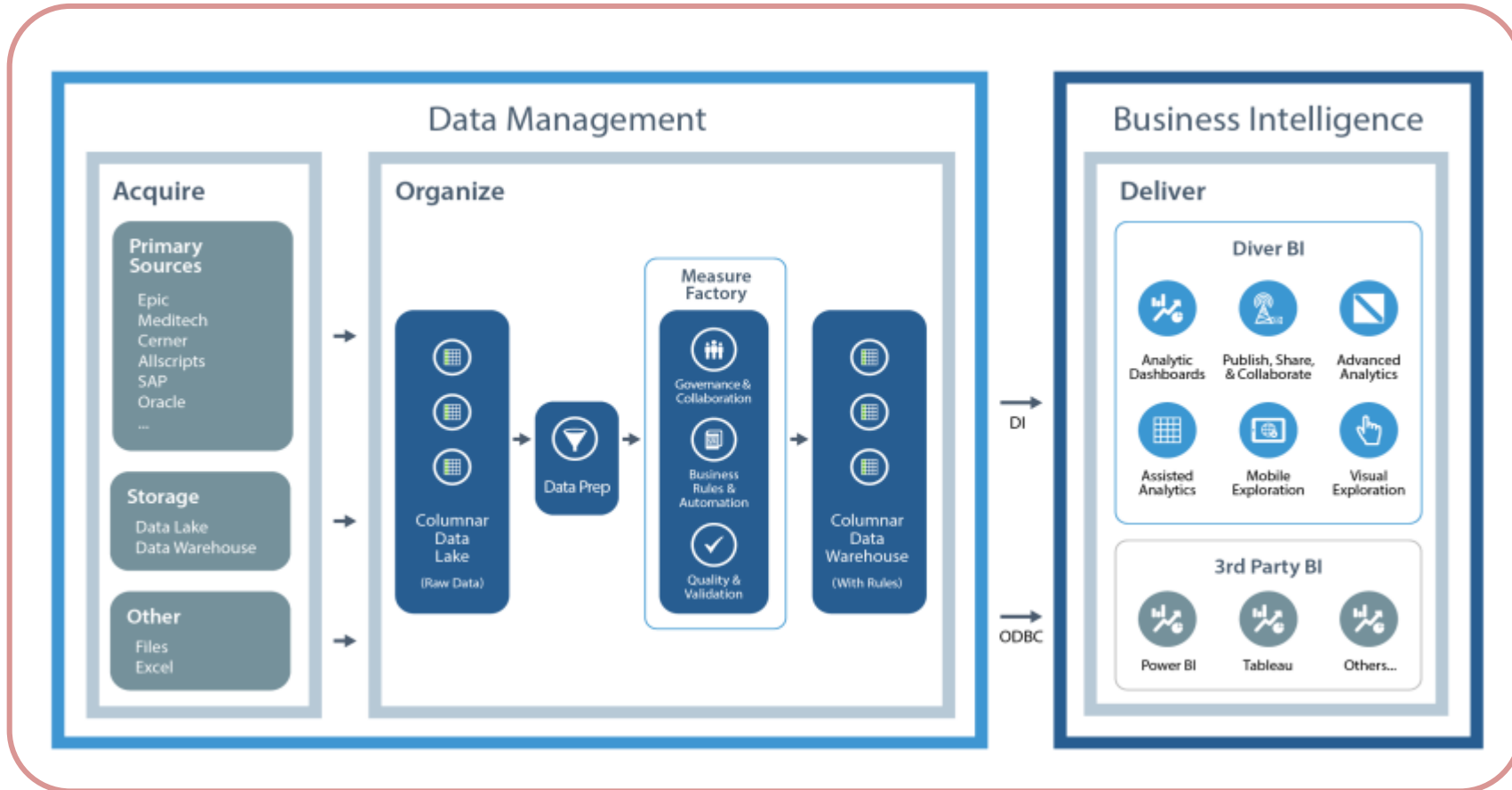
Part 3: Deliver



- Designed for end user
- Practical self service
- Open architecture

Part 4: Deploy

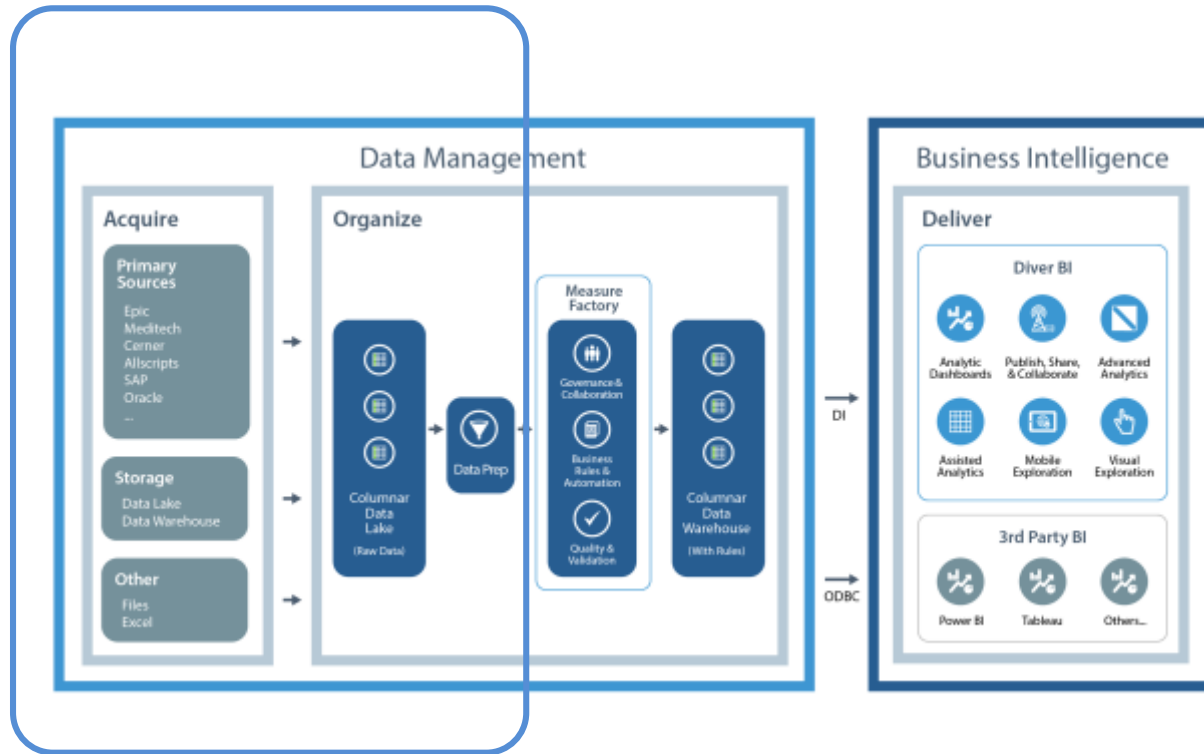
Beginning to end



Part 1: Prepare

Part 1: Prepare

1



Diving In The Data Lake

- DiveLine server as Data Lake
 - Extract data from many sources
 - Store as Models, cBases, or text

- From there:
 - Prepare for users
 - Load into a Measure Factory

Preparation

- But, first:
 - Clean up
 - Combine
 - Transform
- Integrator is still our most powerful ETL tool
- Spectre is catching up

Spectre – Build

- New build operation: Join
 - Like Integrator’s join
 - Left-outer (similar to lookup)
 - Supports right-outer, inner, outer, for advanced join scenarios
- New build operation: Rotate
 - Turns multiple columns into multiple rows
 - Like Integrator’s rotate
- Improved memory usage
 - In some cases

Spectre – Dive and cPlan

- New cPlan operation: Date rollup
 - Create a new dimension by rolling up a date
 - Like ProDiver’s date rollup feature
- New dive operation: Detail windows
 - No summarization
 - Like ProDiver’s detail dump feature
 - Useful for back-end processing, to avoid merging records

Spectre – Calc updates

- `on_previous_row()` updated
 - To enable detail-level cumulative calculations
- New calcs
 - `slope()` and `intercept()`
 - `bit_get()`
 - `format_datetime()`
 - `fixed100()`

Managing Complexity

- Powerful low level tools
- Need a high level tool to manage

```
build {
  cbase-input "/data_sources/charges.cbase"
  output "Charges.cbase"

  add "Outpatient" `value("Service Patient Type") = "Outpatient"
  add "Zero Charge Flag" `if(value("Total Charges") = 0, "Y", null)
  add "Posting Day of Week" `format_date(value("Posting Date"), '
  add "Posting Fiscal Year-Mo" `replace(string(period("gregorian+
  add "Posting Fiscal Year" `substr(value("Posting Fiscal Year-Mo
  add "Service Fiscal Year-Mo" `replace(string(period("gregorian+
  add "Service Fiscal Year" `substr(value("Service Fiscal Year-Mo
  add "Discharge Fiscal Year-Mo" `replace(string(period("gregoria
  add "Discharge Fiscal Year" `substr(value("Discharge Fiscal Ye

lookup {
  text-input "/config/flag_table_Department Code.txt" {
    column "key" type="string"
    column "start_date" type="date"
    column "end_date" type="date"

    column "Special Nursery Department Key" type="boolean" input

    rename "Special Nursery Department Key" "Special Nursery De
  }
  key "Department Code" "key"
  range-key "Posting Date" "start_date" "end_date"
  column "Special Nursery Department Key"
}
```

Spectre Build UI

The screenshot displays the Spectre Build UI interface. At the top, a workflow diagram shows a 'text' input block labeled 'basic.txt' connected to an 'output' block labeled 'basic'. Below the workflow is the 'PropertiesPanel' with the following sections:

- Path (1)**: A list of input files containing 'basic.txt'.
- Columns (6)**: A table listing columns and their types.
- Comments**: A text area for entering comments for the object.
- Properties**: A section for configuring text input properties.

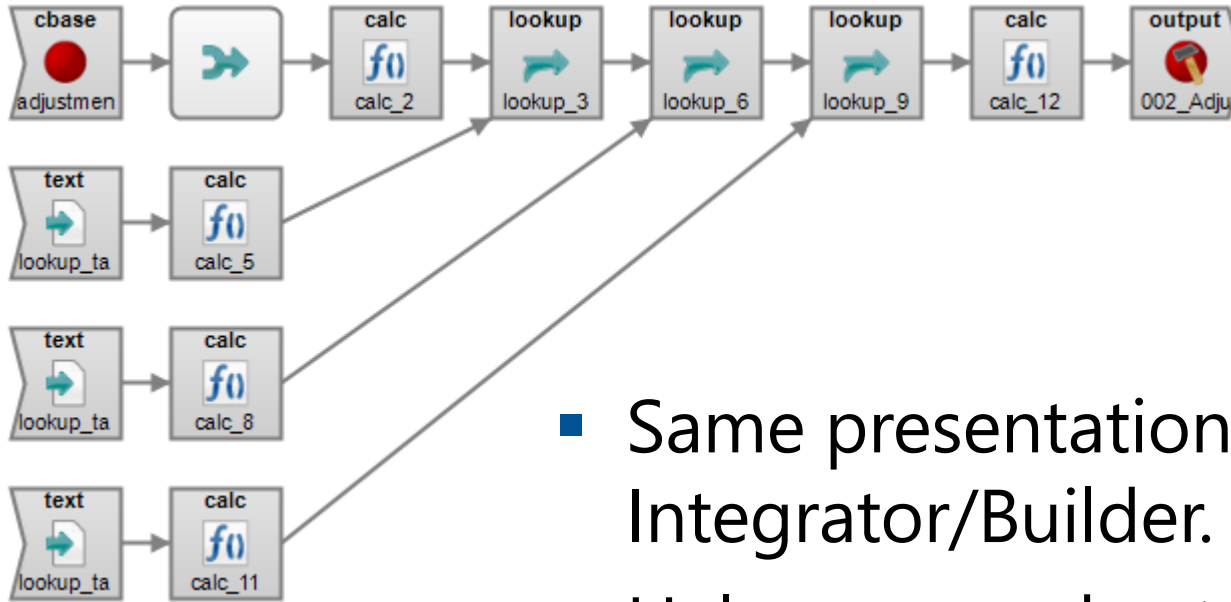
Column	Type
Color	unknown
Taste	unknown
Mood	unknown
Direction	unknown
Weight	unknown

The Properties section includes a 'Quick Search' field and a list of options:

- Text Options**
- Include Other Columns: False
- Contains Column Headers
- Contains Quotes
- Date Format (deprecated)
- Delimiter
- Encoding
- Filename Column
- Limit Rows

At the bottom of the Properties section, there are tabs for 'TextInput Properties' and 'Column Properties (F)'. The 'Show Parameters' button is visible in the top right corner of the interface.

Spectre Build UI



- Same presentation style as Visual Integrator/Builder.
- Helps you understand the whole process

Table Editor

- Can now unlock and modify tables
- Includes:
 - Sort
 - Filter

Stop Editing 0 pending operation(s)

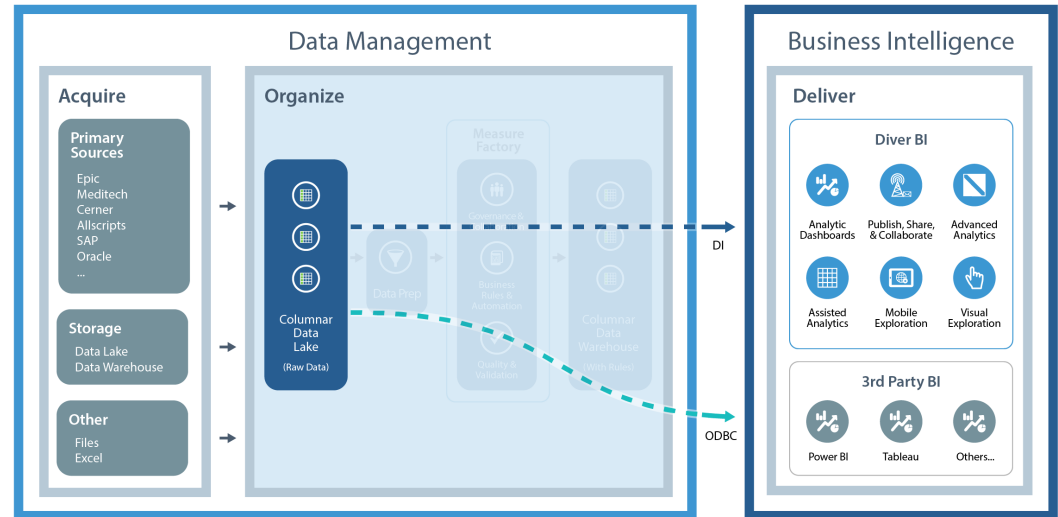
(line)	Units	Date	Salesperson	City	State	Customer Contact	Industry Code
1	1	2012/09/21	Mitchell Brewer	Sharpsburg	SD	Mabel Thornton	Manufacturing
2	1	2014/02/04	Wendell Bates	Camel	CO	Mabel Thornton	Manufacturing
3	10	2012/04/27	Jean Suarez	Denhart	CA	April Stone	Manufacturing
4	10	2013/06/05	Yvonne Acevedo	Lisbon	NY	Wendell Barr	Wholesale Trade
5	12	2016/09/16	Peny Marks	Douglass	MT	Damon Riddle	Mining
6	13	2012/05/08	Leticia Booker	Eckards	CA	Darla Boyle	Trans. Comm & Public L
7	13	2014/02/14	Amy Irwin	Yeomans	CO	Don Dejesus	Construction
8	14	2012/09/27	Priscilla Bartlett	King	SD	Randolph Kline	Construction
9	14	2013/04/26	Yvonne Osborne	Earlville	DE	Bennie Goff	Health, Soc Serv & Pub
10	14	2013/07/25	Ruth Fischer	Bassett	TN	Tonya Mooney	Health, Soc Serv & Pub
11	14	2013/08/03	Nellie Stephenson	Bassett	KS	Trevor Freeman	Wholesale Trade
12	15	2014/02/10	Kathy Mueller	Ironhills	ID	Vanessa Abbott	Retail Trade
13	15	2014/07/23	Delbert Ochoa	Allendorf	IL	Cecil Casey	Manufacturing
14	15	2016/02/07	Kendra Kennedy	Rudd	NY	Dallas Chaney	Manufacturing
15	16	2014/02/23	Sadie Chaney	Sharon	TX	Patrick Puckett	Trans. Comm & Public L
16	16	2014/08/05	Muriel Good	Fisk	MS	Jeannie Curtis	Wholesale Trade
17	16	2015/03/10	Gertrude McIntosh	Earlville	VT	Noel Mayo	Trans. Comm & Public L
18	16	2016/09/07	Joann Scott	Stockton	NJ	Cary Jarvis	Wholesale Trade
19	17	2014/09/25	Gertrude McIntosh	Earlville	VT	Jackie Trujillo	Finance, Insurance & R
20	18	2012/06/04	Caroline Owen	Sifer	GA	Jean Yates	Agriculture, Forestry and
21	18	2013/07/07	Kerry Luna	Cascade	MA	Ed Gomez	Retail Trade
22	18	2014/10/31	Brittany Leon	Earlville	WI	Carol Roy	Construction
23	18	2016/08/13	Johnathan Hom	Rogersville	MO	Viola Chan	Construction
24	19	2012/02/21	Joy Sloan	Lovington	UT	Brent Gallagher	Trans. Comm & Public L
25	19	2016/04/27	Dolores Piggs	Clara	MA	Guadalupe Buckley	Health, Soc Serv & Pub
26	2	2014/06/22	Joann Scott	Stockton	NJ	Silvia Thomas	Agriculture, Forestry and
27	21	2012/01/06	Rosa Dejesus	Wadleigh	NH	Marian Goodwin	Business Services
28	21	2014/09/30	Sadie Chaney	Sharon	TX	Charlotte James	Wholesale Trade
29	21	2014/11/23	Rosa Dejesus	Wadleigh	NH	Felipe Roach	Construction
30	22	2012/05/04	Mandy Bright	Saratoga	ID	Cheryl Hood	Trans. Comm & Public L
31	22	2013/05/04	Terrance Trujillo	Astor	AL	Sophia Carr	Mining

