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BUSINESS INTEGRATION

A Guide to Integrating SAP S/4HANA into Your IT

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Content

Foreword

Approximately 35,000 companies worldwide are facing a monumental task: the implementation of SAP S/4HANA or the migration to SAP's new ERP system.

We have put together a guideline for these companies: What do they need to keep in mind when addressing the issue of integration as part of this task?

Get an overview of the systems and endpoints that need to be integrated with SAP S/4HANA, learn about the different integration patterns, and find out what changes and modernisations to the integration interfaces may occur with SAP S/4HANA.

You should be familiar with the role of connectors and the benefits of content and canonical formats in managing B2B integrations, as well as the criteria that should be considered when selecting the deployment model of an integration platform for S/4HANA integration.

The assessment of integration experts and opinion leaders on S/4HANA integration provides valuable food for thought.

Equally exciting: What questions have SAP user companies already asked themselves when taking a critical and detailed look at SAP's own integration solutions?

What is SAP S/4HANA?

SAP S/4HANA is SAP's strategic and future-ready enterprise resource planning (ERP) system. It is set to replace SAP's core system, SAP ECC, which has been familiar for decades. SAP ECC (SAP ERP) is the functionally equivalent successor to the third generation of SAP ERP systems, SAP R/3.

In addition to covering classic business processes of companies in many industries, SAP S/4HANA supports with integrated modern and intelligent technologies. User companies are therefore enabled to better automate business processes and perform embedded analytics in real time.

SAP S/4HANA, however, is only one part of SAP's overall portfolio, which consists of approximately 300 products and another 200 cloud-only service offerings.

What does SAP S/4HANA mean, what is the history of SAP S/4HANA?

- Written out in full, this product designation means "SAP Business Suite 4 SAP High Performance Analytics Appliance".
  Well, then better keep it simple: SAP S/4HANA.
- Essentially, this is a fourth-generation (SAP) ERP solution, but now based on a database solution developed in-house by the manufacturer. This database solution, SAP HANA, is a combination of a relational database with an in-memory database. It can be used to perform comprehensive analyses in real time or with high performance on extensive amounts of data.
- There is sometimes slight confusion around the "S" in the product name: Does it stand for "Suite" or – as originally assumed – for "Simple" in the sense of "Simplification"? The latter fits perfectly with the idea of the fourth SAP ERP generation and is a challenging task in an increasingly complex business world.
- The first three SAP generations were R/1, R/2 and R/3. The "R" stands for Realtime – which for this SAP ERP generation meant that all inputs and changes regarding the mapping of a business transaction were immediately saved and their impact on all relevant operational areas was immediately taken into account. An invoice generated in the sales department updates at the same moment the information for controlling or accounting – for example, it increases the view of outstanding accounts. The R generations were innovative in their time: All relevant core operational processes have been consistently mapped onto a common data basis and every update is immediately effective everywhere.
- SAP S/4HANA goes beyond simplification via the real-time approach to analytical assessments: It is now possible for every update of a single transaction to be immediately effective and visible in the aggregation as well. For example, should a company want to achieve an increase in sales through a targeted online advertising campaign on a special day, this can be aggregated and directly compared and analysed in comparison to a standard reference day. This was previously not possible in real time due to the volumes of data to be processed.

Another major leap in innovation is that SAP S/4HANA is also available to user companies as a cloud offering. SAP offers S/4HANA in the following versions:

- as an on-premises version: **SAP S/4HANA**
  The user operates these on its own or with a classic operating provider (hosting).
- as a cloud version:
  SAP S/4HANA Cloud, private edition
  This version is hosted on one of the SAP-approved hyperscalers such as Microsoft Azure, Amazon Web Services or Google Cloud Platform. In this case, SAP handles operation, but the user company has its "own", i.e. dedicated environment.
- as a cloud version: **SAP S/4HANA Cloud**
  In this case, SAP takes over the operation, and the user company is only entitled to a "personal" area of a shared environment (multi-tenant). This is a shared deployment platform with other companies.

The last-mentioned SAP S/4HANA Cloud (shared environment) version offers less functionality and more limited customisation options than the two alternatives.

A survey conducted in 2021 by the user associations DSAG (DACH region) and ASUG (North America), revealed that companies in the DACH region currently prefer to use an on-premises variant, with approximately 60% selecting this option. In North America, on the other hand, on-premises, private cloud and hybrid cloud operating models are all similarly regarded, with an adoption share of around 25% for each.

What do SAP users have to deal with during the SAP S/4HANA implementation?

In 2019, SAP announced the discontinuation of support and the stop of strategic further development of the legacy, third-generation system SAP ECC. Therefore, existing SAP ECC customers are expected to have carried out a complete changeover to S/4HANA by 2030 at the latest (as of 2021).

This migration to SAP S/4HANA affects some 35,000 companies worldwide.

The first important milestone was reached in 2020: 10 percent of these existing customers use at least parts of the new system productively. It is also interesting to note that approximately 50 percent of all S/4HANA implementations are new SAP customers (as of 2021).

As a result of the discontinued support and strategic development of the legacy SAP ECC system, 90 percent of existing customers will therefore need to migrate to S/4HANA in the next ten years.

This means a mammoth task for these companies until the switchover is complete:

- Day-to-day business is to continue without friction and unaffected by the changeover. Given the high dependency of business processes on IT systems, that is a heavy burden.
- Added values and opportunities of the changeover need to be identified and implemented so that it is not just a technical conversion without qualitative benefits. Which major tasks that have been postponed so far can be addressed in the course of such a project? How can we sensibly set up a multi-cloud strategy? What opportunities for optimisation exist in a consolidation and modernisation of the IT infrastructure and architecture? So, from an overall perspective, what do we need to do to achieve economies of scale and future security through the implementation of SAP S/4HANA?
- Both business and IT of companies have to cope with new requirements in the context of digitisation and automation in parallel – which means a profound change in itself for many companies.
- Let's not forget that SAP S/4HANA and other SAP offerings are only part of the IT infrastructure: Which non-SAP solutions or legacy systems, considered individually for each company, are the optimal admixture to cover all needs? How high is the share of non-SAP systems in total?
- The experts available to ensure a smooth transition, both internal and external, are already scarce today and will be even scarcer in the 2020s.
- A switchover means change and the opportunity for internal optimisation: What core tasks should be the responsibility of the organisation itself and remain there, and what could be better outsourced? Where are which tasks placed best and most efficiently?

For many companies, the implementation of SAP S/4HANA is like changing wheels at full speed.

This demanding task is significantly more challenging than the last comparable situation at the turn of the millennium – which, by the way, already half of today's decision-makers and affected users are unable to remember as they were not yet working at that time.

What do these requirements mean for the SAP S/4HANA integration task?

That is easy to outline, but monumental in its consequences.
The example of an existing SAP customer with SAP ECC in place is a good illustration. In the simplest case, let's assume that this central core system is "simply" to be replaced by a central SAP S/4HANA system – without any further optimisation considerations.

What does this mean from an integration perspective?
When SAP R/3 or SAP ECC was implemented, a large number of other systems and applications were connected to the core system, as shown here in an abstract and simplified form:

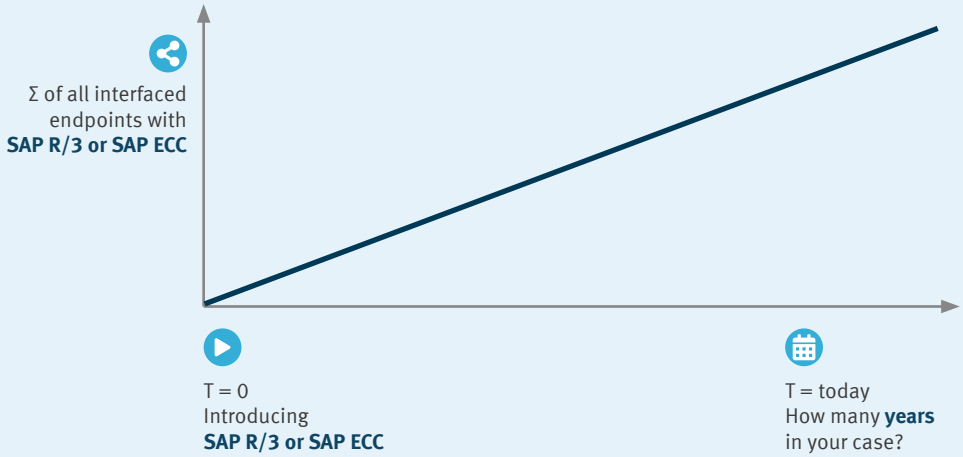

Figure 1: Over years and decades, SAP user companies built up a high number of integrations with the SAP core system

How long might this have taken in the case of the individual company? In the course of a change to SAP S/4HANA, these interfaces have to be upgraded – in a considerably shorter time and in parallel, i.e. accompanying, or all too often following, the central project task.

