



A New Approach to Verifying SAP Data Integrity

SAP Enterprise Data Integrity Testing (EDIT) by Tricentis

Curtis O'Dell, Global Director Data Integrity Solutions Tricentis

PUBLIC

Tricentis Summary

Capabilities

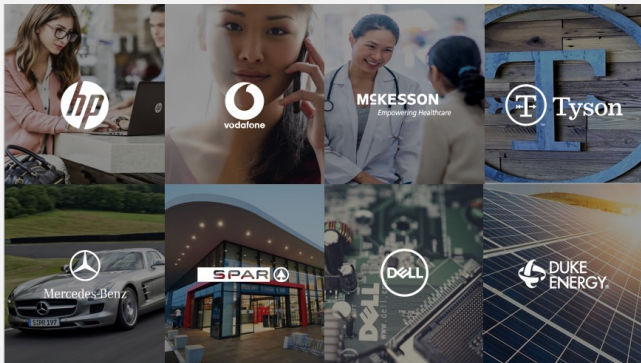
Enterprise Continuous Testing
Change Impact Analysis
Enterprise Performance Testing
Enterprise Data Integrity Testing



Key Objectives

Tricentis technologies and how they can support change in the SAP and non-SAP context

Customer Success



FORRESTER

Total Economic Impact Report



NPV
\$6.0M



ROI
334%



Payback
<6 months



Application
release increase
300%



Production
errors reduced
78%



Testing scope
reduced
85%

[Forrester TEI Report Link](#)

Tricentis Summary

Founded in 2007 by Wolfgang Platz
Over 300,000 teams use Tricentis software
SAP chose Tricentis as the default Quality Assurance Solution in Sept. 2020

Why SAP Chose Tricentis

Global Leader in
Enterprise Testing Solutions

Enterprise-Grade Platform
for SAP Testing and Beyond


Modern, AI-Driven
Technology for Easy Adoption

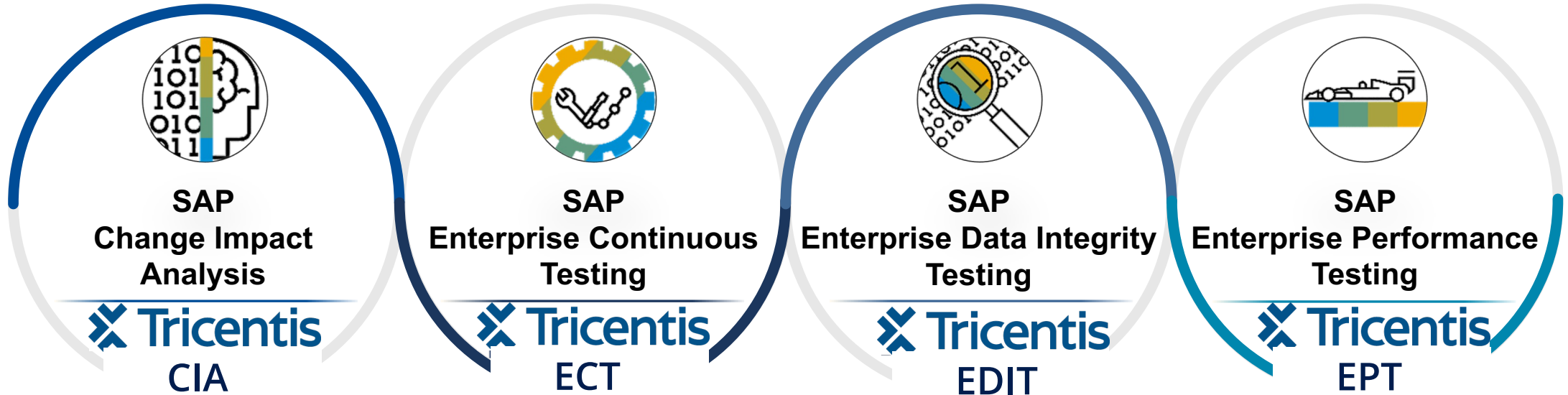
Tricentis-SAP Partnership Value

Ensuring successful business outcomes together

Partnership OEM | Premium Support
Co-Development | Product Reselling

SAP Application Testing Solutions by Tricentis

 SAP[®] Solution Extension



Capabilities

Benefit

- Risk AI – identifies most at-risk objects
- Risk-based test optimization (Hits & Gaps)
- Risk assessments and test plans for packaged app changes

- Achieve 90%+ business risk coverage
- 85% test scope reduction
- Deliver zero-defect updates for only 15% of traditional test effort

- AI-powered, codeless automation
- Test data & environment provisioning
- End-to-end automation at the UI, API & data layer (SAP & 3rd party technology)

- Accelerate release cycles and reduce test cycles times by 80%
- Achieve 90%+ test automation rates
- Boost release confidence with business risk coverage >85%

- Automated, end-to-end testing for any type of data and every data journey
- Tests tailored to catch errors on each step of the data journey
- Model-based test automation

- Catch more data errors upfront
- Test at high volume and velocity
- Deliver higher quality analytical and operational data at scale

- No code approaches for fast test design & maintenance
- Built-in CI pipeline integrations
- One click conversion of functional into performance tests

- Up to 80% faster test design & maintenance
- Keeps pace with releasing fast decreases production issues by up to 90%

Data Integrity Top 4 Business Use Cases

Driving Enterprises with Disciplined Data

- 1. Data Migrations(Non-ERP Migrations):** By offering a unique ability to validate against regression, data can now be moved in a consistent and trusted process ensuring data integrity during the move and going forward.
 - **On- prem to Cloud**
 - **TJX - On-prem to Snowflake**
 - **Prologis – On-prem to Snowflake**
 - **Merger and Acquisitions**
 - **TD Bank – First Horizon**
- 2. Data Integrity:** End-to-End data integrity provides trustworthy data decisioning. Bad decision made on Bad Data:
 - **Bad Reporting for Business –**
 - **ExxonMobil – Reporting - Oil Storage Usage**
 - **Prologis – Logistics – Shipping Warehouse Usage**
 - **Others: Nationwide, Worldpay, Ally Bank**

Data Initiatives with Data Errors can cause costly consequences for your business:

Compliance & regulatory reports

Financial reporting

Customer 360

AI initiatives

IoT projects

Mergers & acquisitions

Analytics & dashboards

Core business processes

Data Integrity Top 4 Business Use Cases

Driving Enterprises with Disciplined Data

3. **Compliance:** Ability to ensure data integrity from data owners and stewards through the compliance and audit processes to delivery.

- **Compliance fines are REAL in regulated industries**

(Mfg., Ins, Bank, Pharma, Finance, etc...)

- TD Bank – Fed / FFEIC / Banking Regs... → AML (Anti Money Laundering) and KYC (Know Your Customer)
- GSK - FDA Compliance... → Pharma, HLS
- Nationwide – IFSR 17 regs, etc.. → Insurance

4. **SAP:** HANA the new ecosystems are hybrid (SAP and non-SAP) and complex. Ability to ensure quality, efficiency and trust across the entire environment is critical to success of the SAP data warehouses.

- Mercedes
- Duke Energy

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Automated Data Integrity

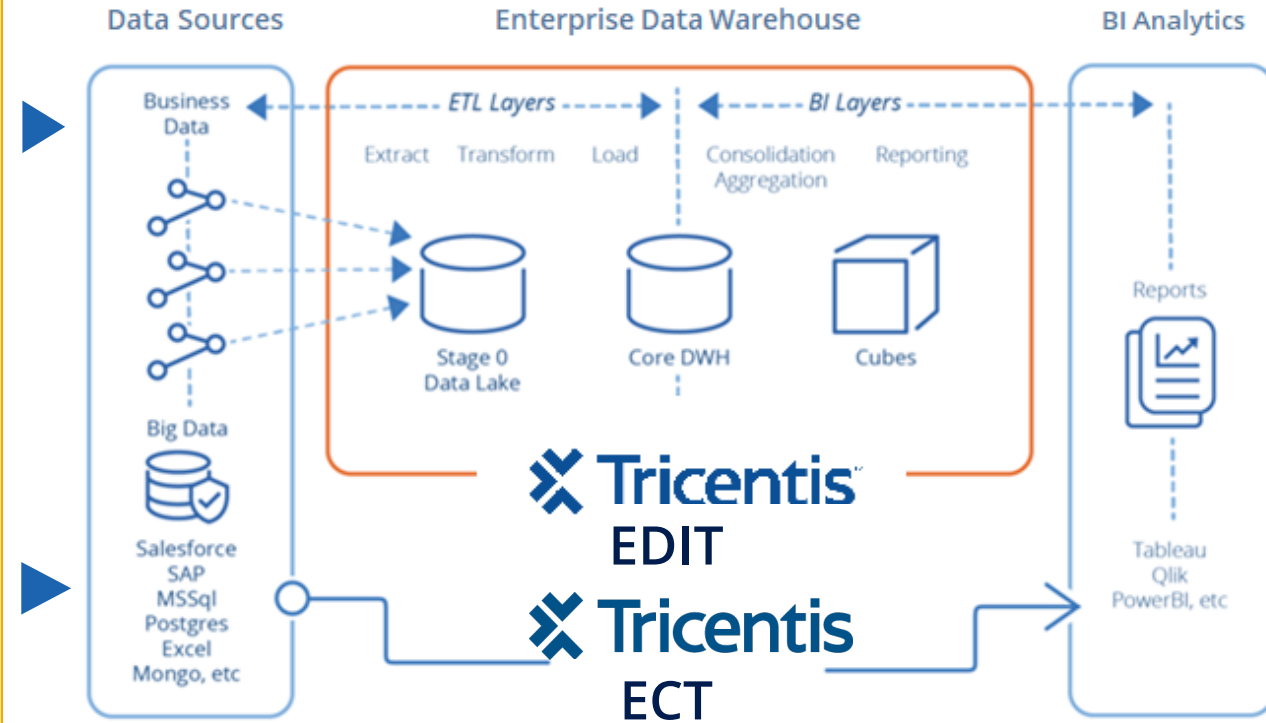
Only solution in the market for Automation and End to End Testing across the EDW

Move from Manual SQL Scripting to Scripless Model Based Test Automation

Covers all Reconciliation and Validation Tasks across the EDW from Sources to Stores to Reporting and Visualizations

Wizards for Ease of Use by any BA, Data Steward, DA, Data Engineer and others

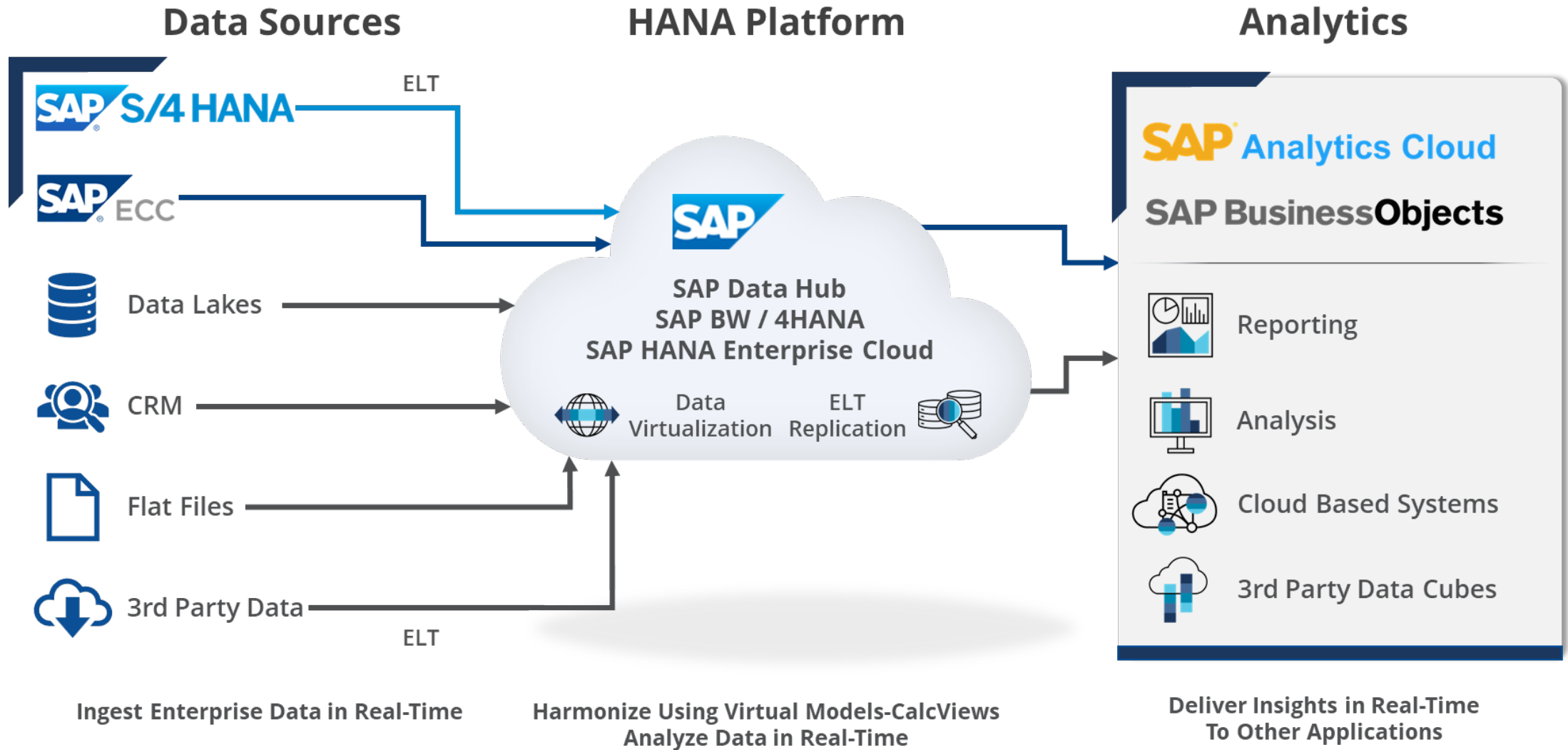
Eliminates Manual Testing of High Impact Data Use Cases such as PDFs, Structured, Unstructured, and Message Data



Full Tosca/ECT Functionality included with each EDIT / Data Integrity!