Loading Complete | 1000 of 1000 lines shown | Total columns: 17 | Delimiter: \t | EOL: \r\n | Encoding: Unicode (UTF-8) w/o BOM

Raw Data Analysis with ProDiver

- Raw Data Analysis
 - Validation
 - One-off queries

- ProDiver handles this well
 - But more on ProDiver later



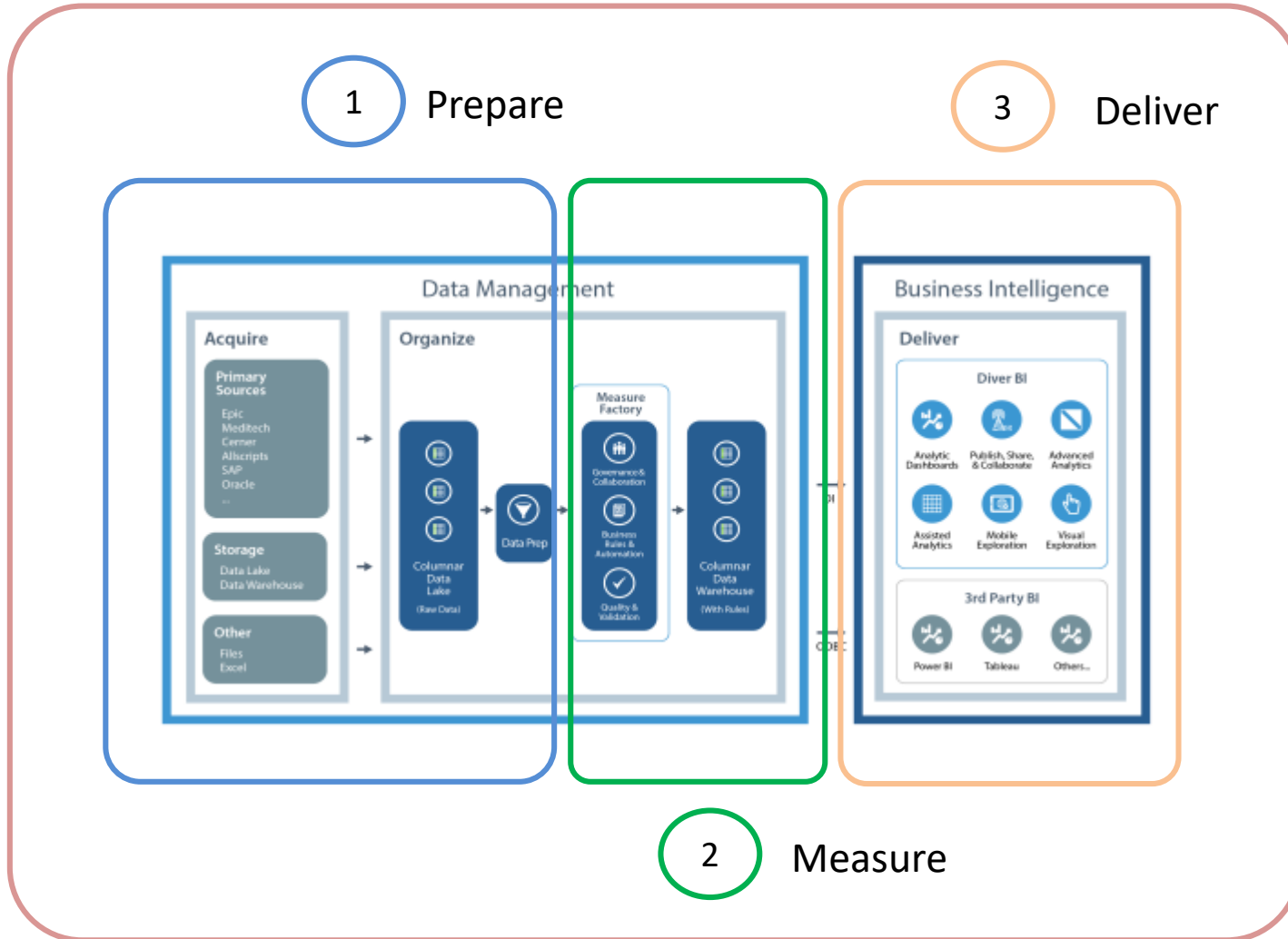
Part 1 Review: Prepare

- DiveLine as Data Lake
- ETL with Spectre
- New Spectre Features:
 - Join, rotate, date rollup, detail windows, new calcs
- New Spectre Build UI
- New Table Editor Features
- Raw Data Analysis with ProDiver
- process

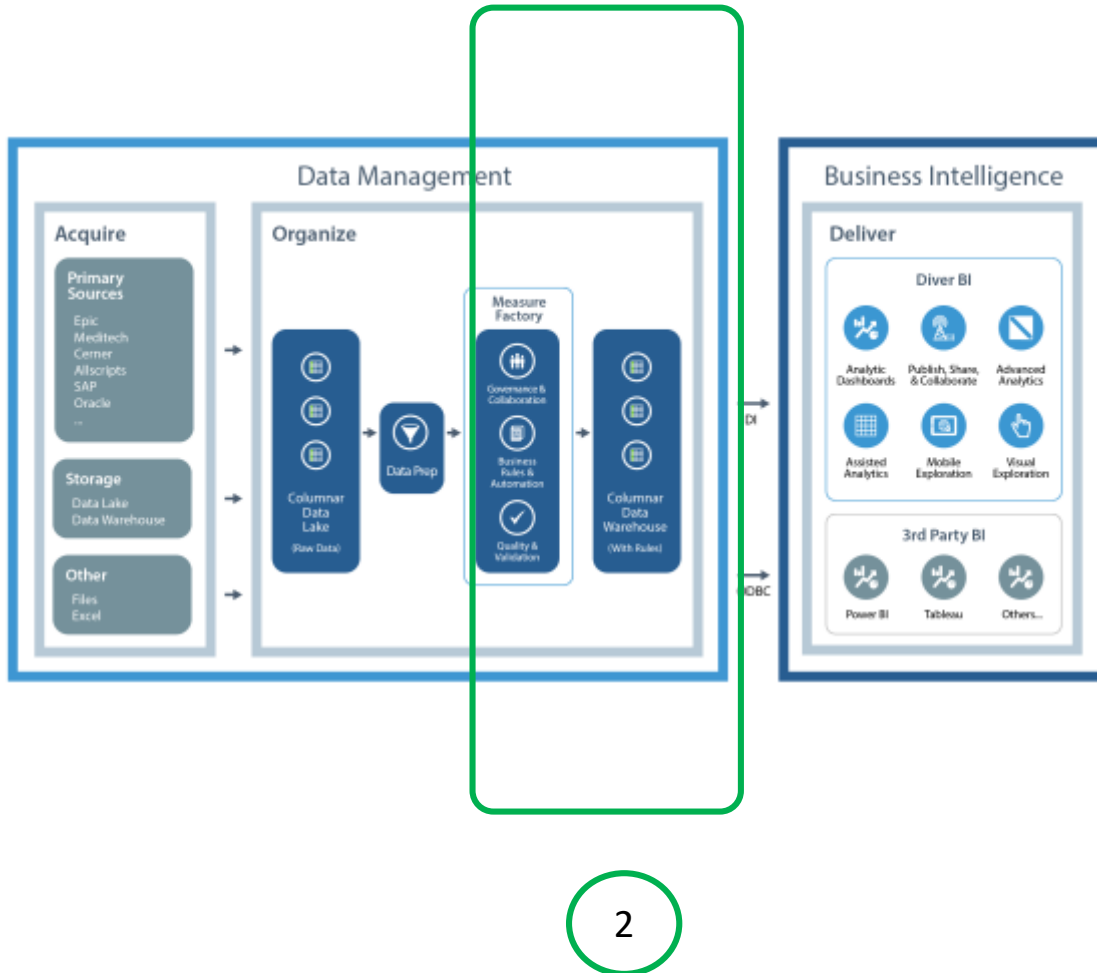
Coffee Break

Part 2: Measure

Platform Map



Part 2: Measure



- Measure-centric approach
- Designed for subject matter expert
- Integrated presentation & development

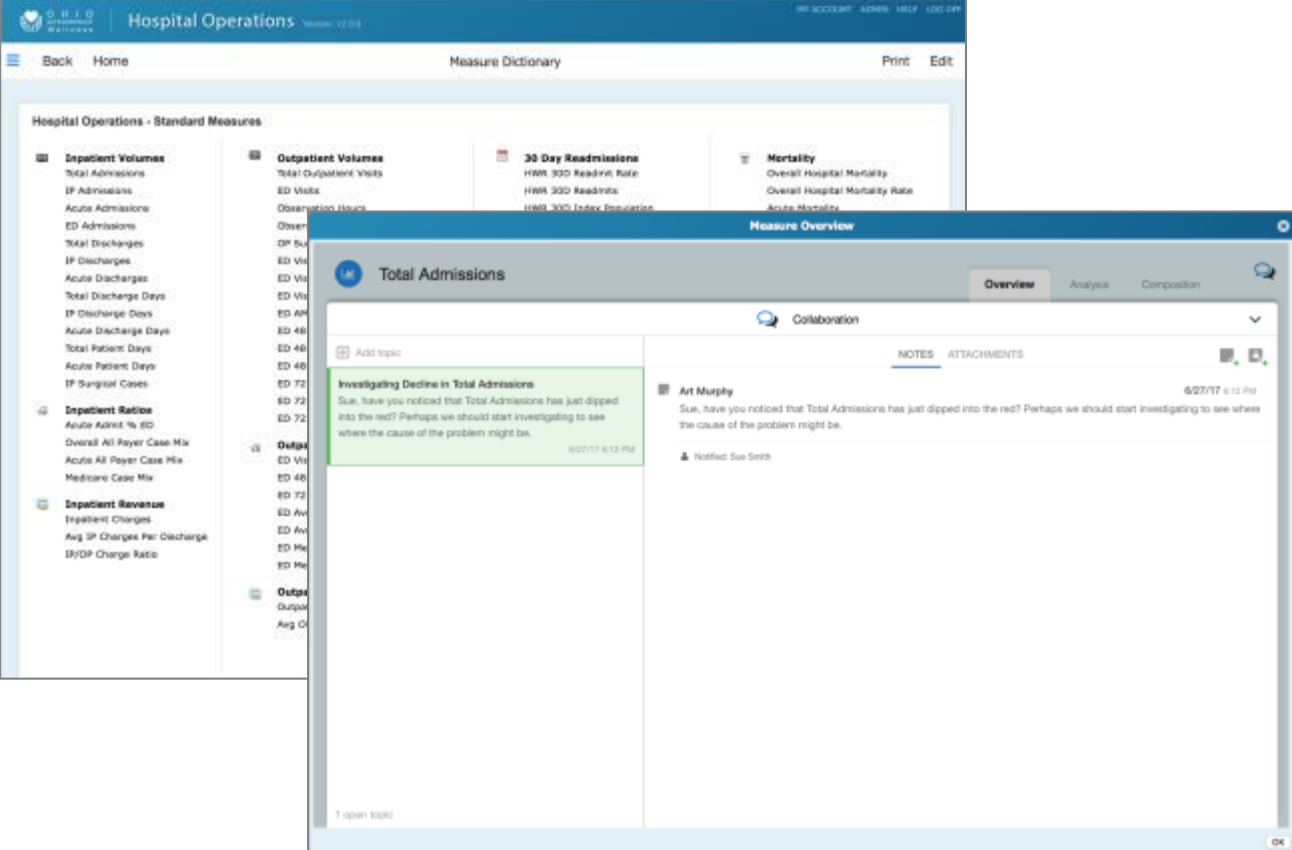
Data Governance

- Data you can depend on
 - Correct
 - Rich
 - Useful
- Requires data governance

Measure Factory - Governance

Accurate, consistent, and well understood measures

- Crucial to assessing and improving performance
- Ensuring relevant, reliable and trusted information
- “Single version of the truth”



The screenshot displays the 'Hospital Operations' software interface. The top navigation bar includes 'Hospital Operations' and 'Measure Dictionary'. Below this, a 'Measure Dictionary' section lists various standard measures such as 'Inpatient Volumes', 'Outpatient Volumes', '30 Day Readmissions', and 'Mortality'. A 'Measure Overview' window is open, showing a 'Total Admissions' measure. This window features a 'Collaboration' section with a note titled 'Investigating Decline in Total Admissions' dated 6/27/17 6:12 PM. The note text reads: 'Sue, have you noticed that Total Admissions has just dipped into the red? Perhaps we should start investigating to see where the cause of the problem might be.' Below the note, a notification indicates 'Notified: Sue Smith'.

Measure Factory Overview

- High-level management of business logic
- Rules
 - Record-level, no summarization
 - Encode core business logic
- Measures
 - User-visible, summarized
 - Lots of metadata

Measure Factory Advantages

- Matrix Portlet
- Time series configured in portlets
- Measure Metadata
- Automatic analysis

- Assisted Analysis, Stamps, Self Service

Measure Factory UI

- Manage a complex measure factory
- Quickly find measures and rules
- Follow references
- Edit calculations and documentation

Measure Factory UI

Rules Measures Data Sets

← → Measures

search measures Group by: [Icons] New Copy Delete

Measure Name	Scope	Definition	Calc
SubAcute Admissions	Admissions	Count of Accounts that are both a SubAcu...	COUNT
SubAcute Discharge Days	Discharges	Total Discharge Days for SubAcute Accou...	SUM(Discharge Days)
SubAcute Discharges	Discharges	Total Discharges for SubAcute Accounts	COUNT
SubAcute Patient Days	Daily Census	Total Patient Days for SubAcute Accounts	SUM(Patient Days)
Acute All Payer Case Mix	Discharges	Overall Payor Case Mix Total divided by O...	AVERAGE(MS-DRG Case Mix)
Acute ALOS	Discharges	Acute Discharge Days Divided by Acute D...	Acute Discharge Days ÷ Acute Dischar...
Acute LOS Opportunity	Discharges	Acute ALOS - Acute ALOS Target, only if A...	SUM(Acute ALOS Variance)
Acute ALOS Target	Discharges	Acute Geometric Mean LOS / Acute ALOS ...	SUM(Acute Geometric Mean LOS) ÷ S...
Acute ALOS Variance	Discharges	Acute ALOS - Acute ALOS TargetAcute AL...	Acute ALOS - Acute ALOS Target
Overall LOS Opportunity	Discharges		SUM(Overall ALOS Variance)
Overall ALOS Target	Discharges	Overall Geometric Mean LOS / Acute ALO...	AVERAGE(LOS Target)
Overall ALOS Variance	Discharges	Overall ALOS - Overall ALOS Target ...	Overall ALOS - Overall ALOS Target
AMI ALOS	Discharges	The sum total of AMI Discharge Days divi...	AMI Discharge Days ÷ AMI Discharges
AMI LOS Opportunity	Discharges	AMI ALOS - AMI ALOS Target, only if AMI ...	SUM(AMI ALOS Variance)
AMI ALOS Target	Discharges	Acute AMI Geometric Mean LOS / Acute A...	SUM(AMI Geometric Mean LOS) ÷ SU...
AMI ALOS Variance	Discharges	AMI ALOS - AMI ALOS Target ...	AMI ALOS - AMI ALOS Target
Avg IP Charges Per Discharge	Discharges	Total IP Charges (for discharged Inpatient ...	AVERAGE(Total Charges IP Discharges)
Avg OP Charges per Visit	Discharges	The sum of charges for all Outpatient Acc...	AVERAGE(Total Charges OP Discharge)
COPD ALOS	Discharges	The sum total of COPD Discharge Days / ...	COPD Discharge Days ÷ COPD Dischar...
COPD LOS Opportunity	Discharges	COPD ALOS - COPD ALOS Target, only if C...	SUM(COPD ALOS Variance)

Showing 348 measures

Measure Factory UI

Rules
Measures
Data Sets

← →
Measures
▶ Acute ALOS

Group by: 📊 🔄 📄 ×

New
Copy
Delete

Measure Name	Scope	Definition	Calc
Psych Patient Days	Daily C...	Total of Patient Days f...	SUM(Patient Days)
Rehab Patient Da...	Daily C...	The sum of Patient Day...	SUM(Patient Days)
SubAcute Admiss...	Admiss...	Count of Accounts that...	COUNT
SubAcute Discha...	Dischar...	Total Discharge Days f...	SUM(Discharge Days)
SubAcute Discha...	Dischar...	Total Discharges for Su...	COUNT
SubAcute Patient...	Daily C...	Total Patient Days for ...	SUM(Patient Days)
Acute All Payer C...	Dischar...	Overall Payor Case Mix...	AVERAGE(MS-DRG Ca
Acute ALOS	Dischar...	Acute Discharge Days ...	Acute Discharge Days
Acute LOS Oppor...	Dischar...	Acute ALOS - Acute AL...	SUM(Acute ALOS Va...
Acute ALOS Target	Dischar...	Acute Geometric Mean...	SUM(Acute Geometric
Acute ALOS Varia...	Dischar...	Acute ALOS - Acute AL...	Acute ALOS - Acute A
Overall LOS Opp...	Dischar...		SUM(Overall ALOS Va
Overall ALOS Tar...	Dischar...	Overall Geometric Me...	AVERAGE(LOS Target)
Overall ALOS Vari...	Dischar...	Overall ALOS - Overall ...	Overall ALOS - Overall
AMI ALOS	Dischar...	The sum total of AMI ...	AMI Discharge Days ÷
AMI LOS Opport...	Dischar...	AMI ALOS - AMI ALOS ...	SUM(AMI ALOS Vari...
AMI ALOS Target	Dischar...	Acute AMI Geometric ...	SUM(AMI Geometric I
AMI ALOS Varian...	Dischar...	AMI ALOS - AMI ALOS ...	AMI ALOS - AMI ALOS
Avg IP Charges P...	Dischar...	Total IP Charges (for di...	AVERAGE(Total Char...
Avg OP Charges ...	Dischar...	The sum of charges for...	AVERAGE(Total Char...