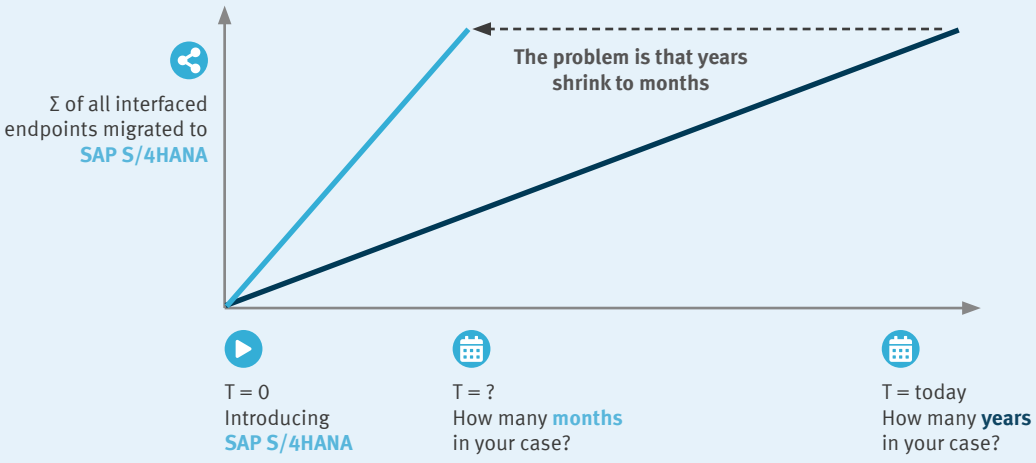

Figure 2: Only months remain in the migration phase for mapping all existing integrations with S/4HANA within the project duration

Gartner, an IT analyst firm, has already articulated this time and risk factor in 2020:

> *Through 2025, 40% of ERP implementations will underachieve as a result of under-investment in integration.* [1]

Many decision-makers are already aware of this: 60 percent already rate the integration of legacy systems into the new SAP S/4HANA world alone as a cost and effort driver that is likely to put a strain on project budgets and resources.

Multi-cloud strategies of enterprises quite rightly have cost and efficiency considerations for operations in mind. The necessary initial trade-off is generated by the task of integrating applications, systems, data sinks and data lakes for BI and analytics applications – now also across cloud boundaries.

As part of project planning, 20 percent to as much as 40 percent of the project budget is therefore already booked for the topic of integration in order to keep this risk to achieving the project goals as low as possible.

[1] *Gartner Magic Quadrant for SAP S/4HANA Application Services, Worldwide, ID G00407891, Published 30 April 2020*

Which systems and endpoints need to be integrated with SAP S/4HANA?

Depending on the individual IT landscape, industry, multi-cloud or digitisation strategy, the number and heterogeneity of integration processes and endpoints to be integrated in the context of an SAP S/4HANA implementation often varies greatly. On a very simple meta-level, four integration fields can be determined in the SAP S/4HANA integration space:

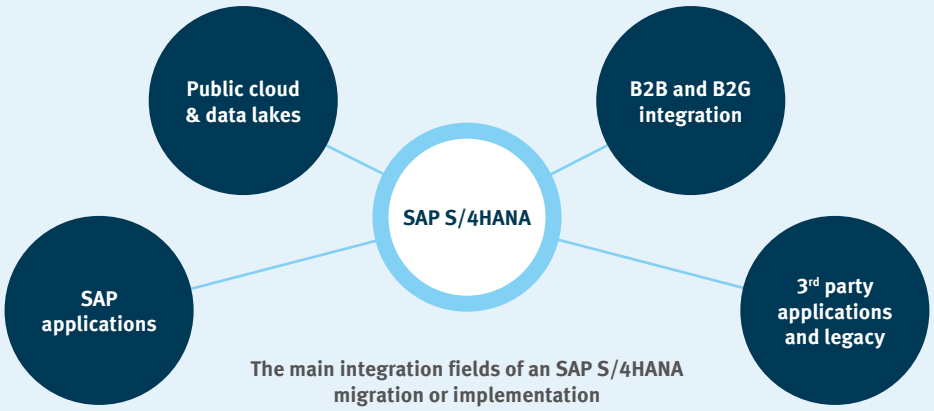

Figure 3: Integration fields in the context of S/4 HANA integration

Note that this classification is deliberately non-technical. It does, however, provide a readily applicable classification grid at the level of use cases. Each integration field has its own specific context and characteristics, which are briefly described below.

3rd party applications and legacy systems

Typically, SAP users use non-SAP products to handle and cover their operational processes and requirements: as cloud-based applications or in the on-premises variant (so-called 3rd party solutions).

The share of these 3rd party offerings varies from 20 percent to over 50 percent, depending on the company.

This share has risen steadily over the past decade as a result of market-agile new providers, especially in the field of cloud-based offerings. Prominent examples are Salesforce, Workday, ServiceNow and Coupa. Some companies also use Microsoft Dynamics 365 – the cloud ERP and cloud CRM solution from the US provider – in parallel with SAP ERP.

In addition, there are a large number of on-premises systems for various areas of application that companies choose. For both categories, these offerings have advantages over SAP offerings or address requirements for which SAP currently provides no satisfactory solutions.

Companies also use non-SAP systems and platforms for eCommerce purposes – marketplace providers such as Amazon or webshop providers such as Shopify – or eco-systems such as trading and collaboration platforms that often support business processes in specific industries. Transporeon, for example, is of great importance to the logistics industry and its partners in the DACH region. Another example in this category are service providers, such as PayPal, which are to be considered as a system or application and also pose integration requirements.

It is essential that these 3rd party applications have technical and process-related as well as semantic requirements regarding their data models, which have to be solved in the context of an integration with SAP S/4HANA. Cloud-based applications bring additional challenges related to firewall configurations.

Even if these system worlds provide certain standards and data models for integration, their breadth and heterogeneity as well as process orchestration is the central task of seamless integration processes.

Legacy systems and proprietary developments further complicate integration options. They often offer only rudimentary or immature interface technologies. Expert knowledge of the best and most stable access options and of possibilities of adapting data models for transactional or master-data driven processes will determine the success of seamless process integration. Should companies decide to run this category of applications at a hyperscaler as well, firewall requirements increase the difficulty of quickly implementing integration requirements.

B2B integration

The B2B integration field is the most challenging and heterogeneous discipline in the SAP S/4HANA integration space. Key reasons for this are:

- **The nature of B2B integration is directly linked to the core processes of companies in their value chain.** Depending on the industry, companies' core business or certain compliance processes are extremely dependent on reliable and smoothly automated processes with business partners. The higher the number of fully integrated partners, the more challenging it is to manage and maintain this for each individual partner and each integrated process.
- **B2B integration has the highest range of technological challenges of all integration fields.** Even though there are standardised and normed procedures for data transmission and data and document structures, the share of non-standardised procedures is enormous. Also, only few established processes are finally being replaced, so the range is continuously growing. The latest example is the use of REST APIs or web APIs for B2B integration for granular real-time processes. Experts do not expect this to supersede existing processes, at least not in the short term. It is not only the lack of industry standardisation of these new integration methods that stands in the way of efficient replacement. Companies are also not interested in introducing new technologies with no evidence of improvement in time, cost or quality for the specific use case. Established and proven procedures are therefore far from being obsolete, which has already been confirmed in the past, especially in this field of integration.
- **The integration of business partners or authorities is accompanied by continuous change services.** These concern both technical requirements such as certificate maintenance of transmission protocols, as well as changes and extensions to electronic document structures.
- **One factor of uncertainty for SAP S/4HANA user companies is the selection and mastery of the appropriate interface technology for the central business system.** This point is of particular importance. It is thus dealt with separately in chapter 7.
- **B2B integration requires a firm grasp of business, technical and process issues.** Many companies find it difficult to have generalists available who can cover all these aspects for setting up integration routes and providing operational support for them.
- **In the context of B2B integration, a wide range of compliance requirements must be addressed.** This is particularly evident when government agencies are involved directly or indirectly. For example, the topic of e-invoice has been much talked about for several years. Another example is the connection to national customs authorities, such as today through SAP GTS. Mastering the specifics and requirements of each country is already a mammoth task in itself.

So far, few companies have consolidated, standardised and modernised their B2B integration infrastructure. Eventually, this or alternatively the selection of an efficient service partner is the only way to ensure the manageability of this integration field.

Public cloud & data lakes

The integration of public clouds is a relatively new phenomenon, but one that is gaining central importance as an integration field.

This is not about applications and systems that are operated as business applications in a public cloud, such as a hyperscaler. This category has already been described above.

The essential and new element is use cases that leverage the capabilities and offerings of hyperscale environments for analytics/BI, machine learning (ML), Internet of things (IoT) and artificial intelligence (AI).

