Overview of System Integration and the Types and Technologies
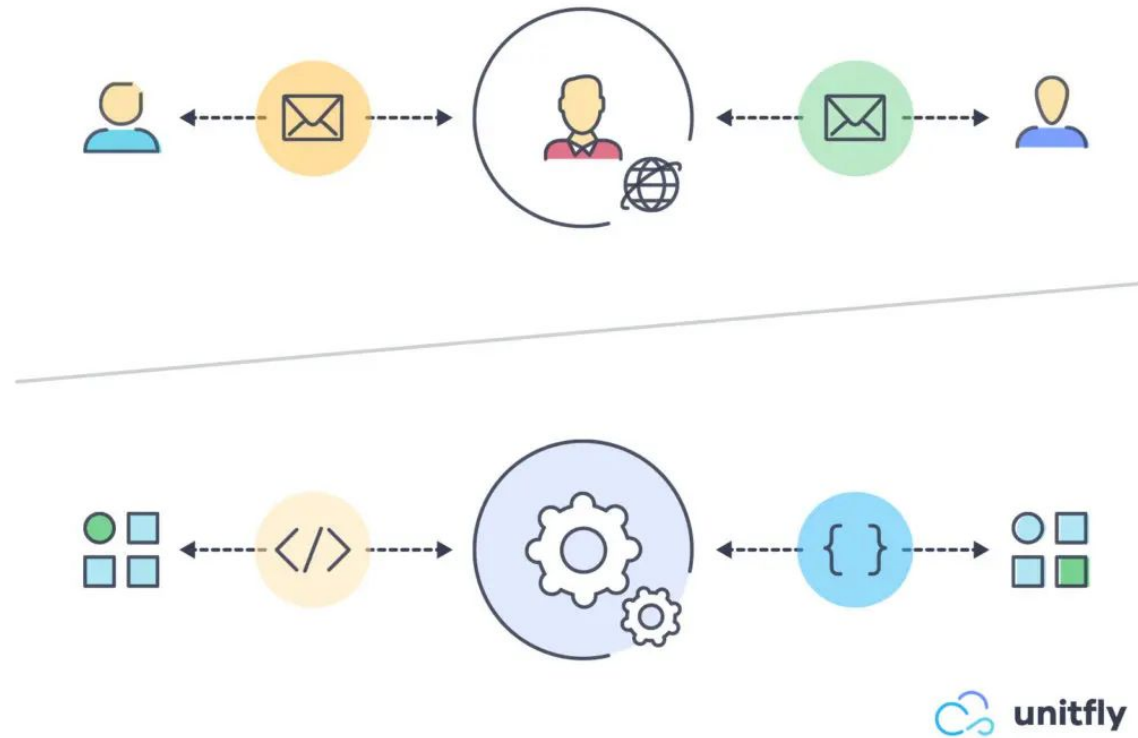
Lesson 1

Objectives

- To introduce the nature of systems integration.

- To enumerate the importance of systems integration.

- To define ERP.

- To discuss the organization structure before systems integration.

Systems Integration

- System integration is a process of connecting two or more systems together.

Types of systems integration

- Enterprise Application Integration (EAI)
  - Enterprise Application Integration is a service-based integration. It's a process that communicates with different services, gathers data, and then proceeds with further steps based on desired action or a workflow. Process can be triggered with the exposed service.

- Data Integration (DI)
  - Usually, every company has a lot of different data sources (or databases). When you want to consolidate your services into one central point of access you need data integration. Data integration enables gathering of data from all services, aggregating, and transforming them into a central place for interactive reporting, most commonly used for management.

- Electronic Data Interchange (EDI)
  - Electronic Document Interchange is core business to business-oriented process. It functions on paperless exchange of documents and electronic standards. By automating paper-based business, companies save time and eliminate cost and errors.

# EAI Mesh networks vs. EAI Hub networks

EAI Mesh networks vs. EAI Hub networks

- Another difference between mesh and hub networks is that in a mesh network, every system must know the data format of every other system. Each system must be able to transform its data format into those of the other systems. But in a hub network the hub is responsible for data transformation. Each system needs to only know the data format expected by the hub.