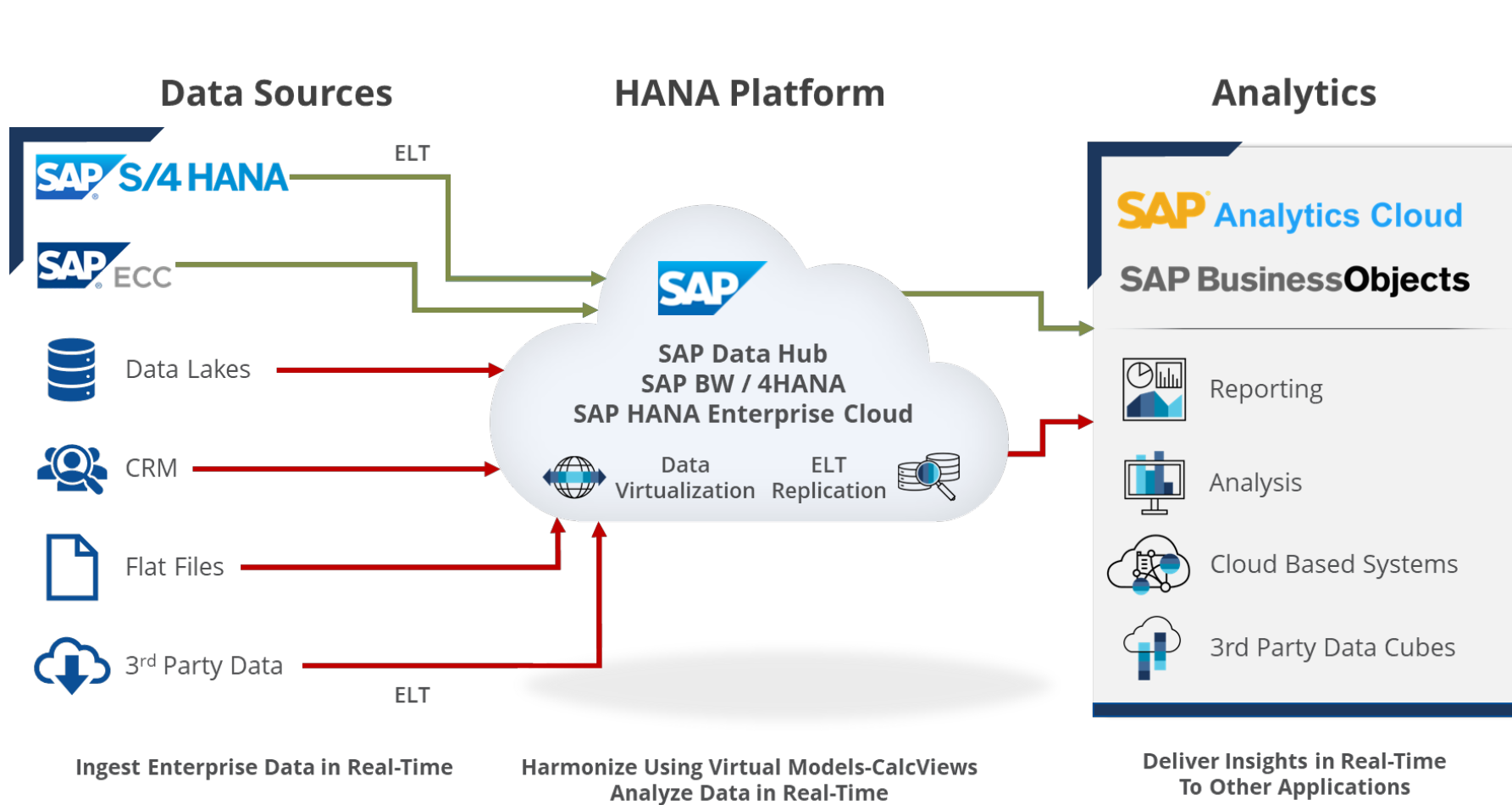
The race is on to find data errors

To **TRUST** data in production, you **MUST** test end-to-end in the test environment



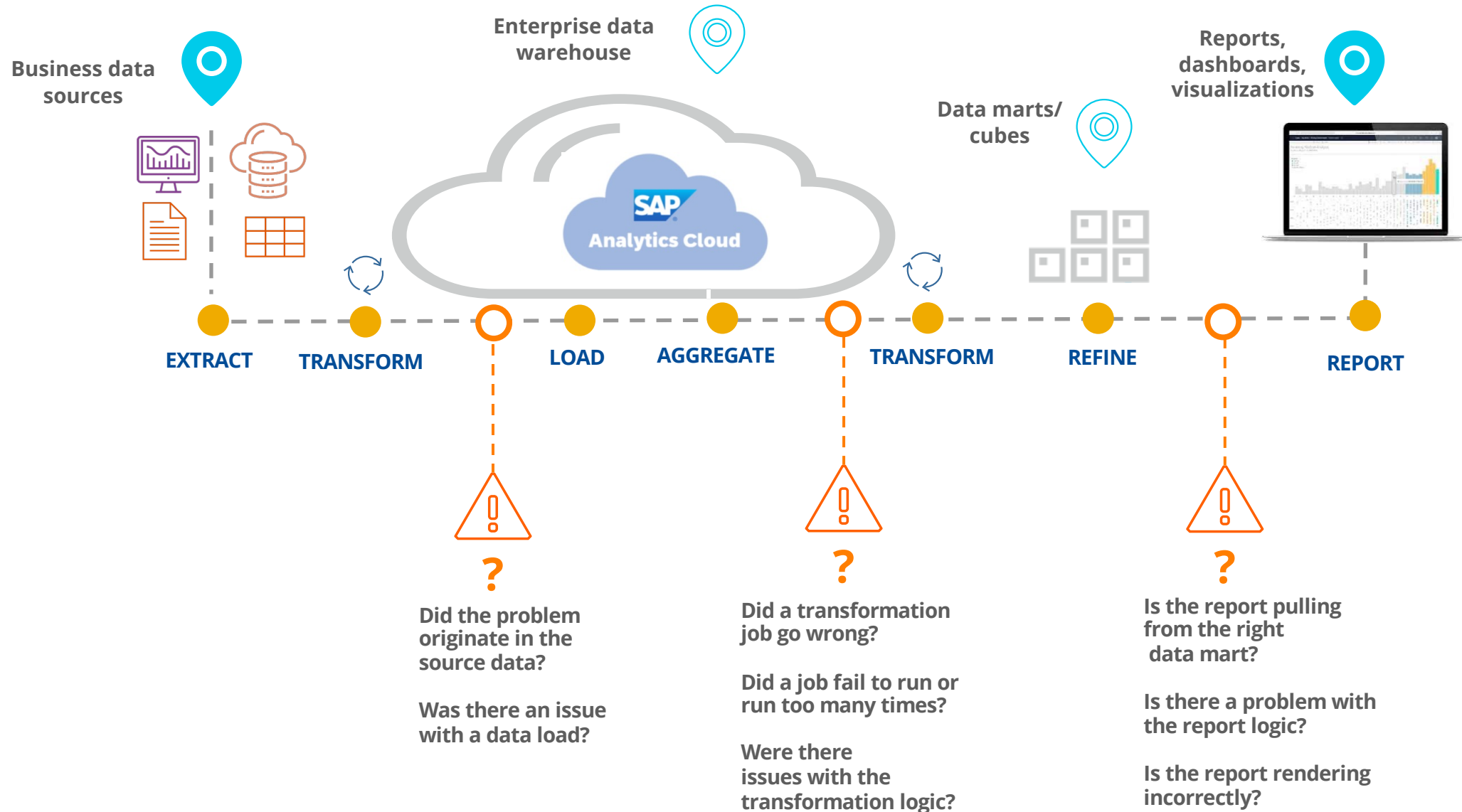
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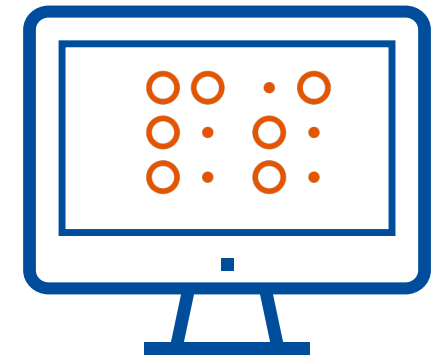
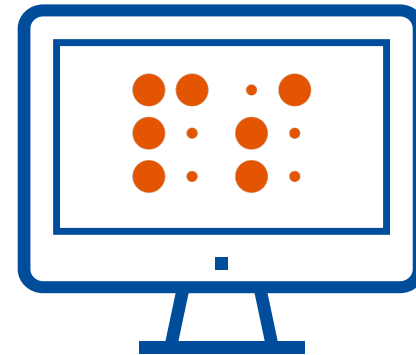
- 1 Pre-Screening**
 - Metadata checks
 - Format Checks
- 2 Vital Field Checks & Field Tests**
 - Completeness: Row count, min/max, avg, sum, checks
 - Correctness: Uniqueness, not null, hash-comparisons, data ranges
 - Integrity: Relation, domain
- 3 Reconciliation**
 - Row by row comparison
 - Comparison of 2 data sets
- 4 Report Testing**
 - UI Automation
 - Visual checks
 - Content check for dimensions
 - Security
- 5 Monitoring**
 - Track row counts
 - Job run times
 - Data distribution per column over time

The race is on to find the data errors



Manual “stare and compare” is **slow and doesn’t scale.**

And is not a great use of your team’s brainpower.



Manual Stare and Compare does not work

Actual Large SAP Client Example!

Screen Shots	Data Covered	Total Cumulative Time
1	100Kb	6sec
10	1Mb	60sec
1,000	1Gb	16.6hrs
1,000	1Tb	16,667hrs (1 man-year)
10X steps in process	10Tb	10 Man-years
50X Different processes	500Tb	500 man-years

- Impossible to do! You are only checking a subset of the data. < 1%

- Hoping your “sample” is good enough for your **cloud migration, production, innovation data projects (ex. AI) and AUDITORS**

SAP Enterprise Data Integrity Testing

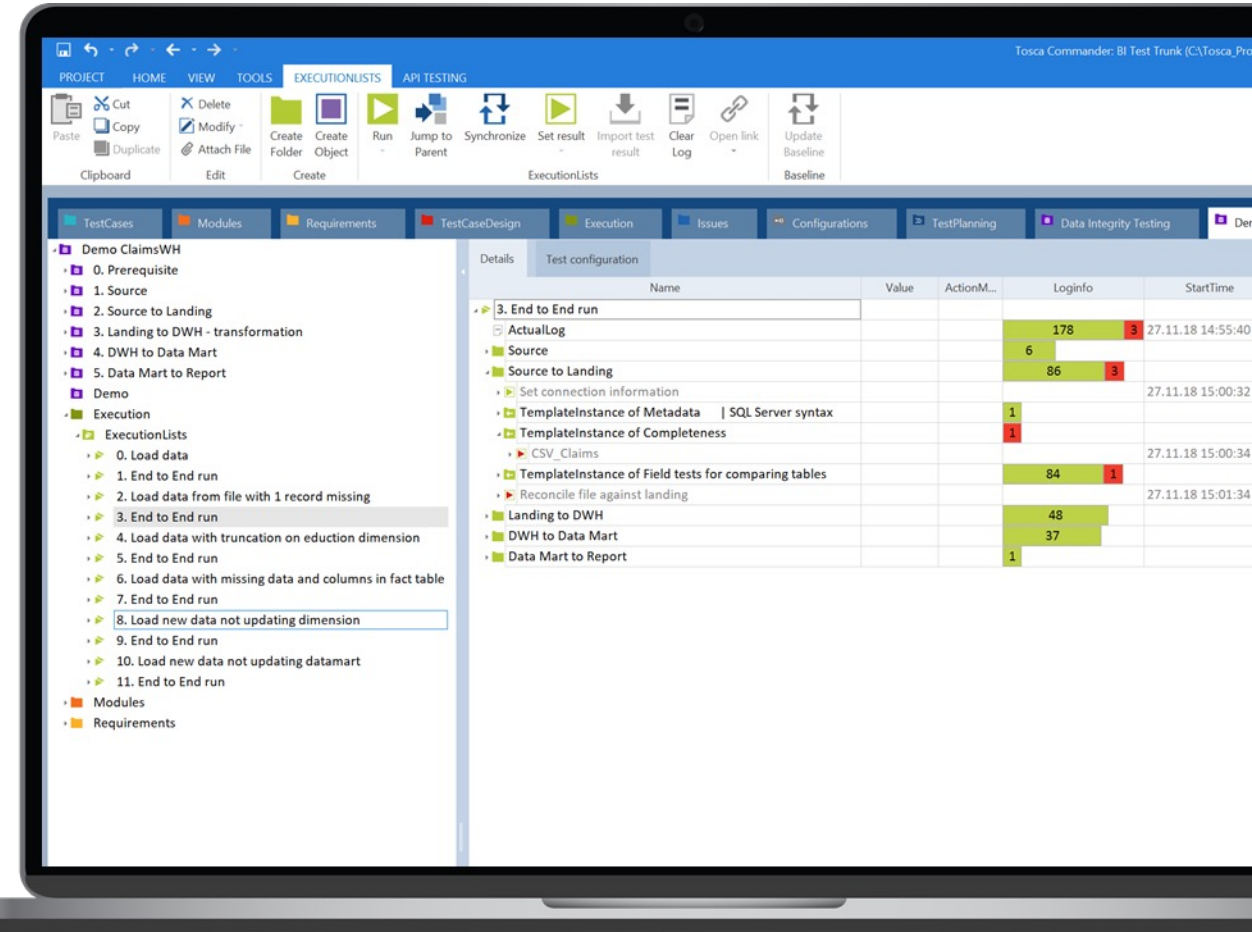
Key Capabilities

- Comprehensive data testing across SAP and 3rd-party technologies
- Actionable reporting
- Customizable risk thresholds
- Low-code/no-code automation
- Integration with DataOps and DevOps tools



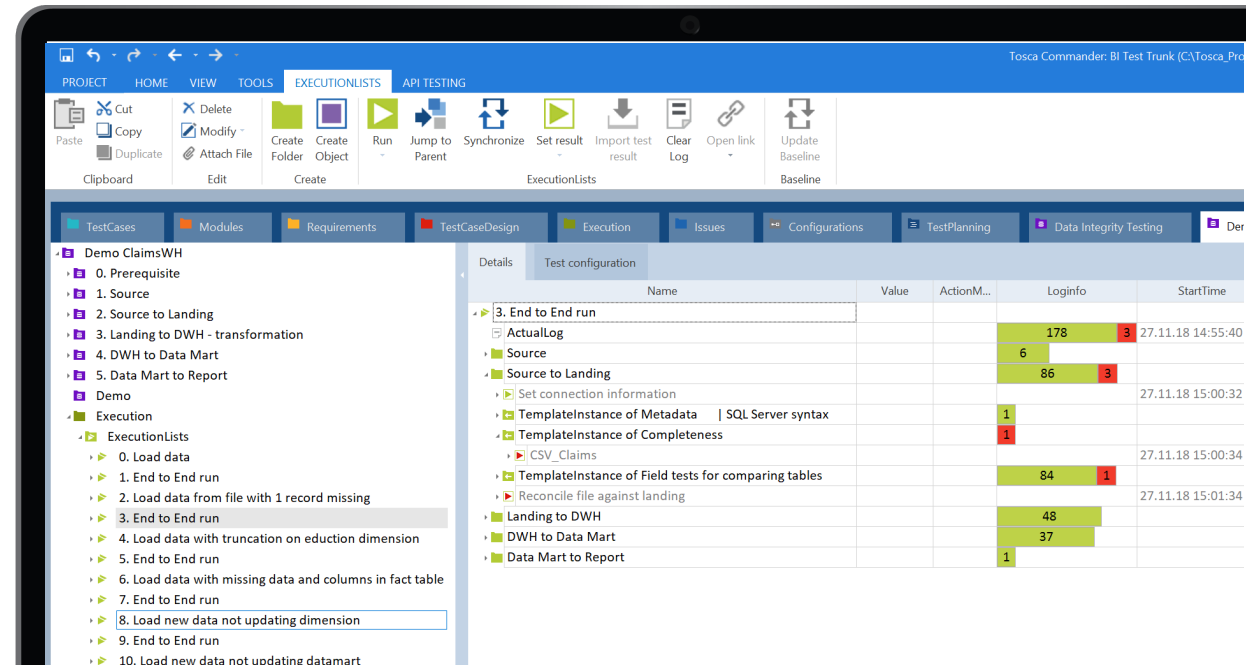
Comprehensive data testing across SAP and 3rd-party technologies

- Tests all data regardless of type, source, or format
- Includes specific data tests tailored to catch errors at different parts of the data journey, from source ingestion to business process step and final report
- Complements existing data tools by filling in the gaps that they don't cover
- Tests at volume and velocity