All these use cases have in common that they rely on the availability of mass data – structured or unstructured. In order for tools available in hyperscale environments to be used for the aforementioned use cases, these mass data must be supplied to them. This is usually done by storing and managing this data in data lakes, which are available as part of the hyperscalers' infrastructure.

No user company will be able to store or manage this mass data cost-efficiently on-premises. This is made clear by the example of collected sensor data from test scenarios or from daily vehicle use in the automotive industry. Only highly scaled platforms such as Amazon (AWS), Microsoft (Azure) or Google (GCP) are able to provide suitable solutions for this task. They also provide additional tools as part of their infrastructure, for example for analytical processing.

A great deal of the data for this use case, such as machine data, originates from non-SAP sources. SAP S/4HANA can also be relevant in such a scenario as a data source for bulk data, such as transactional data, especially for analytical assessments. There are also other use cases – depending on the individual hybrid IT infrastructure of the user company – that make it necessary to connect the central system to data and information sinks in the public cloud. For example, many companies choose to run various business applications with a public cloud provider. The data flow between these applications and SAP S/4HANA often takes place via file interfaces, so that a regulated and managed bidirectional data exchange must be handled via the various file management systems of the public cloud.

Multi-cloud environments are also encountered in the context of hybrid IT infrastructures. In a narrower sense, this means using multiple public cloud offerings. In a broader sense, it describes the fact that the entire IT infrastructure consists of a combination of several (internal or hosted) private and public cloud solutions and cloud-based applications or services are used. Understood this way, almost every SAP S/4HANA user company is pursuing a multi-cloud strategy – and thus faces all the resulting integration requirements: multi-cloud integration between multiple public clouds/hyperscalers, hybrid cloud integration between private clouds and public clouds/hyperscalers.

SAP applications

SAP S/4HANA is just one part of SAP's overall portfolio, which consists of approximately 300 products and another 200 cloud service offerings. This already results in a matrix of more than 150,000 possible point-to-point integrations, without taking into account the decimal place. SAP itself takes responsibility for four core processes and involved SAP applications, providing an out-of-the-box integration solution for each of them. This is helpful and very much welcomed by the SAP community. But in individual cases it leaves a wide field of unresolved integration requirements.

The advantage for SAP customers is that they are able to rely on the openness of all SAP offerings, as this example impressively shows in the context of SAP BW/4HANA: https://blogs.sap.com/2020/08/17/sap-bw-4hana-write-interface-enabled-adso-connected-to-a-3rd-party-tool/

SAP has primarily relied on acquisitions to strengthen its portfolio in the area of cloud-based applications: The most prominent examples are Hybris, SuccessFactors, Fieldglass, Concur, Ariba and Qualtrics. As just mentioned, SAP is set to provide an integration solution for each of four core business processes that are mapped using these applications and SAP S/4HANA.

This assumes that the user company adopts the vision of "Everything with SAP". The typical case, however, is often different; many companies seek other ways to integrate, such as using Coupa instead of Ariba. As the example shows, this is of course possible without problems or frictions.

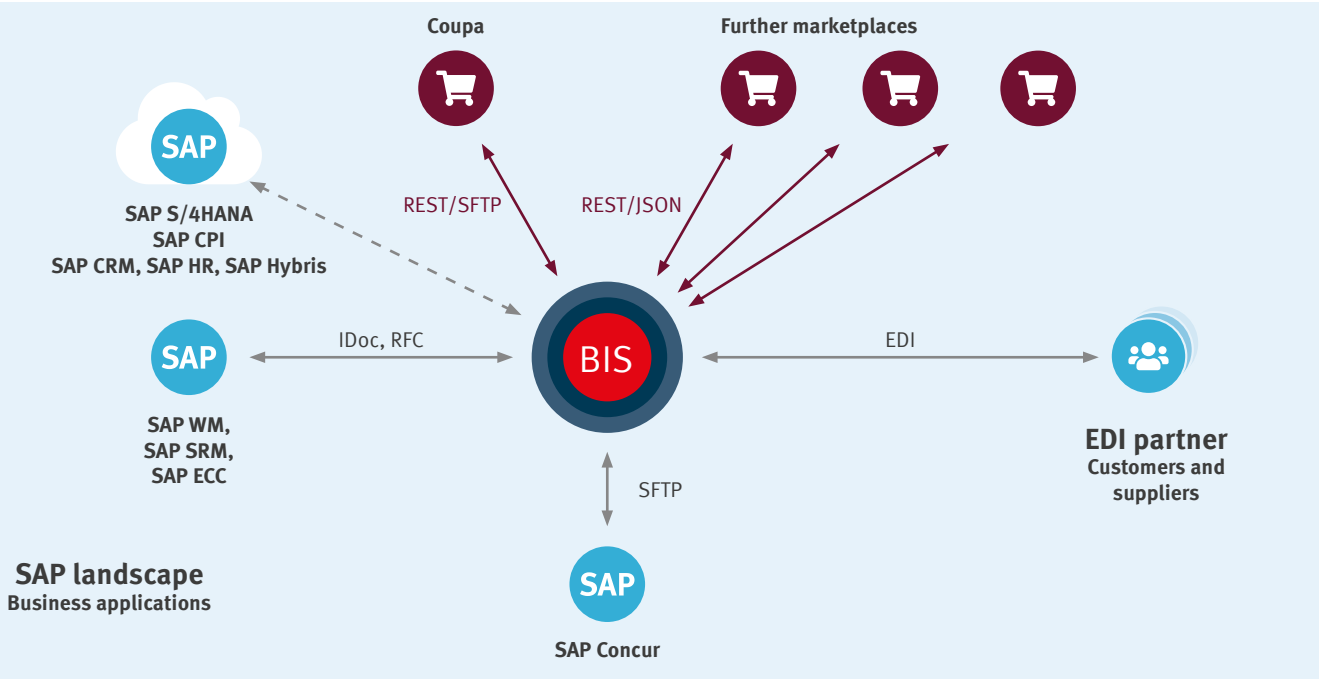

Figure 4: The SEEBURGER BIS platform for comprehensive integration on an unified integration platform

The acquired and listed applications have a "non-SAP" history – after all, they were once "3rd party applications" – and offer various interface options that can be used for integration at any time. The degree of freedom this provides allows companies to find the right SAP or non-SAP solution that meets their business requirements and stays within their budget parameters. Orchestrating overall business processes and integrating data and transactions between applications in such a landscape is not a hurdle that limits this degree of freedom.

How high is the SAP-to-SAP share of the described integration requirements in SAP-dominated IT landscapes?

SAP users have for years pursued a “one-stop shopping” strategy: Whenever business units had a need for business applications, they first checked the offerings of the manufacturer SAP. The supposed advantage: The manufacturer was known for an integrated solution portfolio, so “things fit together” and synergies could be generated. As illustrated above, this is currently only the case to a very limited extent.

SAP itself states at events organised by the SAP user association DSAG that 30 percent of the integration routes it is aware of include an SAP application. Conversely, this means that 70 percent of all integration routes are to non-SAP solutions. Since the integration of the non-SAP solutions was presumably not taken into account here, the result is: The majority of integration needs relate to the integration of third-party applications, legacy systems, partners and cloud environments.

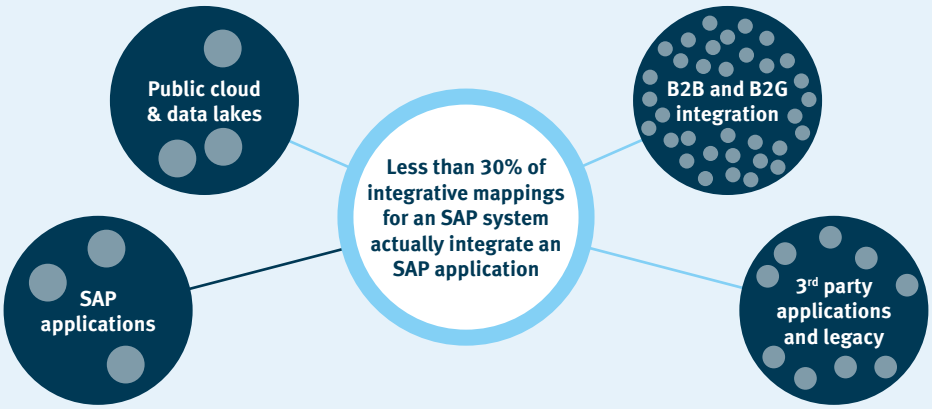

Figure 5: The share of non-SAP integrations in an S/4HANA migration is over 70%

As figure 5 symbolically reflects, one can assume that central systems such as SAP S/4HANA certainly account for a high data and document volume of these integrations. However, the essential point is: The art of integration is to establish seamless connections to all endpoints in such a network. The ability to connect an endpoint in the best possible way is therefore not determined by volume, but by the number and breadth of all requirements. The graphic illustrates once again that B2B integration in particular has a special character. While it has already been described above that this area entails the highest range of requirements and a high degree of business criticality, another special feature is apparent here: B2B integration often has the highest number of endpoints (the respective partners, almost always with multiple transactions to be mapped) with the lowest average volume per endpoint.