Showing 348 measures

🔍
Acute ALOS
in
Inpatient Ratios
▼

⌵ Data

Scope: Discharges ▼

Calc: Acute Discharge Days ÷ Acute Discharges ✎

Filter: Acute Discharge = TRUE ✎

Auxiliary Measures: (none)

⌵ Display

Good Direction: Down ▼

Format: 0.00 ▼

Analyses: <unnamed>

⌵ Documentation

📄

Measure Factory UI

Rules
Measures
Data Sets

← → Rules ▸ Newborn Account

new
✕ Group by: ✕
Show only: ✕
New
Copy
Delete

Rule Name	Rule Type	Parent
Newborn Account	Calc	Accounts
Newborn ALOS Target Count	Calc	Accounts
Newborn Bed Charges Key	Flag	Revenue Code
Newborn Bed Charge	Link	Charges
Normal Newborn Geometric Mean ...	Calc	Accounts
NICU Newborn Account	Link	Accounts
NICU Newborn Discharge	Calc	Accounts
NICU Newborn Account	Calc	Accounts
NICU Newborn ALOS Target Count	Calc	Accounts
NICU Newborn Geometric Mean LOS	Calc	Accounts
Normal Newborn Account	Calc	Accounts
Normal Newborn Account	Link	Accounts
Normal Newborn ALOS Target Count	Calc	Accounts
Normal Newborn Discharge	Calc	Accounts
Normal Newborn Discharge Days	Calc	Accounts
Acute Account	Calc	Accounts
Admission	Calc	Hourly Census
Admission	Calc	Accounts
Total Discharge Days	Calc	Accounts
Observation Visit	Calc	Hourly Census

Newborn Account in Accounts ▾

✦ Data

Calc: Inpatient Account and (admit type code = "4" or Newborn Bed Charge)

✦ Documentation

✦ Governance

Showing 20 rules for the search 'new' sorted by search relevance

Measure Factory UI

- Released in 7.1(1) with Rules and Measures pages
 - Search, group, filter, sort, add, copy, delete...
 - Links to referenced elements

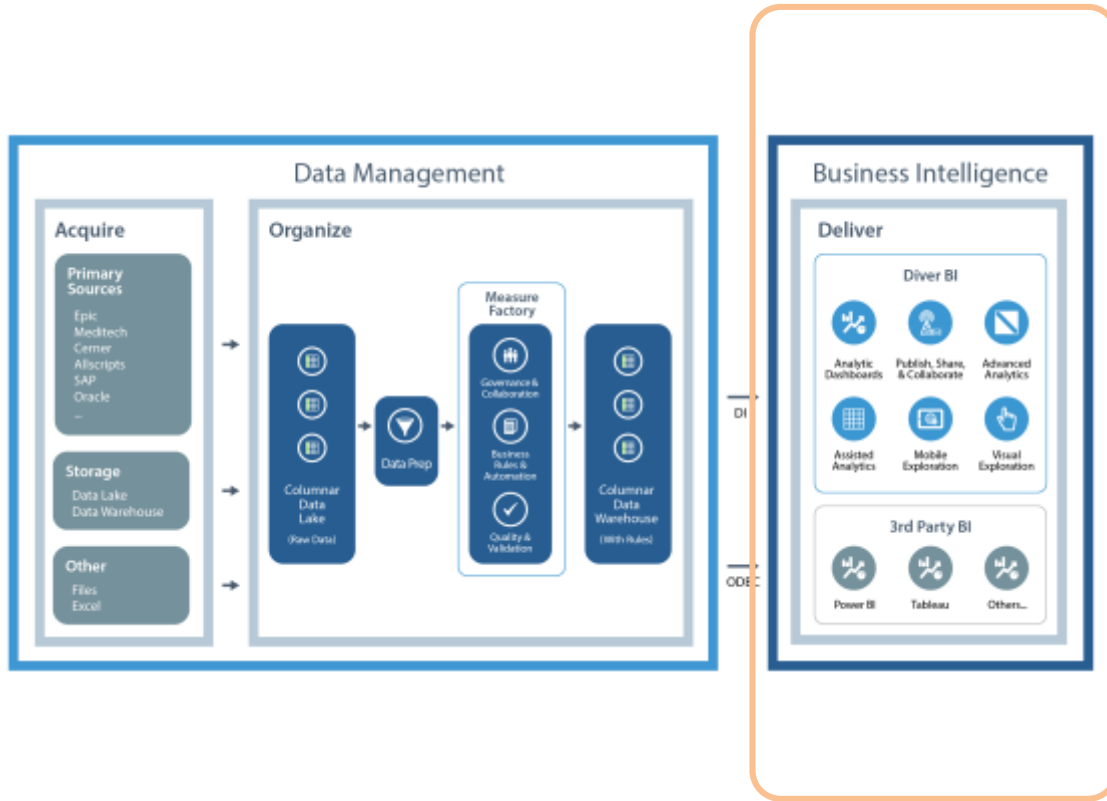
- 7.1(4) added a Data Sets page
 - Manage flag tables, lookups, plugins and links

Part 2 Review: Measure

- Data governance and automation, provided by the Measure Factory
- Many “downstream” advantages
 - Matrix Portlet, automatic analysis, Time Series, ...
- New factory editor user interface

Part 3: Deliver

Part 3: Deliver



- Self Service
- Assisted Analysis
- Predictive Analytics
- Various Platforms
 - Mobile
 - DivePort Measures and Analysis
 - ProDiver

Delivery

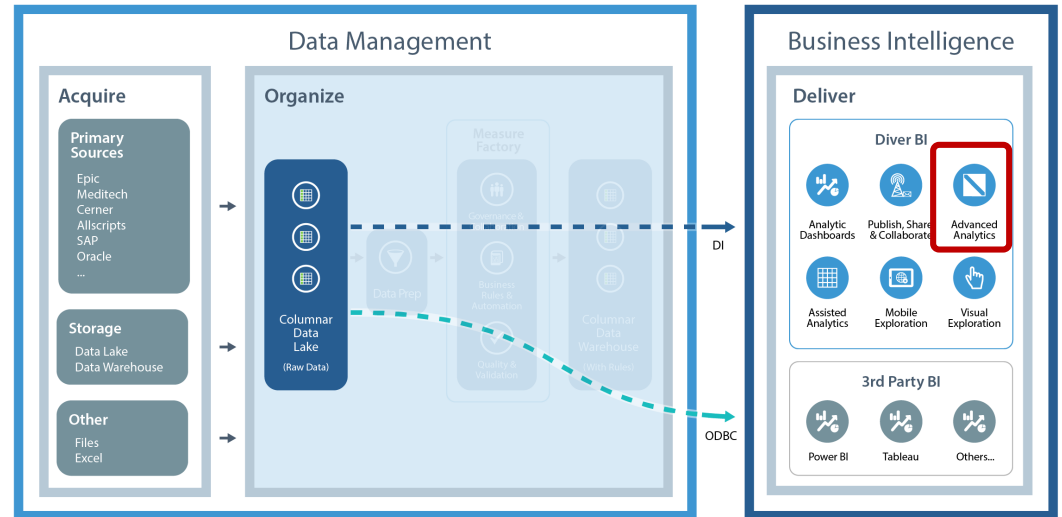
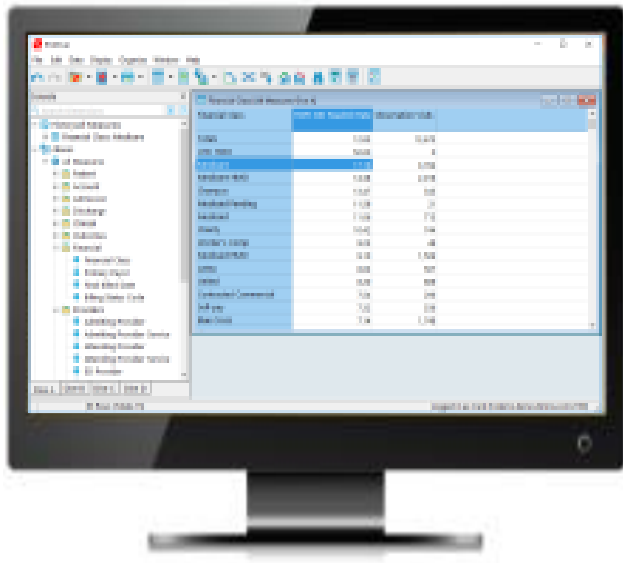
- Diverse user community
- Requires flexible and powerful delivery tools
- Reflected in DI's mission

Mission

Get the **right information** to
the **right person**
at the **right time**
and on the
right device

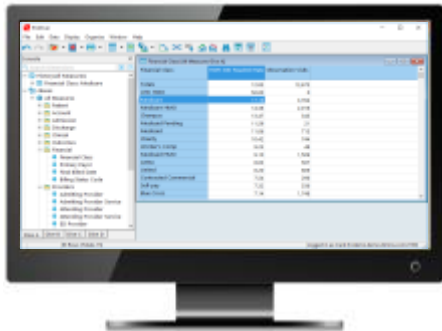
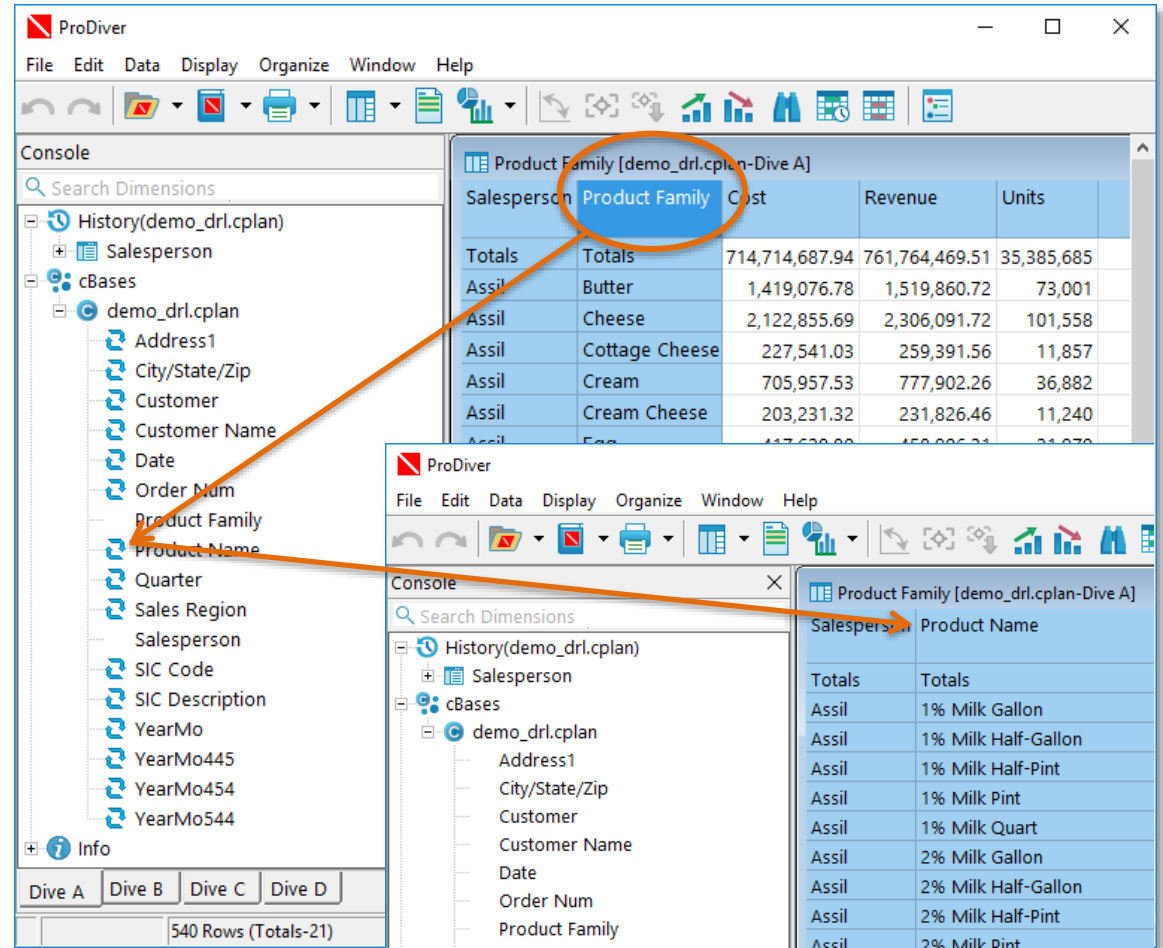
ProDiver

- Data Validation
- Raw Data Analysis
- Ad-Hoc Analysis of Managed/Governed Data



ProDiver – Dimension Switching

- Change Dimensions in Multitabs

The top screenshot shows a pivot table with the following data:

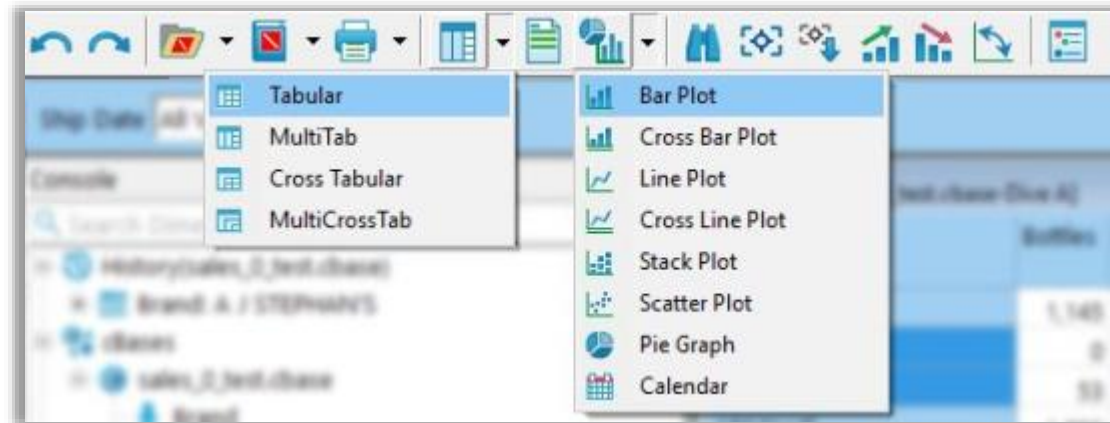
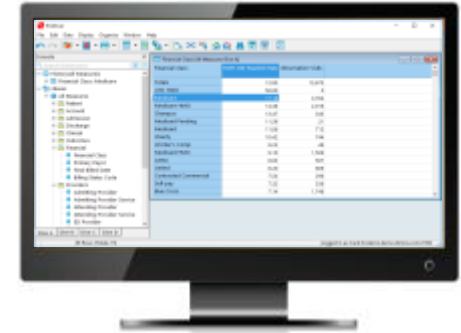
Salesperson	Product Family	Cost	Revenue	Units
Totals	Totals	714,714,687.94	761,764,469.51	35,385,685
Assil	Butter	1,419,076.78	1,519,860.72	73,001
Assil	Cheese	2,122,855.69	2,306,091.72	101,558
Assil	Cottage Cheese	227,541.03	259,391.56	11,857
Assil	Cream	705,957.53	777,902.26	36,882
Assil	Cream Cheese	203,231.32	231,826.46	11,240
Assil	Egg	117,600.00	150,000.00	31,070

The bottom screenshot shows a pivot table with the following data:

Salesperson	Product Name
Totals	Totals
Assil	1% Milk Gallon
Assil	1% Milk Half-Gallon
Assil	1% Milk Half-Pint
Assil	1% Milk Pint
Assil	1% Milk Quart
Assil	2% Milk Gallon
Assil	2% Milk Half-Gallon
Assil	2% Milk Half-Pint
Assil	2% Milk Pint

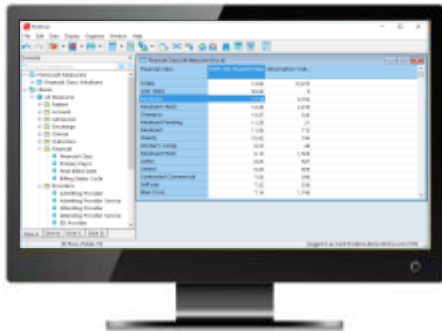
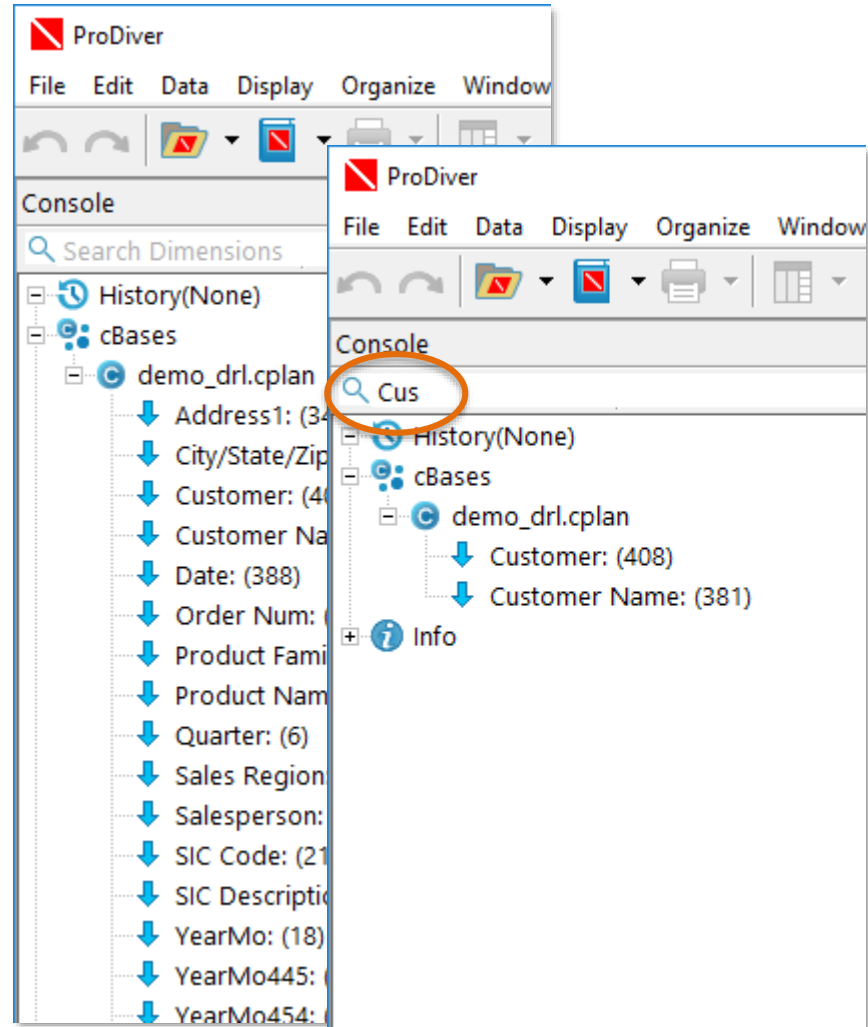
ProDiver - Toolbar

- New Toolbar design
- Better organization
- Larger, cleaner, easier to read



ProDiver – Console Filtering

- Console Filtering

The screenshot shows the ProDiver application window with the Console pane open. The Console pane has a search bar labeled "Search Dimensions" where the text "Cus" is entered and highlighted with a red circle. Below the search bar, the console tree is expanded to show the following structure:

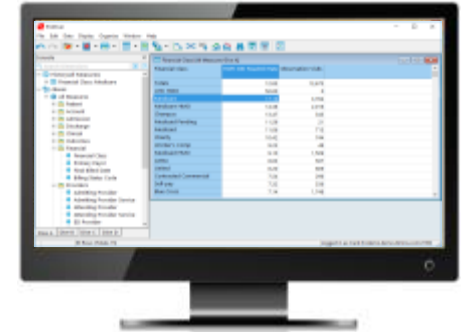
- History(None)
- cBases
 - demo_drl.cplan
 - Address1: (34)
 - City/State/Zip
 - Customer: (4)
 - Customer Name
 - Date: (388)
 - Order Num:
 - Product Family
 - Product Name
 - Quarter: (6)
 - Sales Region
 - Salesperson:
 - SIC Code: (21)
 - SIC Descriptio
 - YearMo: (18)
 - YearMo445: (
 - YearMo454:

The search results are displayed in a separate pane on the right, showing the filtered data for the selected node:

- History(None)
- cBases
 - demo_drl.cplan
 - Customer: (408)
 - Customer Name: (381)
 - Info








ProDiver – Report Styles

- ProDiver Report Styles



ProDiver

File Edit Data **Display** Organize Window Help




 Tabulars >
  Reports >
  Graphs >
 

Monday, April 15, 2019

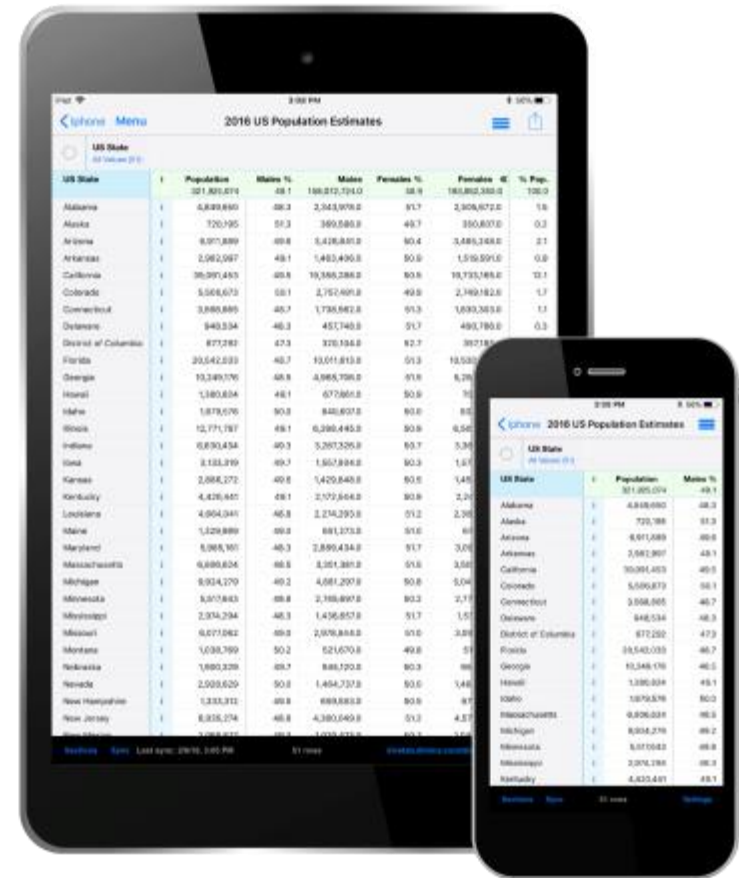
Boston

	Cost	Revenue	Units
2108			
556 -- Alexander Distributing Of Deans Milk	46,514.00	53,117.31	2,914
611 -- Elgin Dairy Foods Inc	163,403.27	170,946.10	7,618
630 -- Appalachian Food Products	6,759.17	6,273.50	248
746 -- Instantwhip Foods	6,187.20	6,984.08	318
2108 Total	222,863.64	237,320.99	11,098
2109			
744 -- Joy Farms Dairy Distributors Inc	10,061.12	9,648.47	356
824 -- Razors Dairy Service	213,606.93	225,236.87	9,720
879 -- Penn Maid Foods Inc	67,942.22	71,683.12	3,889
2109 Total	291,610.27	306,568.46	13,965
2110			

Mobile Analytics with DiveTab

Access data any time, anywhere, on any device

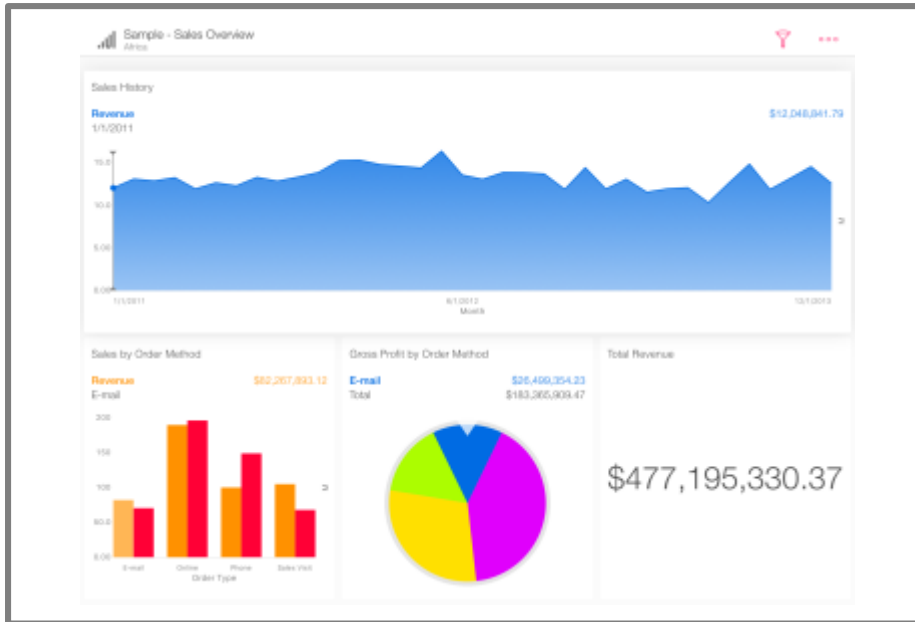
- Multiple form-factors
 - Smartphone
 - Tablet
 - Laptop
- Multiple platforms
 - Android
 - iOS
 - Windows
- Online & offline access
- Dashboards, reports, maps, diving, surveys, and more...



DiveTab Differentiators

Diving, volume, and airplane mode

Others



- Snorkel – shallow
- Snorkel – basically 2D, low volume
- Snorkel – needs air, connected

DiveTab



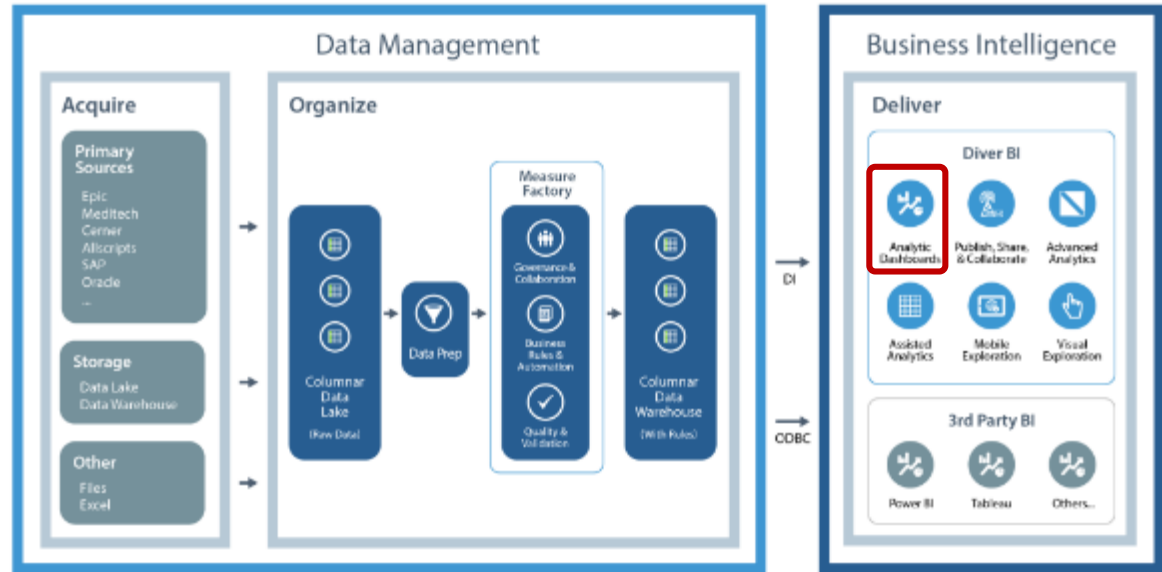
- Scuba – diving deep
- Scuba – 3D, high volume
- Scuba – has a tank, not connected

DiveTab Changes

- Offline Exploration
- Logging User Activity
- Surveys
 - Location-aware questions
 - Questions filtered by other questions
- Improved Excel Export

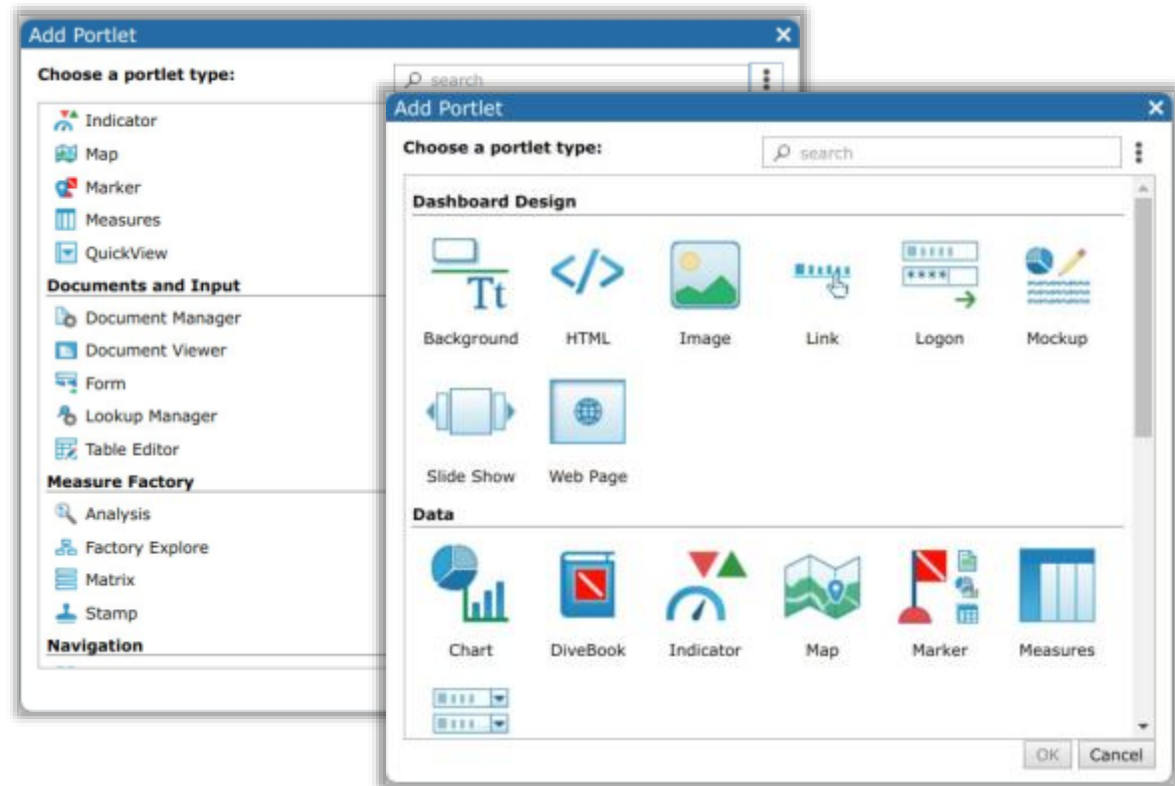
DivePort

- Dashboards
- Scorecards
- Governed Analysis
- 7.1 Changes
 - Portlet Gallery
 - Skin updates
 - Indicator style
 - New QuickViews
 - New Charts