Data Integration

Data integration, put simply, is the process of consolidating data from various sources into a single data set - offering a unified view of the data and efficiently managing it, making it accessible for those who wish to utilize it.
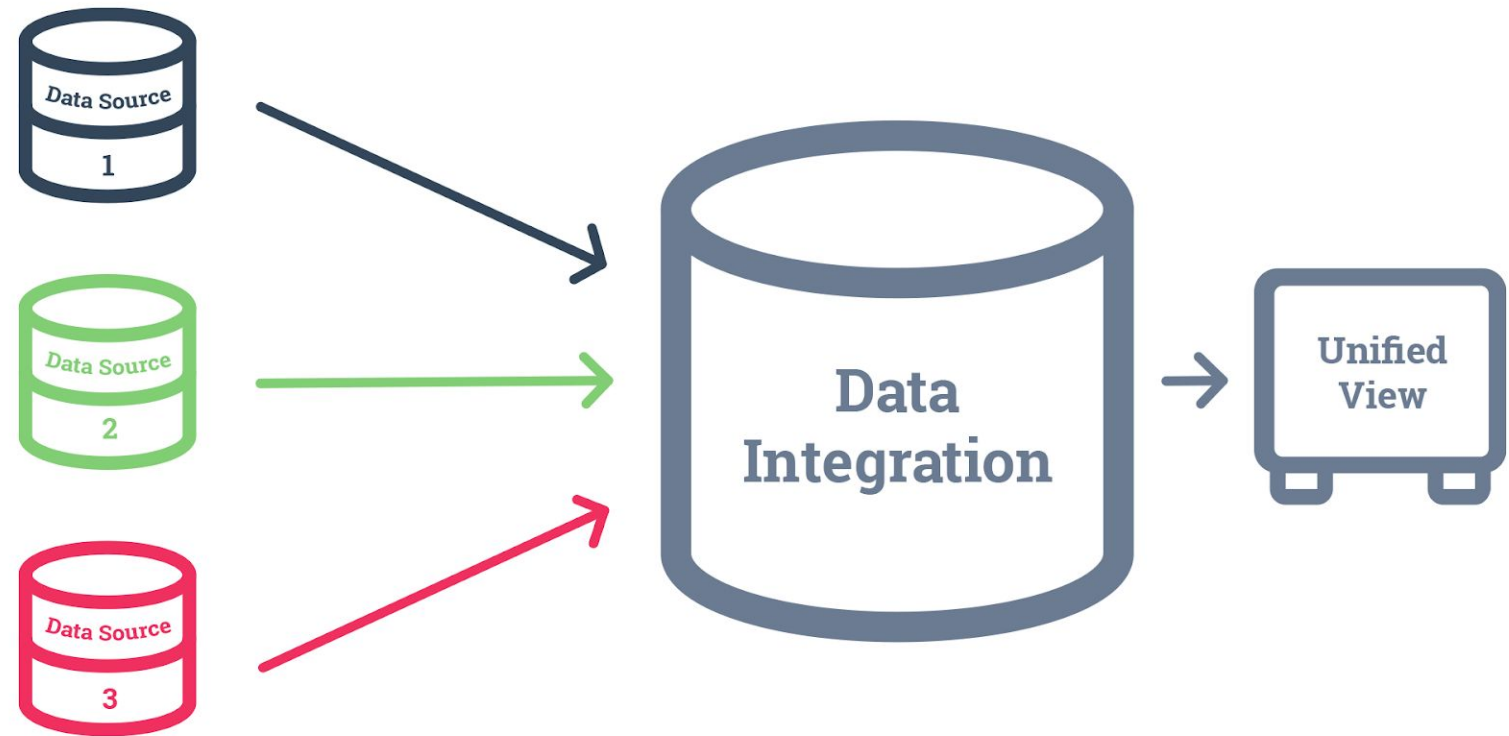
Data Integration as a Service
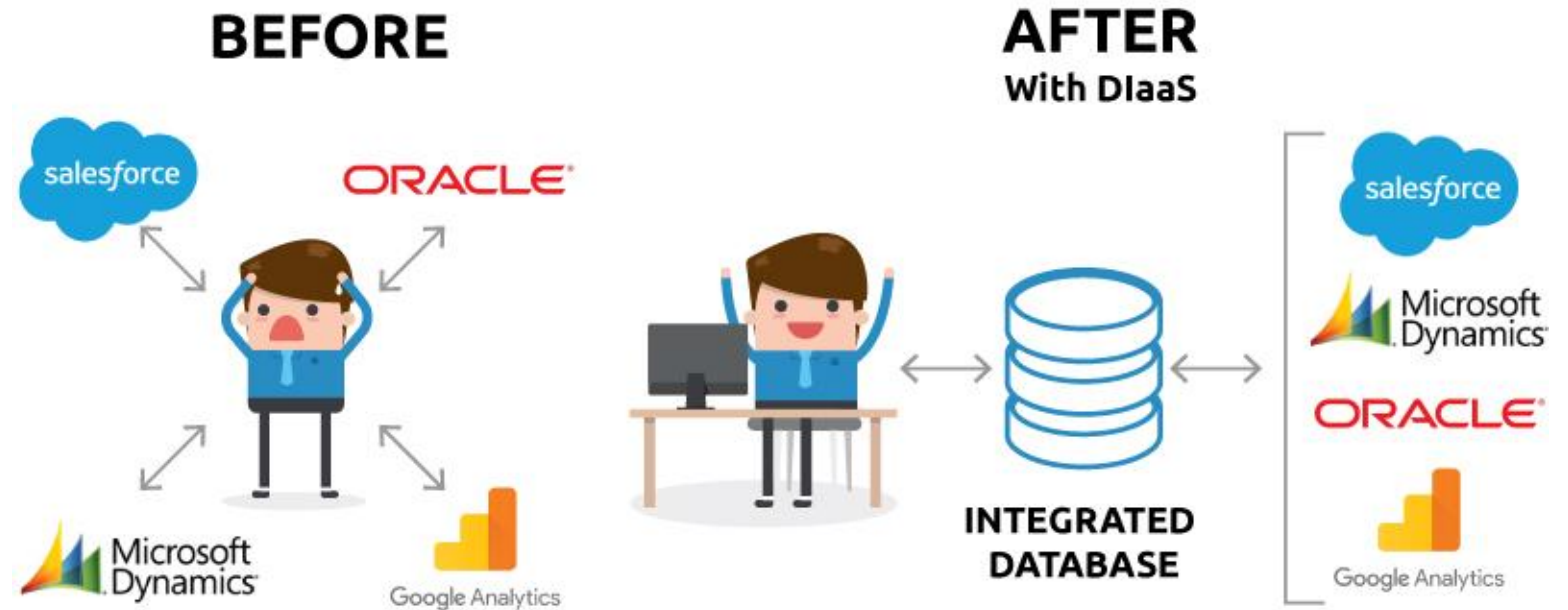
Application Integration vs. Data Integration