In view of these analyses, it is not surprising that SAP integration solutions – such as SAP PI/PO – have found virtually no buyer groups outside the circle of SAP users. It is also not surprising that SAP users usually have additional integration solutions in their IT infrastructure. It is a consequence of the assumption that SAP provides solutions for all business concerns – and the transfer of this assumption to technically oriented solutions such as integration platforms. This SAP-centric view disregards the need for the 70 percent non-SAP integrations and apparently led to non-optimal results, as evidenced by the existence of other integration platforms at the SAP user.

Which integration patterns should I consider when integrating SAP S/4HANA and beyond?

There are a variety of ways to identify, describe and classify integration interfaces in an IT infrastructure. As a rule, these approaches produce comparable results. They often differ in the systematic approach they initially use: Does the primary classification follow use cases (such as A2A, B2B, etc.), integration styles (such as Process, Data, etc.), technically oriented criteria (API, EDI/B2B, MFT, IoT, Database, protocol and data format support, adapter technologies, etc.), or specific integration fields in an integration space as described above? No approach is equally suitable for every purpose and every addressee. In addition, all systematics very quickly become multidimensional and potentially confusing when trying to describe integration interfaces completely.

In today's IT landscapes, it is advisable to get a rough overview of integration requirements via integration patterns – especially if the goal is to identify the essential requirements for an integration platform for the SAP S/4HANA integration space. The reason is simple and obvious: Mapping integration patterns is the core characteristic to determine the capabilities of the platform to be selected.

This capability is the central and essential core feature that is not addressable via a development roadmap – as opposed to a scheduled deployment of a specific adapter for a specific A2A or B2B integration. It determines the investment security for the selection of a suitable platform.

A powerful integration platform needs to be able to map these patterns in a standardised way in a system landscape that is managed centrally: with central functions for development, configuration, user management and monitoring that are as comprehensive and unified as possible. At the same time, it must be possible to provide a solution to the contradictions between integration patterns: How does the platform ensure that bulk data processing or computing-intensive complex integration processes do not negatively impact time-critical processing of granular real-time scenarios or synchronous modes?

Against this background, it is advisable for integration specialists to focus on the following integration patterns for SAP S/4HANA and the entire IT landscape:

- Real-time versus batch scenarios
- Granular versus bulk processing
- Synchronous "pull" (consumer-driven, for example RestAPIs) versus asynchronous "push" (sender-driven) integration patterns
- Transfers in discrete files or streaming
- Trigger mechanisms for integration flows:
  - Request
  - Message
  - Event

As mentioned at the beginning: This categorisation, too, is likely to find critics, raising the question of whether it is complete, unambiguous, and internally consistent. But it has a good reason: These integration patterns and their mastery are central characteristics of a unified integration platform. If a platform fails to support them, their suitability as a comprehensive and future-proof platform for the SAP S/4HANA integration challenge can questioned. It has yet another advantage: It is free of "buzzwords" or vendor-specific terms and helps decision-makers focus on the essentials.

What changes and modernisations are there in SAP S/4HANA for integration interfaces?

For SAP integration experts, terms such as IDoc, ALE, RFC, BAPI or JCO are not mysterious abbreviations. These terms stand for well-familiar SAP interface technologies – and they are "SAP standards", not universally valid standards. Over years and decades, SAP user companies have successfully integrated their central SAP systems on the basis of these technologies.

Did you know, for example, that the IDoc interface was already available as an add-on for SAP R/2? This SAP ERP system was first introduced to the market in 1979.

For SAP S/4HANA, SAP has to walk a tightrope: Users expect innovations and answers to support modern technologies through the new system. At the same time, however, user companies also hope for continued support of the proven technologies listed above. This is associated with the hope of having to make as few changes as possible and simply adopting integrations when "replacing" the central system and integrating SAP S/4HANA into the IT network.

Unfortunately, even this is not easily possible:

- The number of available IDocs is reduced in contrast to SAP ECC, but may be sufficient for many use cases.
- Many available IDocs have undergone changes because, for example, underlying database models have changed in SAP S/4HANA. This has an influence on individual segment fields of familiar IDocs.
- Also, some BAPIs are indicated as blacklisted in the corresponding SAP documentation.
- For security reasons, IDoc and ALE technologies are no longer available at all e.g. with SAP S/4HANA Cloud (the multi-tenant cloud edition).

So even in the best case, every single interface must be checked, revisions made, or available suitable alternatives found. Worth noting: There are, fortunately, corresponding interfaces in SAP S/4HANA for all of the integration patterns presented in the previous chapter. Some patterns can be covered by legacy technologies such as IDoc, ALE, RFC, and BAPIs when available. Three additional interesting interface technologies have been added – to meet the expectation for SAP to deliver on innovation:

- **The OData interface**
  REST API with OData content: It is suitable for synchronous integration patterns, has fairly good message coverage, and is growing rapidly. It is not suitable for batch or bulk processes.
- **The SAP Reliable Messaging interface** (SAP RM)
  A proprietary SOAP interface suitable for asynchronous processing and batch processing: SAP proprietary extensions in the HTTP headers for quality of-service (ExactlyOnce, ExactlyOnceInOrder).
  The technology has a high coverage of supported messages and can often be used as a replacement for IDoc/ALE. It is an interesting alternative for B2B integration scenarios, for example.
- **Business Events** (using SAP Event-Driven Architecture (EDA), since 2020 also available for SAP ECC)
  Event-triggered integration processes via subscription to a business event (such as the creation of a document or the change of a master data record); suitable for granular synchronisation scenarios.

A simple overview is provided by this graphic:

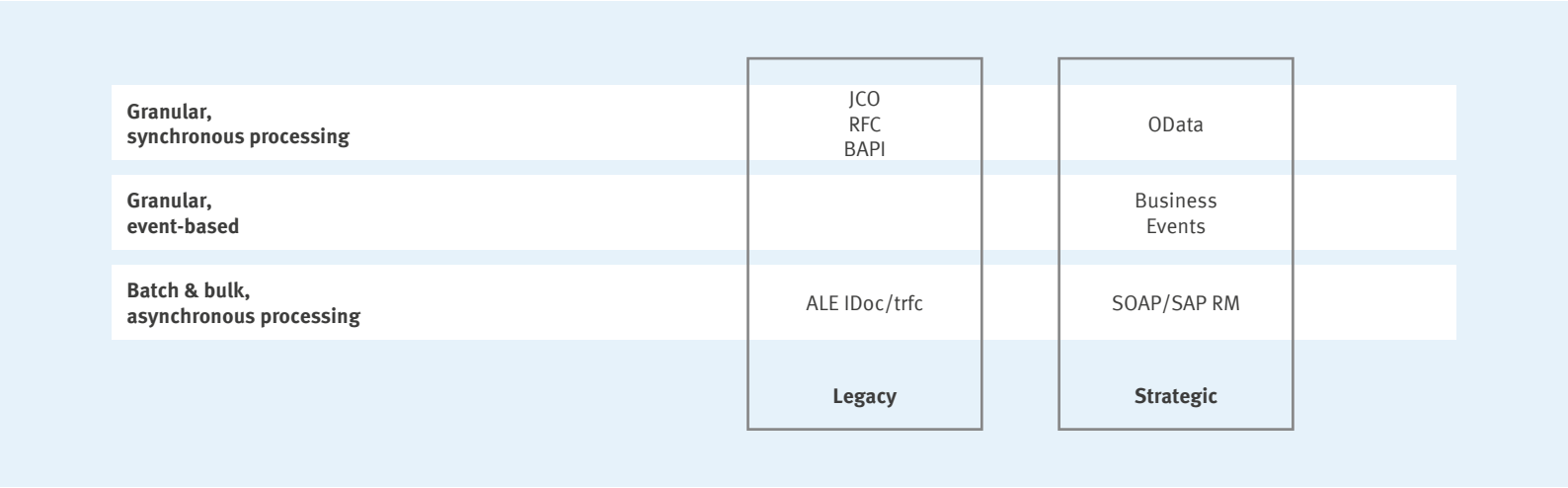

Figure 6: There are corresponding interfaces in SAP S/4HANA for a variety of integration patterns

The categorisation of legacy versus strategic interface technologies in particular shows that SAP S/4HANA users need to be on their guard.

