What is system integration

System integration is the process of connecting different sub-systems (components) into a single larger system that functions as one.

With regards to Information Technology system integration is typically defined as the process of linking together various IT sub systems, services and/or software to enable all of them to work physically or functionally together.

A system is an aggregation of subsystems that makes it able to deliver the overall functionality. It adds the value to the system by integrating the existing systems.

Need of System Integration

- To improve productivity and quality of their operations.
- get the organizations various IT systems to “talk to each other” through the integration
- To speed up information flows and reduce operational costs for the organization.
- Not only used to connect an organization’s internal systems, but also third parties that the organization operates with.

System integration methods

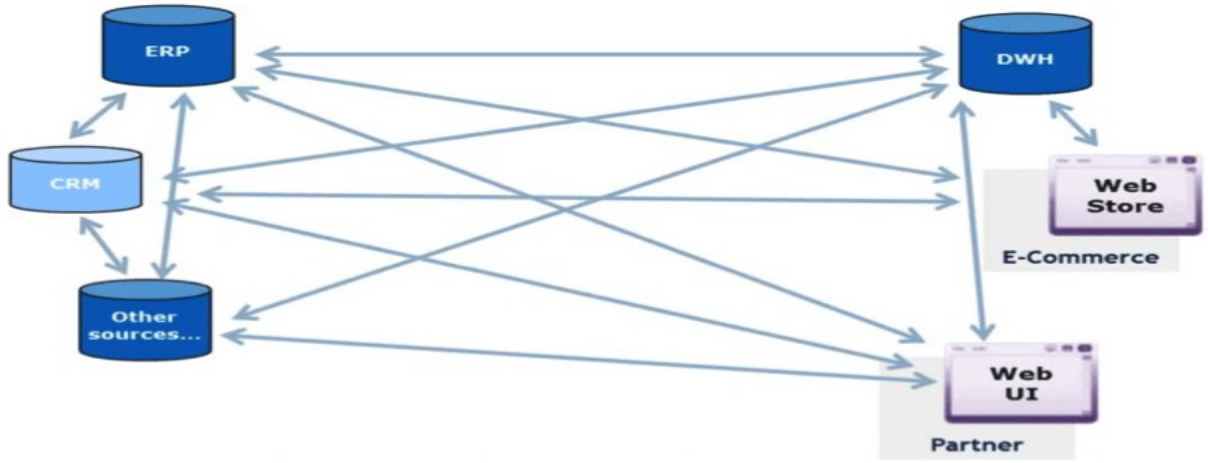
- Point-to-Point Integration
- Vertical Integration
- Star or spaghetti integration
- Horizontal Integration
- Common Data Format integration

Point to Point Integration

It connects a system to another system (sub system) for them to function together and It handles only one function and does not involve any complex business logic.

In a point-to-point integration architecture, when two applications need to communicate with one another, a connection is established and a connector enables application A to speak to application B by sending a message or executing a procedure. A connector is a bridge that allows access to data or application functionalities in a structured manner. Connectors handle the

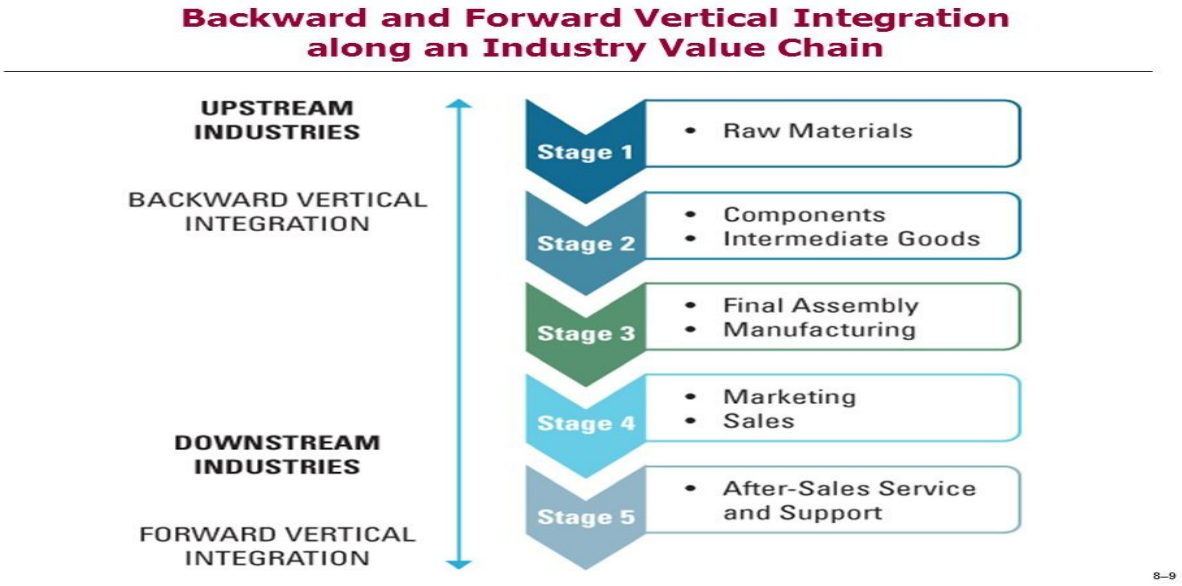
complexities of message translation, integration and any other relating messages operations used to access the application features. When is needed to change either application A or B, the interface needs to be updated in both, and if we add one more application C, for our applications universe to be fully integrated we have six connectors to update and maintain, and this number grows with each application added.