- Data integration technologies were introduced as a response to the adoption of relational databases and the growing need to efficiently move information between them, typically involving data at rest. In contrast, application integration manages the integration of live, operational data in real time between two or more applications.

- The ultimate goal of application integration is to enable independently designed applications to operate together, which requires data consistency among separate copies of data, management of the integrated flow of multiple tasks executed by disparate applications, and, similar to data integration requirements, a single user interface or service from which to access data and functionality from independently designed applications.

- A common tool for achieving application integration is cloud data integration, which refers to a system of tools and technologies that connects various applications for the real time exchange of data and processes and provides access by multiple devices over a network or via the internet

Data integration techniques

- **Extract, Transform and Load:** copies of datasets from disparate sources are gathered together, harmonized, and loaded into a data warehouse or database

- **Extract, Load and Transform:** data is loaded as is into a big data system and transformed at a later time for particular analytics uses

- **Change Data Capture:** identifies data changes in databases in real-time and applies them to a data warehouse or other repositories

- **Data Replication:** data in one database is replicated to other databases to keep the information the information synchronized to operational uses and for backup

- **Data Virtualization:** data from different systems are virtually combined to create a unified view rather than loading data into a new repository

- **Streaming Data Integration:** a real time data integration method in which different streams of data are continuously integrated and fed into analytics systems and data stores

Real-world example

Data integration methods

- **Manual data integration**: Data managers must manually conduct all phases of the integration, from retrieval to presentation.

- **Middleware data integration**: Middleware, a type of software, facilitates communication between legacy systems and updated ones to expedite integration.

- **Application-based integration**: Software applications locate, retrieve, and integrate data by making data from different sources and systems compatible with one another.

- **Uniform access integration**: A technique that retrieves and uniformly displays data, but leaves it in its original source.

- **Common storage integration**: An approach that retrieves and uniformly displays the data, but also makes a copy of the data and stores it.

Manual Data Integration

- Manual data integration occurs when a data manager oversees all aspects of the integration — usually by writing custom code. That means connecting the different data sources, collecting the data, and cleaning it, etc., without automation.

- Some of the benefits are:
  - **Reduced cost**: This technique requires little maintenance and typically only integrates a small number of data sources.
  - **Greater freedom**: The user has total control over the integration.

- Some of the cons are:
  - **Less access**: A developer or manager must manually orchestrate each integration.
  - **Difficulty scaling**: Scaling for larger projects requires manually changing the code for each integration, and that takes time.
  - **Greater room for error**: A manager and/or analyst must handle the data at each stage.

- This strategy is best for one-time instances, but it quickly becomes untenable for complex or recurring integrations because it is a very tedious, manual process. Everything from data collection, to cleaning, to presentation is done by hand, and those processes take time and resources.

Middleware data integration

- Middleware is software that connects applications and transfers data between them and databases. It's especially handy when a business is integrating stubborn legacy systems with newer ones, as middleware can act as an interpreter between these systems.

- Some of the benefits are:
  - **Better data streaming**: The software conducts the integration automatically and in the same way each time.
  - **Easier access between systems**: The software is coded to facilitate communication between the systems in a network.

- Some of the cons are:
  - **Less access**: The middleware needs to be deployed and maintained by a developer with technical knowledge.
  - **Limited functionality**: Middleware can only work with certain systems.

- For businesses integrating legacy systems with more modern systems, middleware is ideal, but it's mostly a communications tool and has limited capabilities for data analytics.

Application-based integration

- In this approach, software applications do all the work. They locate, retrieve, clean, and integrate data from disparate sources. This compatibility makes it easy for data to move from one source to the other.

- Some of the benefits include:
  - **Simplified processes**: One application does all the work automatically.
  - **Easier information exchange**: The application allows systems and departments to transfer information seamlessly.
  - **Fewer resources are used**: Because much of the process is automated, managers and/or analysts can pursue other projects.

- Some of the cons include:
  - **Limited access**: This technique requires special, technical knowledge and a data manager and/or analyst to oversee application deployment and maintenance.
  - **Inconsistent results**: The approach is unstandardized and varies from businesses offering this as a service.
  - **Complicated setup**: Designing the application(s) to work seamlessly across departments requires developers, managers, and/or analysts with technical knowledge.
  - **Difficult data management**: Accessing different systems can lead to compromised data integrity.

- Sometimes this approach is called enterprise application integration, because it's common in enterprises working in hybrid cloud environments. These businesses need to work with multiple data sources — on-premises and in the cloud. This approach optimizes data and workflows between these environments.

Uniform access integration

- This technique accesses data from even more disparate sets and presents it uniformly. It does this while allowing the data to stay in its original location.