Admittedly, established and proven technologies have a long shelf life and often offer mature and coordinated overall concepts, as users know when using IDoc/ ALE (for message control, error handling, etc.). Nevertheless, it must be recognised that SAP will hardly carry out innovations and further developments in legacy areas. Therefore, SAP decision-makers are currently focusing primarily on the possibility of using integration platforms which

- are already capable of covering the entire range of SAP S4/HANA integration offerings,
- enable the technological changeover to the strategic formats with the minimum of effort via decoupling and providing canonical formats.

The **SAP One-Domain model** presently introduced by SAP does not pursue this goal of providing a canonical data model – it is primarily a unified data model for master data across all SAP applications: A "supplier", for example, is thus "the same" in all applications and the relevant master data information for a supplier can be easily exchanged between them (for example, for master data distribution scenarios). The relevance of this model on transaction data (for example its relevance for B2B integration) is still unclear, but it is highly interesting for integration scenarios with non-SAP applications.

Equally exciting will be the introduction of **SAP Graph**, which can be expected at the end of 2021. SAP Graph is intended to make it possible to "abstract" an entire SAP landscape via a REST API interface. This will allow to focus on the content (for example, querying the status of a business transaction across multiple SAP applications by accessing a central API) without having to orchestrate the query across all applications. This innovation is relevant for rapid and simplified app developments based on an SAP landscape, the homogenisation of SAP landscapes (cloud and on-premises) and any integration scenarios.

What role do connectors play in SAP S/4HANA integration?

Many integration teams are racking their brains: Given of the large number of heterogeneous interface technologies that need to be mastered in the SAP S/4HANA integration space, it is almost impossible to acquire the necessary knowledge and achieve the required implementation speed to not jeopardise the project success of a migration to SAP S/4HANA.

Almost all companies have realised that they should not rely on individual coding and back-end developers for integration tasks. For one, technical specialists are not sufficiently available. On the other hand, the integration does not scale, but is tied linearly to the limited capacities. The final result is a confusing landscape that is neither maintainable nor reusable, risky, and extremely expensive to operate and support.

Efficient integration platforms provide the solution: They relieve integration teams of development tasks through configurable standard tools and integration adapters. Once systems are connected to such a platform, these connections may be used for many other integration routes. Centralised administration, management and monitoring help integration teams perform their tasks in an efficient and agile manner: be it in setting up integrations, be it in ensuring smooth and frictionless operation of information flows. This reduces costs and minimises risks.

However, ensuring a successful SAP S/4HANA migration or implementation involves such a massive integration effort that integration teams need additional project accelerators to keep pace. Such project accelerators are connectors.

The use of connectors aims to enable integrations to uniquely describable integration endpoints without detailed knowledge of the required technologies.

A connector provides the maximum possible degree of ease of configuration. It thereby minimises the amount of development and design effort required for integrations.

A connector can use multiple adapter technologies in an orchestrated manner, has clearly defined functions, and may include specific pre-configuration and integration assets (for example, configuration data, mappings, etc.), depending on the endpoint.

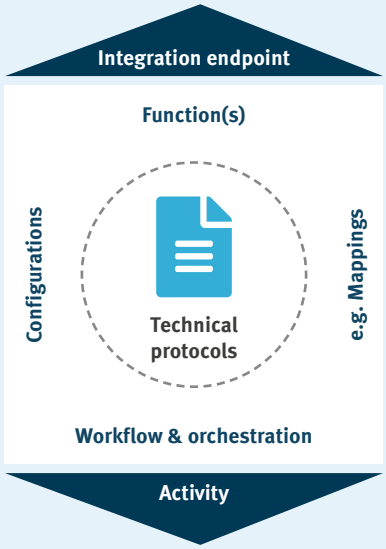

Figure 7: A connector offers the maximum possible degree of simple configuration

Some integration scenarios require no specific connectors, as the endpoints can be connected using generic standard adapters. Such generic adapters are for example (S)FTP, REST API, KAFKA, MQTT, OPC UA, AS2, AS4, mail, EBICS, MLLP, SOAP, JMS, MQ, Database.

Helpful here are so-called "recipes" that provide the user with step-by-step instructions. They enable the endpoint connection to be carried out avoiding "trial and error" and delays due to information gathering.

In summary, connectors within SAP S/4HANA projects enable dramatic project acceleration while minimising the need for specialised skills:

- They reduce complexity.
- They enable configuration instead of programming.
- They help integration teams scale their output.

What are the advantages of content and canonical formats for integrating B2B partners with SAP S/4HANA in a risk-free way?

In the context of the four integration fields for SAP S/4HANA, B2B integration occupies a special position.

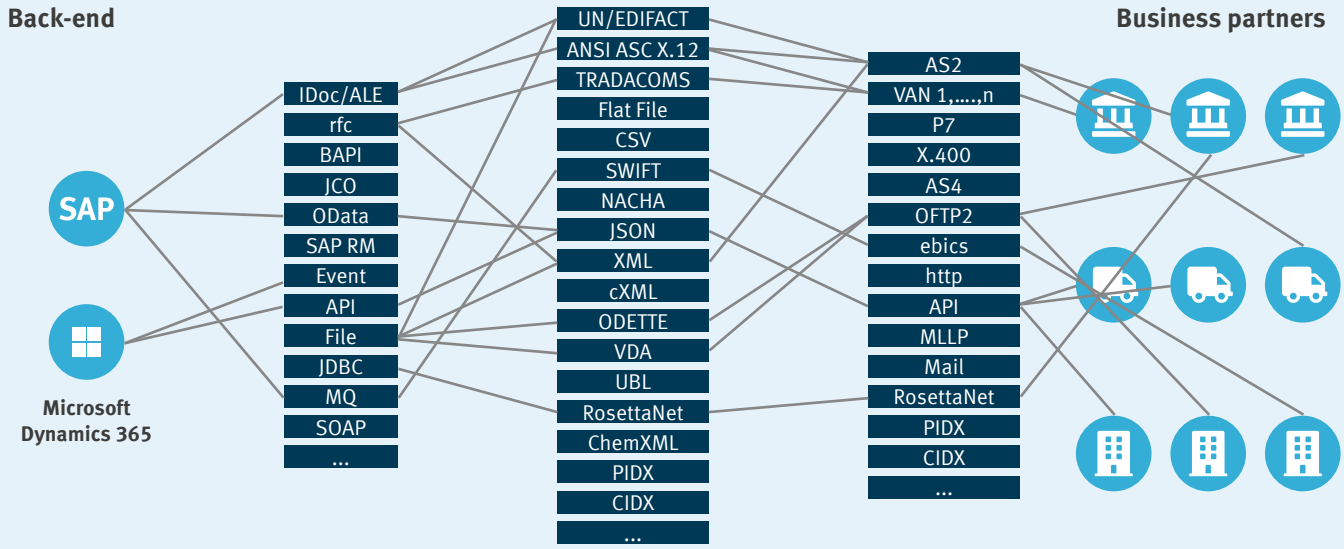

Figure 8: B2B integration with SAP S/4HANA is particularly challenging

In summary, these characteristics are as follows:

Number of connections

If you add up all combinations of partners and associated processes, the result easily exceeds the sum of all other integrations.

Frequency of change

B2B integration is subject to constant change – new technologies, security requirements, processes, changing partner requirements and much more.

Diversity

Although there are technical and industry standards, diversity is high across all partners

Criticality

Complete dependency of core business processes on automation through partner connections.

Business impact

If B2B integration were to fail for just one day, most companies would see an instant impact on their business results.

All or nothing

A B2B integration process either runs perfectly – or not at all. There is nothing in between.

Figure 9: The specifics of B2B integration with SAP S/4HANA

Integration teams, especially those that need to connect SAP S/4HANA with external business partners and government agencies, face additional challenges:

- **Which SAP system interface technology can, should or must we use?**
  Do we rely on legacy technologies or on strategic SAP technologies? If we invest in project efforts today, which technologies are reliably stand the test of time?
- **What is the best way to implement compliance requirements in the context of e-invoicing?**
  How much effort does the team need to put in to implement the legal requirements for a subsidiary or business partners in countries with e-invoicing mandates?
- **How will the use of APIs instead of asynchronous, batch-oriented approaches to B2B integration evolve?**
  What does it mean when strategic business partners map their B2B processes using API technology? Where do the underlying business processes remain the same, and where is there also a discernible change from a process perspective (for example, from push to pull processes)? What does the use of APIs mean in terms of security?
- **How do integration teams scale up the integration of business partners for automated business processes when migrating to SAP S/4HANA and beyond?**
  B2B integration has the highest range of requirements regarding technology, complexity, data format support, or business semantics. Moreover, it depends on testing procedures with external partners, which are difficult to organise. This impedes integration teams, especially in the short timeframe of the SAP S/4HANA migration period, from fulfilling their project tasks in time and to the full extent.

