# SAP S/4HANA:

## From Two-tier ERP to the N-tier Enterprise

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# Introduction: The Two-tier ERP Model Evolves

Building a comprehensive enterprise software strategy that can serve an extended global enterprise has always required a degree of compromise. The software and technology needed to run headquarter operations hasn't necessarily been the right option for running subsidiaries and other smaller operating units within the enterprise. In many cases, software that can run headquarters was seen as too robust and costly to be effective in a subsidiary operation, and the autonomy accorded to many subsidiaries meant that it was easier to let these entities make their own choices rather than impose a solution that could be seen as overreaching, or impractical, or both.

The result is that many enterprises adopted a two-tier ERP strategy that supported a standard enterprise system in headquarters from one vendor and a multiple choice ERP strategy for subsidiaries – effectively creating a multi-vendor, two-tier environment. While precise metrics on the number of companies running two-tier implementations are hard to come by, research by analyst firms Forrester Research and Constellation Research have shown that close to 50 percent of companies surveyed by the two firms have either existing or pending plans to support two-tier implementations.[1]

A large number of mid-market ERP vendors rose to the challenge and built largely effective products that could be implemented in subsidiaries relatively easily. These systems could provide a modicum of connectivity back to the head office, mostly with regard to consolidating financial, inventory, and other basic operational data across the enterprise.

That model worked well for many years, but its inherent limitations are starting to show as the global business world is shifting to all-digital, real-time operations at an unprecedented rate. Instead of being a means to replicate the structural "flexibility" of the global enterprise, two-tier architectures that depend on integrating different vendor systems have become barriers to innovation, cost-containment, and operational efficiency. This has increasingly become the case as the nature of subsidiary operations has evolved to require greater levels of functionality and support for innovation.

This is very much the status quo across the enterprise software industry, and until recently it has been a fact of life companies were forced to accept. The status quo, however, is being challenged in the SAP enterprise ecosystem, and companies that run SAP in their headquarters now have an opportunity to take a second look at whether running a non-SAP ERP system in their subsidiaries is the best strategic choice. This new opportunity is made possible by the continuing evolution of SAP S/4HANA, which is now available both in the cloud and on-premise, allowing organizations to leverage a consistent code line and data structure extending from a fully-functional headquarters system running S/4HANA on-premise to a flexible and adaptive subsidiary solution, also based on S/4HANA, running in a public cloud. With the availability of SAP's PaaS solution, HANA Cloud Platform (HCP) further extends this model by providing a platform for additional functionality not found in S/4HANA, including direct connectivity to other SAP cloud assets, such as SAP Ariba, SuccessFactors, Hybris, and Concur, as well as providing a platform for building net-new functionality.

The ability to use the same product family – with its shared data structures, APIs, and extensibility platform – in a two-tier deployment, makes it possible to envision a better way to support a high degree of operational integration between headquarters and subsidiary operations without sacrificing the autonomy and local requirements that are sacrosanct in many subsidiaries. The fact that S/4HANA leverages the in-memory capabilities of the SAP HANA database allows it to support an unprecedented degree of real-time functionality both within a given tier as well as across tiers. Indeed, as we shall see, the two-tier S/4HANA opportunity, will unleash a degree of integration and business orchestration between headquarters and subsidiary operations that goes well beyond what has traditionally been considered two-tier ERP.

This report discusses the changes that have occurred in the global business world that simultaneously require a greater degree of integration and autonomy between headquarters and subsidiaries, and how that is driving companies to reassess their two-tier strategies in light of the capabilities of SAP S/4HANA as a platform for two-tier operations. This paper concludes with a discussion of the need to look beyond simple two-tier operations to the kind of multi-tier, or n-tier, extended enterprise environments that SAP S/4HANA can support.