Actionable reporting

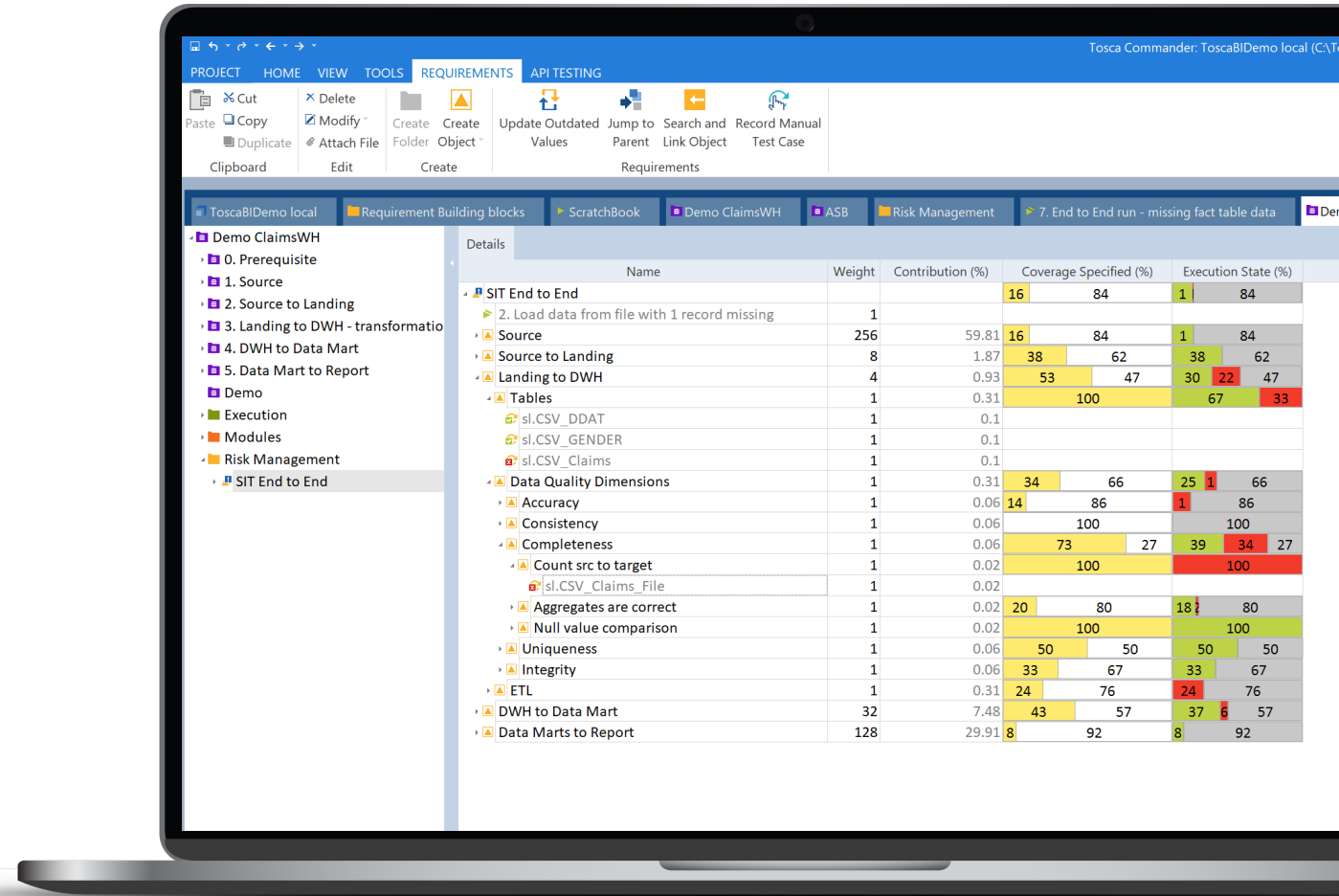
- Pinpoints specific root causes of data errors
- Enables swift remediation of data issues found



Name	Value	ActionM...	Loginfo	StartTime	Duration	Detail
CSV_Claims				26.02.19 15:37:43	00:01.049	
Get source row count			Successfully executed "Select count(*) as Co..."	26.02.19 15:37:43	00:00.422	
Compare source to target			Successfully executed "SELECT COUNT(*) as ..."	26.02.19 15:37:44	00:00.082	
Result Table	{NULL}	Select		26.02.19 15:37:44	00:00.027	
#1	{NULL}	Select		26.02.19 15:37:44	00:00.023	
#2	{B[Sourc...	Verify	Verification has failed.	26.02.19 15:37:44	00:00.016	
Close connection	True	Input	Verification has failed. Expected value == "9124" Actual value: "9123"			

Customizable risk thresholds

- Minimizes “noise” from insignificant issues
- Focuses attention on business-critical data errors



Low-code/no-code automation

- No SQL skills required
- Enables developers, QA, and data teams to collaborate on data testing
- Results in better tests that catch more data errors

Vital Checks: Database to Database Wizard

Source Database Target Database **Match Tables** Template Selection

Match Method: **Load matches from file** **Export matches to file**

Source Table	TargetTable	Meta	Comp	Uniq	Ref	Null	Source/ Target Fields
Person.Address							
Person.AddressType							
Production.BillOfMaterial							
Person.BusinessEntity							
Production.BusinessEntity							
Person.BusinessEntityC							
Person.ContactType							
Person.CountryRegion							

Summary

Comparison Results

Thursday 13 June 2019, 4:04:42 PM

Comparison Failed

Column Errors

Carrier Tracking Number	6
Product ID	242

Showing 1 to 10 of 247 entries

System	Affected Column(s)	SalesOrderID	ProductID
Source	'Product ID'	43659	777
Target	'Product ID'	43659	888
Source	'Product ID'	43661	777
Target	'Product ID'	43661	888
Source	'Product ID'	43664	777
Target	'Product ID'	43664	888

Overview

121317 source row(s) processed
121314 target row(s) processed
250 error(s) found:
247 row(s) with differences in data
3 source row(s) not found in target
0 source row(s) were invalid
0 target row(s) were invalid

Integration with DataOps and DevOps tools

- Seamlessly integrates continuous data testing into your existing practices and toolsets
- Provides audit trails for your data tests



Case study



Mercedes - A large European automotive company drives better customer experiences and higher revenue through better data

About

- Their sales division is responsible for selling their entire range of light commercial and passenger cars
- Their legal entity in Turkey is also an IT base and a solution delivery center for over 40 countries

Business drivers

Drive better customer experiences across touchpoints and unlock new revenue potential by creating a centralized place for trusted customer 360 data.

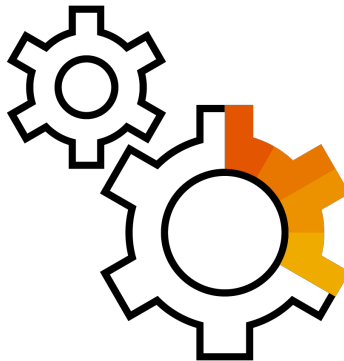
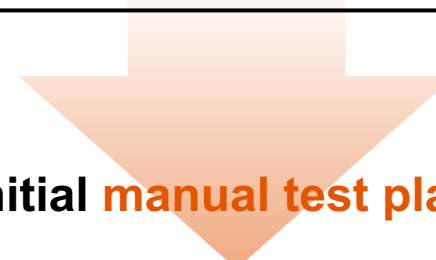


Challenges



Project IDA—Integrated Data Architecture

- Complex transformation rules
- Large data volumes
- Frequent changes expected with source systems and new requirements to the IDA solution
- Lack of resources with advanced SQL and SAP BW skills



Initial **manual test plan** could not:

- Provide end-to-end coverage
- Handle volume
- Keep up with changing environment



Solution

Ingest customer master and transactional data from dealer, internal, and external systems

Consolidate into an EDW

Transform into a sales data mart

Provide access to trustworthy customer 360 data:

- Dealers and internal teams via web portal
- Systems via data feeds



Issues flagged

Customer names being cut off due to data type mismatches



Event

Data transformation



Issues flagged

- Incorrect vehicle history for customers
- Wrong revenue numbers for certain customers



Issues flagged

API calls using fuzzy logic return wrong customers



Solution metrics

Billions
of rows
tested

400k+
rows tested in <
minute

1 test type
25 flexible
test cases
250+ variations

“ It’s impossible for humans to test billions of rows of data. We can now test nearly half a million rows in just one minute. There’s just no comparison.”

Test Automation Engineer,
Major European Automotive Manufacturer



Results

Business results

220

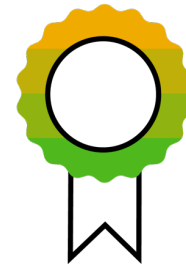
Testing days
saved



Errors pinpointed
for faster fixes



Compliance



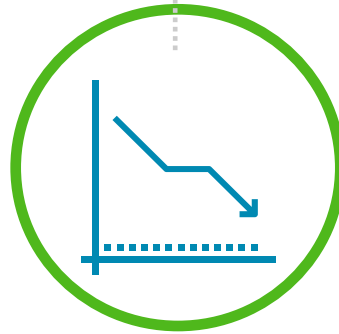
Higher quality customer data
at speed and scale

ExxonMobil – Data Warehouse and CFIN



Combining the Mobil and Exxon Data Warehouses under the S4 Hana Upgrade

24 million
Reports on Oil Reserves



Nigeria reserves were 1,000 of a percent off costing 2.2 million a month in inaccurate reporting. ExxonMobil manages the federal oil reserve and must report to the US Government monthly 3rd Party

Combination of Central Finance (CFIN) under the S4Hana migration

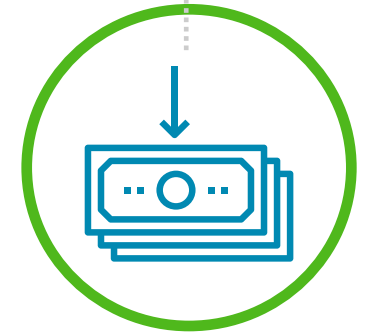
Multi-Millions
Losses per each failure (days down) per Year



SAP merged processes cause huge Manual testing requirements
Down time was growing, and the financial team was under huge delivery pressure closing the books

Compliance reporting K1 partnership challenge. Oil royalties

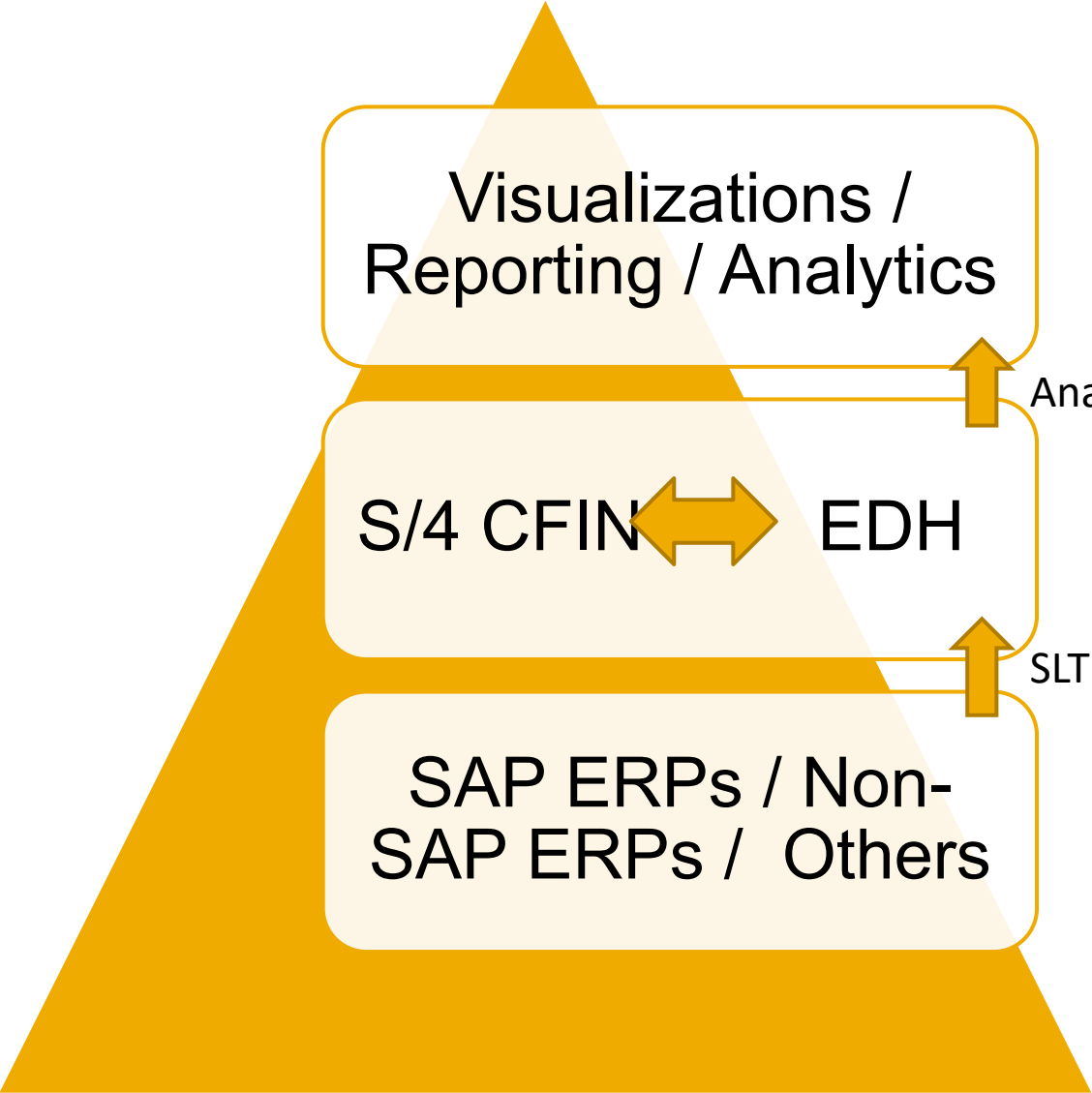
100M+
Accurate Data and regulatory pressures



ExxonMobil has 1000's of partners that they must report to the federal Government, these are Royalty partners with multiple legal requirements



SAP Finance (CFIN) Digital Architecture



SLT - SAP Landscape Transformation Toolset – this was written by SAP as a type of transformation program

EDH - Enterprise Data Hub – ALL the SAP ERP financial data AND the non-SAP systems financial data in one place. A data lake with MDM in Hadoop, HANA and Relational SQL DBs. Includes Analytics and Historical data.

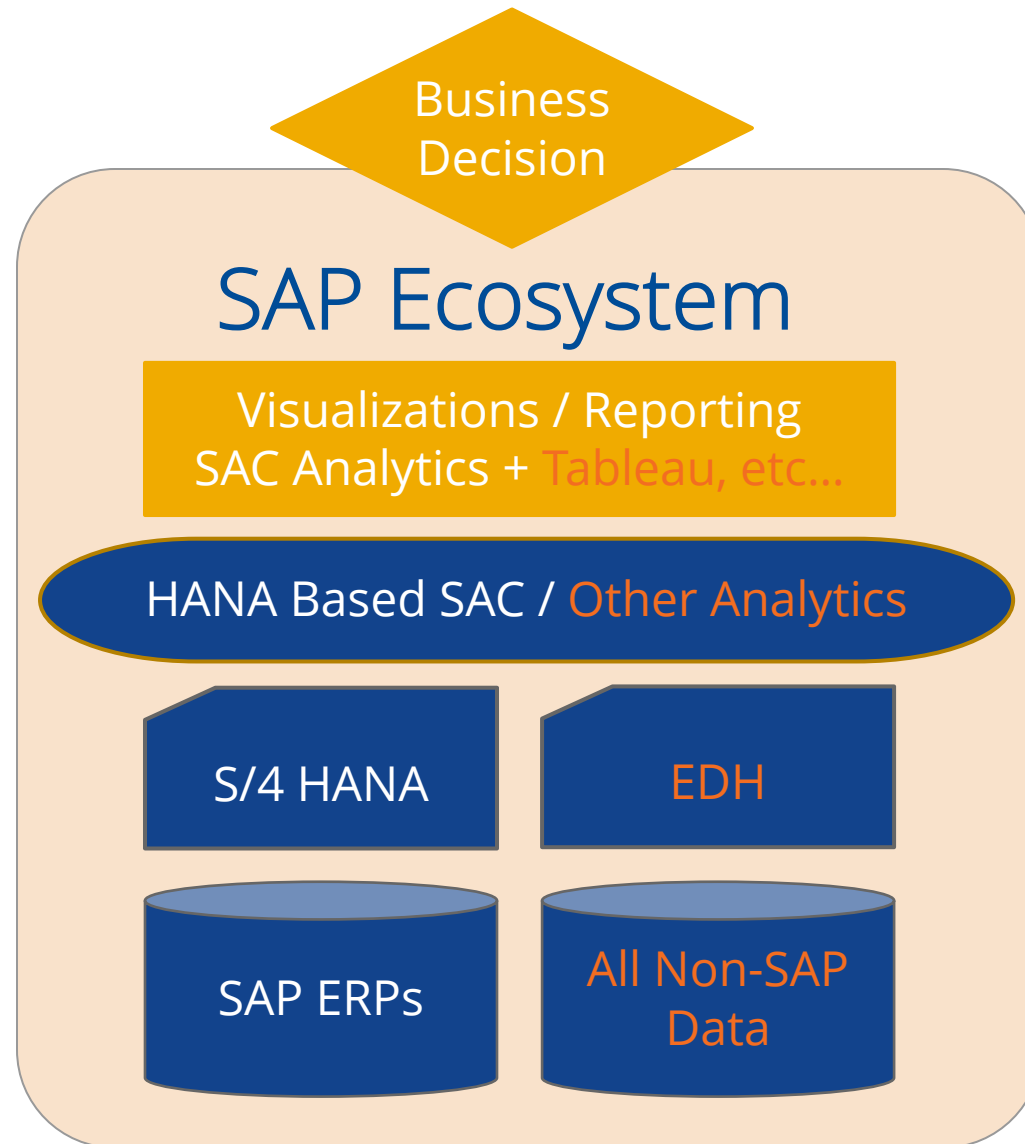
CFIN - Central Finance – HANA with Universal Journal warehouse for ALL the rolled-up reporting numbers for ALL the SAP ERP’s financial data into. This allows Client to report all 10K info from here. Includes Mapping, Posting with Playback and Journaling.