The ideal way to address all requirements largely in parallel is a highly standardised procedure and concept for B2B integration. This concept means the decoupling of:

- Partner content and specific B2B technology
- SAP content and selected SAP interface technology.

The essential and decisive factor that enables this decoupling is the use of a canonical format as an intermediate layer.

The canonical format makes it possible to convert all existing requirements of external partners into standardised and generic business processes – only these are finally integrated with the back-end system.

The conversion of partner-specific characteristics (technology and formats) to these generic processes and the mapping of these drastically simplified and reduced processes to specific back-end interfaces enables the highest degree of manageability and maintainability of complex B2B integration requirements.

Adding new partners then only requires the deployment of partner content, they are no longer the reason for an integration project. External sourcing of partner content makes it possible to choose a provider who also takes care of content maintenance. This reduces all change services to content updates.

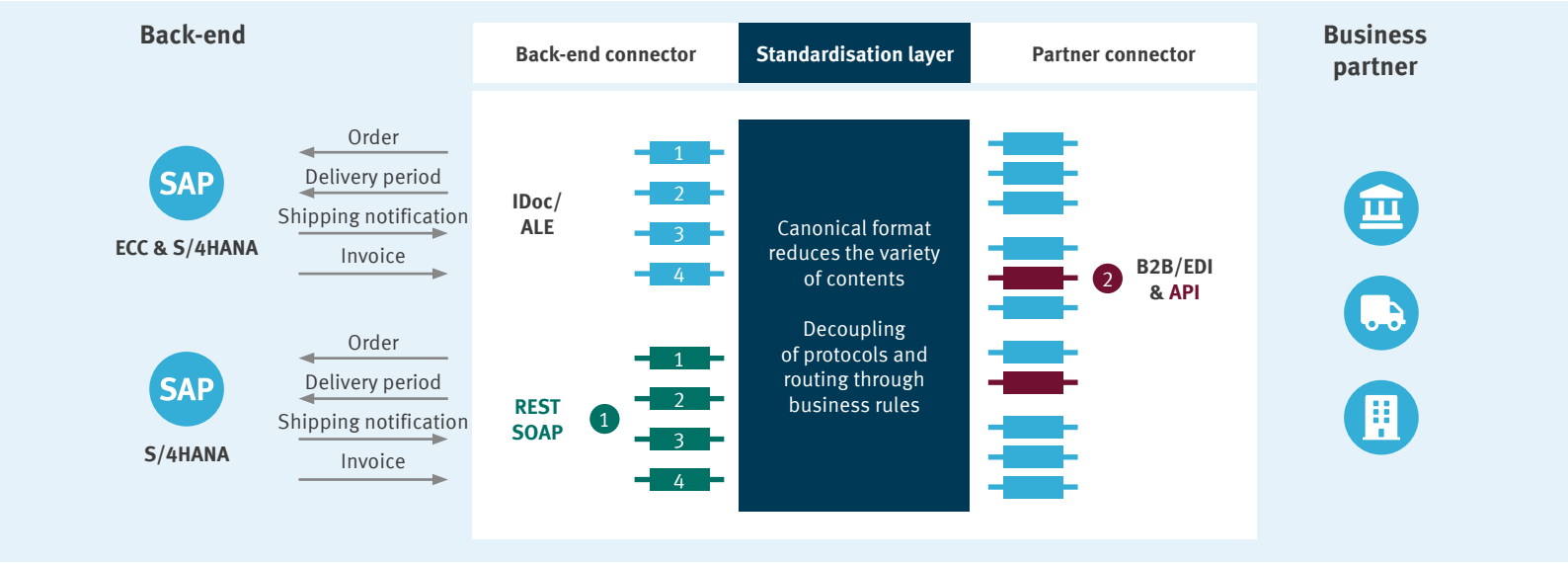

Figure 10: Investment security and reduced effort when migrating to SAP S/4HANA is only possible through decoupling and content

The graphic provides an insight into the concept of decoupling using the example of an SAP ECC user company that is implementing S/4HANA in parallel. On the back-end side, the ERP system, it is easy to see that it does not matter which SAP integration technology (legacy or strategic) is chosen for both SAP versions (ECC or S/4HANA) (top left). To reduce project efforts, a quick decision can be made to initially continue using the SAP IDoc/ALE interface for SAP S/4HANA. Prerequisites are the availability of the necessary IDocs and the adjustments per IDoc that result from the system change in individual segments.

The crucial factor is: Should a changeover for modernisation be carried out in the foreseeable future, the modernisation effort is low (see 1 in the graphic above). It is reduced to a quite limited number of process mappings, while the wide range of partner content already in use can be used further without any problems.

Likewise, the concept helps to follow new trends: The whole concept is agnostic to the B2B integration technology and content formats of individual business partners. As the example 2 in the graphic shows, if a B2B partner uses APIs for exchanging business documents instead of classic approaches, this change is also mastered by deploying the specific partner content – another scale effect of the concept for future security and investment protection.

Hybrid deployment of an integration platform, plain integration services or integration platform as a service (iPaaS)? What is suitable for what, what are the differences?

Let's look at the simplest possible representation of an IT landscape to determine which deployment forms of integration solutions and offerings are most advantageous for which tasks from an integration point of view.

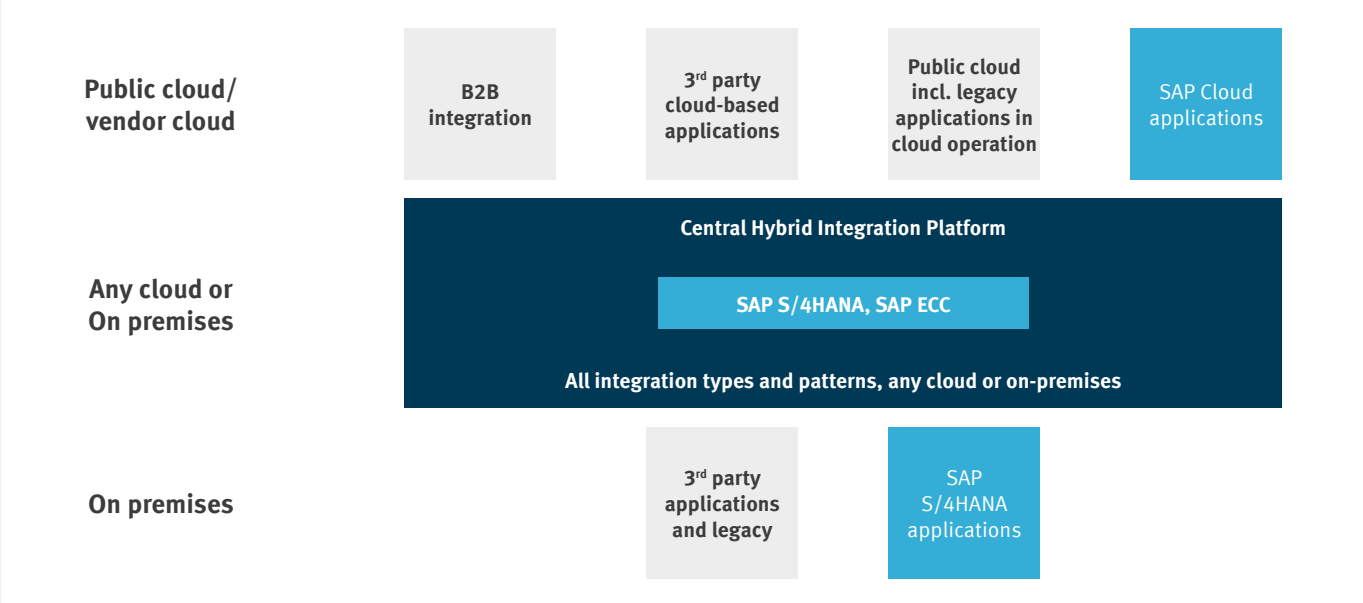

Figure 11: Multi-cloud architecture and the question of the deployment form of an integration solution

The representation chosen here outlines an architecture characterised by multi-cloud considerations and the necessity of all integration fields.

Despite the attractiveness of operating applications in the cloud, companies often decided to deliberately run selected applications on-premises – e.g. for shop floor management, legacy and self-developed systems or the SAP Business Warehouse.

The operating and deployment form of the core ERP system is the cloud, in the case of SAP S/4HANA mostly the hosted private cloud.

The top layer is primarily characterised by public cloud as the operating platform of selected applications as well as many vendor clouds – such as SAP itself, Sales-Force, Coupa, Workday or Microsoft Dynamics 365 – as platforms for obtaining software or application services.

What does this mean for the necessary operating and deployment form of an integration platform

A) An integration solution needs to be available in a hybrid deployment model

This means that it must be operable in all cloud forms (with the exception of the already "closed" vendor clouds of business application providers) and on-premises. This makes it possible to cover all functional, security-specific, risk-minimising and ultimately most cost-efficient integration requirements.