- Some of the advantages are:
  - **Lower storage requirements**: There is no need to create a separate place to store data.
  - **Easier data access:** This approach works well with multiple systems and data sources.
  - **Simplified view of data**: This technique creates a uniform appearance of data for the end user.

- Some of the difficulties are:
  - **Data integrity challenges**: Accessing so many sources can lead to compromising data integrity.
  - **Strained systems**: Data host systems are not usually designed to handle the amount and frequency of data requests in this process.

- For businesses needing to access multiple, disparate systems, this is an optimal approach. If the data request isn't too burdensome for the host system, this approach can yield insights without the cost of creating a backup or copy of the data.

Common storage integration

- This approach is similar to uniform access, except it involves creating and storing a copy of the data in a data warehouse. This leads to more versatility in the ways businesses can manipulate data, making it one of the most popular forms of data integration.

- Some of the benefits include:
  - **Reduced burden:** The host system isn't constantly handling data queries.
  - **Increased data version management control**: Accessing data from one source, versus multiple disparate sources, leads to better data integrity.
  - **Cleaner data appearance**: The stored copy of data allows managers and/or analysts to run numerous queries while maintaining uniformity in the data's appearance.
  - **Enhanced data analytics**: Maintaining a stored copy allows manager and/or analysts to run more sophisticated queries without worrying about compromised data integrity.

- Some of the cons include:
  - **Increased storage costs**: Creating a copy of the data means finding and paying for a place to store it.
  - **Higher maintenance costs**: Orchestrating this approach requires technical experts to set up the integration, oversee, and maintain it.

- Common storage is the most sophisticated integration approach. If businesses have the resources, this is almost certainly the best approach, because it allows for the most sophisticated queries. That sophistication can lead to deeper insights.

Which data integration is right for your business?

Data integration approach	When to use it
Manual data integration	Merge data for basic analysis between a small amount of data sources
Middleware data integration	Automate and translate communication between legacy and modernized systems
Application-based integration	Automate and translate communication between systems and allow for more complicated data analysis
Uniform access integration	Automate and translate communication between systems and present the data uniformly to allow for complicated data analysis
Common storage integration	Present the data uniformly, create and store a copy, and perform the most sophisticated data analysis tasks

Electronic Data Interchange

- Electronic Data Interchange (EDI) is the electronic interchange of business information using a standardized format; a process which allows one company to send information to another company electronically rather than with paper. Business entities conducting business electronically are called trading partners.

- Many business documents can be exchanged using EDI, but the two most common are purchase orders and invoices. At a minimum, EDI replaces the mail preparation and handling associated with traditional business communication. However, the real power of EDI is that it standardizes the information communicated in business documents, which makes possible a "paperless" exchange.

- The traditional invoice illustrates what this can mean. Most companies create invoices using a computer system, print a paper copy of the invoice and mail it to the customer. Upon receipt, the customer frequently marks up the invoice and enters it into its own computer system. The entire process is nothing more than the transfer of information from the seller's computer to the customer's computer. EDI makes it possible to minimize or even eliminate the manual steps involved in this transfer.

Traditional Document Exchange vs. EDI Document Exchange of a Purchase Order

A Traditional Document Exchange of a Purchase Order	An EDI Document Exchange of a Purchase Order
This process normally takes between three and five days.	**This process normally occurs overnight and can take less than an hour.**
•Buyer makes a buying decision, creates the purchase order and prints it. •Buyer mails the purchase order to the supplier. •Supplier receives the purchase order and enters it into the order entry system. •Buyer calls supplier to determine if purchase order has been received, or supplier mails buyer an acknowledgment of the order.	•Buyer makes a buying decision, creates the purchase order but does not print it. •EDI software creates an electronic version of the purchase order and transmits it automatically to the supplier. •Supplier's order entry system receives the purchase order and updates the system immediately on receipt. •Supplier's order entry system creates an acknowledgment an transmits it back to confirm receipt.

Thank You and God bless.

Assignment #1

- Discuss and compare at least five (5) data integration services available from the internet.

- Deadline: Nextweek