While the advantage of point-to-point integration is its simplicity, the disadvantage is its complexity. Even though it is highly advantageous in scenarios where the universe of applications is small, as this number grows, maintenance becomes very problematic and expensive; originating what is commonly called “spaghetti” architecture. If we want to avoid this “spaghetti”, we need to provide an intermediate layer that can isolate the changes between applications, effectively reducing the coupling. To do this, we use middleware.

Vertical Integration

The system components (sub-systems) are integrated by creating functional "silos", beginning with the basic bottom function. This is normally relatively simple and easy method that only involves a limited number of systems (more than two), but on the other hand, this integration method is quite rigid and more difficult to manage in the long term as any new functionally will require its own functional ”silo”. Still, this method can be used effectively to create simple integrations that only need to address a single function.



Star Integration (Spaghetti Integration)

Star integration means that a system where each sub-system is connected with other sub-systems using point-to-point connections. This allows for more functionality, but as the number of integrated systems increases the number of integrations also increases significantly, and the management of the integrations becomes very demanding. As an example, to connect ten systems to each other using this method, will require 45 separate integrations, and every time there is a change in one system, nine connections may need to be re-done as well. Sometimes Star Integration is there for also referred to as "Spaghetti Integration" as an analogy to “Spaghetti code”.

Advantages

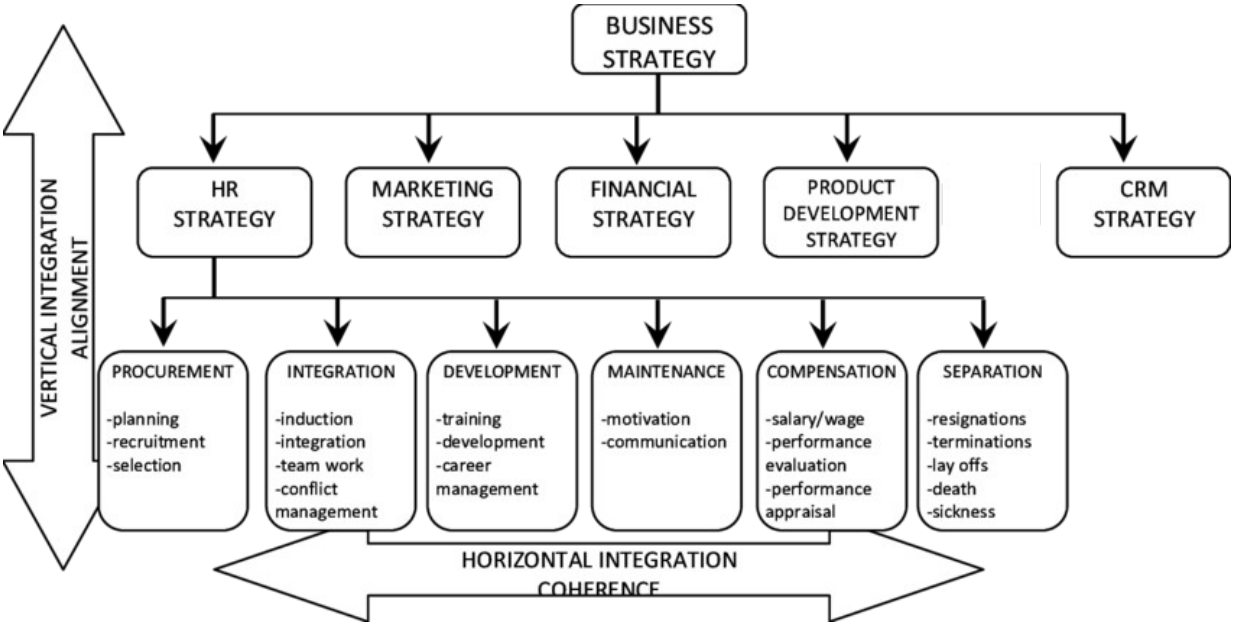
- If one node or its connection breaks it doesn’t affect the other computers and their connections.
- Devices can be added or removed without disturbing the network

Disadvantages

- An expensive network layout to install because of the amount of cables needed
- The central hub is a single point of failure for the network.