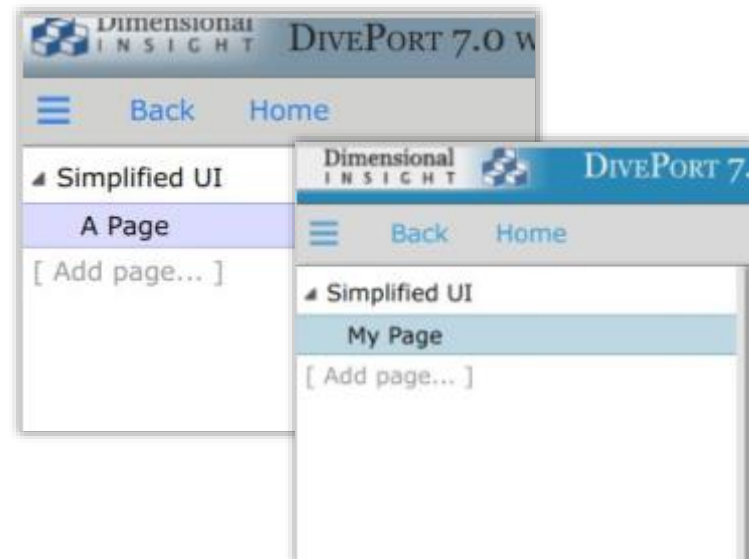
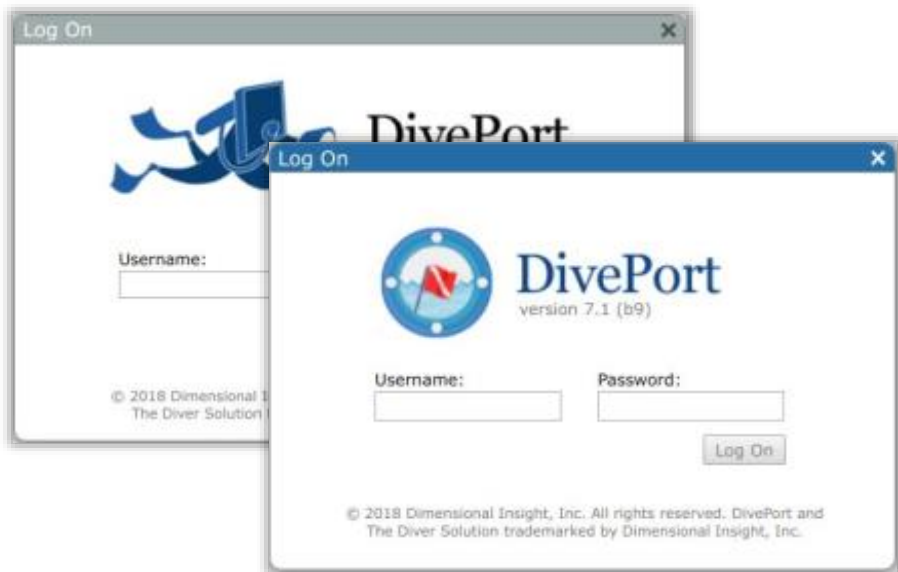
DivePort – Portlet Gallery

- New way to choose a portlet to add
- Quick Search feature
- Categories
- Sort option



DivePort – Skin Changes

- Improvements to the default skin
 - New chart color palette
 - New colors in dialogs and navigation elements
- Previous default is still available as “7.0 Default”



DivePort – Indicator Changes

- Cleaner visual style
- New Indicators:
 - Fill Gauge
 - Circular Gauge



DivePort – QuickView Changes

- New “Flex” style, with lots of options
 - Can be collapsible like a pulldown
 - Can be searchable like a combobox
 - Can select multiple items like a picklist

Product Name Brie 6 oz., Brie 12 ▾

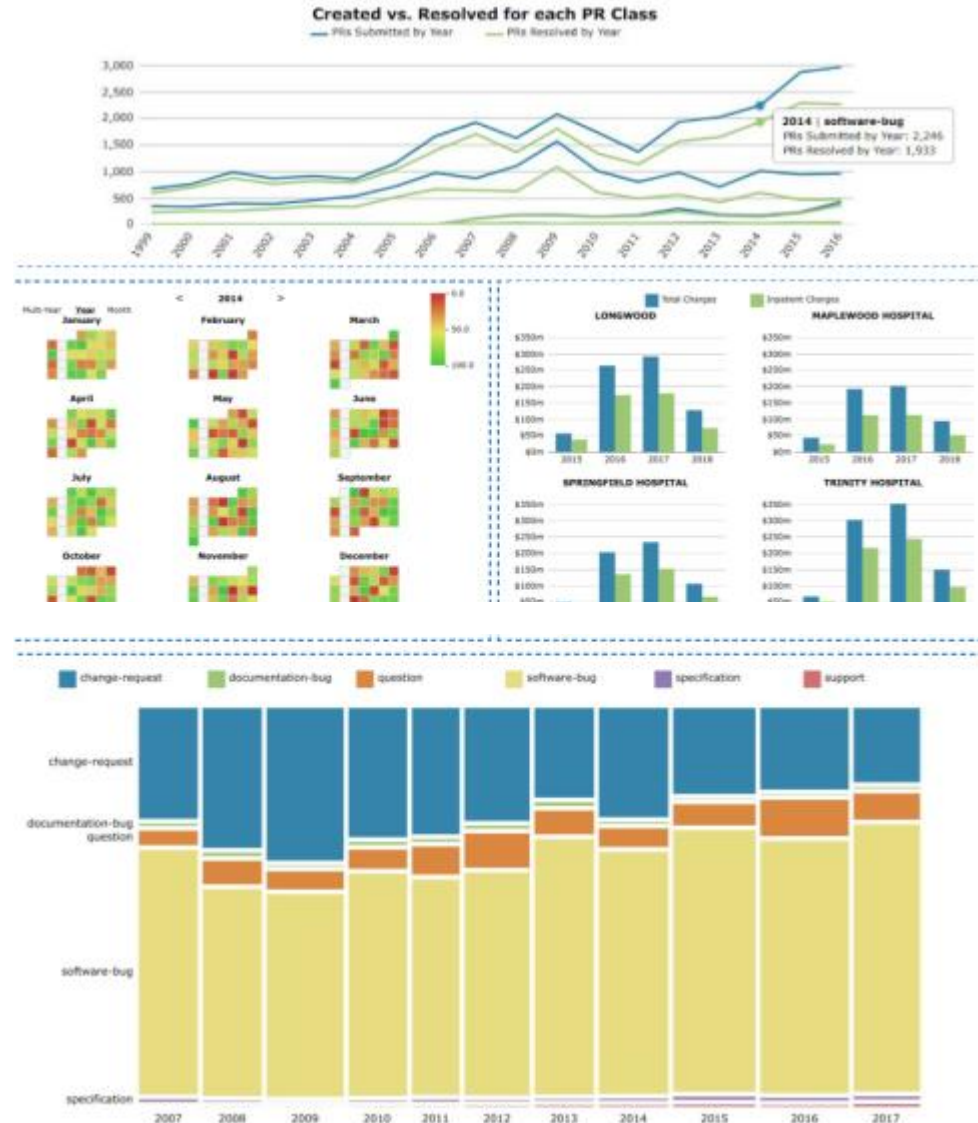
Product Name ⋮ ×

2 values selected: Brie 6 oz., Brie 12 oz.

1% Milk Gallon	American Cheese 5-Pound	Butter, Unsalted - Stick - 1 Pound
1% Milk Half-Gallon	American Cheese 8 oz. Sliced	Cheddar Cheese 5-Pound
1% Milk Half-Pint	American Cheese 16 oz. Sliced	Cheddar Cheese Half-Pound
1% Milk Pint	American Cheese Half-Pound	Cheddar Cheese Pound
1% Milk Quart	American Cheese Pound	Cottage Cheese - Half-Pint
2% Milk Gallon	✓ Brie 6 oz.	Cottage Cheese - Pint
2% Milk Half-Gallon	✓ Brie 12 oz.	Cottage Cheese - Quart
2% Milk Half-Pint	Butter - Whipped - 12 oz. Tub	Cream Cheese - 10 oz.
2% Milk Pint	Butter- Whipped - 8 oz. Tub	Cream Cheese - 14 oz.
2% Milk Quart	Butter, Salted - Stick - 1 Pound	Egg Nog - Half-Gallon

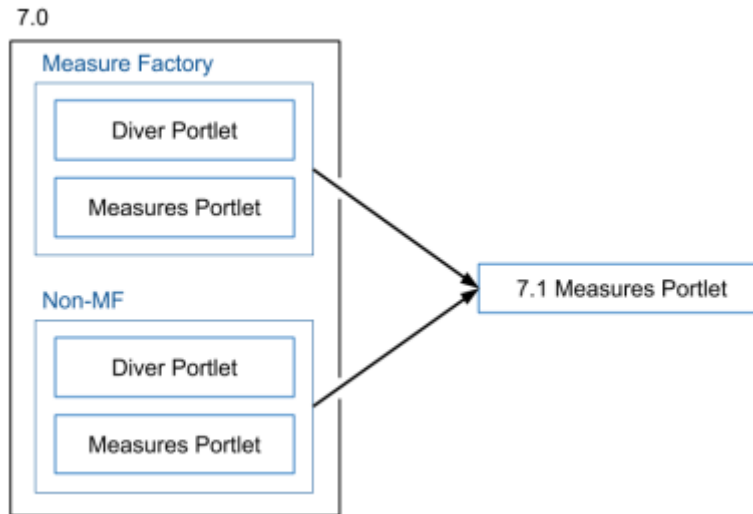
DivePort – Chart Changes

- New chart types
 - Stringline
 - Calendar Heatmatrix
 - Trellis
 - Mosaic
- Custom hover



DivePort – Measures/Diver Portlet Changes

- The Measures Portlet can now dive
 - Separate Diver Portlet no longer needed
 - New dialog style
 - Also, mouse wheel support



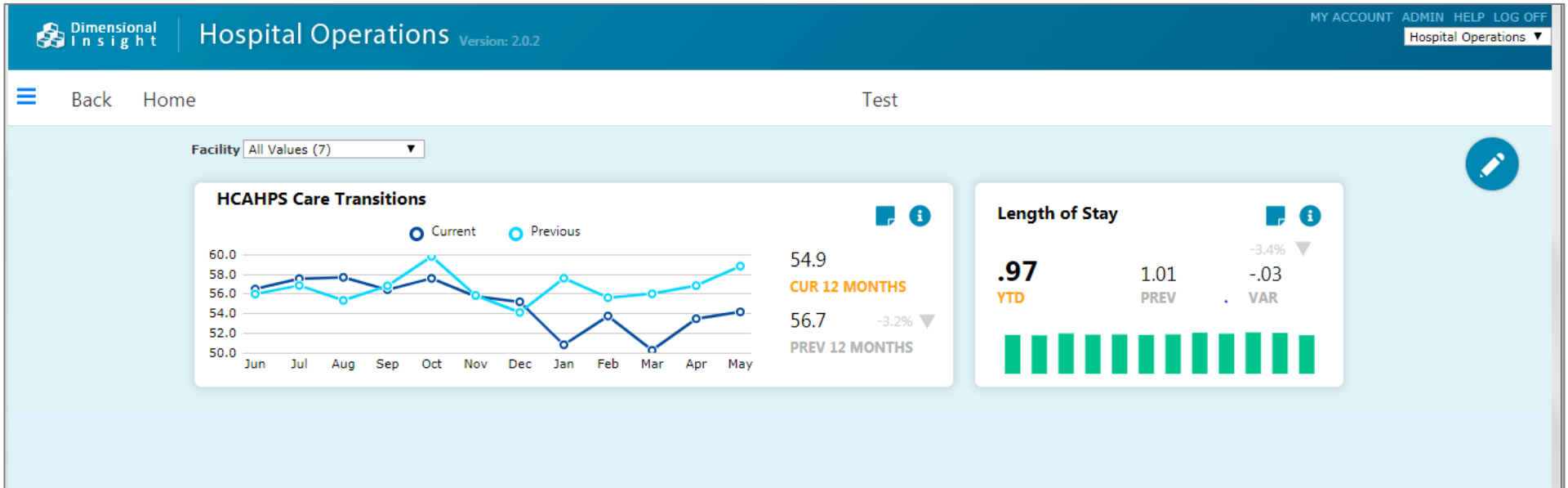
Self Service

- Empower and encourage the end user
 - It has to be easy
 - A data lake is not easy

- Measure Factory
 - Automation
 - Metadata
 - All data in one place
 - Trusted

Self-Service - Stamps

- Preconfigured **self-service** visualizations adapt to a specified measure
- **Integrated analysis** built into measures – automatically



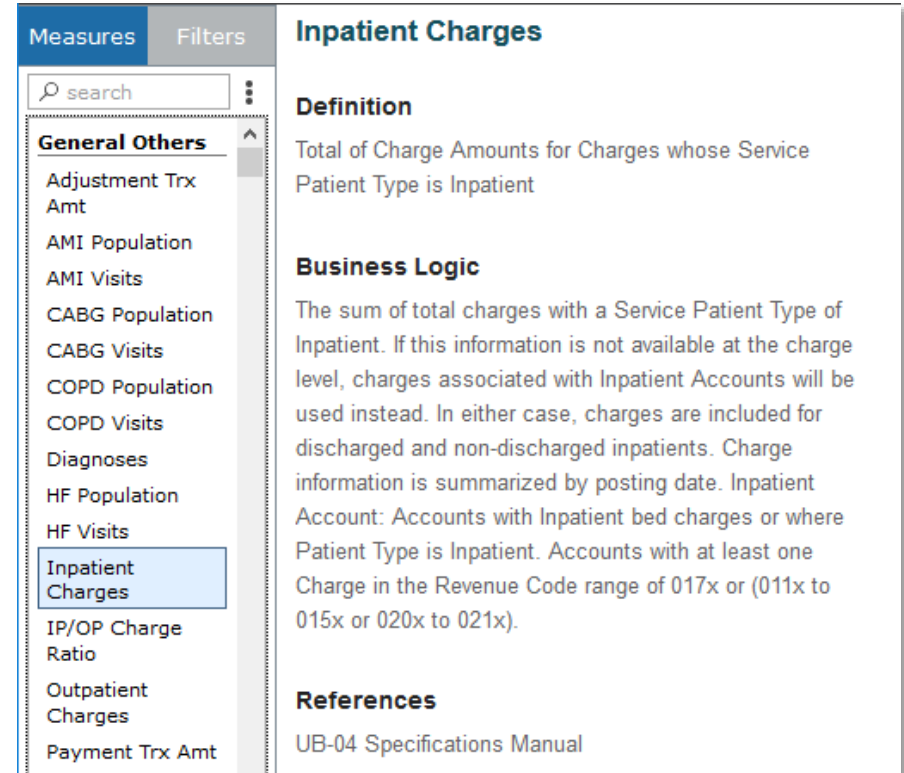
Self Service Demo



Self-Service – Stamp Configuration

- What is a stamp?
 - A collection of portlets, pre-configured and arranged for display
 - Reusable with different measures

- Where do I get them?
 - Default stamps provided by DI
 - DI Applications provide additional application-specific stamps
 - Site admins can add their own custom stamps



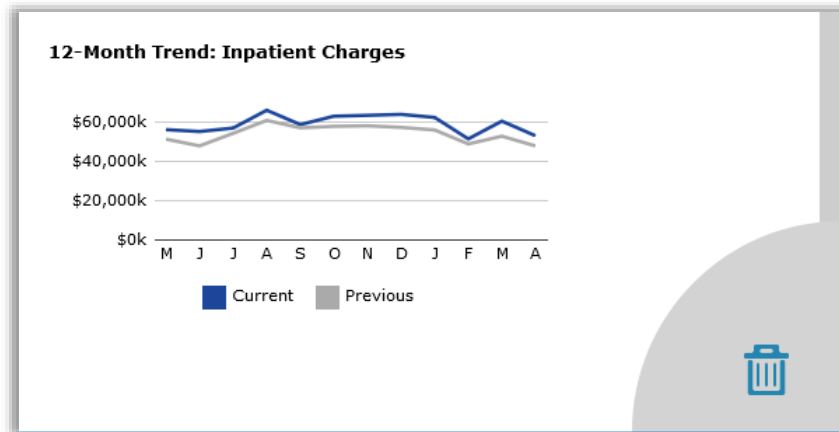
Measures	Filters
<input type="text" value="search"/>	
General Others	
Adjustment Trx Amt	
AMI Population	
AMI Visits	
CABG Population	
CABG Visits	
COPD Population	
COPD Visits	
Diagnoses	
HF Population	
HF Visits	
Inpatient Charges	
IP/OP Charge Ratio	
Outpatient Charges	
Payment Trx Amt	

Inpatient Charges	
Definition	Total of Charge Amounts for Charges whose Service Patient Type is Inpatient
Business Logic	The sum of total charges with a Service Patient Type of Inpatient. If this information is not available at the charge level, charges associated with Inpatient Accounts will be used instead. In either case, charges are included for discharged and non-discharged inpatients. Charge information is summarized by posting date. Inpatient Account: Accounts with Inpatient bed charges or where Patient Type is Inpatient. Accounts with at least one Charge in the Revenue Code range of 017x or (011x to 015x or 020x to 021x).
References	UB-04 Specifications Manual