[1] https://www.forrester.com/report/Its+Time+To+Clarify+Your+Global+ERP+Strategy/-/E-RES56991
https://www.constellationr.com/research/case-two-tier-erp-deployments

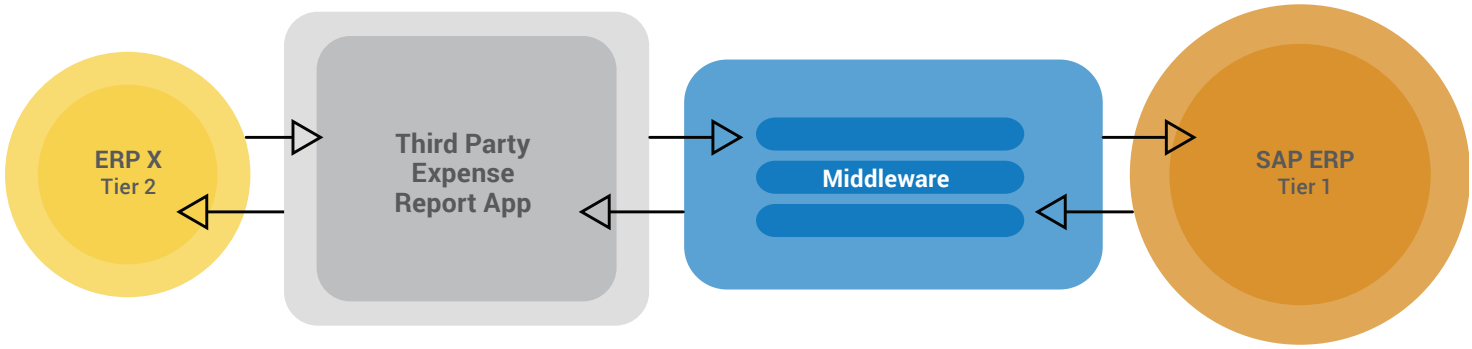
## Two-tier Enterprise Systems – The Limits of the Multi-vendor Model

Two-tier ERP grew up last century in a world that recognized the need for synchronization between headquarters and subsidiaries that nonetheless preserved local autonomy and support for local business processes and requirements. This imperative remains in place in the 21st century as well, but important changes in technology, business culture, and the demographics of the workplace have made synchronization a very different matter than it was in the past.

For many companies, two-tier synchronization meant ensuring that core functions like finance, manufacturing, warehousing, and distribution could be managed at the local level. This was typically accomplished using a mid-market ERP system alongside some other software tool to integrate data upstream to the ERP system of record at headquarters when needed. In a two-tier deployment with two different vendor products in use, this synchronization was managed in multiple ways, including integration via APIs, use of a third party message bus or middleware tool, or even a third party application as the intermediary between the two tiers. For the most part, data interchange in these two-tier systems was done in batch mode, meaning there was no support for real-time analysis or operations. Despite these efforts at data and process integration, the lack of real-time synchronization restricted decision-making to being based on outdated and incomplete information.

The expense management example below is only one of myriad ways in which two-tier ERP scenarios have been deployed in the past. This actual scenario was deployed at a large multi-national SAP customer in order to handle expense reporting from multiple subsidiaries into the SAP ERP system of record.

**Figure 1: Two-tier expense management synchronization using third party app and middleware**



While this two-tier model was highly functional when it was originally implemented, the above example typifies the limits of the two-tier, multi-vendor model. First and foremost is the complexity of inserting intermediary third-party applications and middleware into a business process that spans two tiers that are already challenged by having different vendor software running in each tier. This is the ironic truth about multi-vendor two-tier systems: the inherent complexity of running two different ERP systems is compounded by the need for additional software to complete the "hand-off" from one tier to another.

This added complexity has additional costs. These two-tier systems are hard to maintain and harder to upgrade: with two or more vendors' products in the mix, each one on its own upgrade cadence, these systems can be extremely brittle. Each time one of the vendors updates the features or functionality of their software, the customer and its service provider have to examine the changes to make certain they don't inhibit the synchronization between the tiers. Similarly, when it comes time to do a major upgrade of one of the dependent systems or of the process itself, the orchestration between the moving parts has to be closely examined to ensure that the upgrade doesn't break the process. The all-important function of application lifecycle management becomes increasingly difficult, and the opportunities for breaking the system abound.

### The Limits of Multi-vendor Two-tier Systems

- Different data models require complex integration and orchestration.
- Different vendors' upgrade cadences make processes and their interconnections brittle.
- Changing or creating new business processes creates further complexity.
- Net new innovation is hard to develop and deploy.
- Cloud migration is more complex and costly.
- Most multi-vendor integration is done in batch, and is therefore unable to support real-time processes.
- Lack of real-time interaction limits support for next generation business objectives.