Horizontal Integration

In horizontal integration, a separate sub-system is used as a common interface layer between all sub-systems. Very often this layer is referred to as an Enterprise Service Bus (ESB). This method allows each sub-system to have just one single interface to communicate with all the other sub-systems connected to the common interface layer (i.e., with ten system, there are only ten connections). The benefit of this method is also that each sub-system can be changed or even replaced without having to re-do the interfaces of any other systems.



Common Data Format integration

Integration different IT systems to each other usually require that the data coming out from one system needs to be transformed to a different data format used by the receiving system. As with the Star Integration, if each transformation needs to be done system-by-system basis, the number of data transformations increases significantly and becomes a high maintenance task. To overcome this problem, common data format approach, allows each system to do only one data conversion from its native format to the common (and vice versa). This way the number of required data transformations is just a high as the number of the sub-system

Role of System Integrator

System integrator is enables the data integrations between the different existing systems of the end customer defined in the project scope. This may mean anything starting from simple internal point-to-point connections to very complex many-to-many integrations both internally and with third parties.

The systems integrator involved in designing , implementing, testing the integration solution, and continuous management of the solution as well as contacting third parties to enable connections with them.

System Integrator can be a company that specializes in implementing, planning, coordinating, scheduling, testing, improving and sometimes maintaining IT systems. Good examples of SIs are, e.g., Deloitte, IBM, Accenture, TCS, etc.

System Integration Challenges

- **Constant changes of the integration landscape**

  The longer the project takes, the more significant this issue becomes. Short integration projects could improve the success rate of the project. Further, an agile working methodology that can cater to changing requirements along the way and also after the project is essential for the success of the systems integration.

- **Lack of skilled resources**

  System integration requires expertise that is not easy to come by. Having excellent integration technology is not enough if the required expertise is not there. Most companies struggle to find and retain employees with the required skills set for system integration. The best way to tackle this issue is to use an external third-party provider that can bring the needed integration expertise into the table as required, in addition to providing the integration technology.

- **Lack of accountability**

  When integrating many different sub-systems, the accountability for the success of the integration becomes blurred very easily. You may have multiple stakeholders (e.g., vendors, system owners, etc.) in the equation, none of whom is responsible for the entire system integration. They only care and handle their side of integration at best, but they will not venture outside their own territory. But integration always has more than one party. So, when something goes wrong, the situation turns very easily to finger pointing and blaming

the other parties, instead of someone “owning” the integration. If a single party handles the system integration project, that party is also (often contractually) responsible for the success of such a system integration project, and there is no ambiguity over accountability.

- **Legacy System Integration**

  Most companies that have done business for decades have some old, legacy IT systems in use and running on their own on premise servers. These systems may be essential to the core business of the organization and cannot be replaced easily with a more modern IT system. Integration with such legacy systems may be tricky as they may completely lack any ready-made interfacing capability. Most systems do, however, have the capability to read or write information into a file folder that can the accessed, e.g., through an FTP connection by another system, but sometimes the only way to integrate such sub-systems with other sub-systems is to read and/or write data directly in their database.

How to overcome the challenges

1. Consolidate Disparate Applications

Rather than continuing to rely on disparate, legacy, and outdated systems, modernizing your IT environment allows you to streamline communications, while gaining more automation, control, and visibility, which strengthen those partner relationships.

2. Built-In Connectors for the Most Common Applications

A centralized platform comes pre-loaded with application, SaaS, and B2B/EDI integration connectors to power an enterprise, whether it’s on premise or in the cloud. The right solution allows you to customize and integrate applications to suit your business needs without any additional scripting.

3. Automate Common Business Processes

Automation saves time and money by replacing manually initiated processes with software that reduces errors, enhances your work and process flow, while lowering expenses and improving efficiency across the board.

4. Reduce Dependency on Customized Solutions

Remaining dependent on customized solutions also means you sink more up-front costs into your tools, and it requires developer sources that have inherent risks, as well as needing developers to communicate throughout the software development cycle.

5. Cloud-based iPaaS(integration Platform as a Service) solutions typically use local, on premise adapters that provide the needed functionality for these integrations. Such adapters act as an active local “interface” between the passive legacy system (or its database) and the cloud-based iPaaS solution.