Self-Service – Stamp Usage

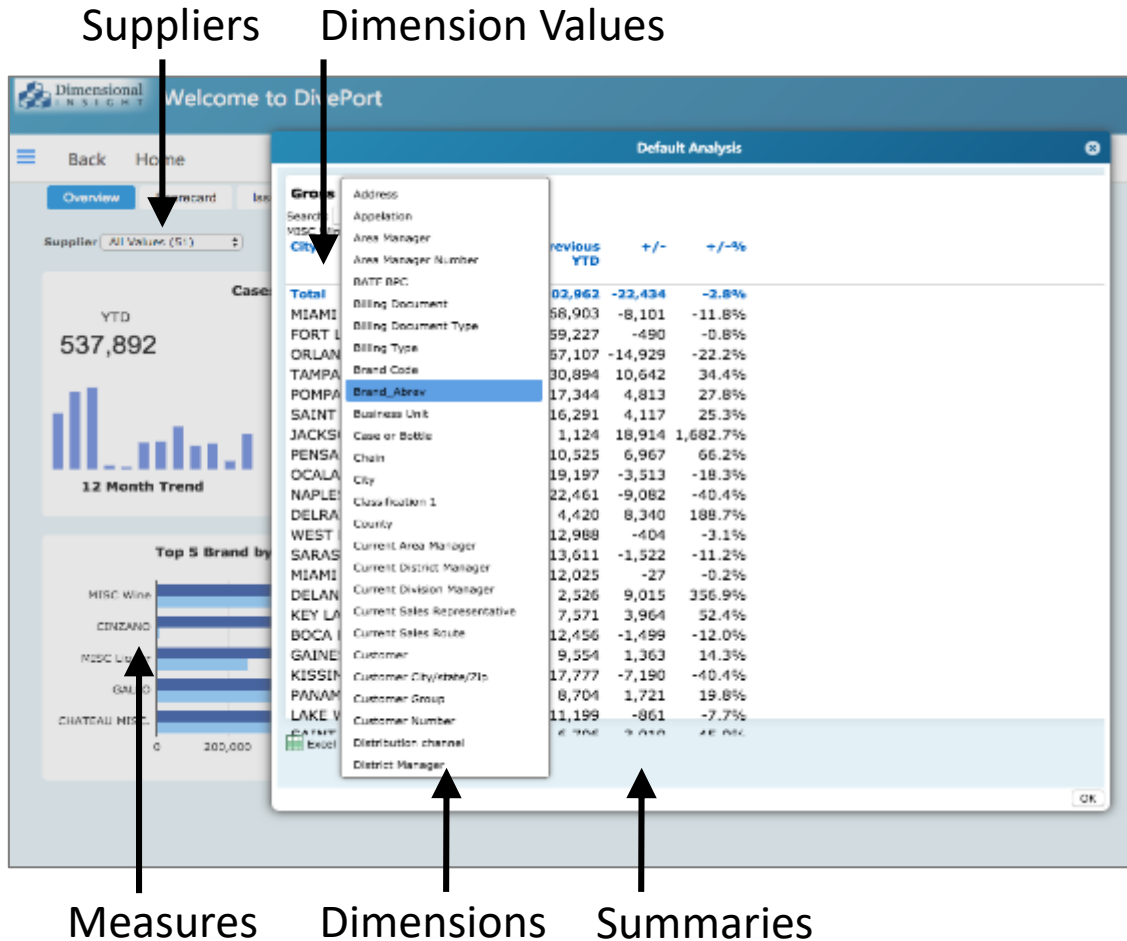
- The Stamp Portlet renders a stamp on a page
 - Simple portlet configuration
 - Edit the portlet to change the measure

- For self-service, each user has their own page
 - New “Stamp Grid” layout
 - Drag and drop stamps in your own playground



Agile Exploration

Unlimited diving without pre-configured dive paths or hierarchies

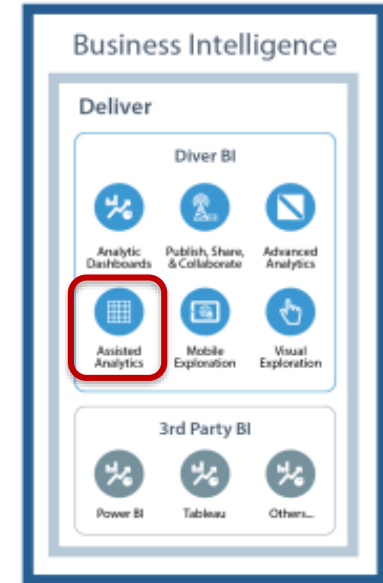


- Dashboard Analysis Example:
 - 7 measures
 - 69 dimensions
 - 51 different suppliers
 - Assuming you dive only 3 deep, the total number of permutations is **114,428,496**
- **Completely automated**

Assisted Analysis

- Too many possibilities
 - Let the software help you find interesting data

- With Assisted Analysis:
 - Software looks ahead
 - Gives you suggestions
 - Rates them on a scale of 1-9
 - You take it from there



Assisted Analysis – Usage

- New Feature in Analysis Portlet
- Three modes
 - Assisted Analysis
 - Lists dimensions by importance
 - Lists values in those dimensions by importance
 - Standard dive table
 - For manual control
 - Measure history chart

Acute ALOS

Focus: Minimum rating:

Rating	Dimension	Rating	Value	Chart
7	Service Line	7	SURGICAL TRACHEOSTOM	
7	Discharge Location	4	LW 3 PROG CARE NRSY	
7	MS DRG	4	003-ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	
		4	853-INFECTIOUS & PARASITIC DISEASES W O.R. PROCEDURE W MCC	
		3	233-CORONARY BYPASS W CARDIAC CATH W MCC	
7	Discharge Service	4	Neonatal Care	
7	Patient Age at Admission	4	020	
7	Discharge Status-Abbrev	4	DC Long Term health Care(63)	
7	Attending Provider	3	Knox, C (PHY_002451)	
7	Admitting Provider	3	Delaney, Z (PHY_004850)	
7	Principal Px Clinical Class	3	Tracheostomy; temporary and permanent (34)	
		3	M_0000775063	
		3	M_0000374299	
7	Primary Care Provider	3	Sloan, T (PHY_027190)	
7	Principal Diagnosis	3	N17.0 - Acute kidney failure with tubular necrosis	
		3	A40.9 - Streptococcal sepsis, unspecified	
7	Patient City	3	MANSFIELD	
7	Patient ZipCode	3	44903	
7	Principal Dx Clinical Class	3	Crushing injury or internal injury (234)	

Assisted Analysis Demo



Assisted Analysis – Algorithms

- What makes a value “interesting”
 - Must be something a computer can detect
 - Doesn’t have to be perfect

- Default algorithm
 - “3-sigma” standard deviation analysis



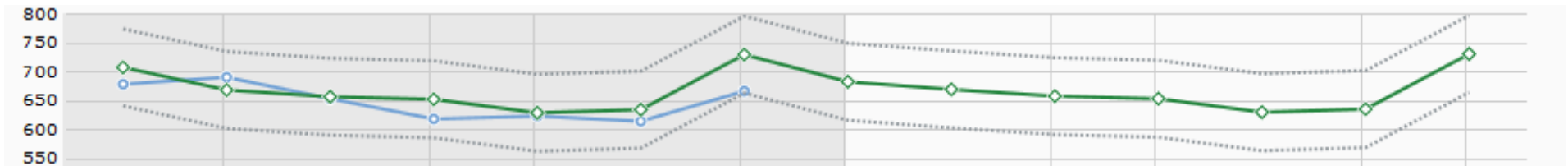
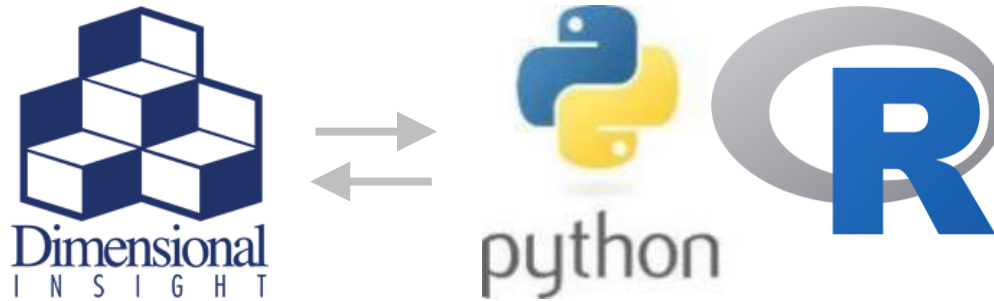
Assisted Analysis – Algorithms

- This is just the beginning
- Future ideas
 - Look for control-chart-style rule violations
 - Predictive analytics



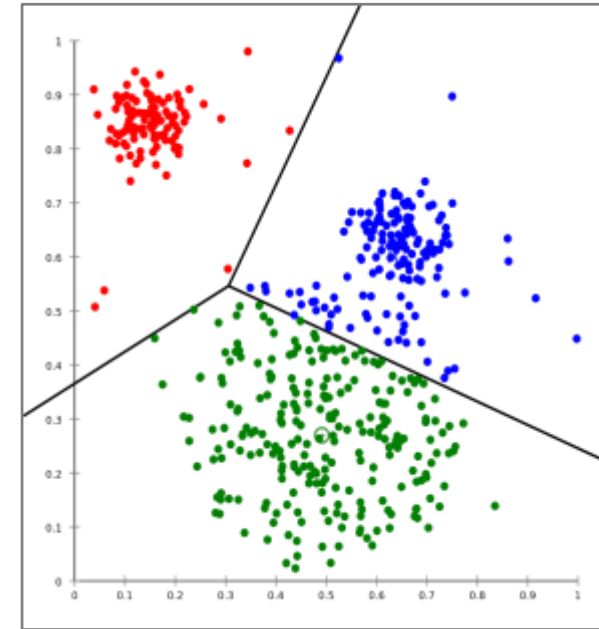
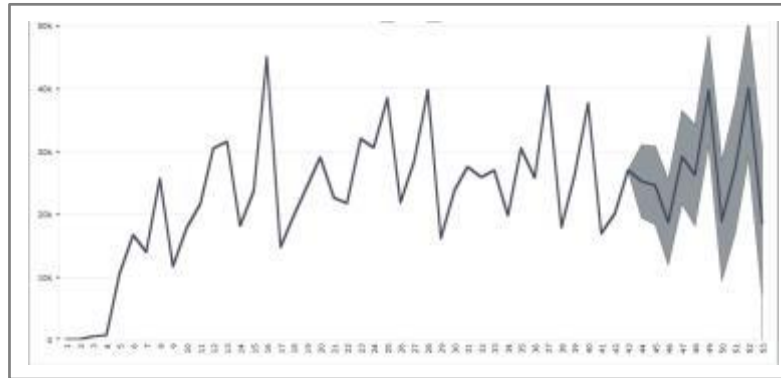
Predictive Analytics and Data Science

- Open Architecture allows use of advanced third-party tools



Predictive Analytics

- Use external tools for statistical analysis and machine learning
- Visualize within dashboards
 - Regressions
 - Clustering
 - Outlier detection
 - Time series forecasting



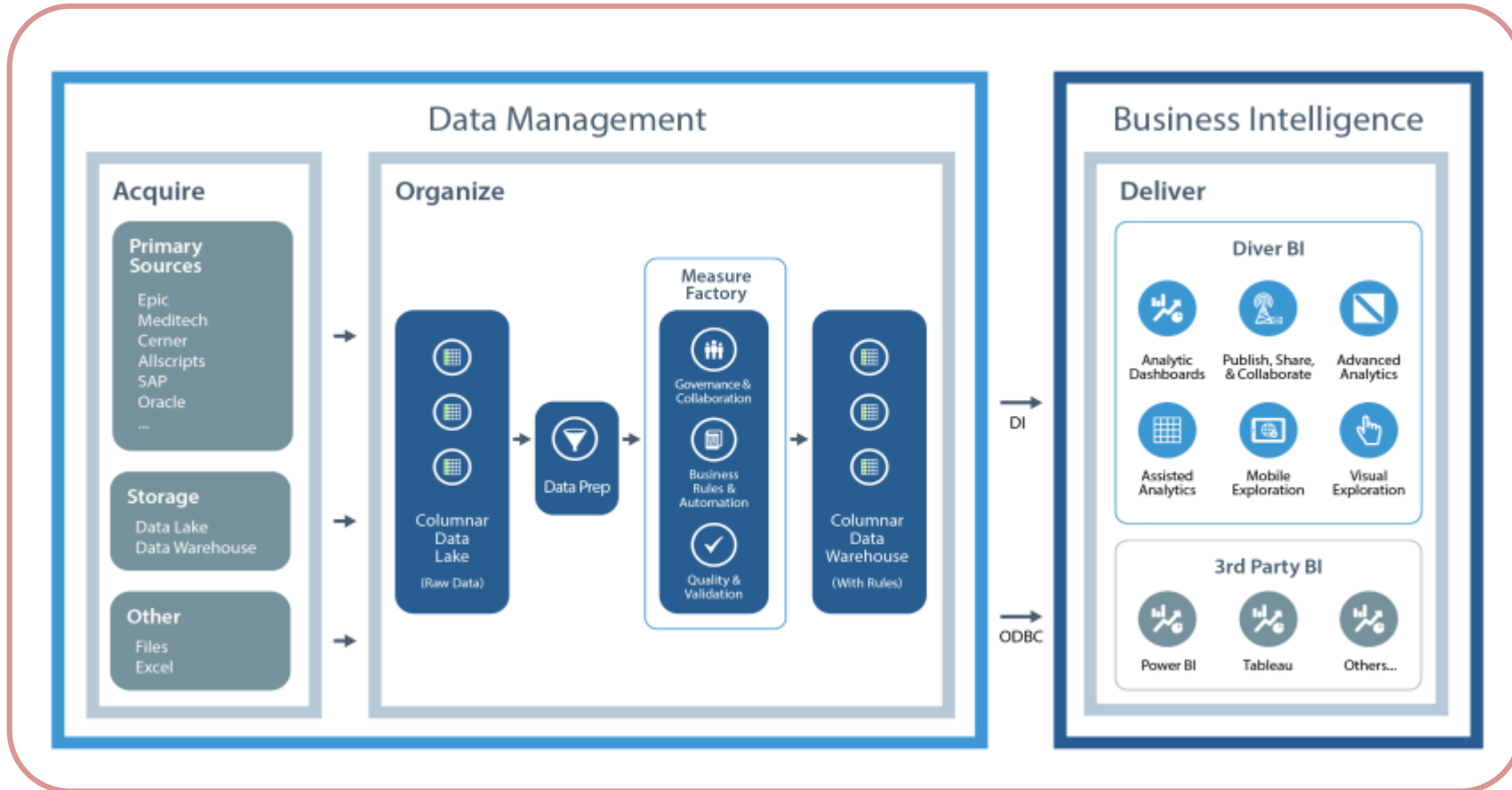
Part 3 Review: Deliver

- ProDiver
 - Change dimension, console filters, updated UI elements
- DiveTab
- DivePort
 - Portlet gallery, new QuickViews, new charts, indicator/measures changes
- Self Service
 - Stamps, stamp grid layout, user pages
- Assisted Analysis
- Predictive Analytics

Part 4: Deploy

Part 4: Deploy

Beginning to end



Workbench Review

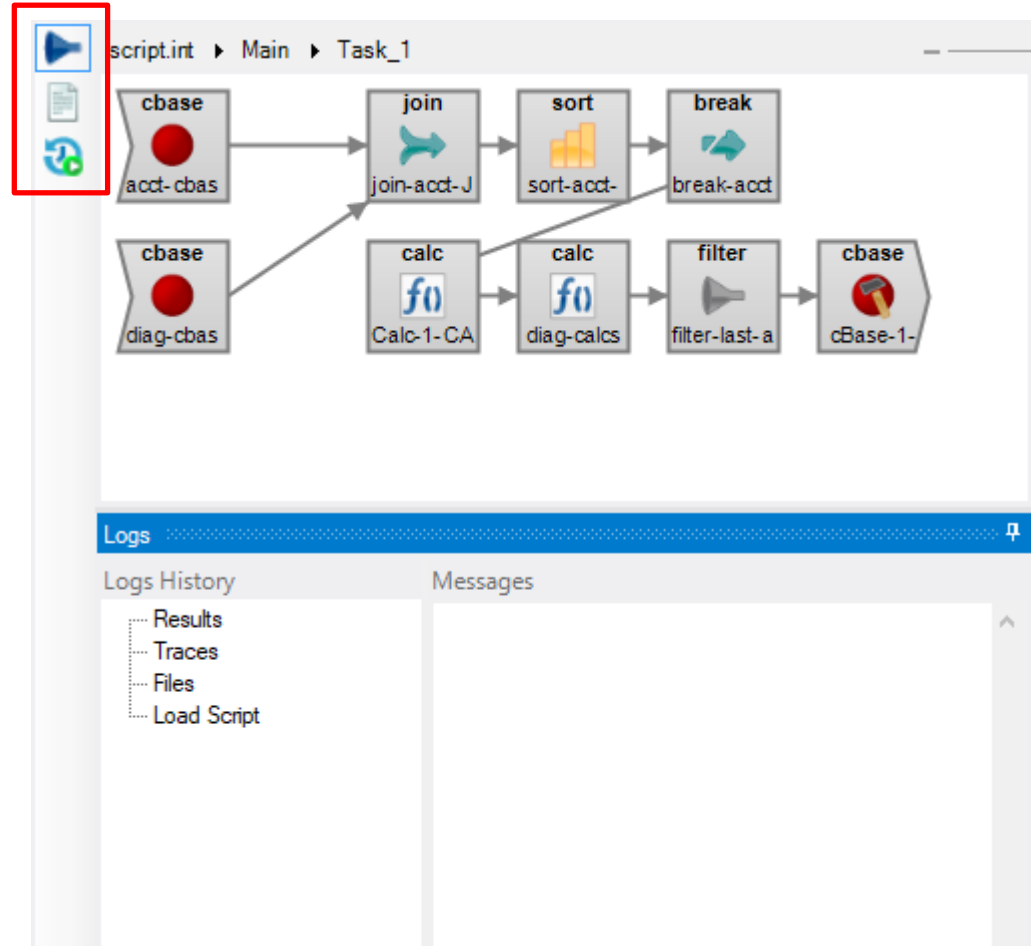
- DI's Client/Server Distributed IDE
- One-Stop Shopping for all development needs
- Server Configuration (users, groups, access control)
- Server Maintenance (active users, processes)
- Allows multiple simultaneous users
- Version Control/File History

New In Workbench 7.1

- View Switcher
- Process Manager
- Spectre Build UI
- Expanded Table Editor
- Connection Manager/Quick Launch dialog
- Measure Factory UI

View Switcher

- Simplifies multiple different views of the same file
- Easily switch between text and GUI views
- New "Run History" control for Process Manager



Process Manager

- Handles Integrator, Builder, Spectre Processes
- Keeps track of all processes running on the server
 - Who launched them?
 - How much memory/processor time are they using?
- View Logs - Success/Failure, Elapsed Time, output, etc.