It is not reasonable and very expensive to deploy an integration platform in a vendor cloud of an iPaaS provider if addressing batch and bulk or highly time-critical processes on-premises. However, if a provider offer its solution as iPaaS in a dedicated form for the user (this model may also be referred to as a Managed Integration Platform in a hosted private cloud), such processes can also be addressed there.

On the other hand, for multi-cloud integrations it is advantageous to operate an integration platform in the public cloud where most applications are run anyway.

In the case of the graphic above, for example, the decisive criterion in which cloud operating platform the core ERP system has found its place.

There are a few select providers of centralised and hybrid integration platforms that give the user company unrestricted freedom of choice for the cloud operating platform. It is important to understand that the terms "centralised" and "hybrid" entail that such a platform can be deployed in a distributed manner across multiple cloud platforms, but managed centrally. It thus remains a homogeneous integration platform, but its runtime is operated in parallel in different clouds.

If an user company chooses such a hybrid integration platform, application management, configuration and set-up of integration processes remains in its hands and responsibility. Specialised providers support the user company via remote services. Providers may assume all or only some of the tasks.

B) An integration solution must be able to be supplemented by plain integration services

Given the number of necessary integrations, many user companies use the implementation of SAP S/4HANA to ask themselves the following question: Which integration fields or subcategories do our integration teams take responsibility for themselves – from set up to operation? Which, on the other hand, are better, more cost-effectively and more reliably dealt with by a provider of well-defined integration services?

The criteria for answering these questions are: Which integration processes differentiate us, are the result of our specific process mapping by IT systems and applications? Put simply: When these integrations run smoothly, we optimise our business processes.

Which, on the other hand, are commodities, require a lot of detailed knowledge and high maintenance efforts – but are indispensable? Also put simply: If these integrations run smoothly, we achieve no optimisation, but still generate high internal effort. There is, however, a business disadvantage or even damage when these do not run smoothly.

An SAP S/4HANA implementation offers the opportunity for modernisation and efficiency gains – and the last category in particular lends itself to entrusting it to a service provider and specialist.

So instead of taking responsibility for set-up, operation, monitoring, troubleshooting and maintenance efforts yourself, this is handed over to an external provider. The provider then assumes this responsibility and vouches for the result with assured processing SLAs. After all, integrations are not about SLAs for system availability, but about ensuring a processing result in time and scope. This is what is meant by an integration service which is thus much more than just an application service.

Which integrations lend themselves to being used as an integration service via an external service provider? The above criteria apply without restriction to the following requirements:

- B2B integration
  - Classical or via API with business partners
  - Regulatory requirements:
    - In the context of e-invoicing and nationally applicable procedures
    - Integration with customs authorities in connection with SAP GTS
- Integration of 3rd party cloud-based applications with an SAP back-end system

C) An integration solution must also be available in the iPaaS model

iPaaS has become very widespread in recent years. One predominant reason is: There has been explosive growth in interfaces over the last decade. Driving factors were the increasing adoption rate of cloud-based applications, the success of APIs as an interface technology, and integration requirements due to multi-cloud strategies. Many integration routes involved the need to integrate an internal endpoint with an external endpoint, for example in the cloud.

iPaaS offerings provide a pragmatic and rapid solution: They provide the necessary technologies and tools, relieve companies of the procurement process of a license-based solution, and involve no effort for operation and application management. Operational requirements can thus be addressed at low entry costs. As long as the data volume is low and the processing speed does not need to be optimised, the costs are still justifiable despite the addition of further integrations. However, this development leads to a decentralisation of the data and information flow in the company.

Modern iPaaS offerings are able to overcome these drawbacks as part of a hybrid integration platform – the iPaas offering being one component of an integrated integration landscape. Centralisation is therefore ensured.

The main advantage of using an iPaaS solution today is that it is managed by the provider for the user, but can be optimised for the company's specific needs in terms of performance and scope. This does not relieve the user companies of the obligation to take responsibility for the result and the professionalism, but it does relieve operations.

What do integration experts and opinion leaders advise?

Let's summarise the insights that have been identified so far to define the framework for a suitable integration platform for SAP S/4HANA:

- **Functional coverage of all interface technologies required for the integration fields in the S/4HANA integration space**
  - The platform must be able to convincingly cover all four integration fields: 3rd party applications and legacy, B2B integration, public cloud and data lakes, SAP applications. The coverage of all non-SAP endpoints is essential, as these account for more than 70 percent of the requirements. It is crucial that any integration process can draw on all available interface technologies and combine them as desired. Thus, each integration process may include any number of systems or applications.
  - For the central system, SAP S4/HANA, the platform must master the SAP legacy technologies as well as the strategic SAP interface technologies. These interfaces are proprietary, but open.
- **Powerful and concurrent coverage of all integration patterns**
  - The platform needs to master all relevant integration patterns.
  - The platform must be able to execute these integration patterns in parallel and concurrently without negative side effects in processing.
- **The integration platform provider must provide project accelerators and standardised content**
  - For applications and systems, this is apparent in a wide range of available connectors or recipes for the rapid implementation of project tasks.
  - For business processes, primarily for B2B integration, it is demonstrated by an extensive library of partner content and process maps to SAP ERP systems.
- **Cloud deployment and support for hybrid multi-cloud scenarios**
  - The platform must be able to be operated in any public as well as (hosted) private cloud and on-premises.
  - The platform must also be able to be deployed hybrid (distributed across clouds) while being managed centrally.

The picture becomes complete when you take a look at user requirements. While the topic of integration was previously reserved for integration specialists, it is easy to see that this group of specialists is rapidly becoming a bottleneck. It is therefore essential that today business users, too, have to implement their integration requirements independently via self-services apps. Certainly, this is often limited to simpler scenarios, such as providing secure and managed file transfers with external partners – exactly where, for example, email or an FTP server is out of the question for reasons of security, compliance, governance or technical limitations (e.g. file size).

What all requirements have in common is the hybrid nature of each individual requirement – the integration platform is required to cover a mixture of all aspects

- hybrid endpoint integration in a multi-cloud landscape,
- hybrid integration styles and patterns,
- hybrid accelerators,
- hybrid operating platforms and models
- and the support of hybrid user personas

to do their jobs in the context of integration (implementing the jobs-to-be-done approach in parallel with ensuring technology requirements).

Opinion leaders and experts, such as the analysts at Gartner, therefore recommend a so-called hybrid integration platform as a solution, also and especially for SAP S/4HANA users. The word "hybrid" here reflects the platform's addressing of all the hybrid requirements mentioned. This is analysed and substantiated in two recent reports:

- *Ensure Your Integration Strategy Supports Modern Integration Trends*
  Published on 23/02/2021 –
  Reference: ID G00743374
- *How to Successfully Tackle API-Based SAP S/4HANA Integration*
  Published on 01/12/2020 –
  Reference: ID G00732196

The analysts fall short of the claims in the above-mentioned list at some points and go into more detail elsewhere about the importance of reusability and the management of API integrations – an important aspect especially for SAP S/4HANA users.

After all, they are faced with the task of integrating more than 70 percent of non-SAP applications. However, an integration platform that is to be taken seriously provides this quality: It is a key core function to manage and integrate both internal and external APIs on the same unified platform which also provides the basis for further integrations.

Likewise, the analysts emphasise the essential advantage of centralisation for integrations: for e.g. operation, management and administration and the reduction of the required skills of the users. These are now reduced to just one tool. This saves direct and indirect costs and efforts, drastically shortens the time required to set up new integrations, enables maximum reusability, and provides integrated governance.

An example of a possible solution for SAP S/4HANA user companies is shown in figure 12 – reflecting Gartner's recommendation.