These multi-vendor systems are also difficult to adapt to changes in business or technology strategy, and in fact can be significant barriers to innovation. If new functionality is needed that extends or leverages a business process that is based on a multi-vendor system, enabling that change can become excessively complex: the new functionality may be available from only one of the vendors, necessitating a customization job on the other tier. Even if all the vendors have native offerings that include whatever new functionality is required, adapting each vendor's data model, any new APIs, and of course the business processes themselves become a complex endeavor that can further exacerbate the brittleness of the system. This complexity expands if subsidiaries are given the flexibility to choose different regional solution providers.

Similarly, as companies migrate to the cloud, maintaining a multi-vendor process can become even more complex. The ability of such a system to support the migration of one or more components to the cloud is not always evident, and in fact such a migration may trigger the need for a complete overhaul of the process.

***The result is that many of the companies that deployed these multi-vendor two-tier models have seen their existing business processes and their aspirations to support increased levels of innovation stagnate in the face of this complexity.***

Even if these obstacles can be surmounted, in many cases the synchronization between tiers occurs in anything but real time. In all too many cases, that synchronization is done as a batch process, which severely limits the usability of the system, particularly in domains where real time responsiveness is becoming essential to business success, such as advanced supply chain and capacity planning, budgeting, and many others. The underlying complexity of these batch processes is not to be ignored: maintaining this integration requires considerable investment in ETL tools and processes, and a non-trivial effort in managing the data transformation and governance needed to sustain these efforts

Finally, these limits can also impact the increasing need to deliver next-generation analytics. The lack of real-time synchronization, combined with the different data models and the complexity of the orchestration layer, makes it difficult to support the kind of real time analytics needed to meet modern business requirements.

This means that as the business and technology environment changes, the brittleness of these multi-vendor systems becomes a liability. The need to support new business models – like those emerging in domains such as customer interaction, Internet of Things (IoT), logistics, advanced planning, talent management, supply chain and procurement – requires a degree of agility that multi-vendor systems have trouble supporting without adding more complexity. These limits become even more problematic when taking into account the technology shifts now at play in the market. Whether it's a matter of deploying new cloud-based apps, getting ready for new opportunities like IoT, or adapting business processes to new opportunities, multi-vendor systems are almost guaranteed to make the deployment and management of these solutions more complex than they should be.

The result is that many of the companies that deployed these multi-vendor two-tier models have seen their existing business processes and their aspirations to support increased levels of innovation stagnate in the face of this complexity. The ability to meet this challenge by offering a single-vendor two-tier solution that largely does away with these obstacles is what makes the evolution of SAP's S/4HANA product line so significant.