Processes

Running Processes

Script Location	RunID	Parameters	StartedBy	Status	CPU	CPU Peak	CPU Avg
racess://programs/buildall.prd	20190724_171209	NumRecords=1000_diveLine...	admin (Manual)	Running			
racess://programs/generate.int	20190724_091210_1	NumRecords=1000	/programs/buildall.prd	Warning	13%	13%	
racess://programs/race_spectre.build	20190724_091211_1		/programs/buildall.prd	Warning	15%	15%	
racess://programs/race_classic.dbc	20190724_091212_1		/programs/buildall.prd	Succeeded	13%	13%	
racess://programs/race_classic_year.dbc	20190724_091215_1	YEAR=2014	/programs/buildall.prd	Succeeded	-	-	
racess://programs/race_classic_year.dbc	20190724_091214_1	YEAR=2013	/programs/buildall.prd	Succeeded	13%	13%	

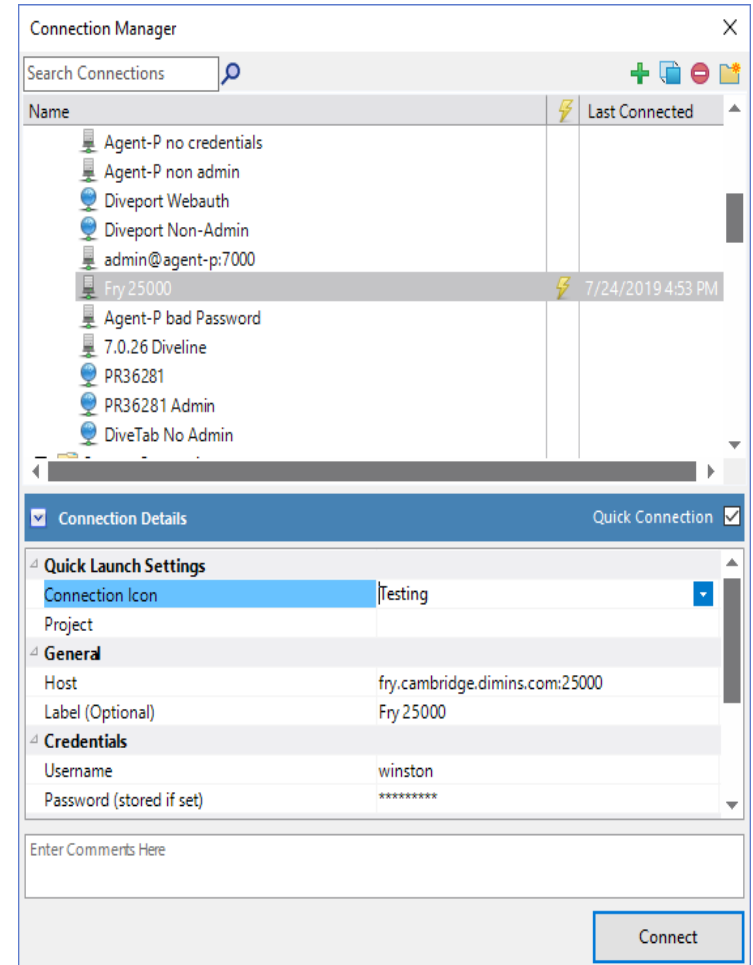
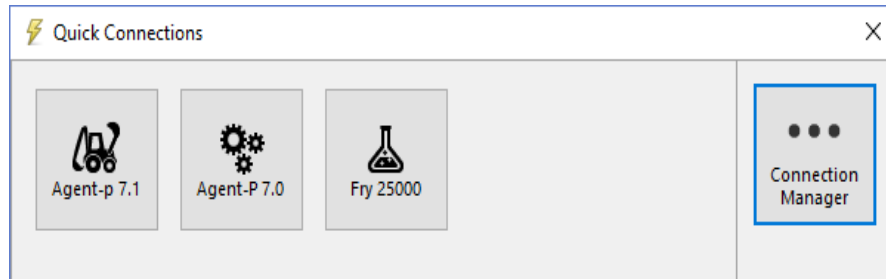
```

Type: Spectre Path: racess://programs/race_spectre.build Run ID: 20190724_091211_1
Started By: /programs/buildall.prd Status: Warning
Start: 7/24/2019 5:12:12 PM End: 7/24/2019 5:12:13 PM Elapsed: 00:00:00.969

Time Source Type Output
5:12:12 PM Info Normal Environment Variables:
5:12:12 PM Info Normal di_home = e:\di_solution\di-dataroot
5:12:12 PM Info Normal di_project = races
5:12:12 PM Info Normal Command Line: f:\c7.0\spectre.exe build /programs/race_spectre.build j 2 -project races
5:12:12 PM Stderr Normal spectre build 7.0 (d51 r186847) DEBUG
5:12:12 PM Stderr Normal 00:00:00.024: Temp folder: project://races/temp
5:12:12 PM Stderr Warning 00:00:00.039: WARNING: project://races/programs/race_spectre.build:9:31: Unexpected attribute 'name' for 'output'
5:12:12 PM Stderr Warning 00:00:00.039: WARNING: project://races/programs/race_spectre.build:10: Unexpected tag 'layout-data' for 'build'
5:12:12 PM Stderr Normal 00:00:00.084: Selected delimiter: '\t'
5:12:12 PM Stderr Normal 00:00:00.114: No encoding specified, but the input looks like ISO-8859-1
5:12:12 PM Stderr Normal 00:00:00.121: Reading project://races/data/data.txt...
5:12:12 PM Stderr Normal 00:00:00.126: Using encoding ISO_8859-1:1987
5:12:12 PM Stderr Normal 00:00:00.126: Using locale en_US
5:12:12 PM Stderr Normal 00:00:00.437: 1,000 rows, 16 columns
5:12:12 PM Stderr Normal 00:00:00.438: Sorting strings...
5:12:12 PM Stderr Normal 00:00:00.453: Writing e:\di\projects\races\cbases\race.cbases...
5:12:13 PM Stderr Normal Finished in 0.794 seconds with 2 warnings and 0 errors
5:12:13 PM Stderr Normal 00:00:00.794: This build used 27MB of memory.
5:12:13 PM Stderr Normal 00:00:00.795: Total cBase size: 63KB
5:12:13 PM Stderr Normal 00:00:00.374: 100% (1,001 lines)
  
```

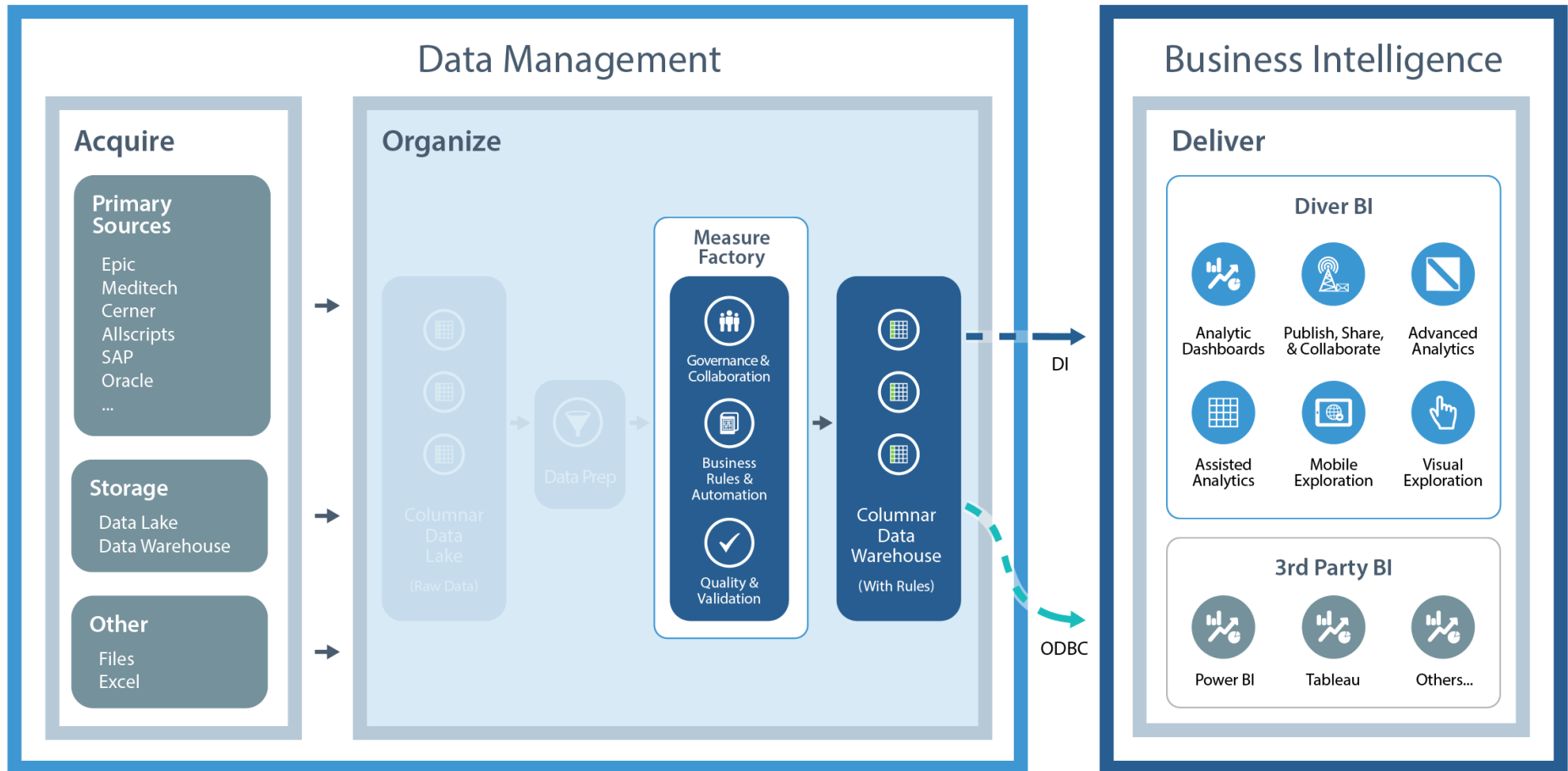
Connection Manager/Quick Launch

- Consistent Connection Manager UI
- New “Quick Launch” dialog makes connecting to select servers quicker.

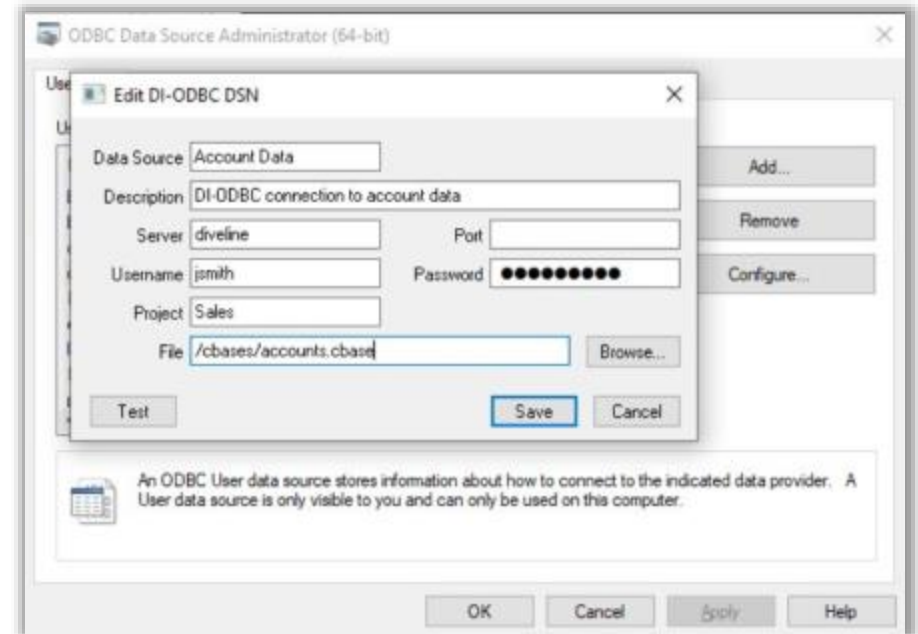


Open Architecture

Analysts can use their tool of choice



- New DI-ODBC Driver
 - Connect third-party applications to DiveLine
 - Use SQL to query a Measure Factory, cBase, cPlan, or dive script
- Examples
 - Synchronize data into an Excel sheet
 - Use the Spectre engine to feed an alternative graphing tool
 - Dump cBase data to import into another application

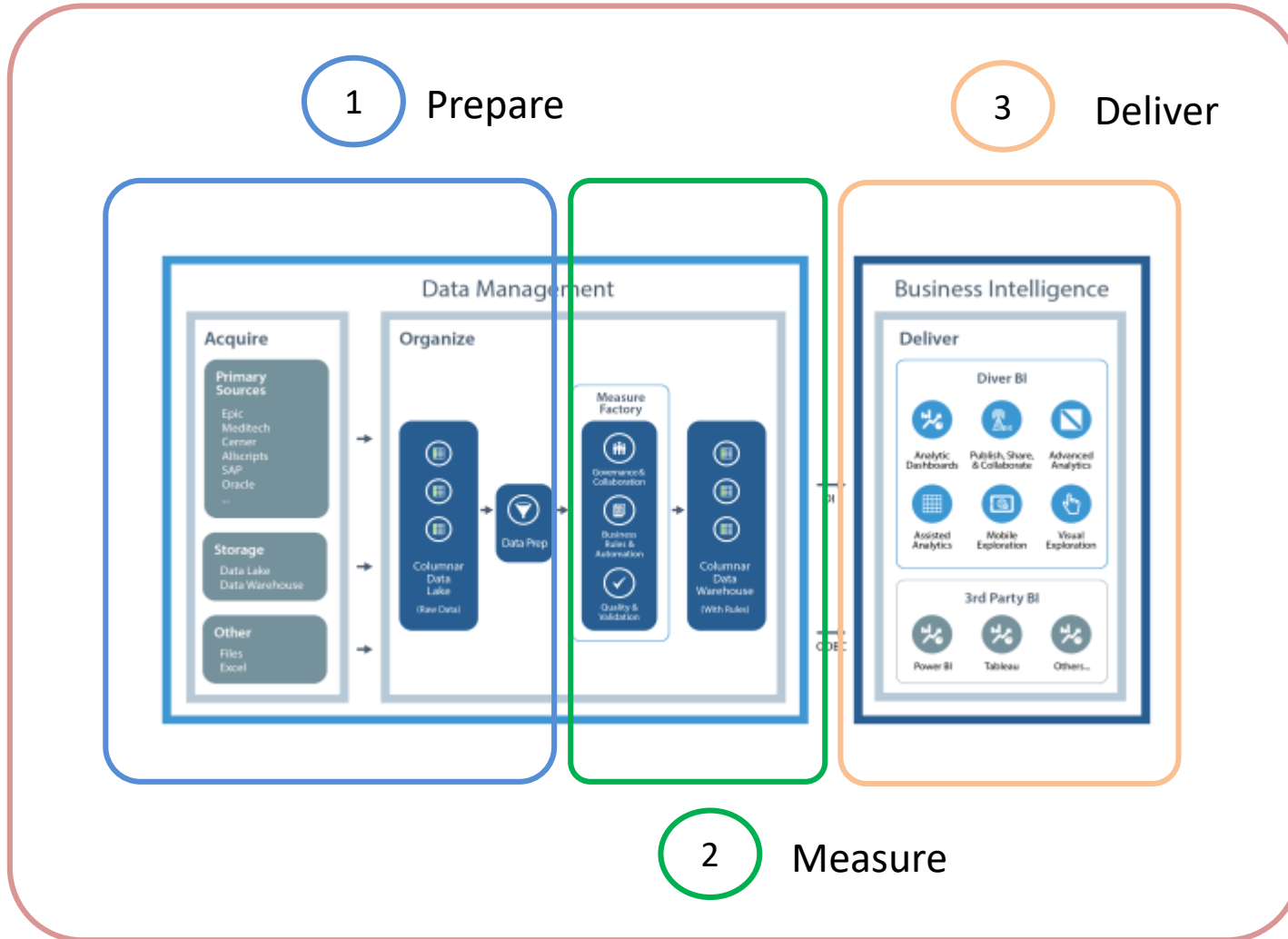


Part 4 Review: Deploy

- Workbench
 - View switcher
 - Process Manager
 - Quick Launch
 - Connection Manager
- DI-ODBC
 - Connect to third-party tools