Analytics Feeds into and from Data Staging

SLT and MDM - Transactional and Master Data Feeds

SAP and Non-SAP Data Process Testing
Data Testing End to End across your SAP Central Finance Architecture, example of mixed data sources. SAP feeds and exports are often the issue. We can test internal and external to SAP.

SAP Digital Architecture – CFIN

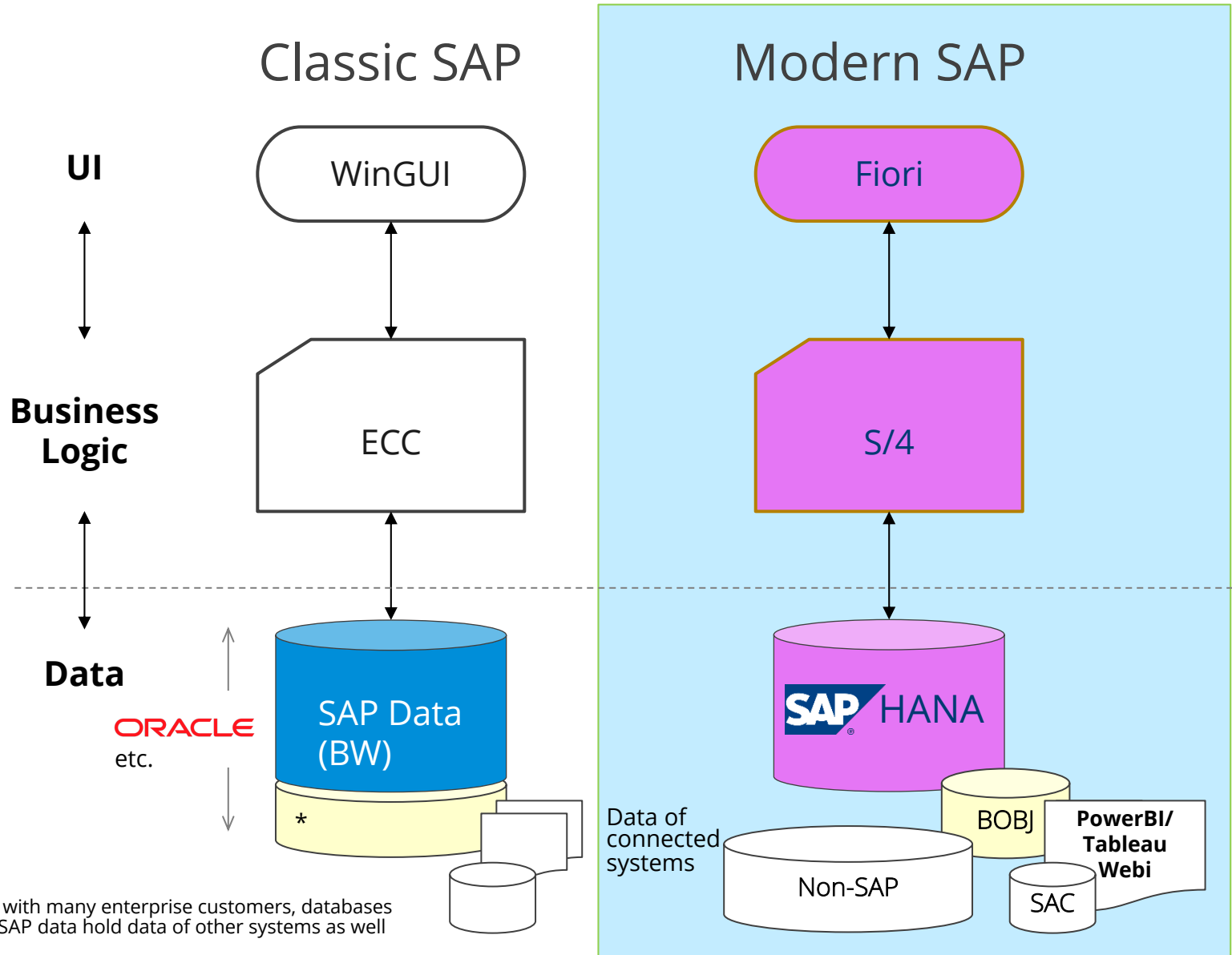


Note: Separation of Data Stores
Requires testing across ALL
SAP and Non-SAP data

Analytics and Reporting
includes processes outside
of SAP

(EDH) Enterprise Data Hub is
created to store ALL non-SAP
system
data

SAP S/4HANA



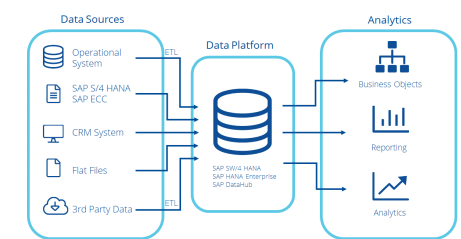
UI Technologies
API Testing

oData
RFC, SOAP RFC
IDOCs
REST/HTTP(S)/JSON/XML

Change Impact Analysis

Tricentis **CIA**

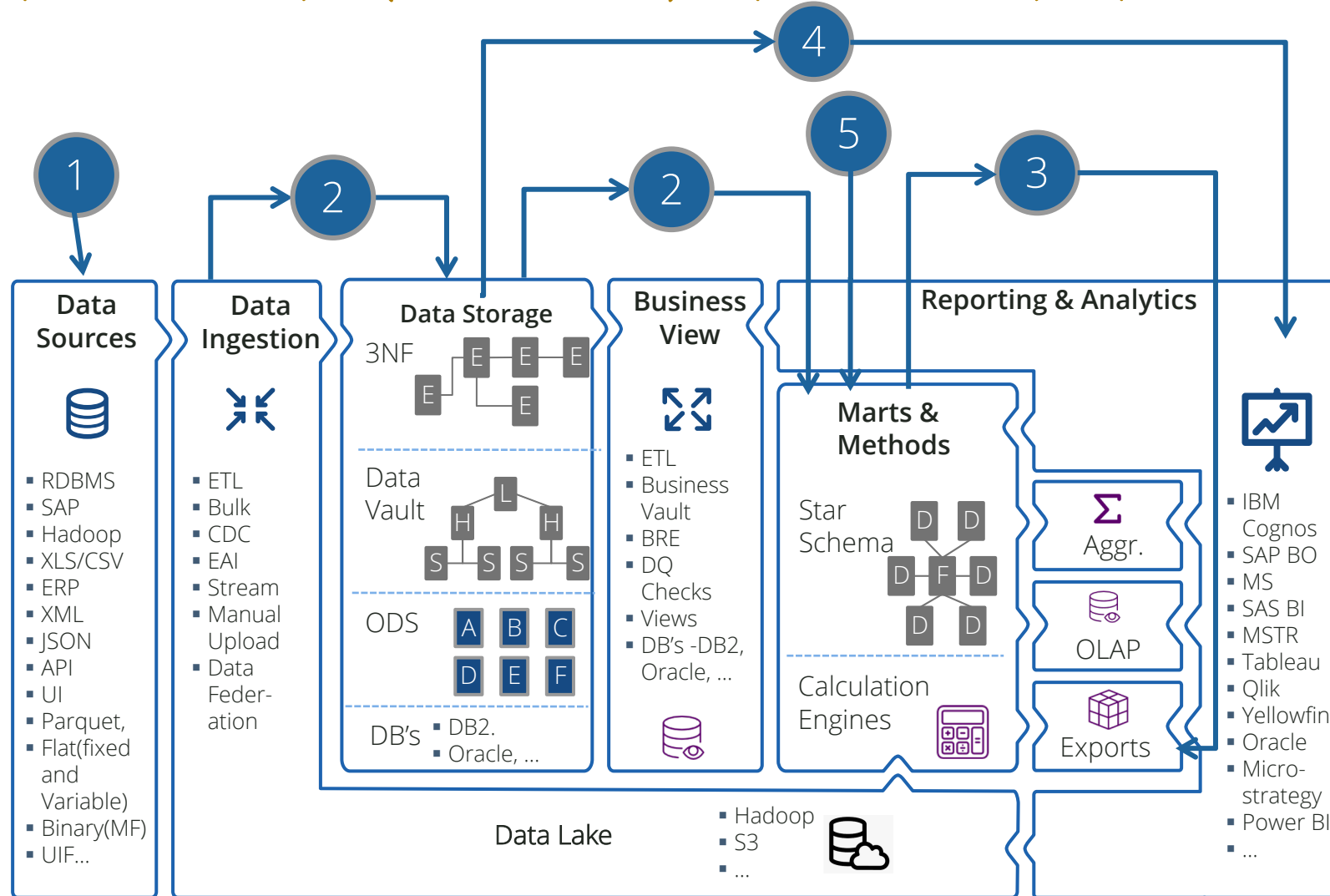
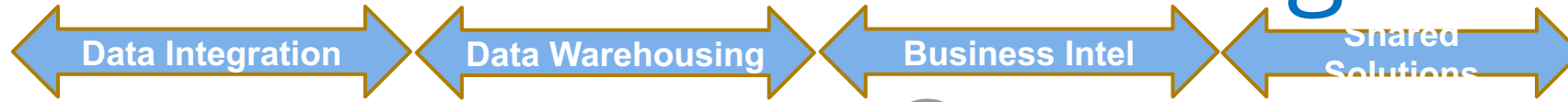
Change Intelligence



Tricentis **EDIT** Data Reconciliation

* ... with many enterprise customers, databases for SAP data hold data of other systems as well

End to End EDW/BI Testing



- ## 1 Pre-Screening

 - Metadata Checks
 - Format Checks
- ## 2 Vital Checks & Field Tests

 - Completeness: Row Count, Min/Max, Avg, Sum Checks
 - Correctness: Uniqueness, not null, Hash-Comparisons, Data Ranges
 - Integrity: Relation, Domain
- ## 3 Reconciliation

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- ## 4 Report Testing

 - UI Automation
 - Visual checks
 - Content check for dimensions
 - Security
- ## 5 Monitoring

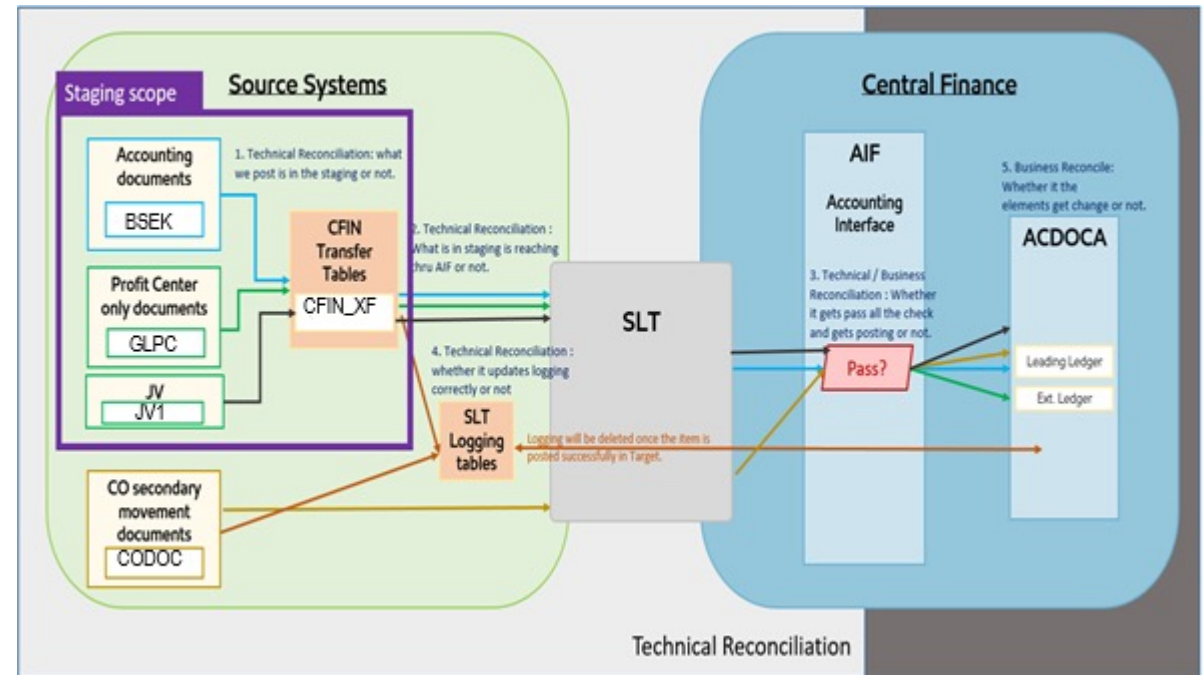
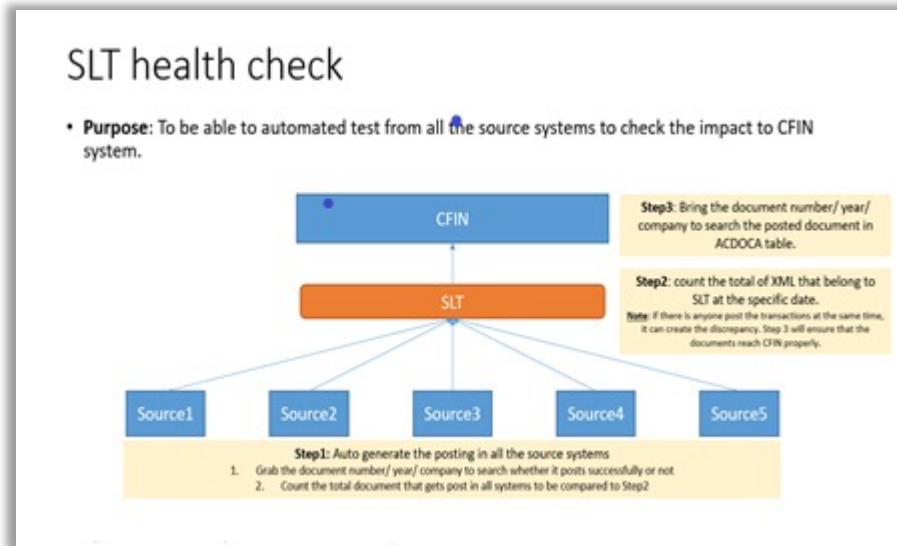
 - Track row counts
 - Job run times
 - Data distribution per column over time