## S/4HANA in a Multi-tier Environment

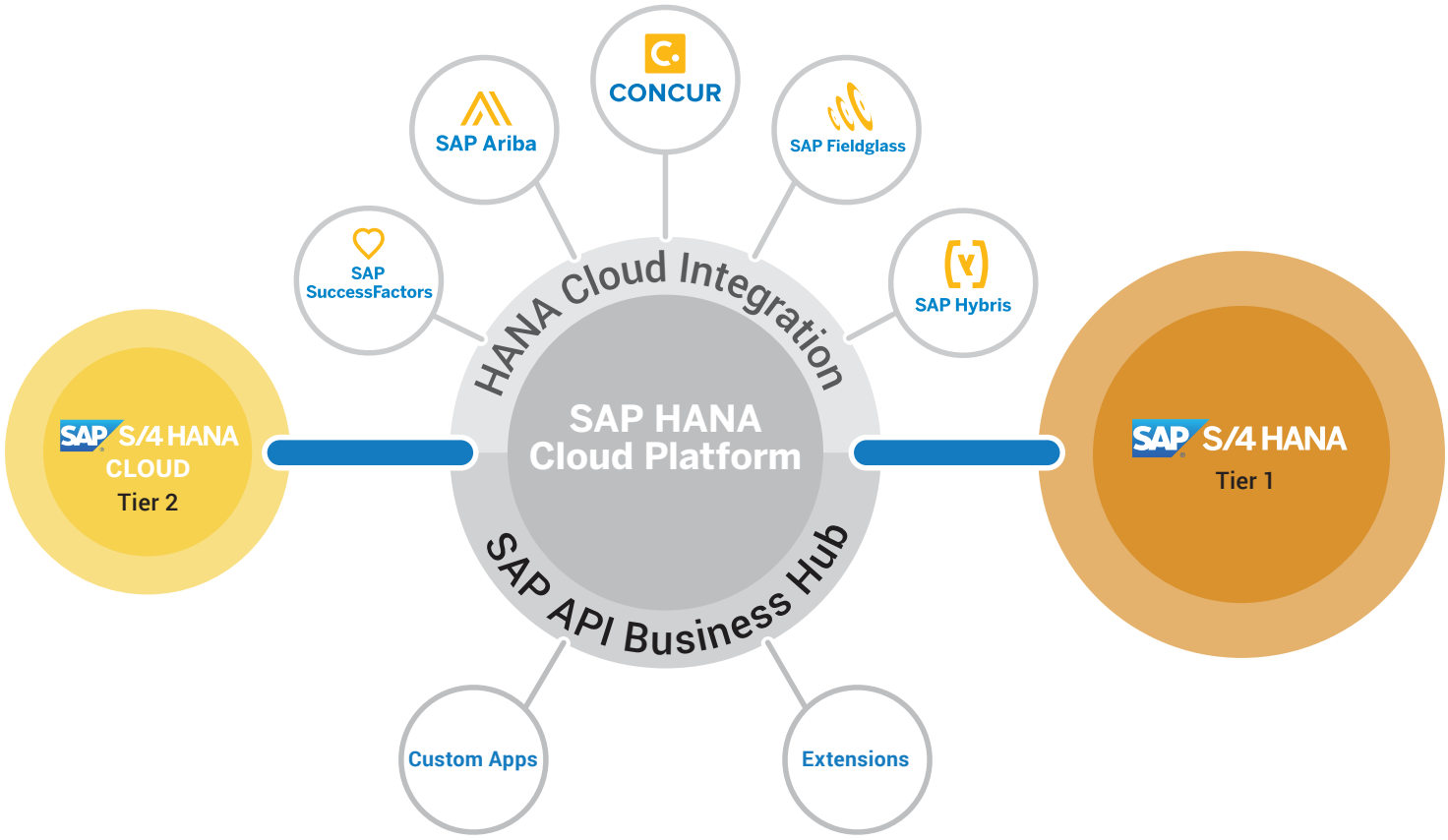
The current market stasis is now changing as SAP's S/4HANA cloud products have evolved to meet these myriad needs: SAP can now offer a viable single vendor tier-two, public cloud solution. That solution, running in a subsidiary, can be integrated with S/4HANA running on premise at headquarters, setting the stage for the next generation, multi-tier enterprise. This next generation two-tier model can actually have more than one manifestation within the SAP product family: The compatibility of the S/4HANA data model with SAP's on-premise ECC allows companies to run two-tier systems that include ECC in headquarter operations and S/4HANA in the second tier as well.

SAP's continuous evolution of its cloud strategy – the company now claims a leadership position in the market with over 110 million cloud users – lends credence to its plans for a two-tier strategy based on S/4HANA on-premise and S/4HANA Cloud. The prospect of S/4HANA supporting on-premise headquarter operations and S/4HANA public cloud offerings supporting two-tier or n-tier operations has a number of important benefits. In addition to the obvious benefits that cloud implementations provide – including elasticity, flexibility and rapid deployment, this solution combines the benefits of a cloud/on-premise hybrid with support for extensibility at the platform level: Functionality not available in the core of the S/4HANA cloud edition can be built and maintained in the SAP HANA Cloud Platform (HCP).

Additionally, this two-tier model provides, via HCP and its integration technology, access to other SAP cloud assets – like SAP SuccessFactors Employee Central, SAP Ariba procurement, and Fieldglass, among others. While some of the tier-two functionality in the S/4HANA public cloud product is still emerging, the vast majority of two or n-tier requirements will be met by the combination of S/4HANA on premise and S/4HANA public cloud. This should provide a sufficient planning window for most large companies contemplating a next generation two-tier or n-tier environment.

SAP's multi-tier approach is designed to meet a wide variety of scenarios, from a largely independent subsidiary that has minimal interoperability requirements with the head office, to a fully interdependent subsidiary operating in real-time synchronization with headquarters. Support for these different scenarios includes the ability to leverage SAP cloud assets, via HCP, in both subsidiary and headquarter operations. This allows for a fluid and comprehensive multi-tier strategy that in turn allows for access to enterprise-wide functions outside the core ERP functionality in a multitude of scenarios. (See figure 2.)