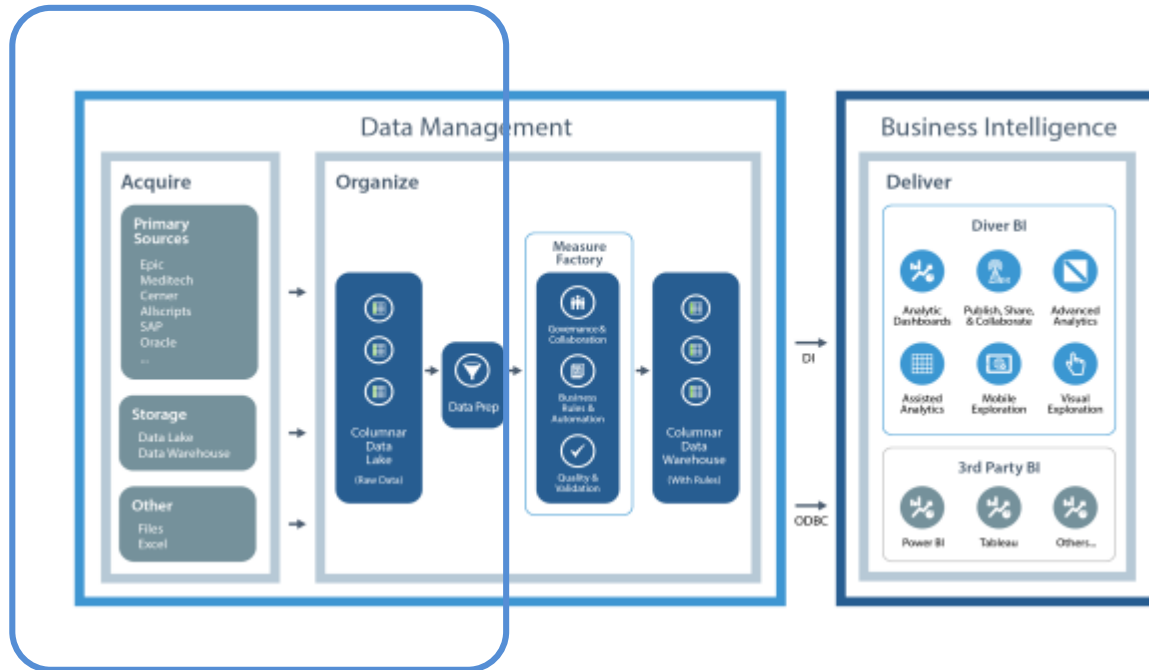
Future Plans

Platform Map



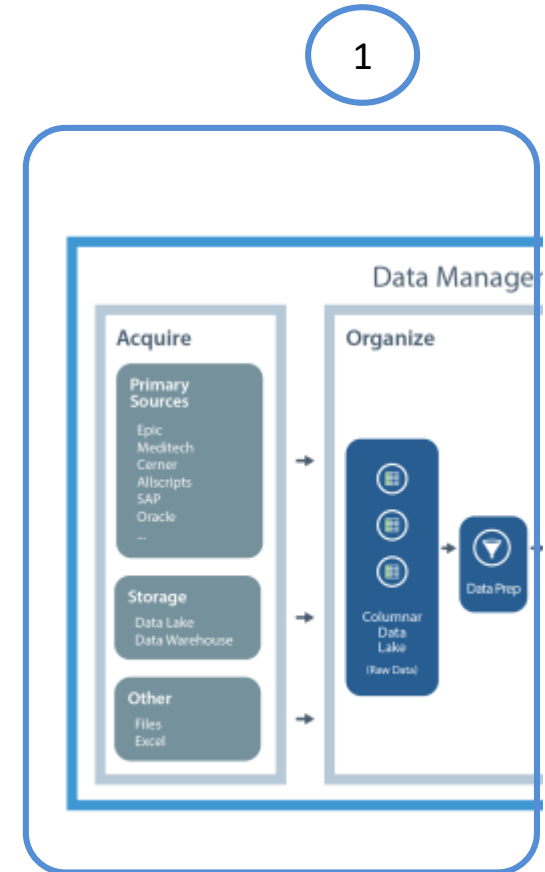
Prepare: the Future

1 Prepare



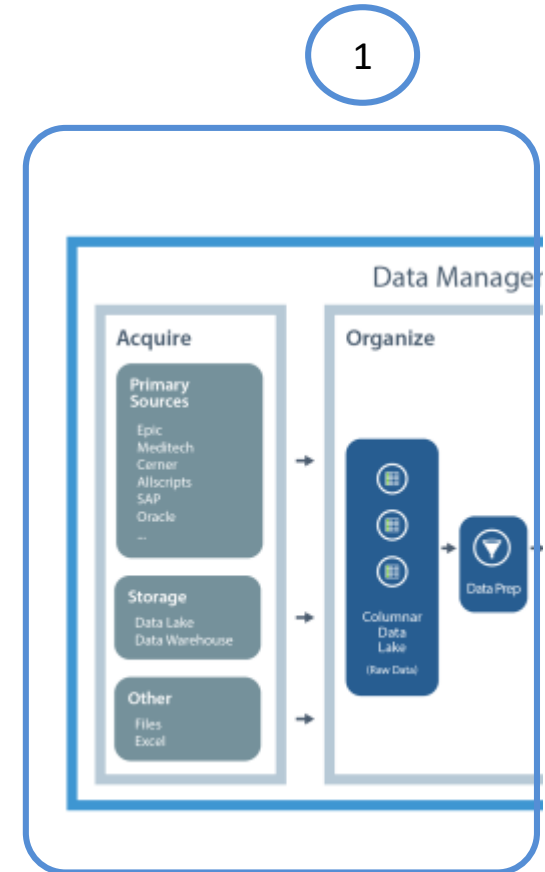
Future: Spectre

- New system for analyzing the whole build/dive process
 - Reduce peak memory usage
 - Share results of some operations
 - Cache intermediate results

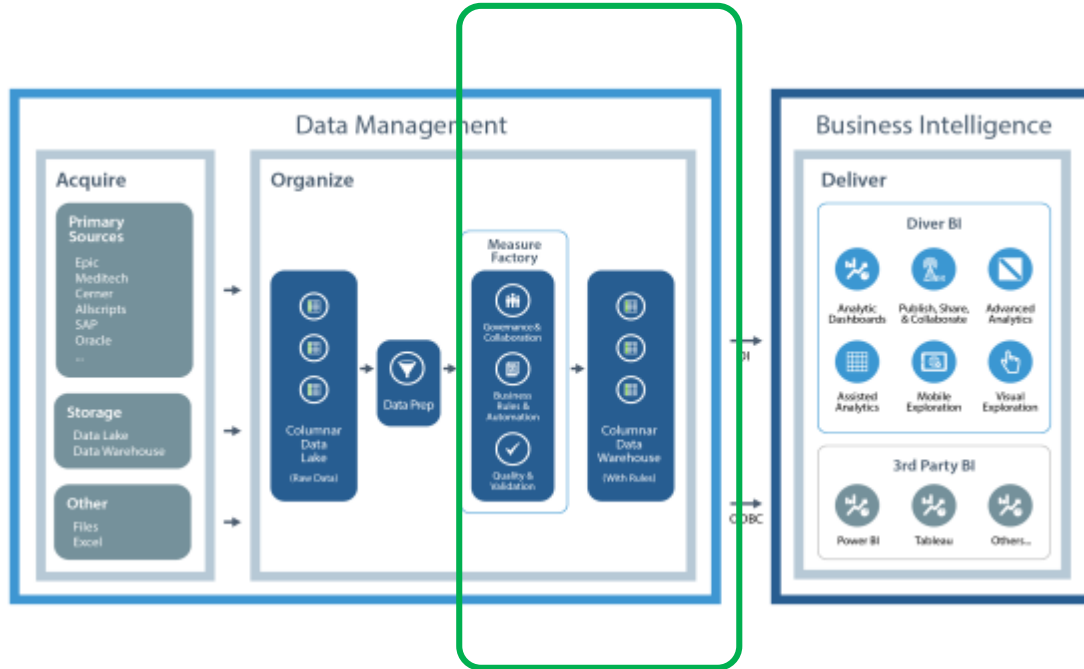


Future: Upload Portlet

- Drag & Drop file upload
- Text file, Excel sheets, images, docs...
- “Required columns” feature
- Custom validation and processing



Measure: the Future



2 Measure

Future: Measure Factory

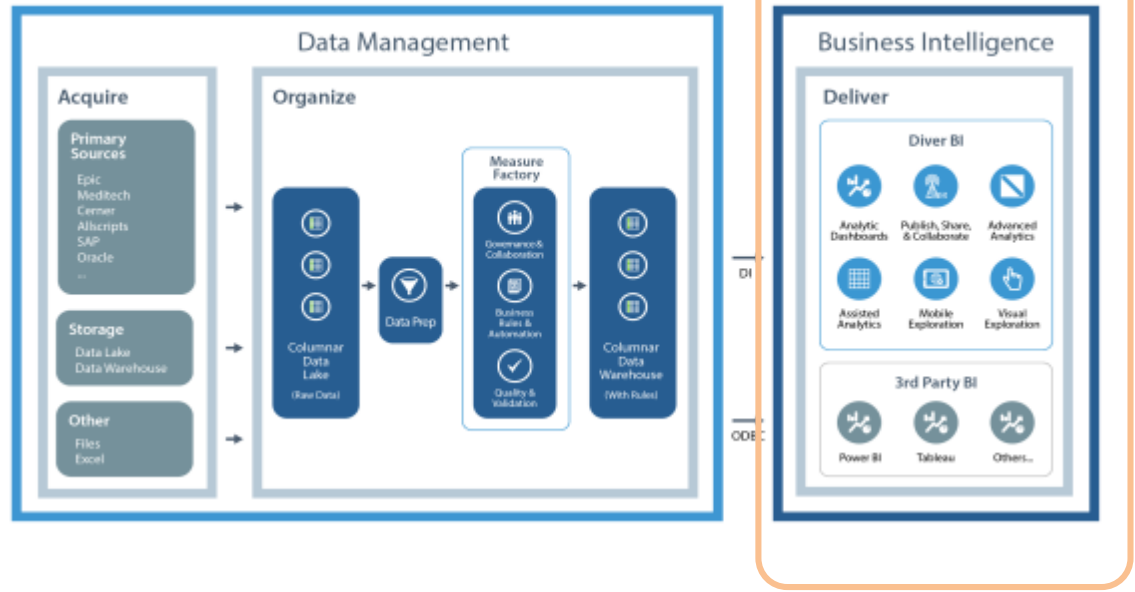
- Track Data from Data Sources to Factory
 - Measure Factory can track a measure back to the factory inputs
 - Extend metadata farther back
 - To original data sources
- Multi-application support
 - Techniques exist to combine applications in a factory
 - Improve support for this
 - Integrate it into the graphical interface

Future: Measure Factory

- Easier transition to factory
 - Tomorrow we'll discuss migrating to a factory
 - Make this even easier
- Factory Editor UI Updates
 - Analyses
 - Factory settings

Deliver: the Future

3 Deliver



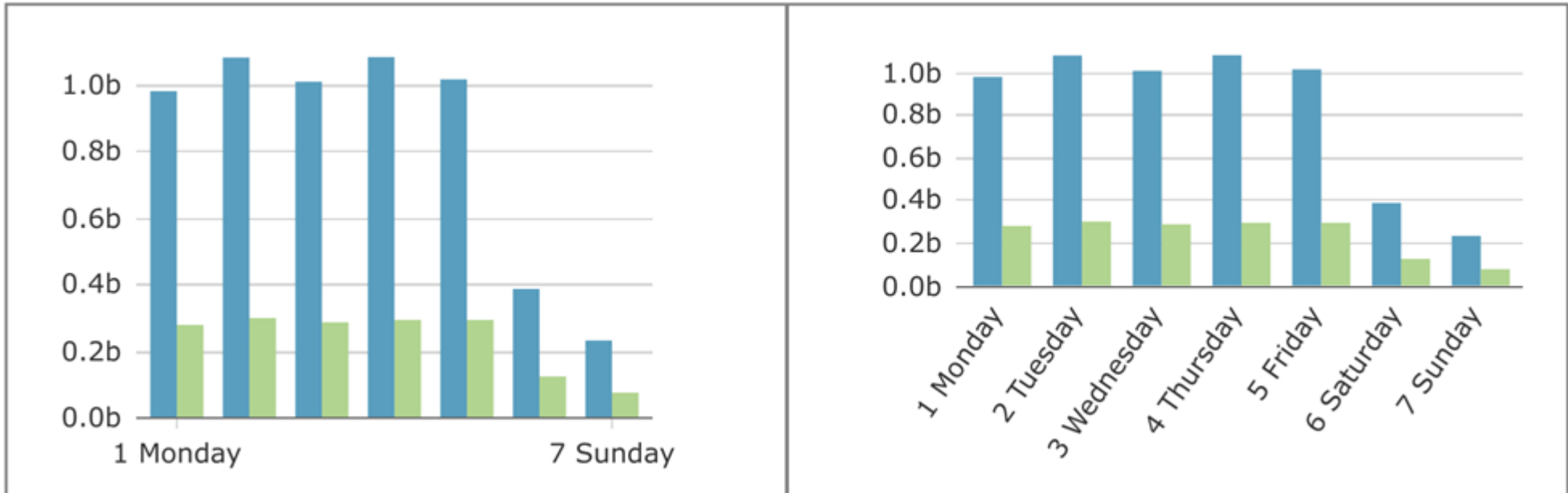
Future: DivePort

- Chart Animations
 - Animations for (many) charts:
 - “load” animation
 - “change” animation
 - Almost ready

- Map Filter Feature
 - Filter portlets CrossLink-style by zooming into a map
 - Almost ready

Future: DivePort

- More Charts
 - Control Charts
- Slanted tick labels
 - In testing



Future: DiveTab

- Self Service in DiveTab
 - Add stamps to DiveTab
 - Let users create their own pages
 - Sync them across devices

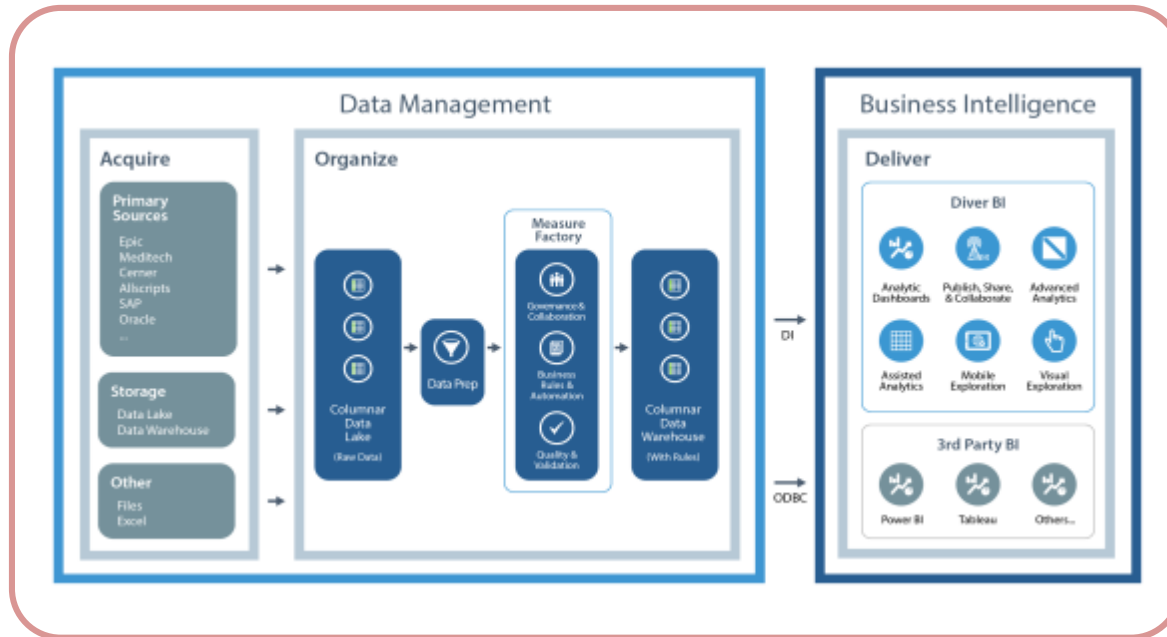
Future: Assisted Analysis

- Add more algorithms to Assisted Analysis
 - Statistical
 - Predictive
 - Control-chart
 - And more

Future: ProDiver

- More interface changes
 - Improve usability
- Measure Factory Integration
 - Measure categories
 - Show metadata

Deploy: the Future



4 Deploy

Future: User Management

- Improved Active Directory integration
 - Connect to AD Roles

- Authentication standards
 - Multi-Factor Authentication (MFA)
 - OATH, FIDO2 / WebAuthn

Future: Measure Factory

- Limiting Measures selection
 - Simplify for specialized users
- Speed up Factory builds

Diver Platform Architecture