SAP Staging / SAP SLT Use Case

• SLT Health Checks

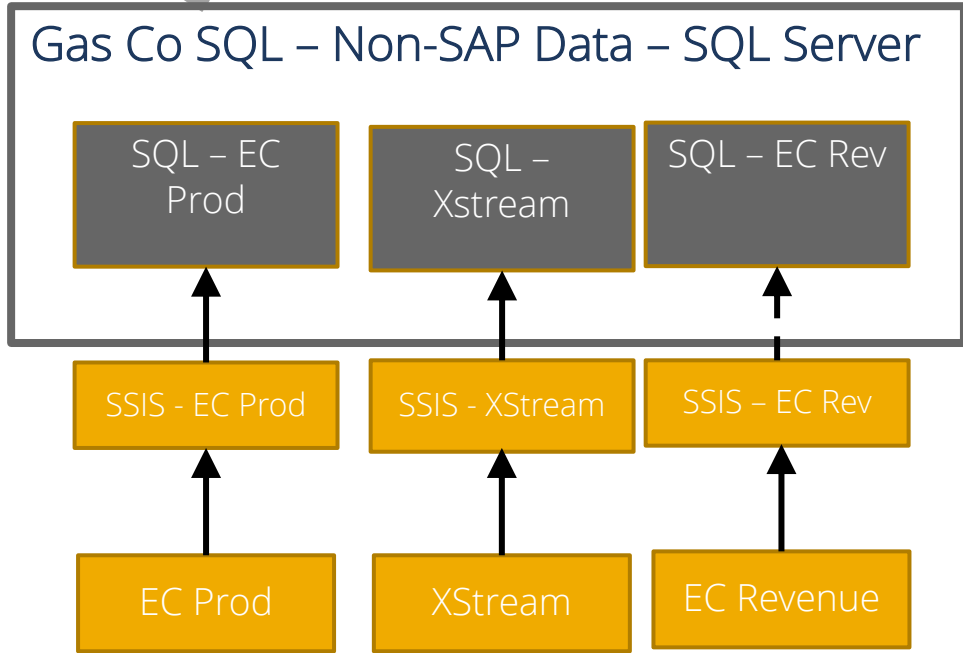
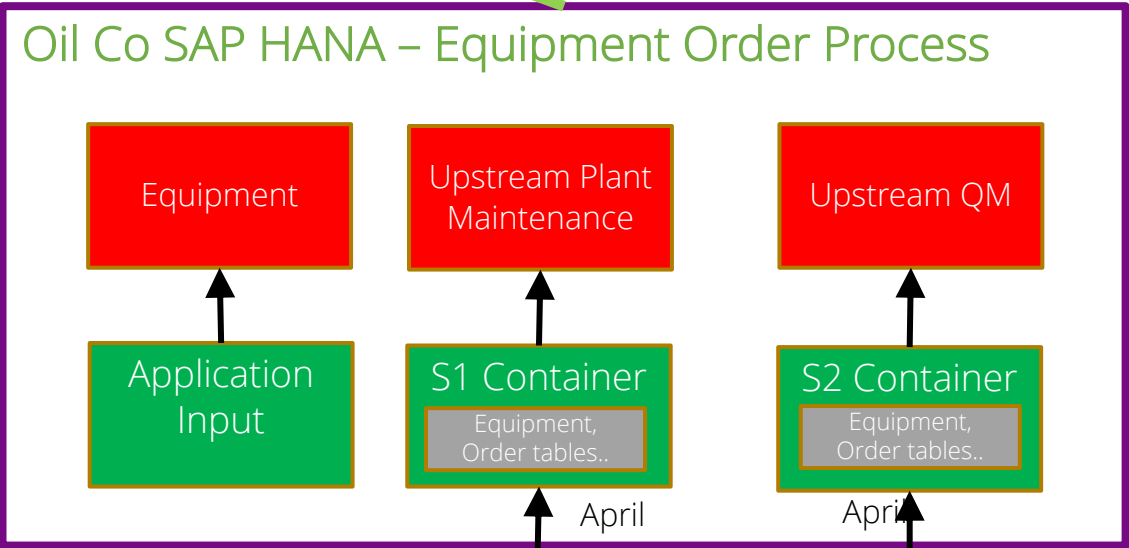
• Staging/SLT Reconciliation Example -

- Reconciliation in source system (Document number match in source system BKPF)
- Validation and reconciliation between source system and Central Finance AIF interface
- Reconciliation between source to-be-transferred document and Central Finance ACDOCA
- Reconciliation of balance between source system and Central Finance ACDOCA



SAC / Tableau – Reporting and Visualization

Actual Example for SAP and Non-SAP Processes



Use SLT to Integrate Input Data ECC to HANA

Duke Energy

Duke delivers on transforming customer experience
with the move to SAP S/4HANA

PROJECT BACKGROUND

- Transform the customer experience starting with streamlining internal billing systems for a universally optimized customer experience
- Duke's leadership knew testing would be a critical component to the project's success

COMPLICATIONS | CHALLENGES

- Consolidating 4 different billing applications into a single system
- Ensure the S/4HANA project did not negatively impact critical business processes
- Automating testing for multiple SAP applications –SAP for Utilities, SAP Marketing, SAP commerce cloud, ICU, C4C, Fiori and Customer recommendation engine

SUCCESSFUL BUSINESS OUTCOMES

- Test automation is viewed as high quality, high business value
- Advanced from waterfall to weekly SAP releases
- Defects discovered earlier, enabling faster and more efficient defect resolution

250

End-to-End Tests
Run Weekly

0

Defect
Releases

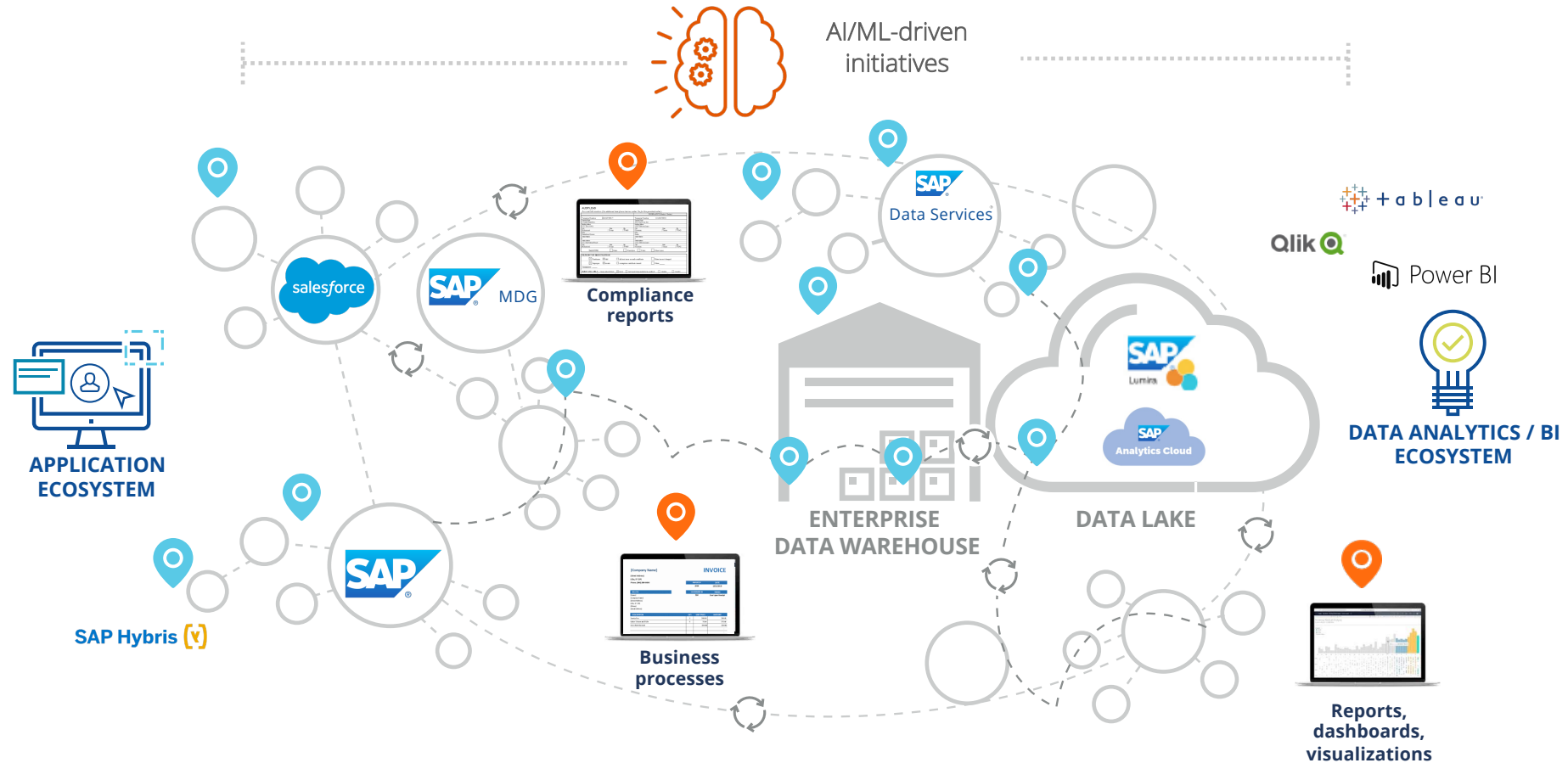
150

Unattended Tests
Run Nightly
(under 12 Mins)



Today, your data is always on the move

through increasingly complex landscapes



...to many different destinations

Today, your data is always on the move

through increasingly complex landscapes

Application problems:

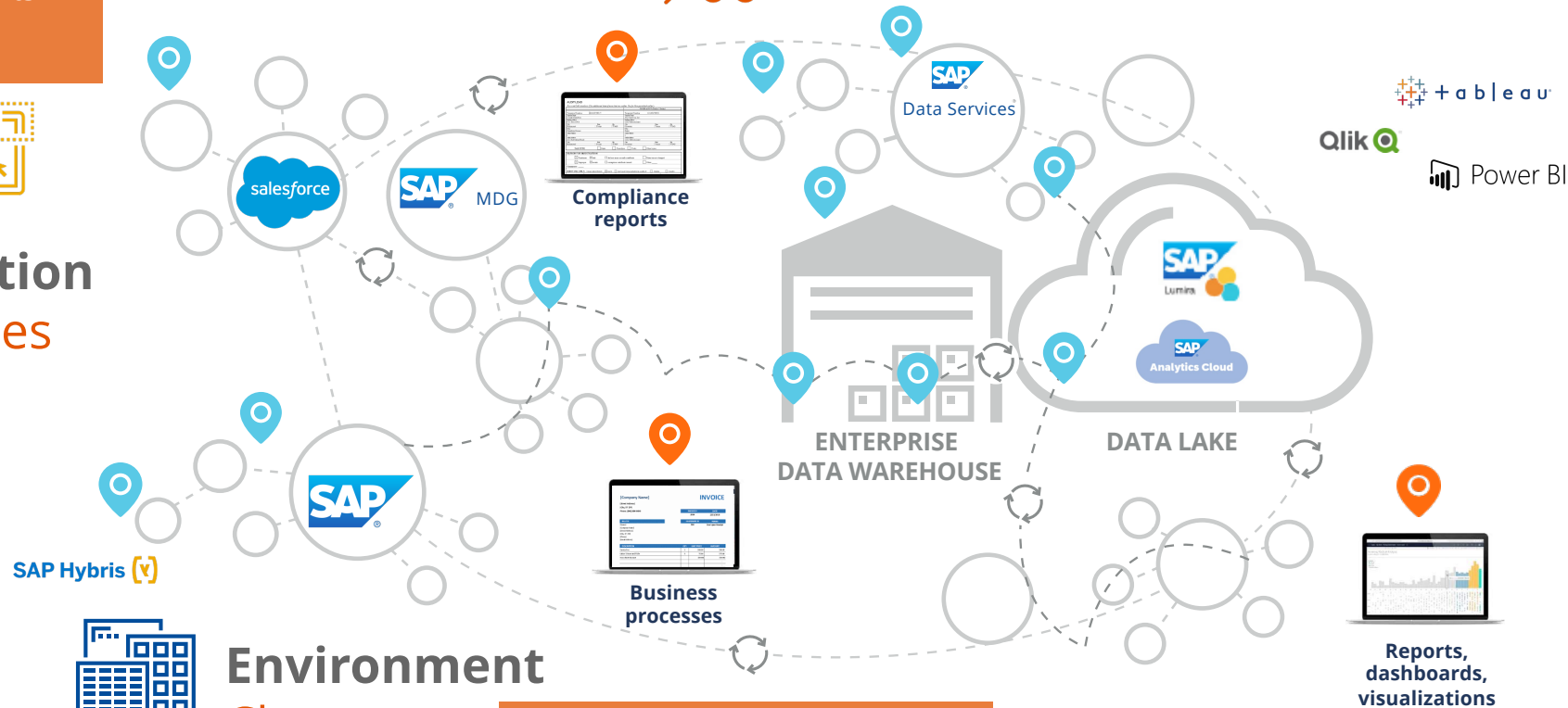
- Technical/UI changes
- Business requirements
- Customizations



Application Changes



AI/ML-driven initiatives



SAP Hybris



Environment Changes

Environment problems:

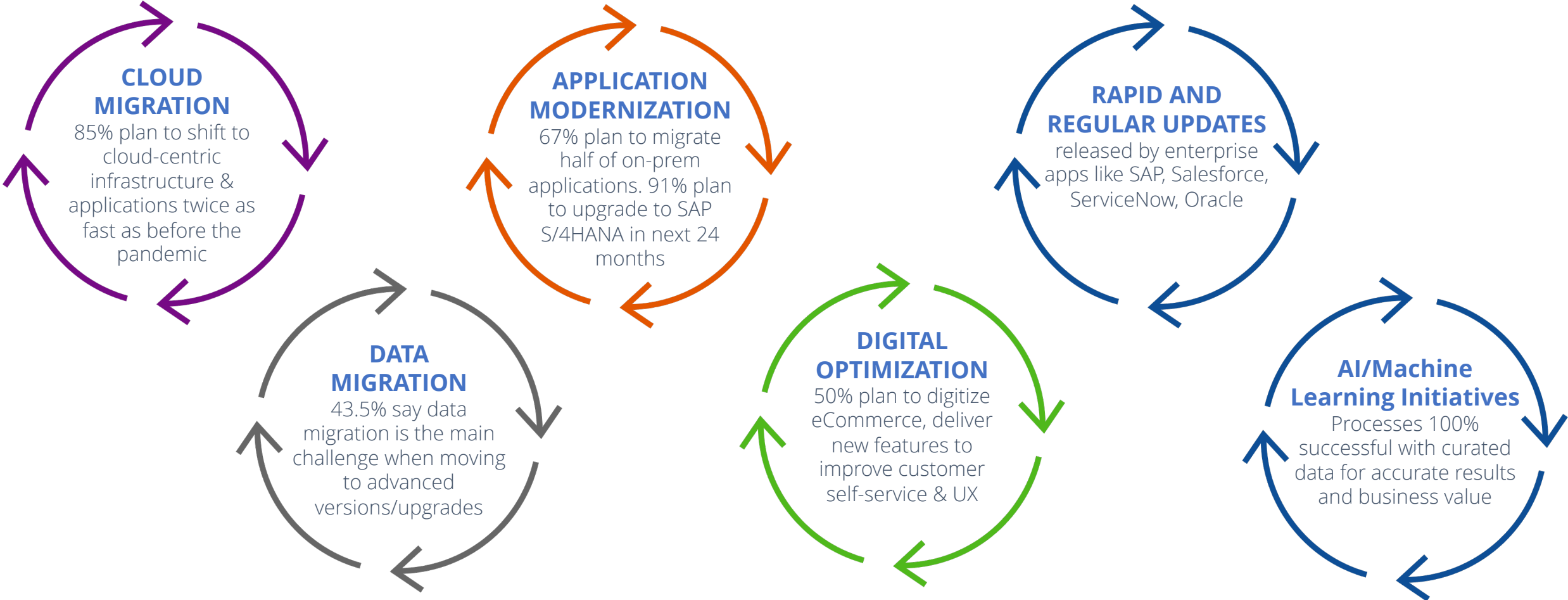
- System / desktop updates
- Integrations
- Network changes

Data Changes

Data problems:

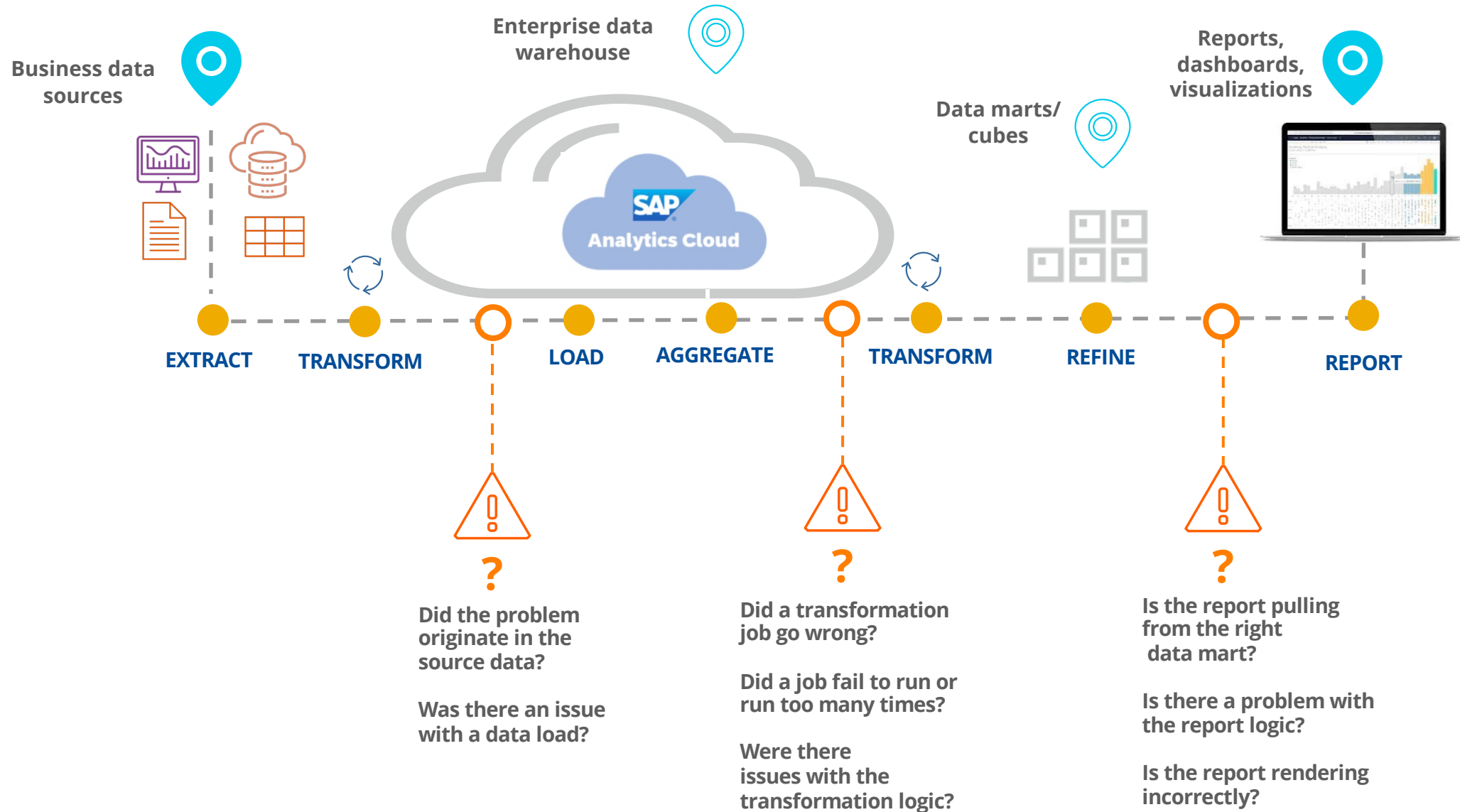
- Incorrect data
- Duplicate data
- Missing data

Accelerated Digital Change Introduces Risk



*Sources: Mayfield CXO Survey – Post COVID-19 Impacts to IT, IDC FutureScape IT Industry 2021 Predictions, ASUG Tricentis Survey 2021 – Future of SAP Delivery

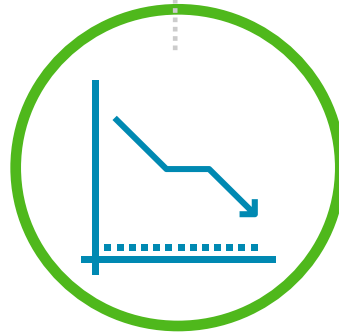
The race is on to find the data errors



Costly consequences for your brand and bottom line

Major
oil & gas
company

\$2.2 million
per month



Untrustworthy reports,
poor decision making, data
monetization issues

Top 5 US
insurance
company

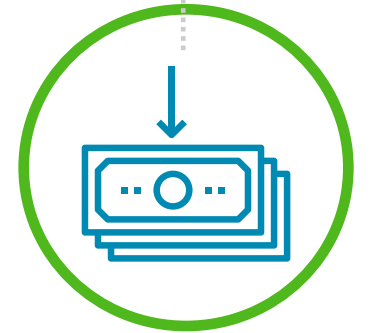
40k
Incorrect invoices



Operational issues across
business processes

Major bank

\$50M+
In AML/KYC fines



Costly
compliance issues

Major pharma
company

\$100's million
In failed innovation

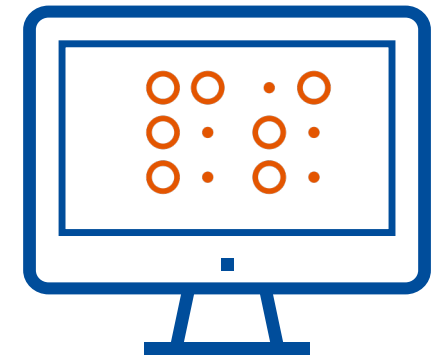
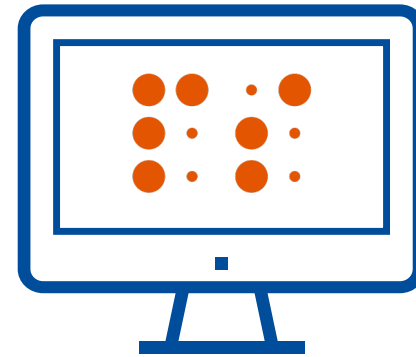


Suboptimal
AI/ML-driven
initiatives

**So why isn't your data
better already?**

Manual “stare and compare” is **slow and doesn’t scale.**

And is not a great use of your team’s brainpower.



Manual Stare and Compare does not work

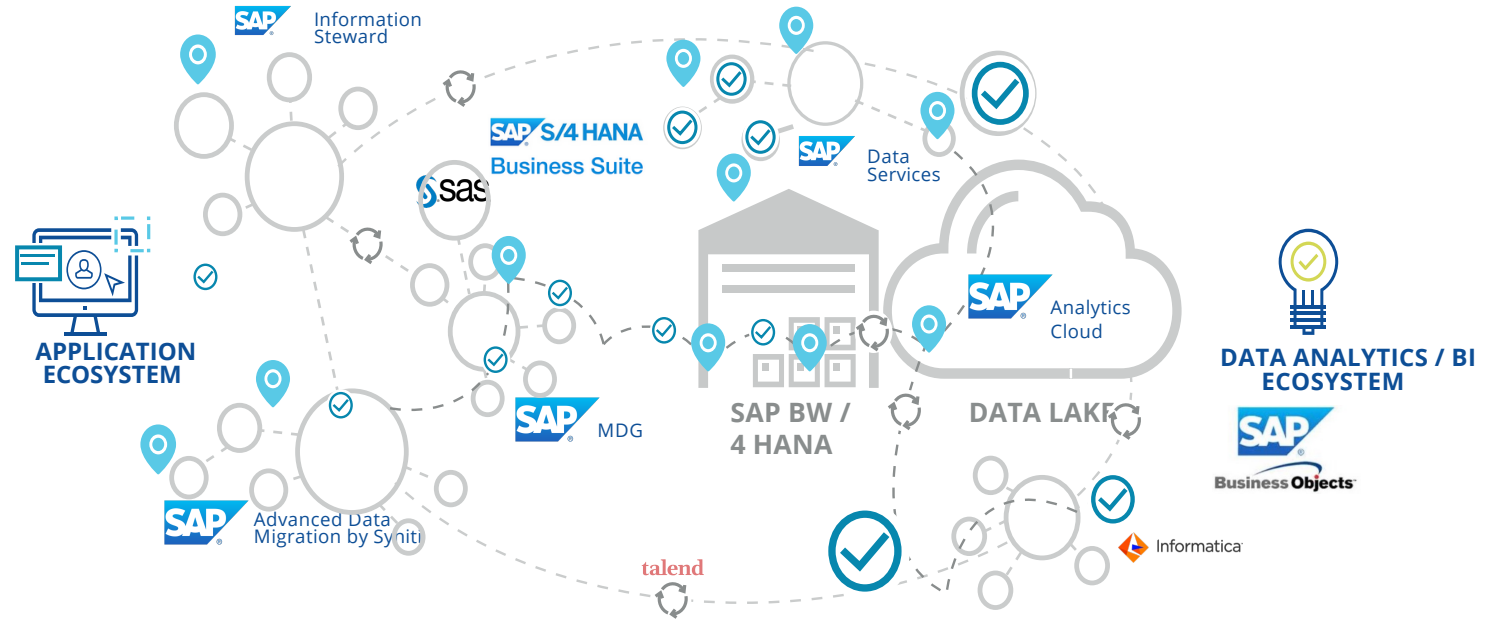
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To Trust the SAP Production Environment(s):



You must End to End Test in the SAP Pre-Prod Environment(s):



It's time to bring the discipline

**of end-to-end testing
to the world of data**



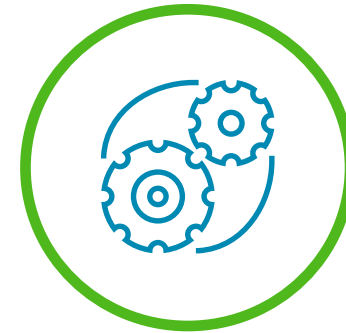
Includes data, UI, and API testing for any data type — across your entire landscape.

SAP Enterprise Data Integrity Testing **by Tricentis**

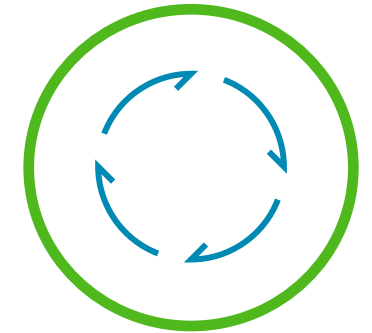
A data TESTING solution that's...



End-to-end

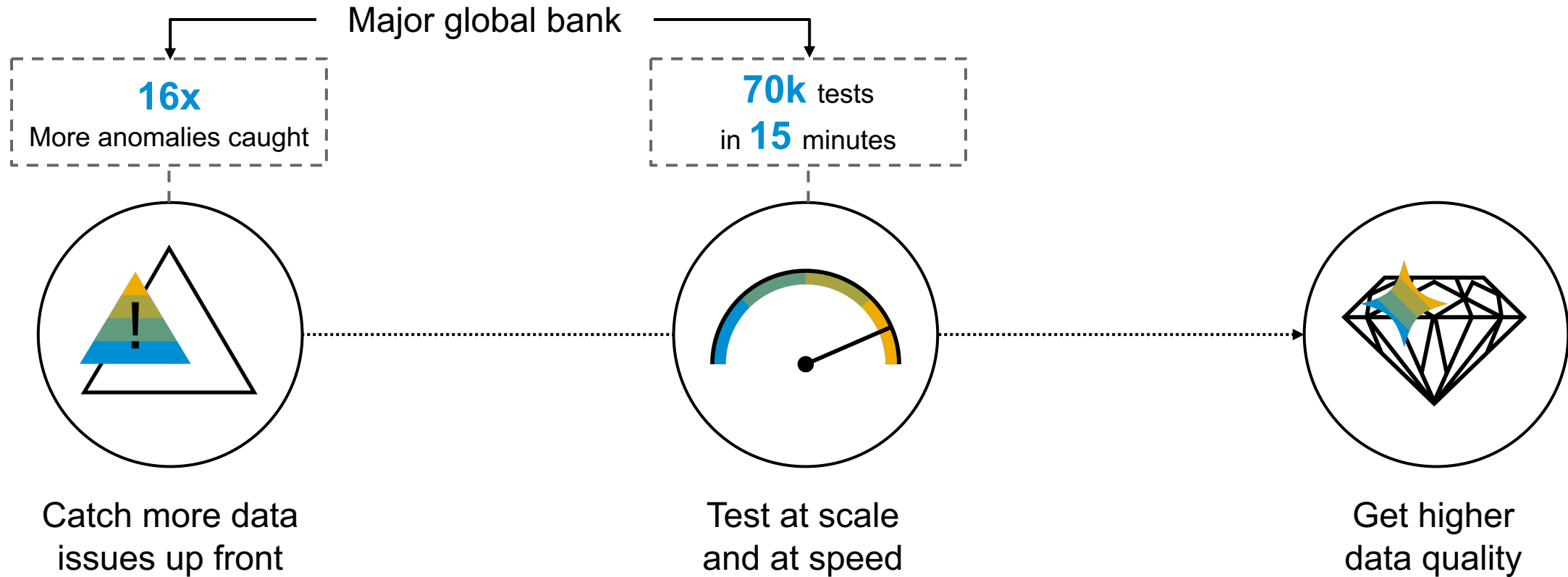


Automated

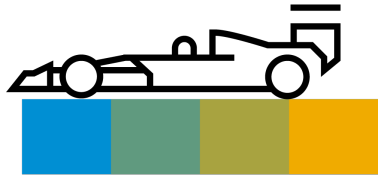


Continuous

SAP Enterprise Data Integrity Testing

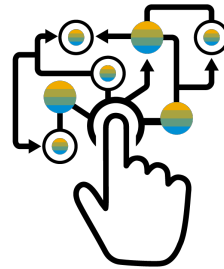


Key Benefits



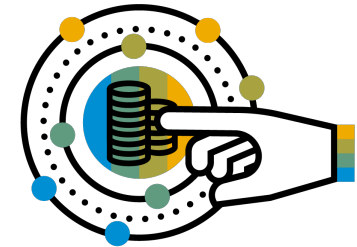
Speed with Fast Design and Maintenance

Catch more data issues upfront



Risk Reduction with Automated Testing

Test at scale through automation

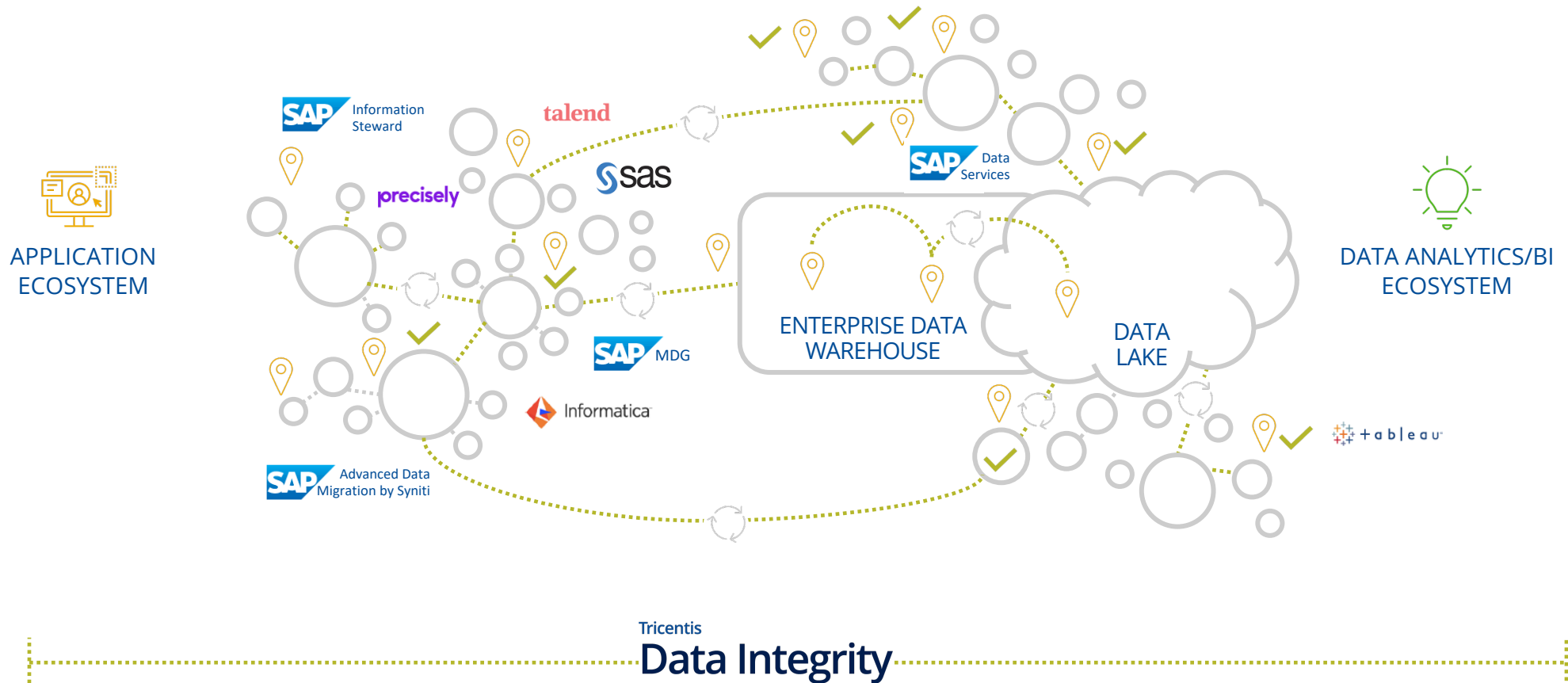


Lower TCO

Reduce cost by eliminating manual testing practices

Fill your data management gaps

with data testing that's end-to-end, automated, and continuous






An addition to your toolkit

to maintain data integrity across the enterprise



Point products

 <p>System/ vendor</p>	 <p>Type</p>	 <p>Time</p>
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Data profiling, data monitoring, data stewardship, MDM, Data cleansing, ETL, BI & Analytics testing @ single points....