Figure 2:



A subsidiary can run a separate version of these SAP cloud assets, or connect to an enterprise-wide instance; whichever is most relevant for the business model. And, both headquarters and subsidiaries can add new SAP cloud functionality as needed, providing a single-vendor option for bringing on board key business processes in domains such as finance, human resources, talent management, contingent labor, time and expense billing, customer interaction, and procurement.

***The strategic choice that really matters at this juncture in the evolution of business and technology is about changing, adapting, or implementing new business processes that are enabled in software, without requiring extensive customization that would "break" the cloud model.***

SAP's two-tier and multi-tier offering is part of an important refinement to the notion that local subsidiaries must be given the choice to run whichever ERP system is realistic in their local setting, or, that a third party vendor's low-cost ERP system is sufficient to meet the needs of a subsidiary operating in the global economy of today. Rather, the strategic choice that really matters at this juncture in the evolution of business and technology is about changing, adapting, or implementing new business processes that are enabled in software – be they enterprise-wide processes or those specific to a local or micro-vertical need – without requiring extensive customization that would "break"' the cloud model. This is a far cry from the rationale that local "autonomy" trumps interconnectivity and business process synchronization with headquarters.

This new definition of choice requires that local subsidiaries leverage the new opportunities available in the cloud – inherent in using SAP's HANA Cloud Platform to extend S/4HANA – while using the same single-vendor cloud platform and software to maintain business continuity across the entire enterprise. This continuity is defined by the ability to leverage processes, data, and analytics across the enterprise without having to maintain the interoperability of sub-systems that would be required to accommodate the complexity inherent in a multi-vendor n-tier system. Making this functionality available from a single vendor's code base, data model, and platform is the reason S/4HANA is poised to change the stakes in two-tier and n-tier enterprise software systems.

There are other important capabilities that accrue to this new model of two-tier functionality. The knowledge acquired by implementing S/4HANA in one tier can be used to accelerate the implementation of S/4HANA in another. Attributes, such as master data, enterprise-wide KPIs, and business processes that are established in one tier can be readily transferred to the other. Indeed, once the configuration of a given S/4HANA tier is finalized, it can be used as a template to quickly bring other subsidiaries on board.

SAP's plans for a two-tier model based on S/4HANA can also support a strategy of relative stability in the core, and innovation at the edge. Rather than use an upgrade to S/4HANA as the jumping off point for innovation in the core, a company can choose to maintain its core headquarter business processes as it upgrades from ECC to S/4HANA. Innovation can be realized by using the capabilities of HCP to extend the overall functionality of the enterprise through the use of other SAP cloud assets, or as a platform for building applications that meet specific vertical or local requirements.

# Conclusion: S/4HANA, HCP, and the Nth Tier

The case for S/4HANA as a single-vendor two-tier solution has the added benefit of supporting additional "tiers" as they become relevant to an enterprise. The most obvious of these relates to the IoT opportunity. IoT devices, by virtue of the quality and quantity of their data, their location outside the "edges" of traditional enterprise IT, and the unique characteristics of their functionality and operations, will best be deployed as a separate tier in the enterprise. That tier will need specialized data connectivity and governance, access to Hadoop and other large-scale computing platforms, and other capabilities that will run best in the cloud. These requirements make a good case for treating IoT as a separate tier, one that needs to have the same connectivity and orchestration as any other tier, but, due to its specific requirements, is best left outside the traditional two-tier ERP model.

This is where the HCP component comes in. HCP can function as the connectivity hub for these kinds of assets, as well as the staging ground for the integration and analysis of their data. HCP can also serve as the platform for designing specific operational applications and services that leverage these devices' unique functionality and requirements, such as Hadoop, specialized machine learning, or predictive analytics capabilities. This allows HCP to provide the next generation of innovation – specifically the innovation not built into both the on-premise and cloud versions of S/4HANA – without breaking the requirement that cloud-based enterprise applications not be subject to customization.

The ability of S/4HANA to support these different multi-tier scenarios is still emergent, but SAP is closing in fast on being able to provide a broad and highly integrated functional footprint for its on-premise and cloud versions. The extent of this compatibility between cloud and on-premise versions across two or more tiers makes it appropriate to look at S/4HANA as a multi-tier solution today. This is particularly true for firms that are looking to support their complex business processes as they move towards achieving the business transformations that will be part of the cost of doing business, if not now, then sometime in the very near future.