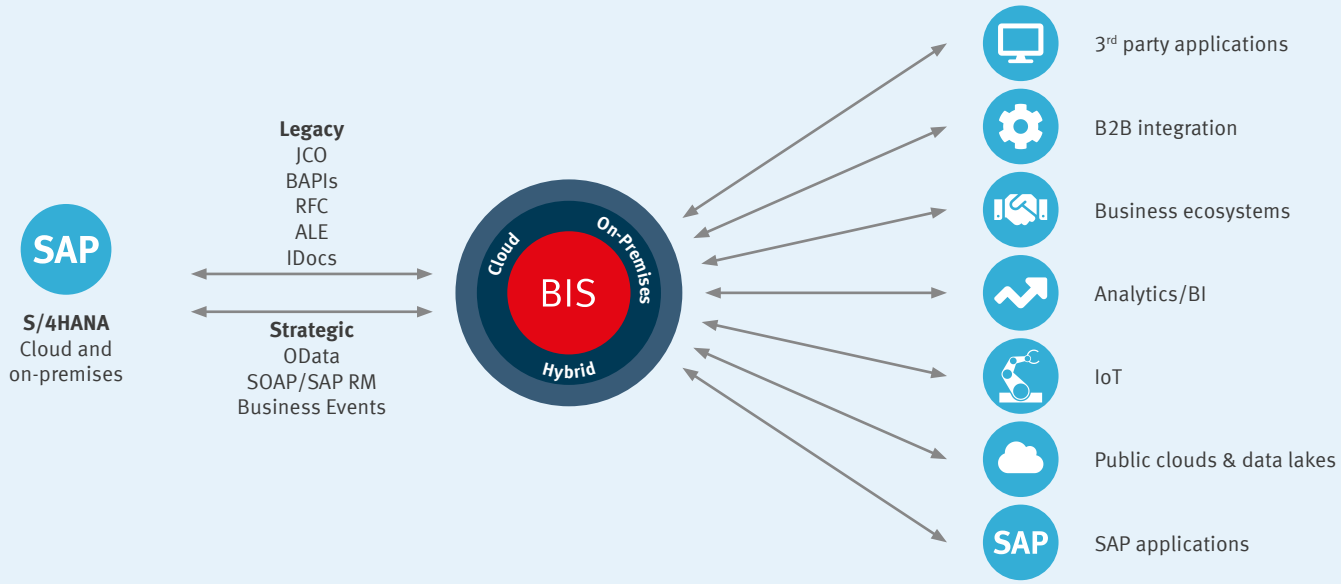

Figure 12: Management and integration of internal and external interfaces on a unified platform

The solution shown covers the entire SAP S/4HANA integration space. Its core features are:

- Consistent and comprehensive **hybrid character**, as demanded above. This also includes the provision of integration services for the discussed commodity requirements such as B2B integration and e-invoicing mandates, the connection of SAP GTS to international customs authorities or the connection of cloud-based applications.
- **Centralisation**, as it is a centrally manageable platform with the support of all functionality and technology for all integration fields.
- **Standardisation** via provided solutions.
- Availability of project accelerators such as **connectors**.
- Availability of an immense library of ready-to-use integrations (**pre-packaged content**), as is particularly necessary in the B2B integration field.

Why is it not sufficient to consider only the technology?

Many user companies focus on selecting a technical integration platform or relevant integration services. This is indeed crucial for the reasons mentioned above.

The graphic below compiles all the essential building blocks that are key to addressing the integration problem.

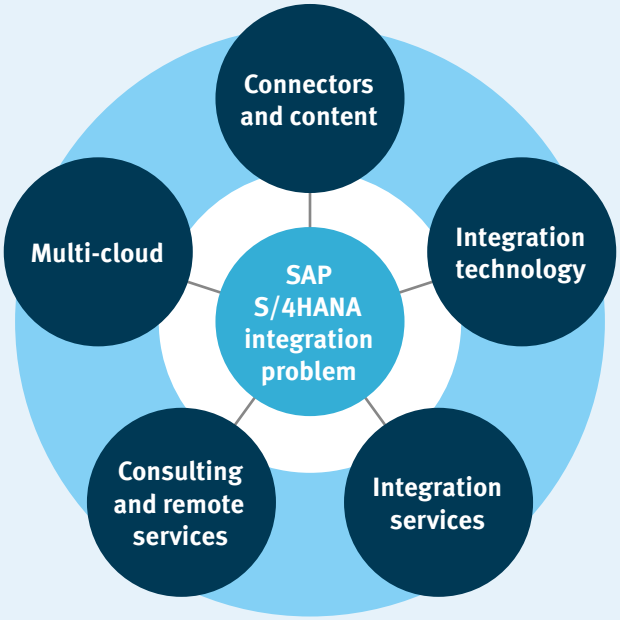

Figure 13: Essential building blocks that are the key to mastering the S/4HANA integration problem for many SAP user companies

Something that many user companies partially neglect is the importance of consulting and remote services. The main reason is that most user companies underestimate the specific characteristics of integration projects in the course of a system change.

To avoid this, external specialists must be involved at an early stage as consultants. In this way, project risks can be identified and addressed early on to ensure that SAP S/4HANA goes live on time and in the required scope.

What makes these integration projects so special?

- The "jump-start problem": The integration teams are often the ones that get involved quite late and then have to contribute ad hoc in the short remaining time of the overall project.
- Integration teams are almost always engaged in multiple parallel sub-projects with highly specific requirements during system changes, often all in permanent change mode.
- Individual integration projects are often very volatile: Teams implementing interfaces need to wait for system availability and meaningful test data. Dependencies on other project teams and external partners make stringent execution of individual tasks almost impossible. Test results then lead to the next iteration, and the circle begins to turn again.
- Time and effort of interface implementations and integrations are very often hard to estimate in advance due to lack of knowledge and experience.
- Once the projects have gone live, remote services by specialists and expert support for the integration platform are guarantees for ensuring the overarching integration processes in daily operation. No integration team appreciates a support partner who, after analysing log and trace files, closes the support case with the curt message that, technically speaking, there is no problem when integration routes are in place. Competence, hands-on mentality and pragmatism characterise a valuable platform partner, especially in this phase.
- Forward-thinking project managers on the part of the customer are aware of these particularities and choose an integration platform provider who takes responsibility for the success of the project together with them and accompanies them on this path and beyond.

What critical questions do SAP users have regarding SAP's integration offering?

The term "integrated application systems" sounds somewhat antiquated, but it used to be the core advantage of the business solutions from Walldorf and was the reason for their market success: All business processes in a company could be covered in an integrated way with one application system.

Today, this is no longer the case: As already mentioned, SAP offers about 300 products and another 200 cloud service offerings, according to its website – and many of them are just no longer integrated with each other. While the core SAP S/4HANA application still largely represents SAP's original promise, many relevant SAP cloud applications, for example, are third-party purchases with their own database and business logic. It is often no longer advantageous to use the "integrated application system" criterion as a reason to purchase new solutions from SAP. Providers such as Salesforce, Workday and Coupa are thus proliferating in SAP's existing customer base.

SAP has made many efforts to facilitate the integration of SAP landscapes for its customers through its own offering and an overarching data model (SAP One Domain Model). This is good and is also acknowledged by the SAP community.

When selecting suitable integration platforms for SAP S/4HANA, many user companies include SAP offerings in a preliminary selection – if only to solve SAP-to-SAP integration requirements via the provider itself.

After a deeper analysis, and taking into account the experience and recommendations of third parties, they ask themselves the following critical questions when it comes to using SAP offerings for a fully comprehensive integration platform:

- **Do SAP users really and necessarily need the SAP Integration Suite for SAP-to-S/4HANA integration?**
  The main reason to consider the SAP integration solution is the SAP-to-S/4HANA integration scenario. It is becoming apparent, however, that such scenarios could eventually do without middleware altogether. So how should the tool be reassessed?
- **Is it in SAP's strategic interest to provide the most appropriate integration solution for 3rd party endpoints?**
  The integration of non-SAP solutions accounts for 70 percent of integration requirements. Is SAP really going to provide good integration solutions for potential and real competitors?
- **In this context, what does the high share of 3rd party providers in the context of the integration offering mean for the integration of 3rd party solutions?**
  SAP needs to focus and third-party application integration offerings appear not to be a core domain. The customer receives a heterogeneous integration solution consisting of building blocks from different manufacturers – for example, for important third-party integrations, from Rojo, a consulting firm with a few dozen employees.
- **Is the SAP Integration Suite the appropriate hybrid integration platform for solving the SAP S/4HANA integration problem?**
  If one critically examines relevant core requirements to the solution – what is the result? Why, for example, has PI/PO not achieved market success outside the community of SAP user companies, where the product is subject to neutral evaluation?
- **Is SAP the same reliable and sustainable partner for integration solutions as for SAP Business Applications?**
  What distinguishes the related experiences of SAP user companies in recent years? What costs and efforts have gone into PI/PO, the B2B add-on, the SAP Business Connector, the Crossgate platform in the past – and what value is left at the end for the user company? What happened to the Advantco solutions? How reliable is the third-party offering of Cloud Elements after the takeover by an SAP competitor?
- **How can I obtain reliable information on what SAP Integration Suite license costs will amount to in the end?**
  SAP itself is transparent; license costs are also relatively easy to access. To get assurance of all the costs involved, decision-makers should take a look at the terms and conditions. They are available here: https://blogs.sap.com/2021/03/24/integration-suite-usage-analytics/

Decision-makers need to define how to design their selection processes and which criteria to apply. The selection of a central hybrid integration platform requires diligence, technical considerations and, of course, the inclusion of business and investment security criteria.

For these good reasons, many companies look at other market alternatives than just the offerings from SAP. One good solution could be, for example, leveraging the advantages of SAP-to-SAP integration offerings from Walldorf, but looking for integration specialists when it comes to non-SAP integration with S/4HANA.

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