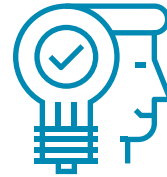


Better business outcomes



An addition to your toolkit

to maintain data integrity across the enterprise



Point products

System/
vendor

Type

Time

Data profiling, data monitoring, data stewardship, MDM, Data cleansing, ETL, BI & Analytics testing @ single points....



End-to-end data testing

Data & system agnostic,
automated, continuous

SAP EDIT
by Tricentis

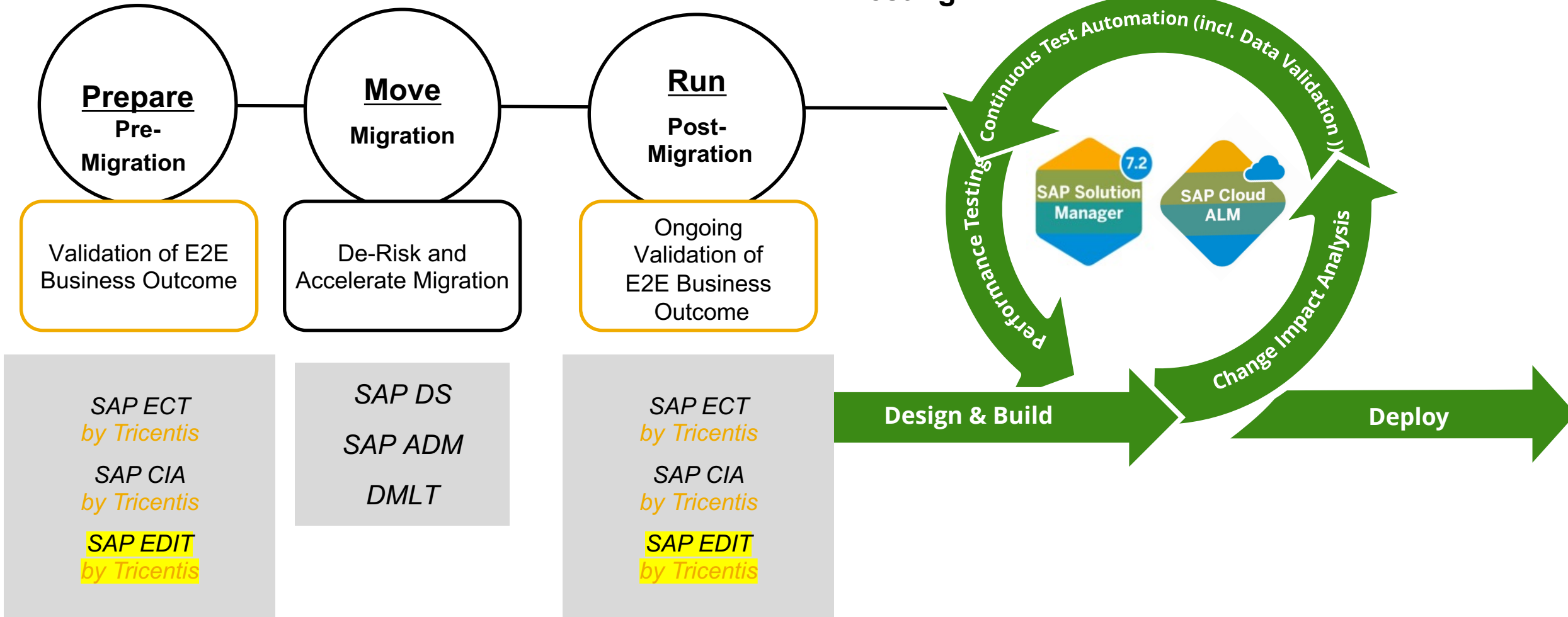


Better business outcomes

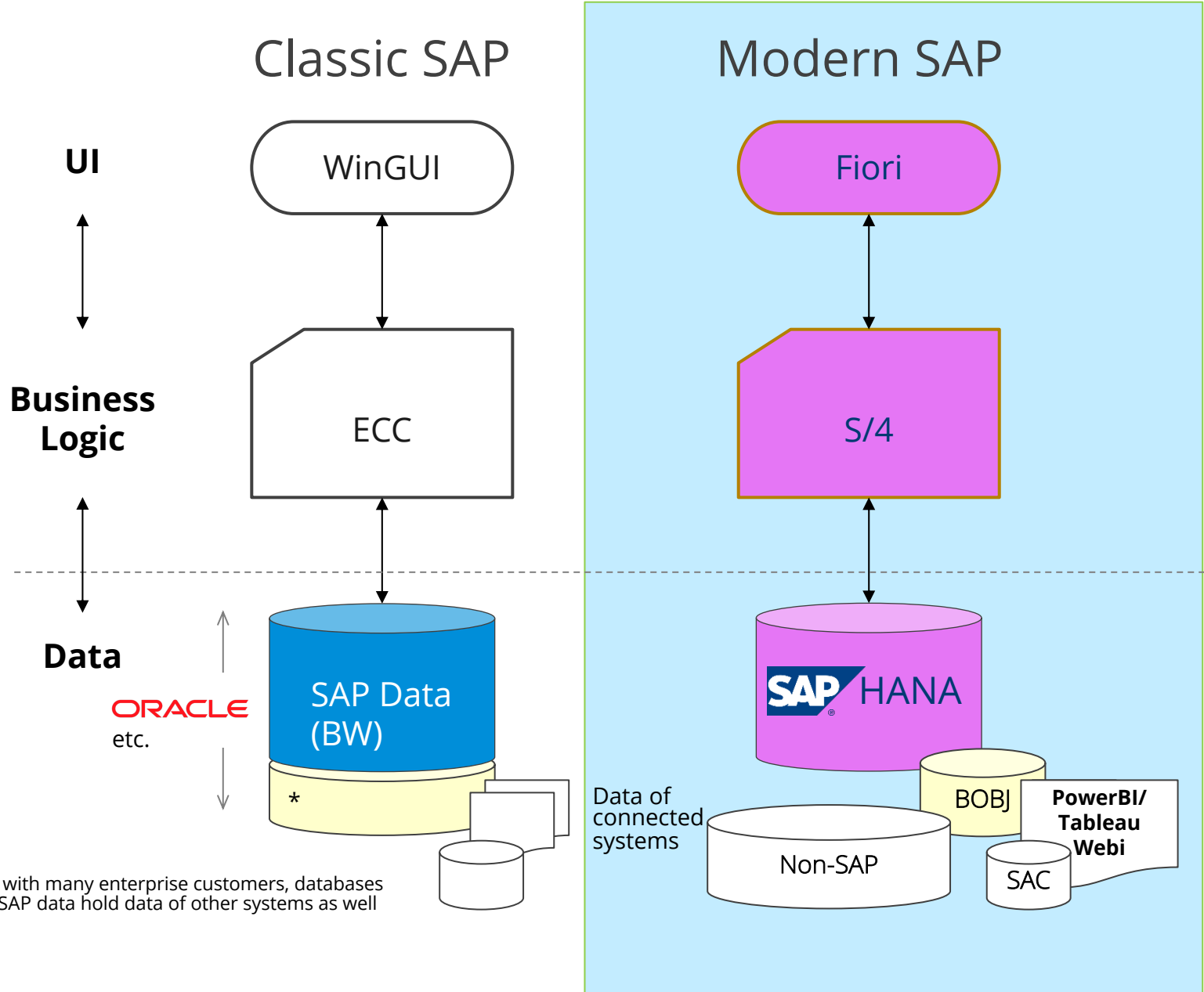
SAP Specific Data Coverage Examples...

SAP Migration (RISE) End to End Process validation

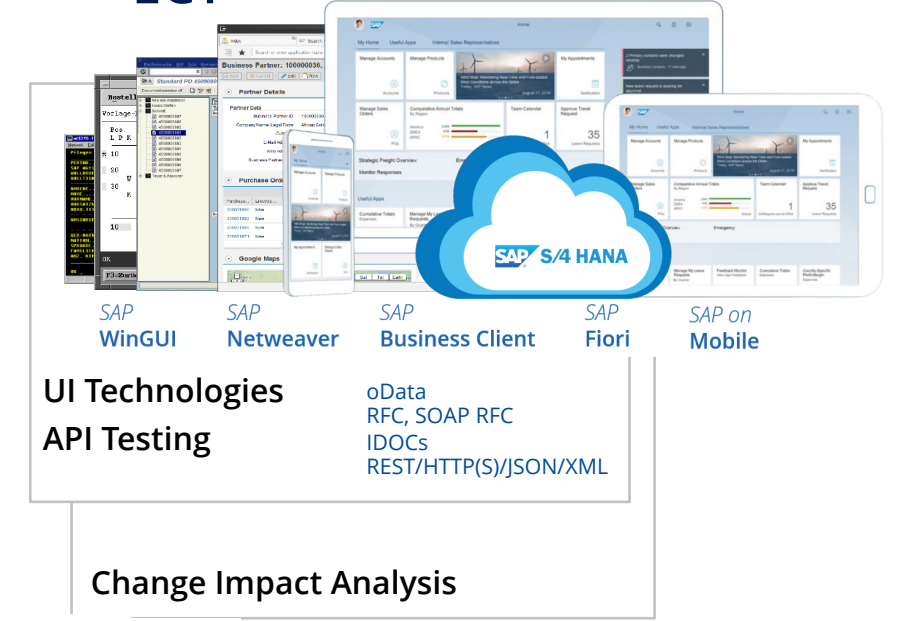
SAP Enterprise Continuous Testing, Change Impact Analysis, Enterprise Data Integrity Testing



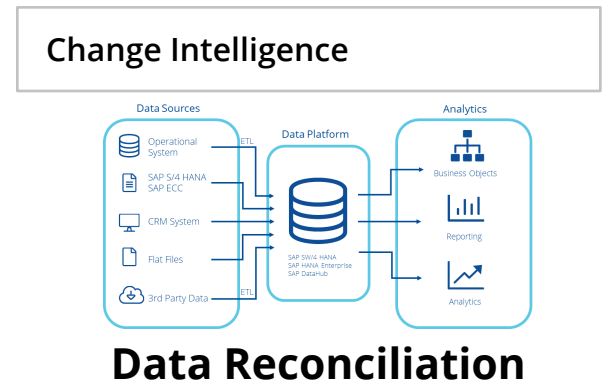
SAP S/4HANA – EDIT for Trustworthy Data



Tricentis ECT



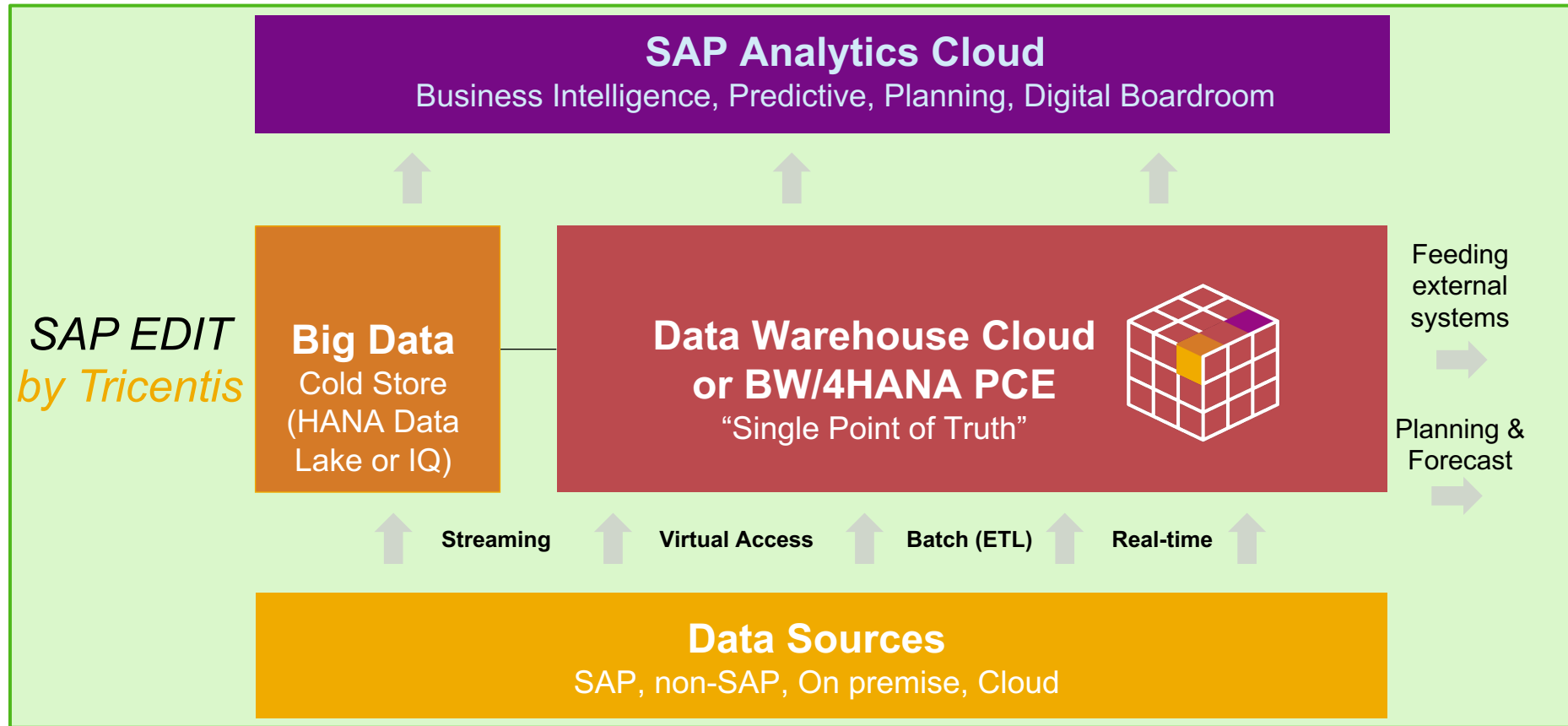
Tricentis CIA



Tricentis EDIT

* ... with many enterprise customers, databases for SAP data hold data of other systems as well

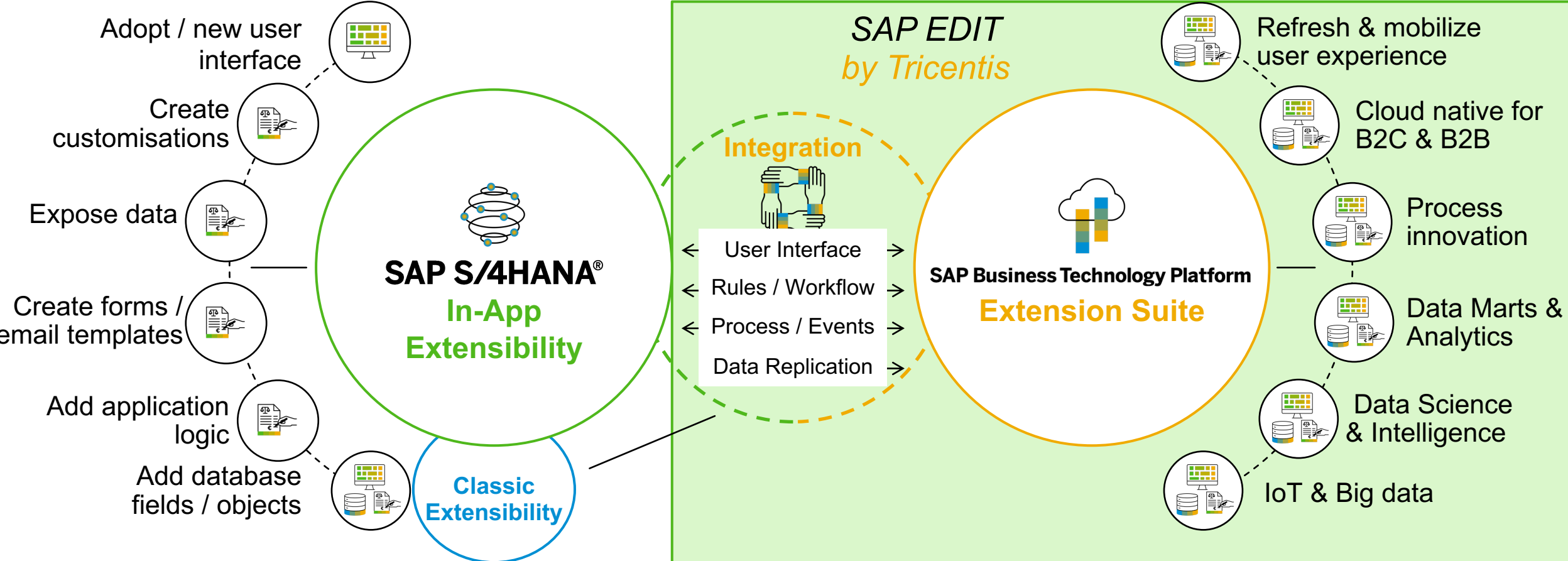
SAP Data Warehousing and Data Lake – EDIT for Trustworthy Data



EDIT benefits for a SAP Data Warehouse

- Validation of Cloud Integrations to SAP and Non-SAP based data sources
- Validate and Reconcile SAP Dimensional Data and Master Data processes
- Trust in the implementation of all business content

SAP BTP Extension Suite – EDIT for Trustworthy Data



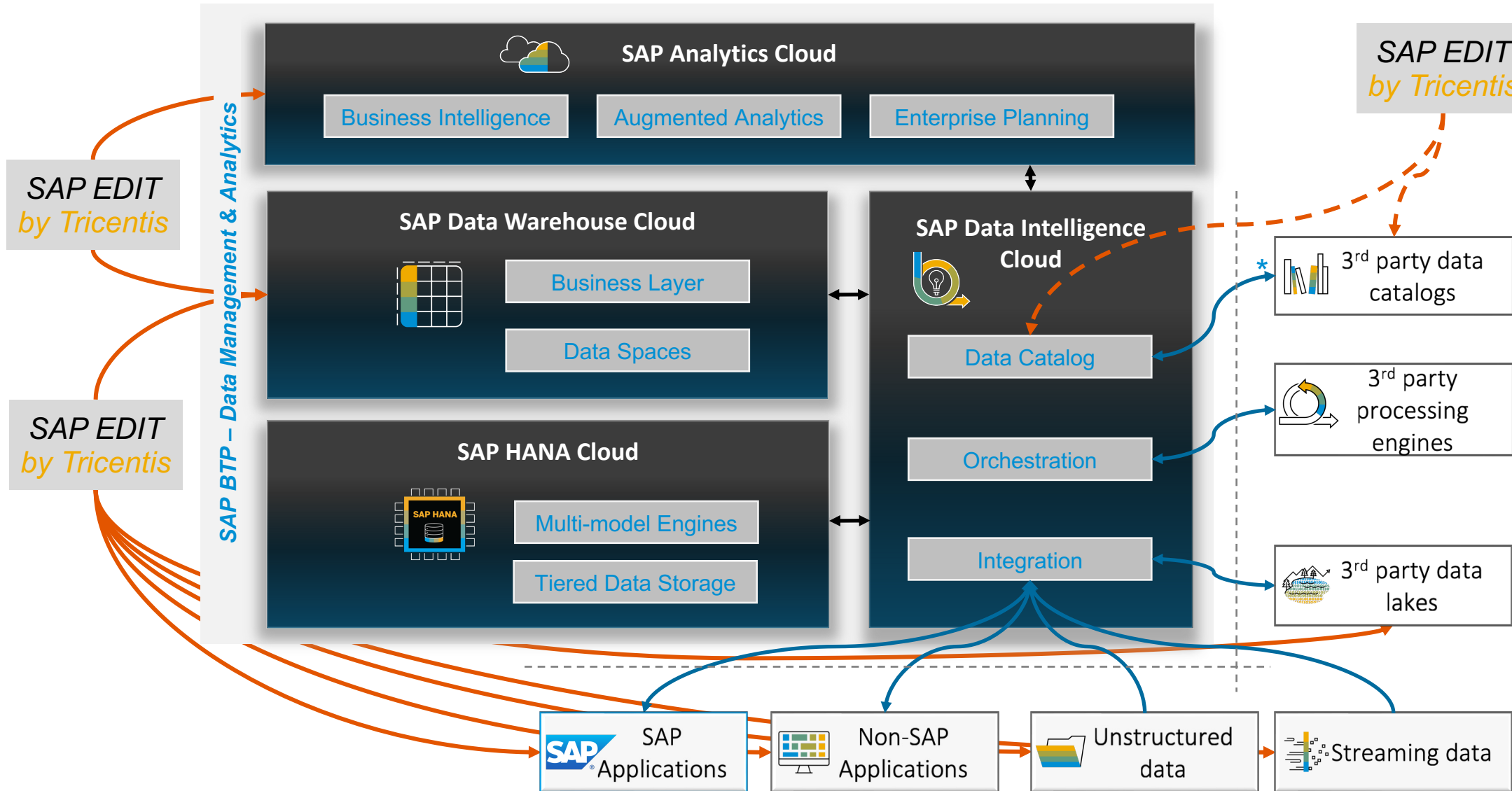
EDIT Benefits for SAP Extension Suite

- Ability to validate processes with SAP Data seamlessly to other systems
- Included API testing for process interconnection and automation
- Accurately checking data processes Lowers legal and GDPR risks
- Validate processes are streamlined and integrated accurately

SAP Data Intelligence, a pillar of the SAP BTP

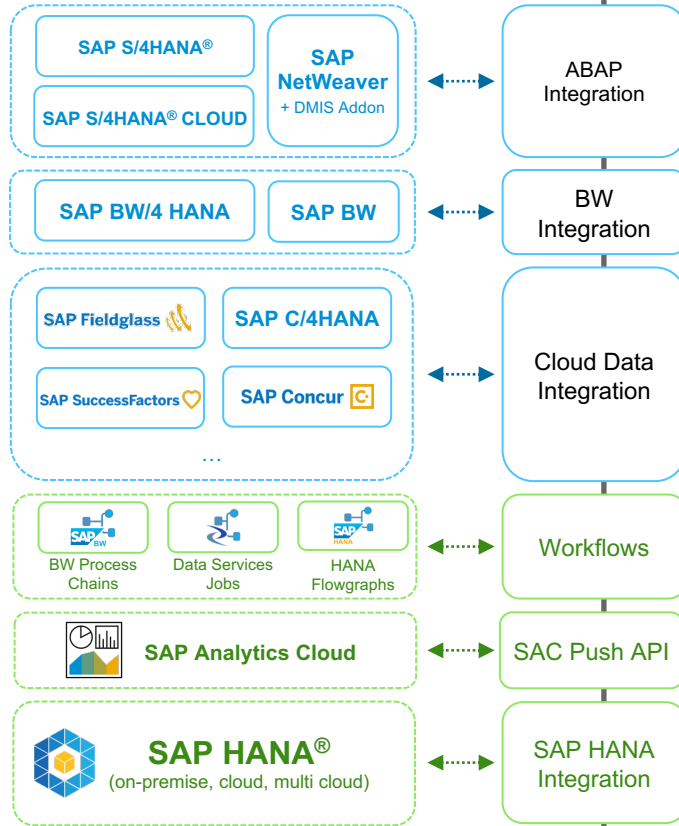
Enabling and end-to-end data fabric

- Reconcile data to ensure transformation rules have been implemented correctly
- - - → Read metadata for efficient test case creation

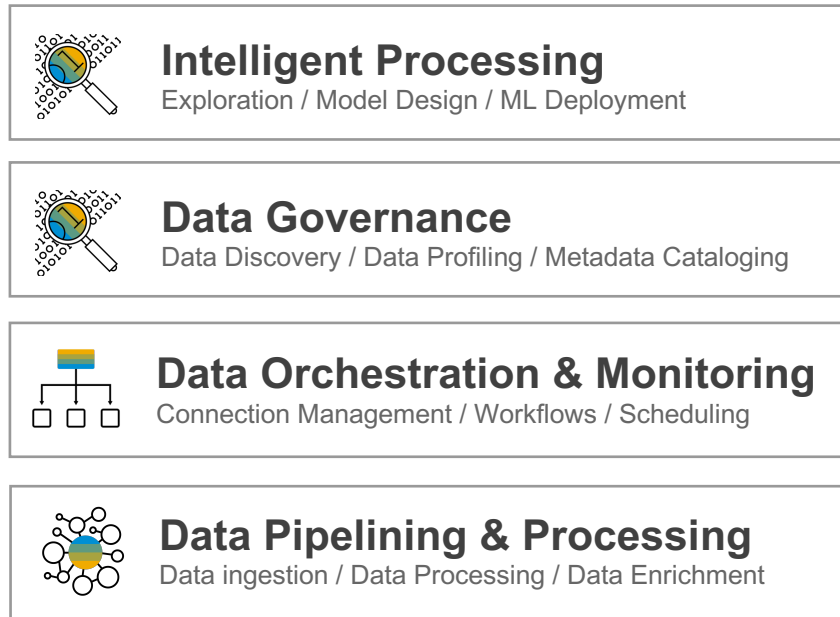


SAP Data Services

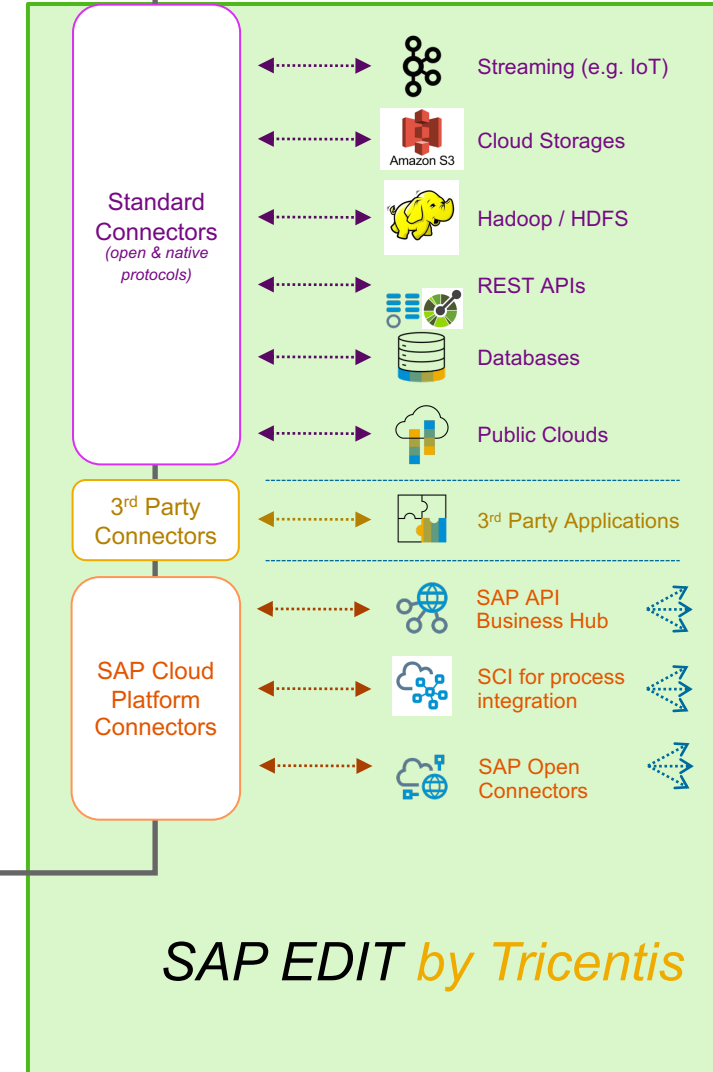
SAP Applications



SAP Data Services



Distributed & External Data Systems



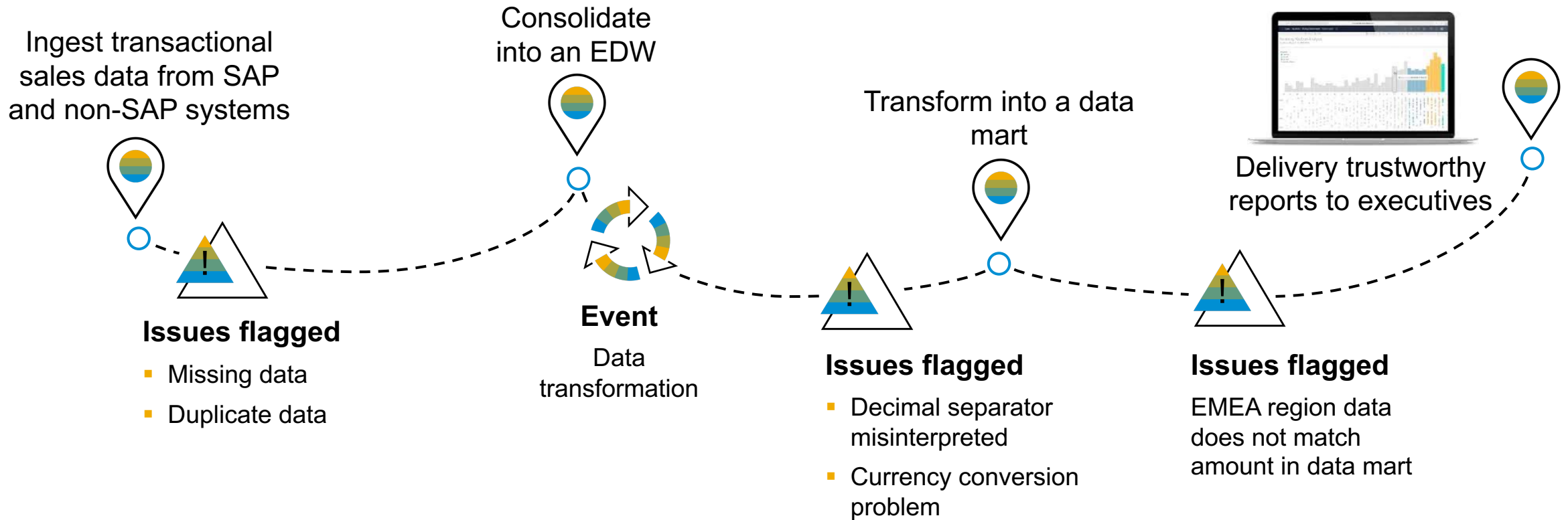
SAP EDIT by Tricentis

EDIT Benefits for a SAP Data Warehouse

- Reconcile any Data Migration from legacy systems
- Validation for SAP use cases (eg ODP)
- Testing for the accuracy of real time information or Cloud data

Deliver trustworthy data

Example scenario—data analytics



Keep operations running smoothly

Example scenario—Finance AR invoicing

